Response

to Main Document

Achim Mueller/SCH/SKF
07/12 01:08 AM

Subject: Raceway Qualification Test with Pre-Damaged THU2 BTF-0065

Response to: Inspection and Test Reports

Category:

st021209.doc

Raceway Qualification Test with Pre-Damaged THU2 BTF-0065

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st02t209 1496576kB Achim Müller

Content

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	Conclusion	**page 4**

Tabellen und Bilder

Key words: Truck Hub Unit, Raceway Qualification Test, Damage

Test Description

A THU has been pre-damaged due to non rotation during assembly (see report ST02T207). This bearing was then put on a THU test rig and run under "Raceway Qualification Test" conditions.

These test conditions are chosen such, that heavy but realistic corner loads, which may occur under normal operation, are simulated. The dominant loading condition (85% of the test time) simulates + 0.25 g cornering load. Road recordings ("Service Condition Recordings...", NL93T035, G.-J. Scheers) are proposing that this condition occurs with a percentage of less than 0.3% under linehaul service. It is assumed that during city delivery, a similar cornering condition is present for less than 2% of the total service life of a vehicle.

Based on this information it is a safe assumption that every hour of test time, the test rig operates at 500 rpm, simulates approximately 2650 miles of operation under city delivery condition, while it represents more than 8000 miles under linehaul conditions.

Test Results

The reported bearing was operating for 395 hours when a vibration level, which was twice as high as the base level of the already damaged bearing was measured. These 395 hours would be already equivalent to approximately 1,000,000 miles of city delivery condition. Upon inspection small damages on the inboard outer ring raceways were detected (see picture 1).

Picture 1: circumferential operation traces and scratches on run, predamaged THU outer ring raceway

During a Design Verification Test, these scratches would have been evaluated as bearing damage, and the test would have been terminated.

Since the target of this test was to demonstrate the feasibility of a 50,000 miles inspection interval, it has been decided to continue the test instead of investigating the observed damage in detail.

Upon restarting of the test, the bearing was overloaded by mistake. The overload was such that a axial load equivalent to approximately 1 g was acting on the THU. The bearing was immediately heavily damaged on the raceways and inner ring guiding flanges (see picture 2). Nevertheless the test was continued with this, now excessively, damaged bearing.

Picture 2: THU cone after overload

The bearing is operating since then for 32.5 hours under the earlier described test condition. The test time would translate into approximately 86,000 miles of field operation under city delivery conditions.

During the test, inboard and outboard inner ring temperatures were recorded (see table 1). After test termination, the axial endplay of the Truck Hub Unit was determined to be 0.315 mm.

Test Time [h]	Inboard inner ring temp. [°C]	Outboard inner ring temp. [°C]
6	130	not recorded
11.6	150	130
18.7	165	133
25	180	140
28.4	180	140
32.5	190	150

Table 1: Inner ring temperatures

Conclusion

From the above result it is concluded, that a damage caused by a wrong assembly method (i.e. no rotation during clamping) will not immediately affect the bearing performance. It is, however, to be expected that such damage will reduce the potential service life of a Truck Hub Unit.

The heavy bearing damage caused by mistake would have been noticed during a "Basic Inspection" of the wheel end. The wheel would have been considered as rotating rough and noisy. Continuing the test for another 32.5 hours (equivalent to 86,000 miles under city delivery condition) shows that the chosen 50,000 miles interval between two "Basic Inspections" is sufficient to detect bearing damages prior to a safety critical condition of the wheel end.

Response to Main Document Achim Mueller/SCH/SKF 07/17 01:22 AM	**Subject:** Raceway Qualification "Water Contaminated Grease" **Response to:** ☐ Inspection and Test Reports **Category:**

st021210.doc

Raceway Qualification Test on BTF-0065 with "Water Contaminated Grease"

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st02t210 1460736kB Achim Müller

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Tabellen und Bilder

Key words: Truck Hub Unit, water contamination, raceway qualification,

1. Objective

To demonstrate the performance of a THU with water ingress under Raceway Qualification Test Conditions.

2. Test Bearings

Test Bearing: BTF-0065 manufactured by Aiken USA

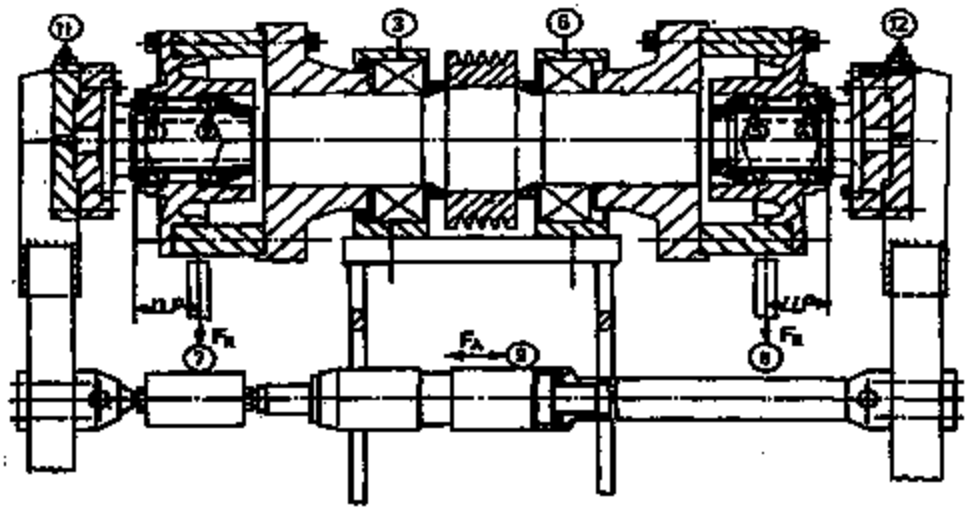
Customer: ArvinMeritor

Application: 13200 lbs Front Steer Axle

3. Test Rig

The test was performed on SKF Truck Hub Unit test rig THU4 in Schweinfurt, Germany. A principle sketch of the test rig is shown below.

Picture 1: Principle sketch of the THU test rig



Two bearing units are running at the same time. Radial and lateral load are applied with hydraulic cylinders as under road running conditions.

Radial load is applied independently to each unit, lateral load is applied via a single rod to both units at the same time. The lateral load, applied at a loading radius equivalent to the tire radius, creates a moment load in the unit.

The spindles are equipped with thermocouples to measure the bearing temperature. Also the rig support bearing temperature and vibration level for alert stop are measured.

Rotational speed and loads are electronically controlled and monitored.

A picture of the THU test rig is shown below in picture 2.

Picture 2: Truck Hub Unit test rig

4. Test Description

This test is designed to evaluate the raceway fatigue life of the tested THU under severe but realistic conditions. The conditions have been chosen to accelerate the test while ensuring a realistic failure mode. The test does not determine the L_{10} life of the test THU since not enough bearings are tested for such an evaluation.

5. Test conditions

5.1 Test Target

Two units will be tested until failure or max $2*L_{10}$. In this case L_{10}= 208 hours. L_{10} is calculated using SKF computer program BEACON assuming the load cycle below.

5.2 Load Conditions

Time [sec.]	Acceleration (g)	F_{rad} (kN)	F_{lat} (kN)
102	0.25	40.4	10.1
3	0	29.4	0
12	-0.25	18.5	-4.6
3	0	29.4	0

5.3 Assembly Conditions

Load line from vehicle inside (LLP):	62.5mm
Wheel radius:	533mm
Clamp force of the inner rings:	80 kN
Speed:	500 min^{-1}
Cooling:	air cooling equivalent 100km/h
Temperature measuring points:	measured in the spindles under the raceways with thermocouples

5.4 Remarks

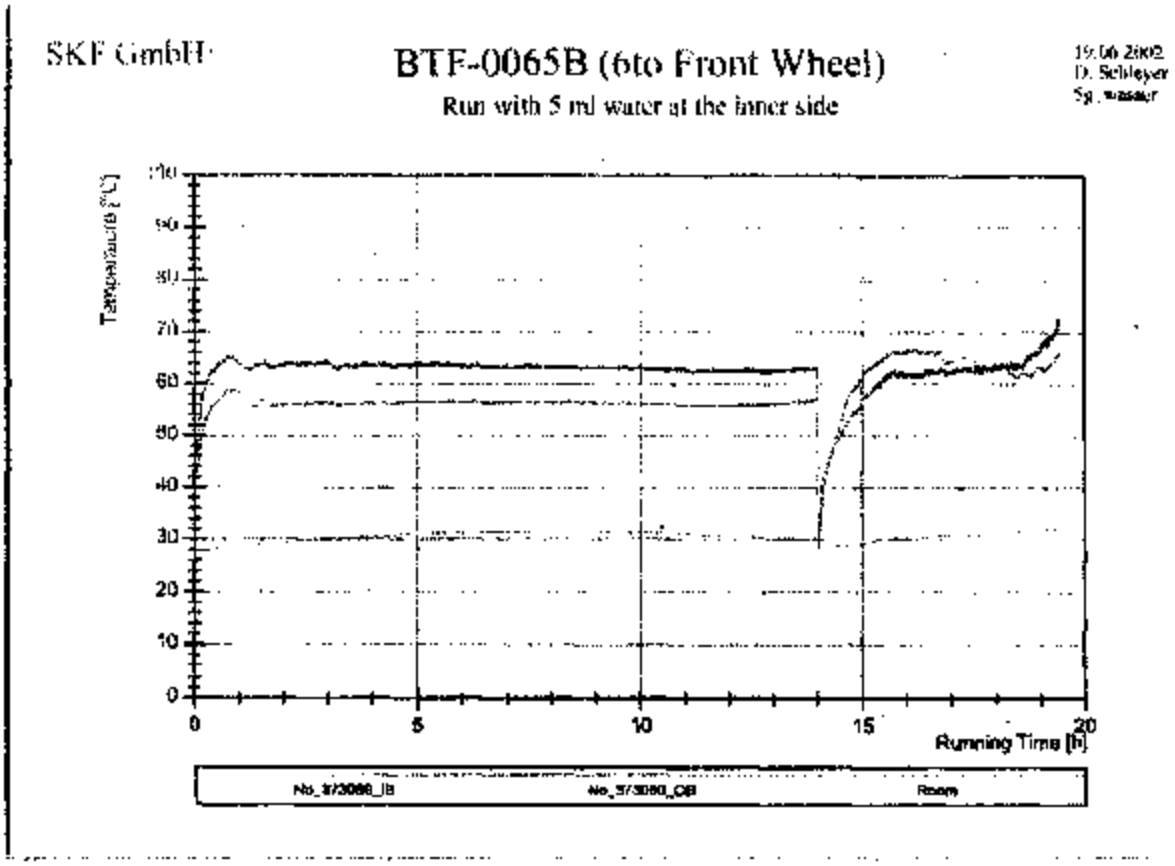
Both bearings were lubricated with 61 grams of grease in which 1.5% of water (0.9 gram) were dispersed. One bearing was equipped with an R-SAFE type seal, the other with a garter seal. After 37.5 hours of operation, the rig was stopped and a grease sample was taken from the bearing with the R-SAFE seal. The amount of water in the grease dropped to 0.3%, i.e. water is evaporating during operation.

The missing amount of grease was substituted and 5 grams of water were injected to the inboard inner ring retaining flange.

The earlier mentioned test cycle was run for 14 hours continuously, followed by a standstill period of 10 hours.

6. Test Results

After the addition of the aforementioned 5 grams of water, the test bearing completed 14 hours of operation and the following standstill period. Upon restart of the operation, it was noticed that the bearing temperature increased steadily, indicating a bearing damage (see picture 3).

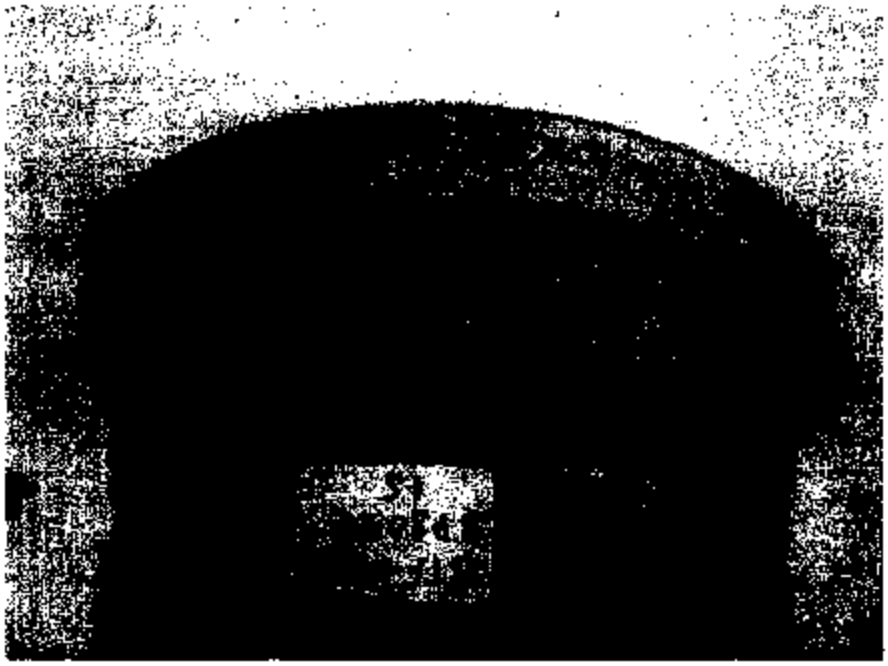


Picture 3: Temperature recording indicating bearing damage after standstill period

The bearing was run for additional 4.5 hours until it was decided to terminate the test.

7. Bearing conditions after the test

After disassembly and cleaning of the bearing, the inboard inner ring of the unit shows several shallow spalls (see picture 4). The appearance of the roller raceways is shiny.



Picture 4: Spalled inboard inner ring raceway (the arrow indicates the sense of rotation)

Grease samples were taken from both units. It was determined that the bearing with the garter seal showed only traces of water. The amount of water in the spalled unit was reduced to approximately 1.5 grams only.

8. Conclusions

The damage of the spalled unit has the same appearance as damages of bearings returned from the field (see ST02T206). This confirms that even relatively small amounts of water, entering a Truck Hub Unit will cause major damage in a short time.

It could furthermore be demonstrated that water, which entered the bearing, eventually evaporates during operation. This can explain the presence of salt and other minerals in bearings returned from the field, without obvious water content in the lubricant.

Response

to Main Document

Achim Mueller/SCHESKF
07/17 06:44 AM

Subject: Stud Assembly Test

Response to: ☐ Inspection and Test Reports

Category:

st021211.doc

SKF Report. No.: Supplement ST02T205 Updated: Mar 11, 2003Total Pages: 3
Page # 1

AIR LEAK TEST

Additional Investigations

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st02t205supplement 458752kB Achim Müller

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Tabellen und Bilder

Key words: Truck Hub Unit, Air Leak Test,

Test Description

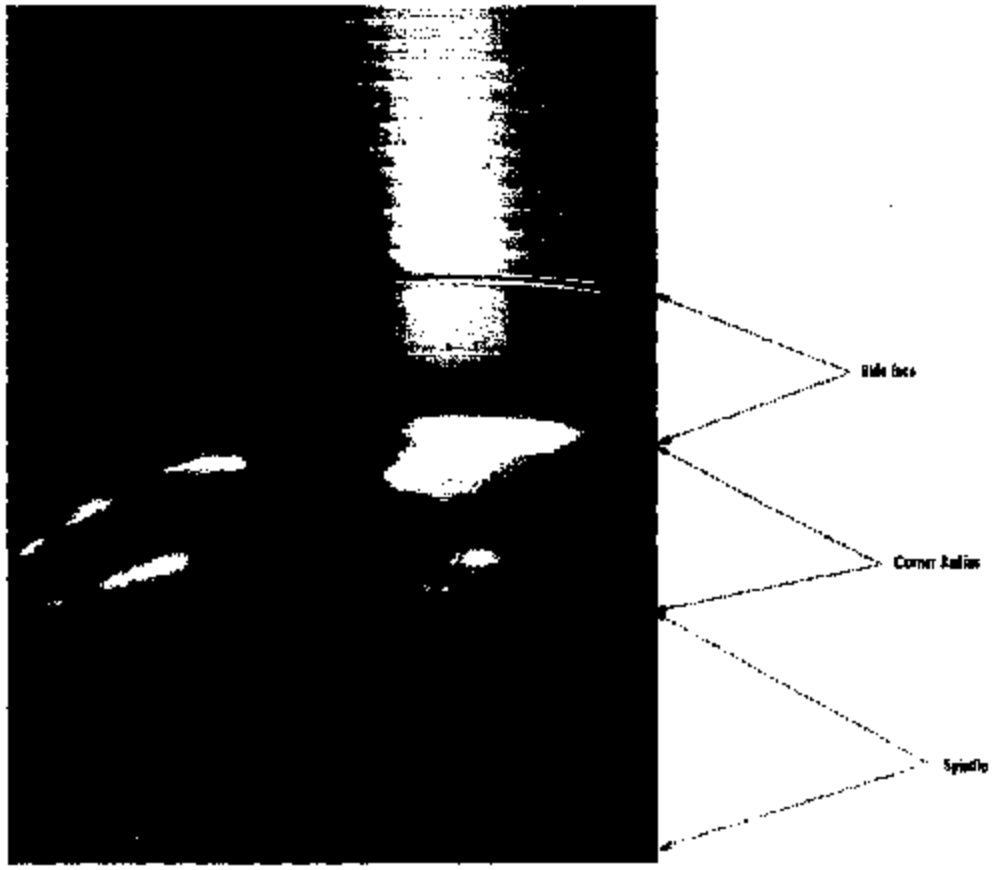
Additional air leak tests as described in ST02T205 have been performed on an original ArvinMeritor wheel end assembly using the O-ring, which is in use in the series assembly since April 2000. For comparison, the same test was performed on a European trailer axle wheel end assembly (see picture 1) without additional sealing.

Test Results

Neither of the two wheel end assemblies showed any air leak along the spindle and knuckle side face.

Conclusion

This test proves the effectiveness of the O-ring, which was introduced by ArvinMeritor to be assembled onto the front wheel spindle. It also proves that European wheel ends do not exhibit the potential leak path along the knuckle side face and the spindle due to their different manufacturing process (see picture 1).



Response

to Main Document

Achim Mueller/SCH/SKF
07/24 04:03 AM

Subject:	Report about Outboard Outer Ring Spalls
Response to:	Inspection and Test Reports
Category:	

UB186_02.doc 186-02.pdf

SKF

BU Trucks Product Design

Translation of
"Untersuchungsbefund Nr. 186/02"

Purpose of the Investigation

Evaluation of bearing damage, spalls on outboard outer ring raceways.

Results

1. Macroscopic Investigation

1.1 THU 9/8282

1.1.1 Outboard Outer Ring Raceway

The raceway exhibits several non-uniform distributed brinelling marks. From these marks, axially oriented spalls are originating (see picture 1). The marks show signs of "false brinelling" and contact corrosion. The honed surface structure is still visible outside the axial marks.
At both ends of the overrolled area of the raceway fine corrosion pittings are detectable. Most pittings are at the large raceway diameter, they are distributed equally around the circumference.
The large raceway diameter of the raceway exhibits plastic deformation in circumferential direction. This appears to be caused by edge stresses in the rolling contact.

1.1.2 Inboard Outer Ring Raceway

The raceway exhibits no spalls. The honing structure is still visible. At both ends of the raceway corrosion pittings are detectable. There are less pittings than on the outboard side.

1.1.3 Area between the Raceways

No corrosion pittings are detectable between the raceways.

1.1.4 Inner Rings and Rollers

Outboard: Indentations due to overrolled metallic particles, abrasive wear, no corrosion, honing structure still visible.
Inboard: Abrasive wear, no corrosion, honing structure still visible.

1.2 THU 9/8284

1.2.1 Outboard Outer Ring Raceway

Several shallow spalls are found on the raceway. The honing structure is still visible. Some areas, which are oriented axially, are completely smoothed.
At both ends of the overrolled area of the raceway fine corrosion pittings are detectable. Most pittings are found at the large raceway diameter.
The large raceway diameter of the raceway exhibits plastic deformation with pittings in circumferential direction. This appears to be caused by edge stresses in the rolling contact.

1.2.2 Inboard Outer Ring Raceway

Conclusion

Both Truck Hub Units exhibit spalls at the outboard outer ring raceway. Brinelling marks and smoothings, caused by "false brinelling" are the starting points of these spalls. The brinelling marks are partially accompanied by corrosion. The formation of brinelling marks is obviously supported by the water content of the lubricant.
In the area of the end of the contact zone at the large diameter of both outer ring raceways of the Truck Hub Units, corrosion pittings are equally distributed around the circumference. This indicates a corrosive reaction during operation. The intensity of corrosion pittings is highest at the large raceway diameter of the outboard raceway and is reduced towards the inboard side. Water enters obviously the bearing from its outboard side.

The edge loading of the raceways is a secondary damage mode.

SKF Werkstoffmechanik	**Untersuchungsbefund Nr. 186/02**	Datum: 2002-07-11 Seite 1 von 9

Angefordert von: Herrn A. Müller, ATT-PK	**P.-Nr.:** 149/02
Teile: 2 THU **Type:** BTF-0052 **Bezeichnung der Lager:** 9/8282 9/8284 "Ryder, Big springs, TX, R.S."	**Werkstoff:** OR:SAE 1055 M **Wärmebehandlung:** OR-Laufbahn: induktiv gehärtet Rollen: einsatzgehärtet

Zweck der Untersuchungen:

Schadensfalluntersuchung. Schälungen auf den flanschseitigen OR-Laufbahnen.

Ergebnisse:

1. **Makroskopische Beurteilung**

1.1 THU 9/8282

1.1.1 OR-Laufbahn flanschseitig

Auf der Laufbahn befinden sich mehrere Standriffel in verschiedenen Abständen. Die Standriffel sind Ausgang von in axialer Richtung ausgedehnten Schälungen (siehe Bild 1). Die Standriffel zeigen Merkmale von "false brinelling" und Korrosion im Stillstand. Die Honriefen sind außerhalb der Standriffel noch gut erkennbar.
Zu beiden Laufspurenden hin erkennt man im überlaufenen Bereich unter der Stereolupe feine Lochfraßkorrosion. Diese ist im Gebiet am großen Durchmesser am stärksten. Diese Korrosion ist über den Umfang gleichmäßig verteilt.
Am flanschseitigen Rand der Laufspur befindet sich in Umfangsrichtung eine Spur plastischer Deformation. Sie scheint durch Kantenlauf von Rollen erzeugt worden zu sein.

1.1.2 OR-Laufbahn inboard

Die Laufbahn zeigt keine Schälungen. Die Honriefen sind gut erhalten.
Unter der Stereolupe erkennt man im Gebiet zu beiden Laufspurenden umlaufende Lochfraßkorrosion. Diese ist deutlich schwächer als auf der flanschseitigen Laufbahn.

1.1.3 Mittelschulter

Auf der Mittelschulter befinden sich Korrosionsnarben.

1.1.4 Innenringe und Rollen

Outboardseitig: Metallabriebeindrückungen, keine Korrosion, abrasiver Verschleiß, Honriefen noch gut sichtbar.
Inboardseitig: keine Korrosion, abrasiver Verschleiß, Honriefen noch gut sichtbar.

1.2 THU 9/8284

1.2.1 OR-Laufbahn flanschseitig

Auf der Laufbahn befinden sich einzelne flache Schälungen. Die Honriefen sind sichtbar. Es existieren aber Gebiete mit völliger Glättung, die überwiegend axial orientiert sind.
Zu beiden Laufspurenden hin erkennt man unter der Stereolupe feine Lochfraßkorrosion. Sie ist am großen Durchmesser stärker ausgeprägt.
Am flanschseitigen Rand der Laufspur befindet sich in Umfangsrichtung eine Spur plastischer Deformation mit Pits. Sie stammt offensichtlich vom Kantenlauf von Rollen.

verfasst:	Kopien an:
STW 3 / Nl / Wo	ATT-PK, STW, STW3

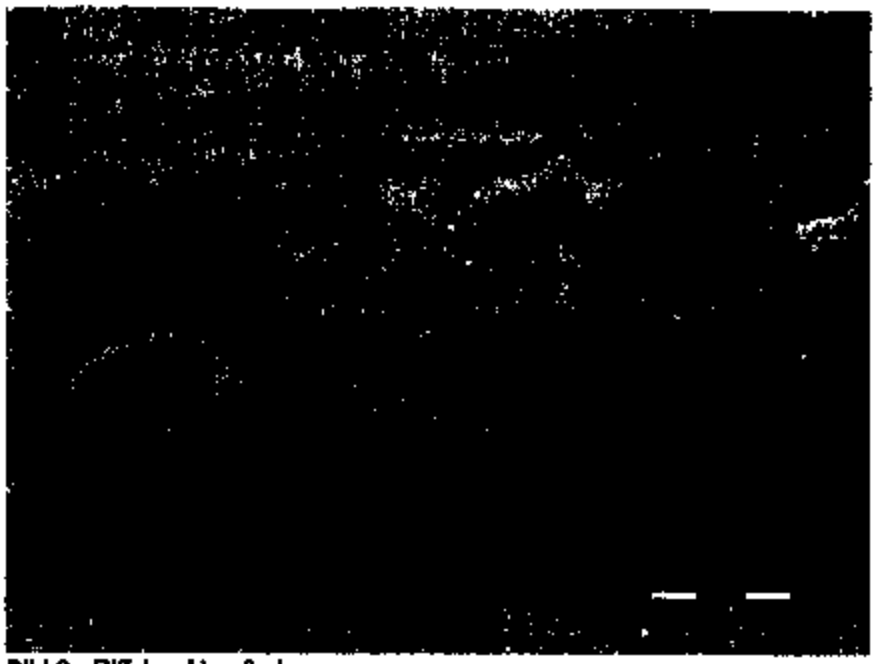
Im Gebiet der Laufspurränder beider OR-Laufbahnen der THUs ist Lochfraßkorrosion gleichmäßig in Umfangsrichtung verteilt. Dies deutet auf Korrosion im Lauf. Die Lochfraßkorrosion weist am großen Laufbahndurchmesserende flanschseitig die höchste Intensität auf und nimmt zum Inboard hin ab. Die Wasserzufuhr kommt demnach vom Outboard.

Der Kantenlauf der Rollen flanschseitig ist ein konkurrierender Ausfallmechanismus.

THU 9/8282 - OR Laufbahn flanschseitig

Bild 1

THU 9/8282 - OR Laufbahn flanschseitig



Umlaufrichtung

Bild 2: Riffel auf Laufbahn

Bild 3: Detail von Bild 2

THU 9/8252 - OR Laufbahn flanschseitig

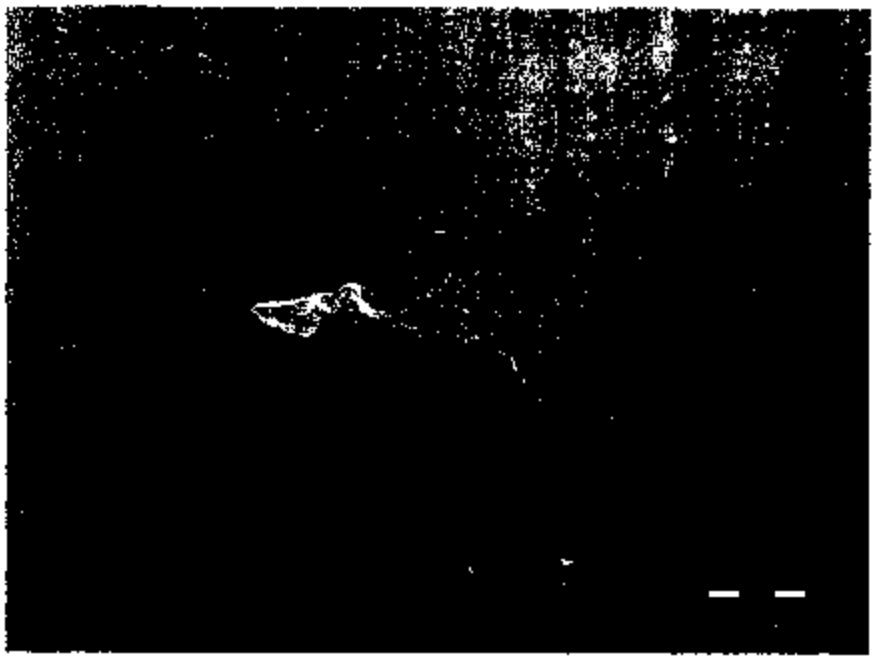


Bild 4: Bildung einer Schälung

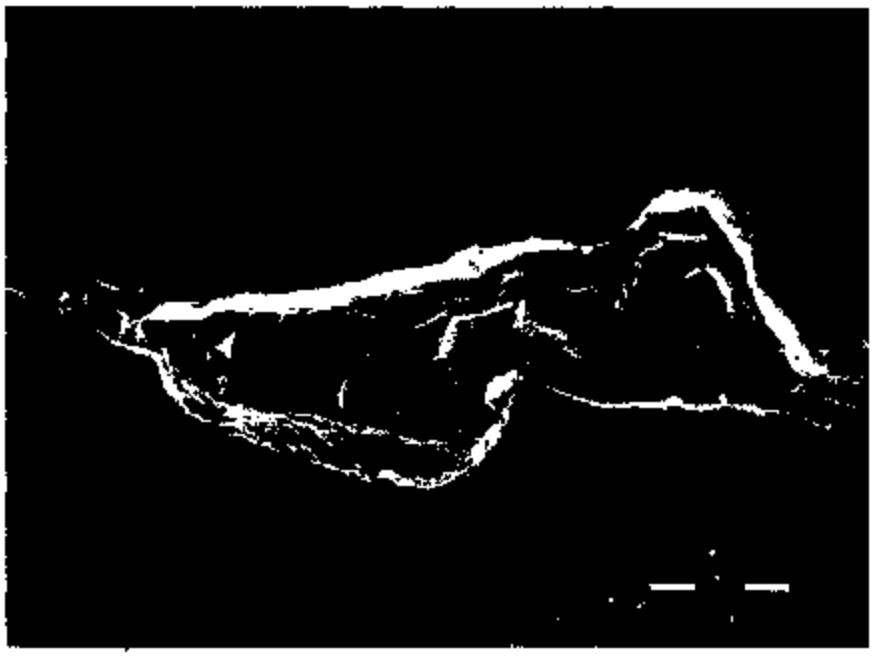


Bild 5: Detail von Bild 4

THU 9/8282 - OR Laufbahn flanschseitig

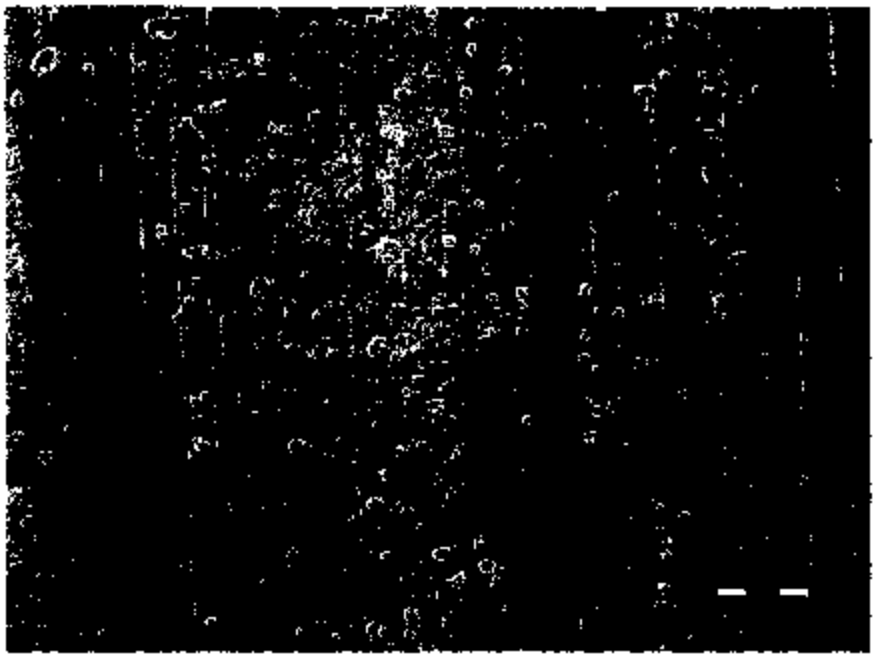


Bild 6: Lochfraßkorrosion

Bild 7: Detail von Bild 5

THU 9/8284 - OR Laufbahn flanschseitig

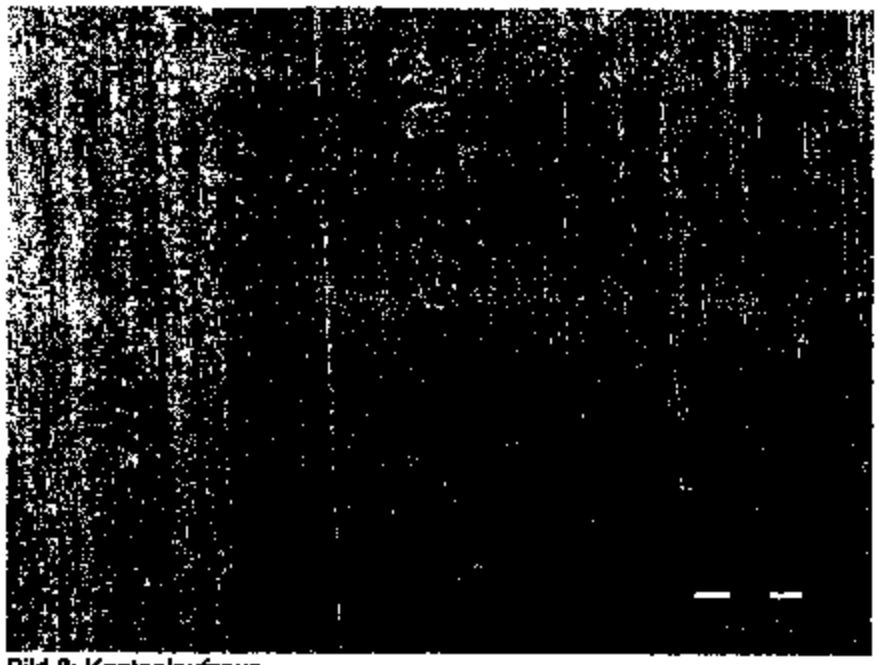


Bild 8: Kantenlaufspur

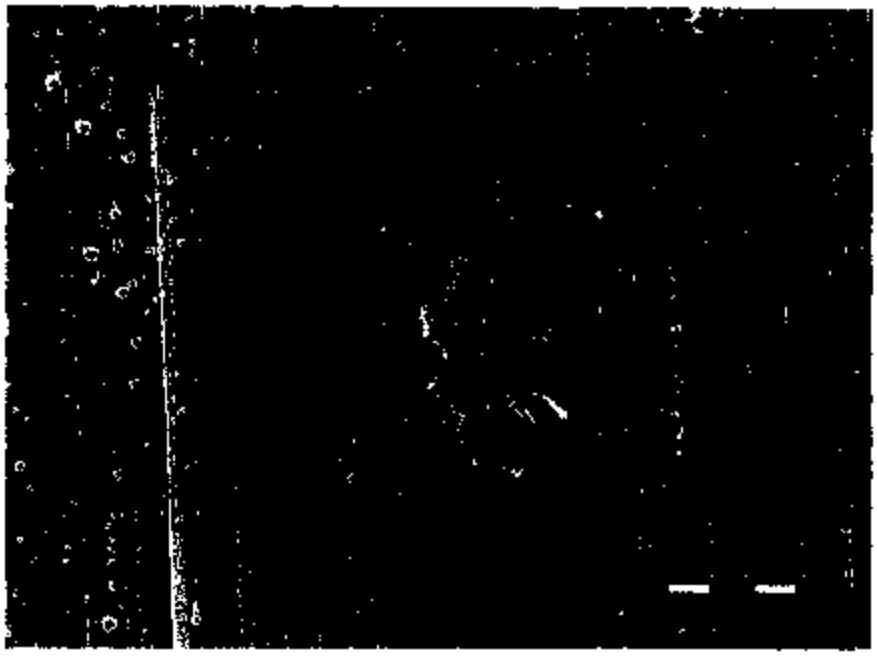


Bild 9: Detail von Bild 7

THU 9/8284 - OR Laufbahn flanschseitig

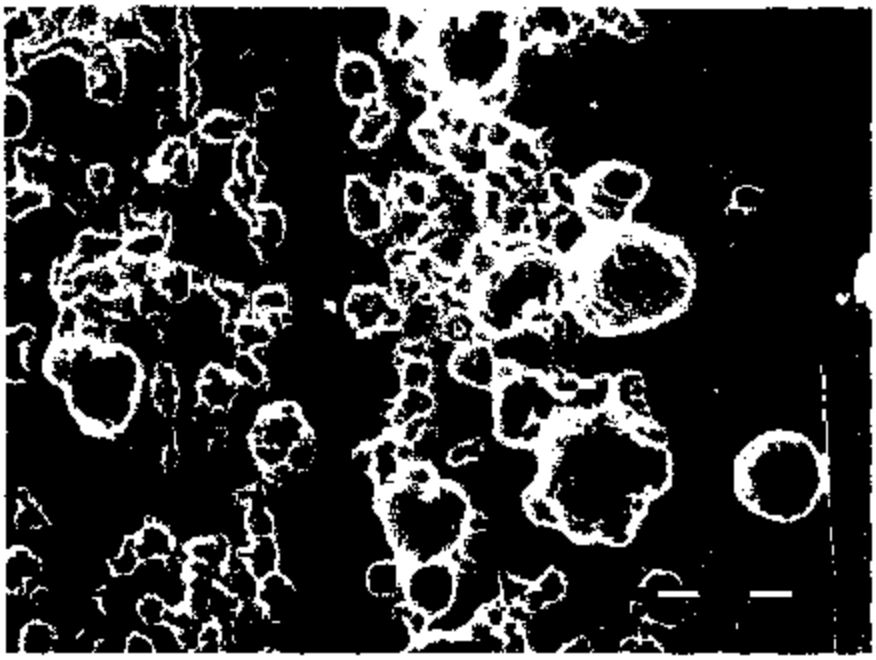


Bild 10: Detail von Bild 7

THU 9/8284 - OR Laufbahn flanschseitig

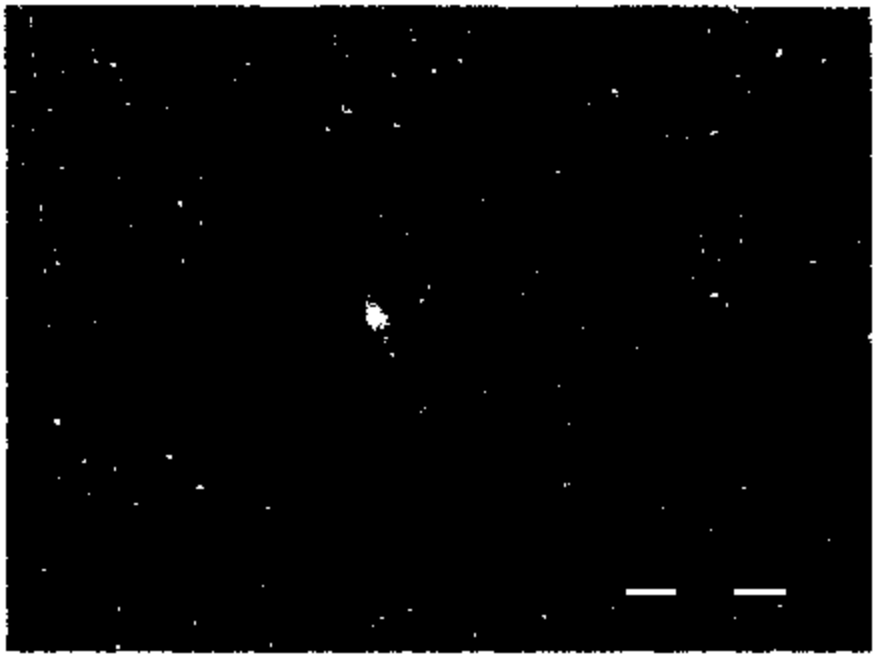


Bild 11: Staubverteilung

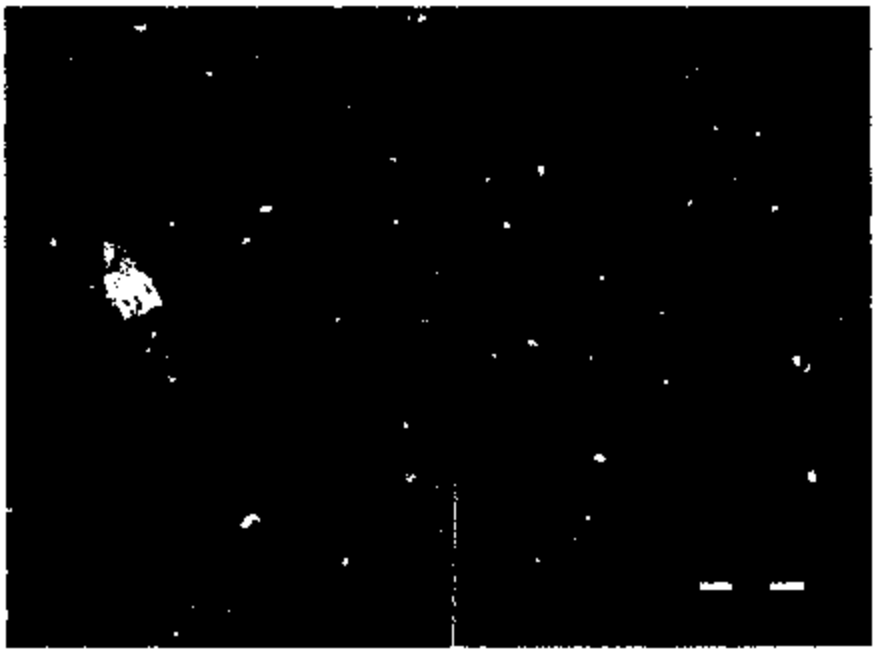


Bild 12: Detail von Bild 11

Response

to Response:

Bruce Weeks/AMER/SKF
07/24 05:30 AM

Subject: OB Outer Ring Spalls - Report with Translated Picture Captions

Response to: Report about Outboard Outer Ring Spalls

Category:

UB186_02 with captions.do

SKF

BU Trucks Product Design

Translation of
"Untersuchungsbefund Nr. 186/02"

Purpose of the Investigation

Evaluation of bearing damage, spalls on outboard outer ring raceways.

Results

1. Macroscopic Investigation

1.1 THU 9/8282

1.1.1 Outboard Outer Ring Raceway

The raceway exhibits several non-uniform distributed brinelling marks. From these marks, axially oriented spalls are originating (see picture 1). The marks show signs of "false brinelling" and contact corrosion. The honed surface structure is still visible outside the axial marks.
At both ends of the overrolled area of the raceway fine corrosion pittings are detectable. Most pittings are at the large raceway diameter, they are distributed equally around the circumference.
The large raceway diameter of the raceway exhibits plastic deformation in circumferential direction. This appears to be caused by edge stresses in the rolling contact.

1.1.2 Inboard Outer Ring Raceway

The raceway exhibits no spalls. The honing structure is still visible. At both ends of the raceway corrosion pittings are detectable. There are less pittings than on the outboard side.

1.1.3 Area between the Raceways

No corrosion pittings are detectable between the raceways.

1.1.4 Inner Rings and Rollers

Outboard: Indentations due to overrolled metallic particles, abrasive wear, no corrosion, honing structure still visible.
Inboard: Abrasive wear, no corrosion, honing structure still visible.

1.2 THU 9/8284

1.2.1 Outboard Outer Ring Raceway

Several shallow spalls are found on the raceway. The honing structure is still visible. Some areas, which are oriented axially, are completely smoothed.
At both ends of the overrolled area of the raceway fine corrosion pittings are detectable. Most pittings are found at the large raceway diameter.
The large raceway diameter of the raceway exhibits plastic deformation with pittings in circumferential direction. This appears to be caused by edge stresses in the rolling contact.

1.2.2 Inboard Outer Ring Raceway

SKF 001825

Conclusion

Both Truck Hub Units exhibit spalls at the outboard outer ring raceway. Brinelling marks and smoothings, caused by "false brinelling" are the starting points of these spalls. The brinelling marks are partially accompanied by corrosion. The formation of brinelling marks is obviously supported by the water content of the lubricant.
In the area of the end of the contact zone at the large diameter of both outer ring raceways of the Truck Hub Units, corrosion pittings are equally distributed around the circumference. This indicates a corrosive reaction during operation. The intensity of corrosion pittings is highest at the large raceway diameter of the outboard raceway and is reduced towards the inboard side. Water enters obviously the bearing from its outboard side.

The edge loading of the raceways is a secondary damage mode.

Picture Captions:

Picture 1 – Brinnelling on Raceway (Comment at side is direction of rotation)
Picture 2 – Close up of picture 1
Picture 3 – Further close up of picture 2
Picture 4 – Initiation of Spall
Picture 5 – close up of Picture 4 (showing intercrystaline fracture, not sub-surface)
Picture 6 – Corrosion Pitting
Picture 7 – Close up of Picture 6 (note that German version is in error stating this is close up of picture 5)
Picture 8 – Small Etch on Raceway
Picture 9 – Close up of Picture 8
Picture 10 – Further Close up of Picture 9
Picture 11 – Distribution of Over-rolled Dust
Picture 12 – Close up of Picture 11

Response

to Main Document

Achim Mueller/SCH/SKF
07/26 02:47 AM

Subject: Static Water Splash Test

Response to: [] Inspection and Test Reports

Category:

st02t212.doc

STATIC WATER SPLASH TEST ON ARVINMERITOR KNUCKLE

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Project		
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Michael D. Lewis	ADNA	SKF NATC
Achim Müller	ATT-PK	SKF Schweinfurt
Archiv	MWI	SKF Schweinfurt

st02t212 5795840kB Achim Müller

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Key words: Truck Hub Unit, Water Splash Test, ArvinMeritor, Knuckle

Purpose of the Test

The purpose of this static test was to prove if water may enter the joint between a Truck Hub Unit's inner ring and the knuckle side face of ArvinMeritor's front steer axle.

Test Description

A Truck Hub Unit BTF-0065 was assembled onto a new knuckle of an ArvinMeritor front steer axle. A torque of 800 Nm (590 ft-lbs) was applied to the inner lock nut. The specified minimum clamp torque is 680 Nm (680 Nm). The outer lock nut was clamped to specification.

The knuckle is than installed horizontally to a rig. To achieve some temperature variation, the Truck Hub Unit was set into rotation by means of a driving belt. Simple tab water was than sprayed onto the joint between knuckle and inner ring side face (see picture 1).

Picture 1: Static Water Splash Test set up

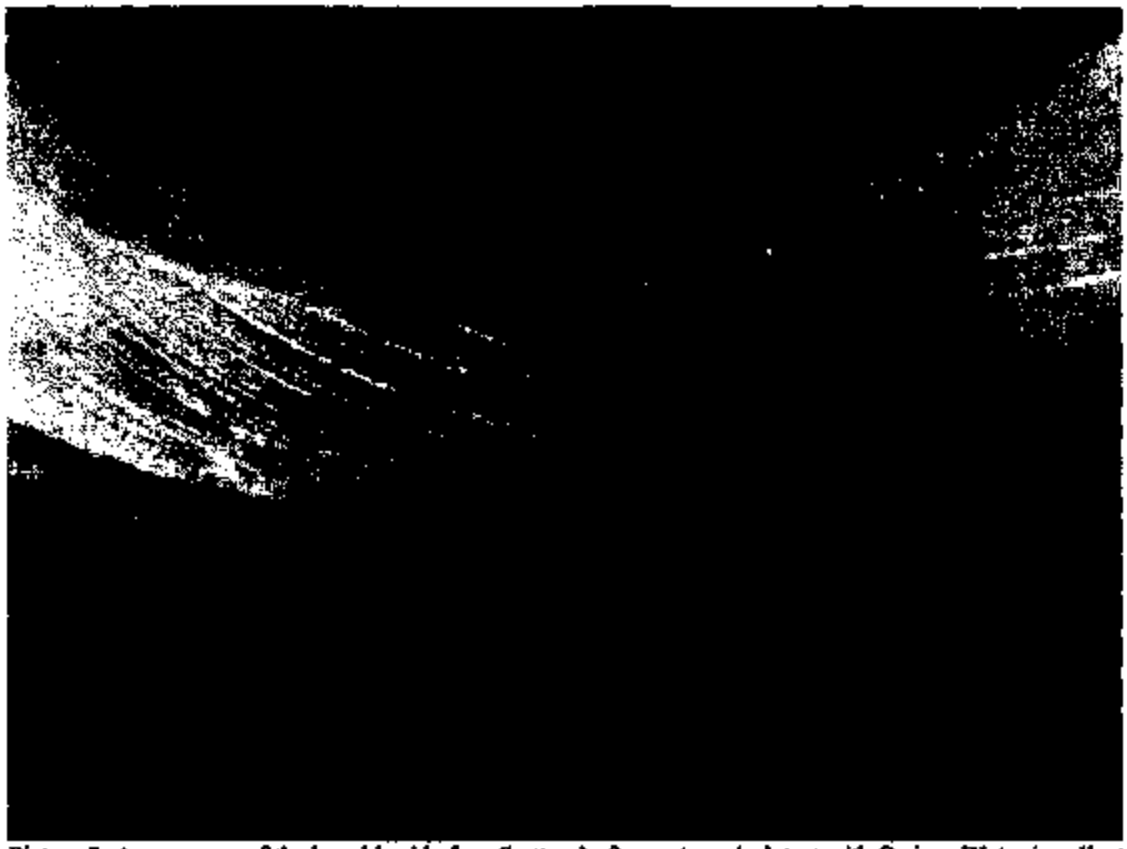
The rotational speed of the unit was set to be 800 rpm during "dry" periods, while it was 300 rpm during time periods with water splash. The duration of each time period was set to be 30 minutes.

Test Results

Two different assemblies were tested: one with an O-ring in the joint, a second without this seal. The first test was run for 16 "water splash cycles", the second for 13. Temperatures at the outer ring (inboard side) were determined to be around 25°C during water splash, and around 60°C without.

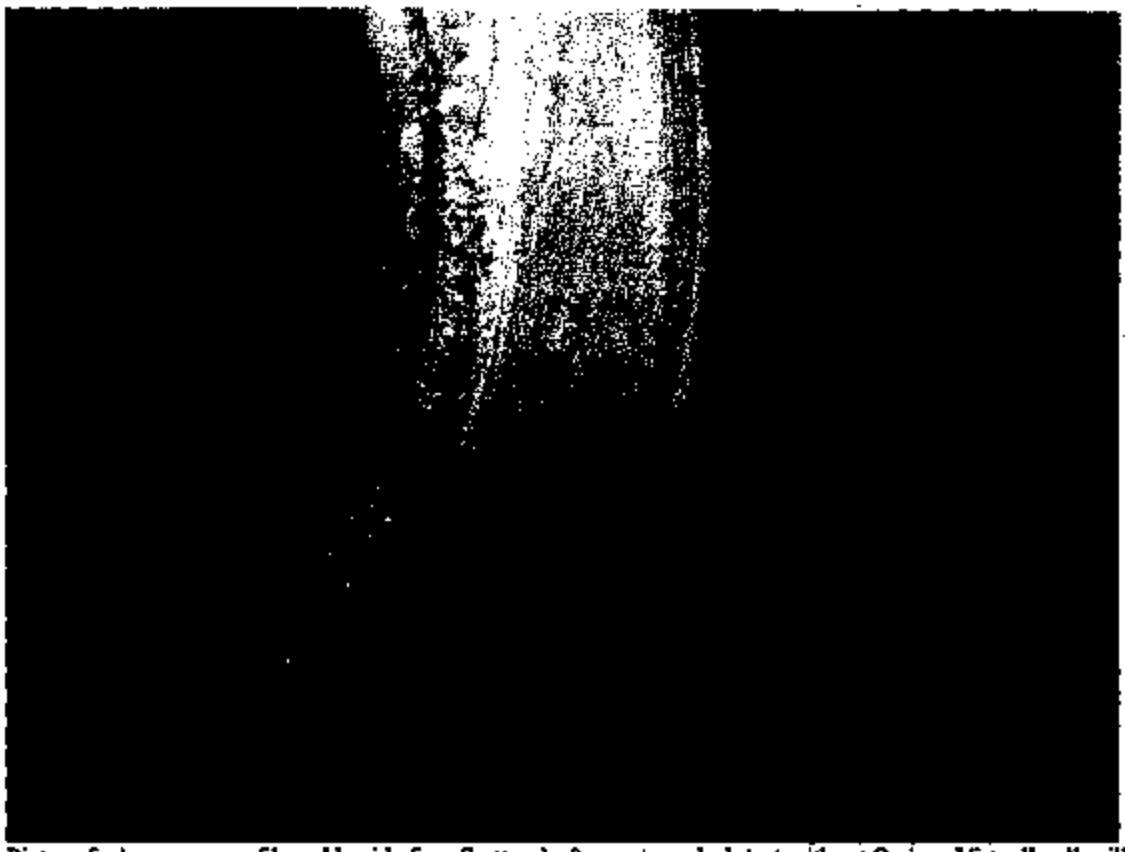
The following pictorial depicts the appearance of the knuckle side face after each test and the bearing side face and bore after the test without the O-ring.

Picture 2: Appearance of the knuckle side face (top) after water splash test with O-ring. Water intrusion along the milling traces is visible.

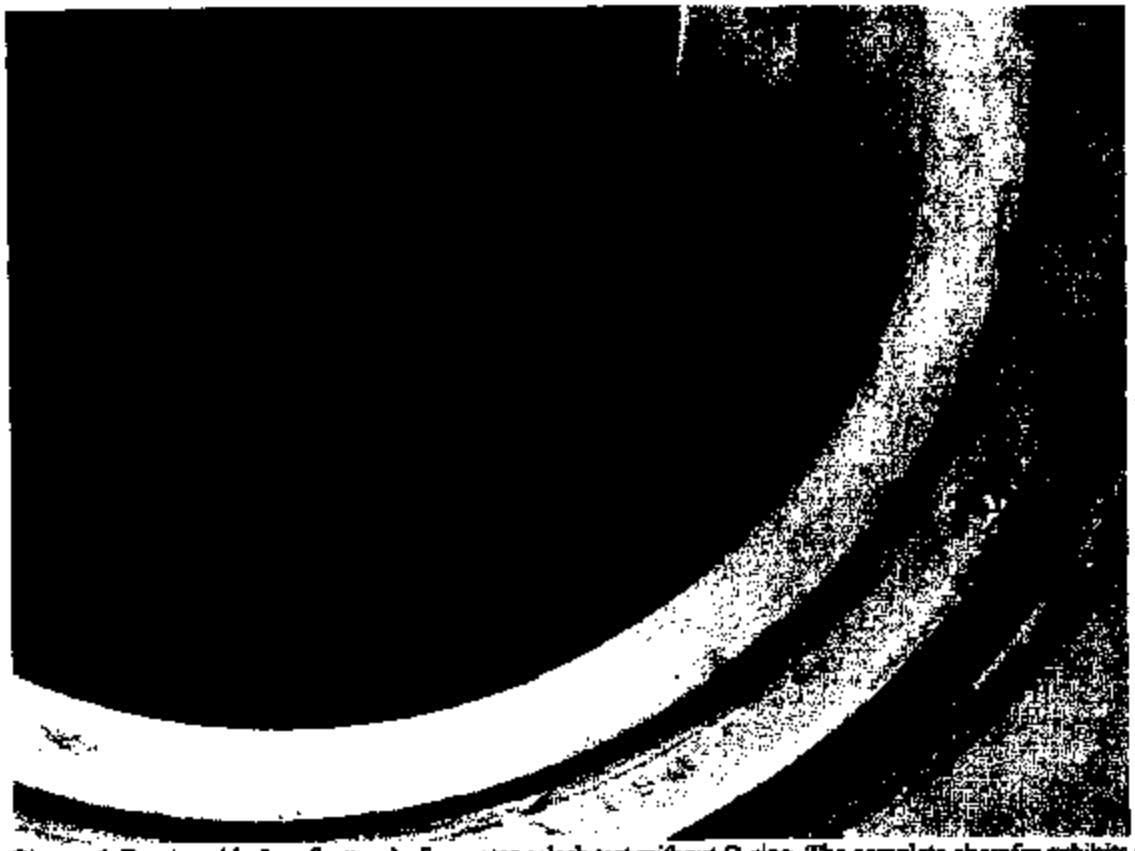


Picture 3: Appearance of the knuckle side face (bottom) after water splash test with O-ring. Water is collected in the cavity between spindle, O-ring and bearing side face.

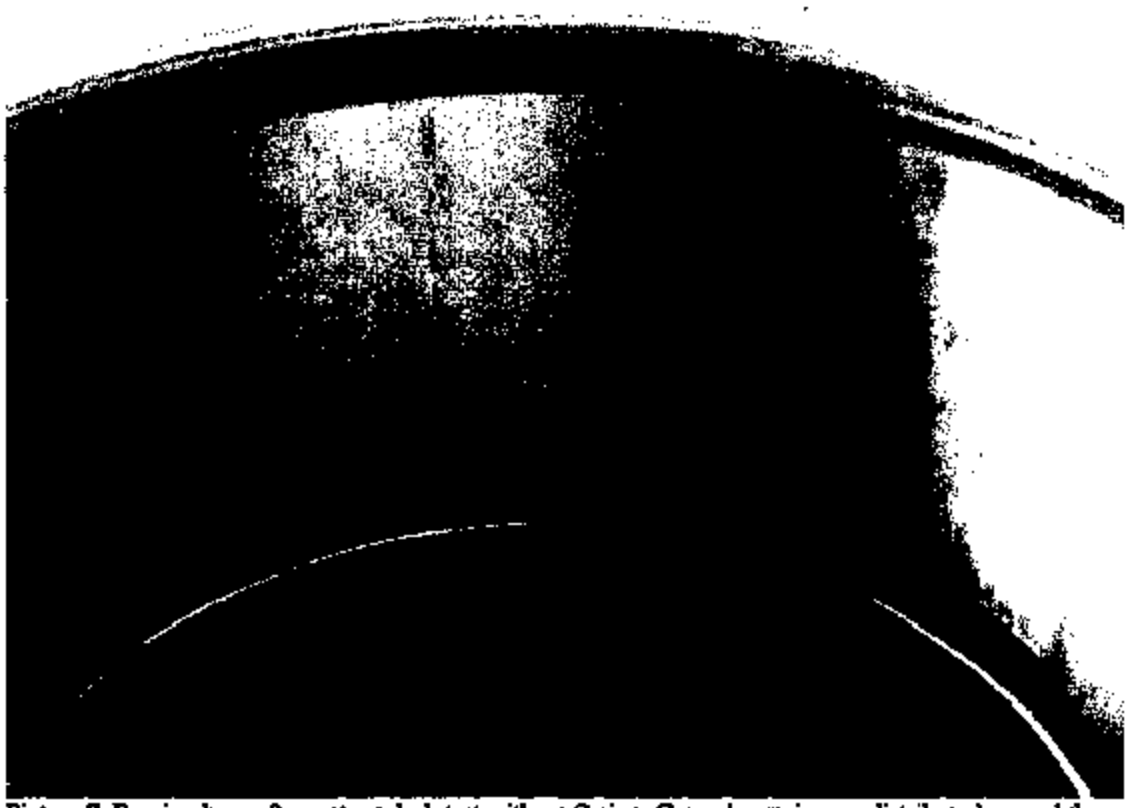
Picture 4: Appearance of knuckle side face (top) after water splash test without O-ring. Corrosion marks are now visible on the spindle



Picture 5: Appearance of knuckle aids face (bottom) after water splash test without O-ring. Virtually all milling marks are indicating water intrusion.



Picture 6: Bearing side face (bottom) after water splash test without O-ring. The complete chamfer exhibits corrosion marks.



Picture 7: Bearing bore after water splash test without O-ring. Corrosion stains are distributed around the complete circumference.

Conclusion

This test proves the potential water leak path between the knuckle and inner ring side faces and along the stub axle. It is to be assumed that the risk of water intrusion is increasing, when dynamic loading conditions like cornering and/or braking are applied.
The test also proves the performance of a sealed (O-ring) joint.

Response

to Main Document

Achim Mueller/SCH/SKF
09/08 02:06 AM

Subject: Water Splash Test on European Wheel Assembly

Response to: Inspection and Test Reports

Category:

sauerwatersplash.do

SKF

BU Trucks Product Design | Static water Splash Test on SAF Axle

Purpose of the Test

The purpose of this static test was to prove that water may not enter the joint between a Truck Hub Unit's inner ring and the axle side face of SAF's (Sauer Achsenfabrik) trailer axle.

Test Description

A Truck Hub Unit BTF-0056 was assembled onto a new wheel end spindle of an SAF trailer axle. The bearing was clamped with 80 kN.
The knuckle is than installed horizontally to a rig. To achieve some temperature variation, the Truck Hub Unit is set into rotation by means of a driving belt. Simple tab water is than sprayed onto the joint between axle and inner ring side face (see picture 1).

Picture 1: Water Splash on joint between Truck Hub Unit (top) and axle (bottom)

The rotational speed was set to be 800 rpm during "dry" periods, while it was 300 rpm during time periods with water splash. The duration of each time period was set to be 30 minutes.

Test Results

Only one assembly without O-ring in the joint was tested for 13 "water splash cycles". The temperature variation was between 30°C and 65°C.

Upon disassembly, no corrosion was found in the joint between THU and axle (see pictures 2 to 4).

SKF 001839

Picture 2: Top view on axle side face and transition to spindle

Picture 3: Side view on axle side face and transition to spindle

Picture 3: Bearing side face. The crescent shaped reddish corrosion trace indicates the outer diameter of the axle side face

Conclusion

This test proves that water doe not easily enter the joint between axle and bearing side face (if at all). Water, which is splashed onto said joint, will flow along the outer diameter of the contact zone between inner ring and axle and eventually drip off.

Discussion

Main Topic

Bernd Stephan/SCH/SKF
07/01 02:48 AM

Subject: Letter from ARM to Ryder

Category:

This is the letter that ARM submitted to Ryder today.

As you can see, instead of identifying a rifle shot. They mentioned that they are going to focus on a detection device. They formatted the letter this way because it very quickly became obvious that a few parts could turn into many parts.

Notice that timing is aggressive for the vibration detection.

---------- Forwarded by Robert J Bondy/DET/SKF on 06/28/2002 10:49 AM ----------

Thomas.Sanko@ArvinMeritor.com on 06/28/2002 10:39:46 AM

To: robert.j.bondy@skf.com
cc:
Subject: Ryder letter

<<TS61702Response.doc>>

Tom Sanko
Product Manager-Drivelines & Front Axles
248-435-1573
248-435-1968 fax
thomas.sanko@arvinmeritor.com

TS61702Response.doc

ArvinMeritor™

2135 W. Maple Rd.
Troy, MI 48084

arvinmeritorinc.com

June 26, 2002

Mr. Jim Cald
Ryder
Logistics & Transportation
Solutions Worldwide
3600 NW 82 Avenue
Miami, FL 33166-6623

Dear Mr. Cald:

During our meeting in Miami on June 14th, a team led by Mr. Jerry Thrift requested a proposal from Meritor regarding the FF981 hubs in service on approximately 38,000 Ryder trucks. The concern was the number of hub failures being experienced at mileages less than the 750,000 mile warranty and the inability of the current inspection methods performed at various Ryder locations to adequately detect progressing bearing deterioration during regularly scheduled preventive maintenance.

We were asked to review vehicle data subsequently provided by Ryder against our own records of axle shipments and recommend a target population of trucks on which the hubs would be replaced at no expense to Ryder. An e-mail from Mr. George Bowers dated 6/13/02 detailed Ryder's expectations for this program.

First let me update you on the current status of our investigation and other activities.

1. Our investigation of the data so far does not identify a "rifle shot" population of trucks that we would propose Ryder remove from service. However, we are continuing to review the data.

2. We recognize that our test procedure TP-0251 is subject to technician skill.

3. We are developing an electronic diagnostic device to remove all operator subjectivity. The device has been used in the lab and on a vehicle in our garage. This assessment provides conclusive results enabling one to easily distinguish a hub in "good" condition from one in a state of some distress. The comparison was made between a new hub and one that resulted in disagreement among personnel during the inspections performed in LaVergne, TN. We invite you to our facility in Troy, MI. for a demonstration as early as next week if your schedule permits. Alternatively, we can transport the device with a technician to any Ryder location of your choice.

4. We plan to have the prototype model developed into production units by the end of September 2002.

Upon availability of production models of the diagnostic tool, quantities sufficient to stock each Ryder location will be provided free of charge along with any necessary training.

From that point forward, inspections would be performed with this tool in conjunction with TP-0251.

We believe this to be a reasonable and equitable approach to the current problem and look forward to your concurrence to begin as soon as possible. If we can determine a "target" population on which to focus our prototype inspection process we can accelerate the preventive maintenance at those locations.

Sincerely,

T. M. Sanko
Product Manager
CVS Front Axle / Driveline
ArvinMeritor, Inc.

Name	Robert J Bondy/DET/SKF
E-mail	
Phone	
Role	
Goals	
Other	

Discussion

Main Topic

Robert J Bondy/DET/SKF
06/05 05:39 PM

Subject: Ryder Tennessee letter

Category: PLB

Robert J Bondy
06/05/2002 05:27 PM

To: Richard W Frett/ELG/SKF@SKF, Timothy D Gifford/KOP/SKF@SKF
cc:
Subject: Information: Hub Review In Tennessee

---------- Forwarded by Robert J Bondy/DET/SKF on 06/05/2002 05:27 PM ----------

Robert J Bondy
06/04/2002 11:03 AM

To: Bernd Stephan/SCH/SKF@SKF, Arno Stubenrauch/SCH/SKF@SKF
cc:
Subject: Information: Hub Review In Tennessee

Bernd:

I've already copied Bruce, Bill and Mike

Please make sure to read the last part of the Ryder Expectations of ARM " Please ask that your group bring
> with them plans to address rapid replacement of our unitized hubs."

Regards,

bob

---------- Forwarded by Robert J Bondy/DET/SKF on 06/04/2002 11:00 AM ----------

Dale.Bell@ArvinMeritor.com on 06/03/2002 04:54:39 PM

To: robert.j.bondy@skf.com
cc:
Subject: FW: Hub Review In Tennessee

```
> -----Original Message-----
> From:          Rosenthal, Robert
> Sent:          Monday, June 03, 2002 3:13 PM
> To:        Sanko, Thomas; Bell, Dale
> Cc:        Mejaly, Joseph
> Subject:       FW: Hub Review In Tennessee
```

>
>
> For your information.
> We need to give them facts, on how long hubs will run after detection of a
> spall.
> Rosey
>
> -----Original Message-----
> From: McLendon, Bruce
> Sent: Monday, June 03, 2002 1:24 PM
> To: Rosenthal, Robert; Pan, J
> Cc: Hyatt, Jeffrey; Comer, Danny
> Subject: FW: Hub Review In Tennessee
>
> Read the following request from Ryder Bruce
>
> -----Original Message-----
> From: John_W._Murphy@ryder.com@AUTO
> Sent: Friday, May 31, 2002 4:19 PM
> To: mclendbe@meritorauto.com
> Cc: Jerry_F._Thrift@ryder.com; George_Bowers@ryder.com;
> Harry_F._Ryder@ryder.com; Patrick_Porter@ryder.com
> Subject: Hub Review In Tennessee
>
> Bruce, I had the opportunity to speak with both Harry Ryder and Patrick
> Porter this afternoon. From the information provided to me I am convinced
> that our maintenance practices are correct and the issue at hand is
> product
> quality.
> It appears that the issue at hand now is that a technician may or may not
> be able to feel the spalling bearings during PM inspection. In addition,
> SKF and Arvin-Meritor do not know the mean time to failure once spalling
> begins.
> The failure rate which Ryder is seeing is raising at an alarming rate. I
> know we have a meeting set up for the week of June 10th. The purpose of
> my
> writing is to make sure that Arvin-Meritor understands the expectation of
> the upcoming meeting.
> During our next meeting Ryder is not expecting to hear more on the length
> and duration of tests that are currently underway. The time has come for
> a
> more proactive approach to this issue. Please ask that your group bring
> with them plans to address rapid replacement of our unitzed hubs.
> Regards,
> John Murphy

Discussion

Main Topic

Claes Rehnberg/GHQ/GOT/SKF
05/30 09:20 AM

Subject: **Report to ARM**

Category: Information

Updated version as of 2002-05-31

THU2 report to ARM 4.pp

Main failure causes identified

- **SKF**
  - CFW seal leakage
  - R-safe seal leakage
  - Stud hardness
- **ARM**
  - Water intrusion along the spindle
  - Mounting without rotating
  - Stud replacements

CFW seal
cause sheet

- **Cause:** IR Seal failure / not sealing properly
- **Effect:** Unacceptable higher indication on premature seal failure rate in North America environment.
- **Parts**
  - Affects CFW parts made 1997 through April 2000
  - Replaced by improved R-safe from May 2000 onwards
- **Findings**
  - Grease used as lubricant. Less grease does not mean it can't perform what it was intended to do.
  - Grease fill (in cavity between lips) amount less in Aiken compared to Luechow
    - might lead to early failures due to less contamination resistance
      - Luechow fill 1.5 g (remain 0,8 g after assembly)
      - Aiken fill 0,3 g
    - No spec's on grease fill from Freudenberg
  - Grease fill is used primarily for reducing seal lip wear
  - Average seal life shorter in NA compared to Europe
    - Operating differences ?
    - Maintenance differences ?
  - CFW seal pumping action reduces effect over time
  - Abnormal events 1999 (week 17,18,19) ?
    - In Aiken (production)
    - at ARM (design, mounting etc)
  - Failure rate <1% lead to change from CFW to R-Safe seal
  - >1 % water will break down the grease function
- **Conclusions**
  - Different grease fill
    - Study show no effect on seal wear
      - Statistics to support statement
    - water immersion will reduce life if
      - Statistics to support statement
  - Question to ARM: How much water will normally spray on the bearing ?
  - Question to ARM: What's the extent of high pressure cleaning
- **Recommendations**
  - Retrofit pop-out bolt from Wabash
    - To be checked by the driver min once per day
    - To be used in combination with ABS signal warning

SKF 001850

R-safe seal
cause sheet

- **Cause:** fR Seal failure / not sealing properly
- **Effect:** Unacceptable higher indication on premature seal failure rate in North America environment.
- **Parts**
  - Affects R-Safe parts made after April 2000
- **Findings**
  - Molding defects
    - fill not completed on one lip or both lips / de-flashing not complete
    - 8 claimed parts returned from ARM
      - 6 showed defects on both lips
      - The other 2 was not seal related
    - Water intrusion only possible when both lips are defect
    - Defects on the seal lips are run out under operation due to wear
      - have seen on samples that at least one lip is repaired within 100.000 miles
    - Defect rate found is < 2%% of both lips
      - note: The findings are from inspection of the last production lot. However the scrap rate was the same for the other production lots Samples from the other production lots will be checked for verification.
    - Lack of warranty data update from ARM
    - 100 % air test already implemented in Elgin
- **Conclusions**
  - Water intrusion could happen if:
    - Both lips defected
    - Water flooding at early mileage (before lip repair itself)
  - Rig test on pre-damaged bearings shows residual life in excess of 80.000 miles.
- **Recommendations**
  - Retrofit pop-out bolt (as for CFW)
  - Implement 3 extra inspections
    - at 50, 100 and 150 thousand miles
  - Complete instrumental road test for verification
  - Seal material change (high temperature)

SKF 001851

Stud hardness
cause sheet

- **Cause:** Studs with hardness out of spec, incl high hardness variation
- **Effect:** Fractures occurring at low mileages or during re-torque of wheel nuts
- **Parts**
  - Affects studs from supplier Ingersoll. Delivery started Feb 2001
- **Findings**
  - Bolts delivered outside SKF spec's 500+ HV 0,3.
    - SKF spec's in Vickers 0,3
      - NATC uses video monitoring equipment
      - Ingersoll measures with manual equipment
    - Correlation issues between NATC and Ingersoll
  - Affects shipment lot #4, and possibly #3 & #5
  - Pending proper 8D report from Ingersoll
  - MascoTech bolts from 1997 with >500,000 miles up to 456 HV 0,3
- **Conclusions**
  - Ingersoll have not a capable HT process
  - Measurement principles different
    - SKF key spec on surface hardness
    - Ingersoll measurement principle focus core
    - Difficult translation between two meas. principles
- **Recommendations**
  - Temporary deviation to be issued to Ingersoll for slight increase in surface hardness
  - Revalidate Mascotech as supplier with new heat treat process

Leave out for now

Unhardened IR raceway cause sheet

- **Cause:** Unhardened IR raceway
- **Effect:** Early spalling
- **Parts**
  - Affects bearings during Q1 2000
- **Findings**
  - 20 bearings with unhardened inner rings returned from field
    - Early spalling started
- **Conclusions**
  - Heat Treatment process not working properly for a short period of time
  - No further returns received after corrective actions.
  - Root cause identified and fixed.
- **Recommendations**
  - Case closed

Water intrusion along the spindle cause sheet

- **Cause:** water ingress in the bearing
- **Effect:** Unacceptable higher indication on premature seal failure rate in North America environment.
- **Parts**
  - Affect units before August 2001
- **Findings**
  - Traces of corrosion proving that water intrudes along the spindle into the bearing.
  - Investigations on 30 returned units from the field, previously thought to be seal failures show in 21 cases actual failures due to water intrusion along the spindle.
  - ARM introduced an O-ring August 2001
- **Conclusions**
  - Incidents like this considerably less in European environment
  - Possibly the spindle rigidity not sufficient
  - ARM's introduction of O-ring improved the problem
- **Recommendations**
  - Do FEA of assemblies of ARM and Europe for benchmarking.
  - Introduce pop-out bolt from Wabash

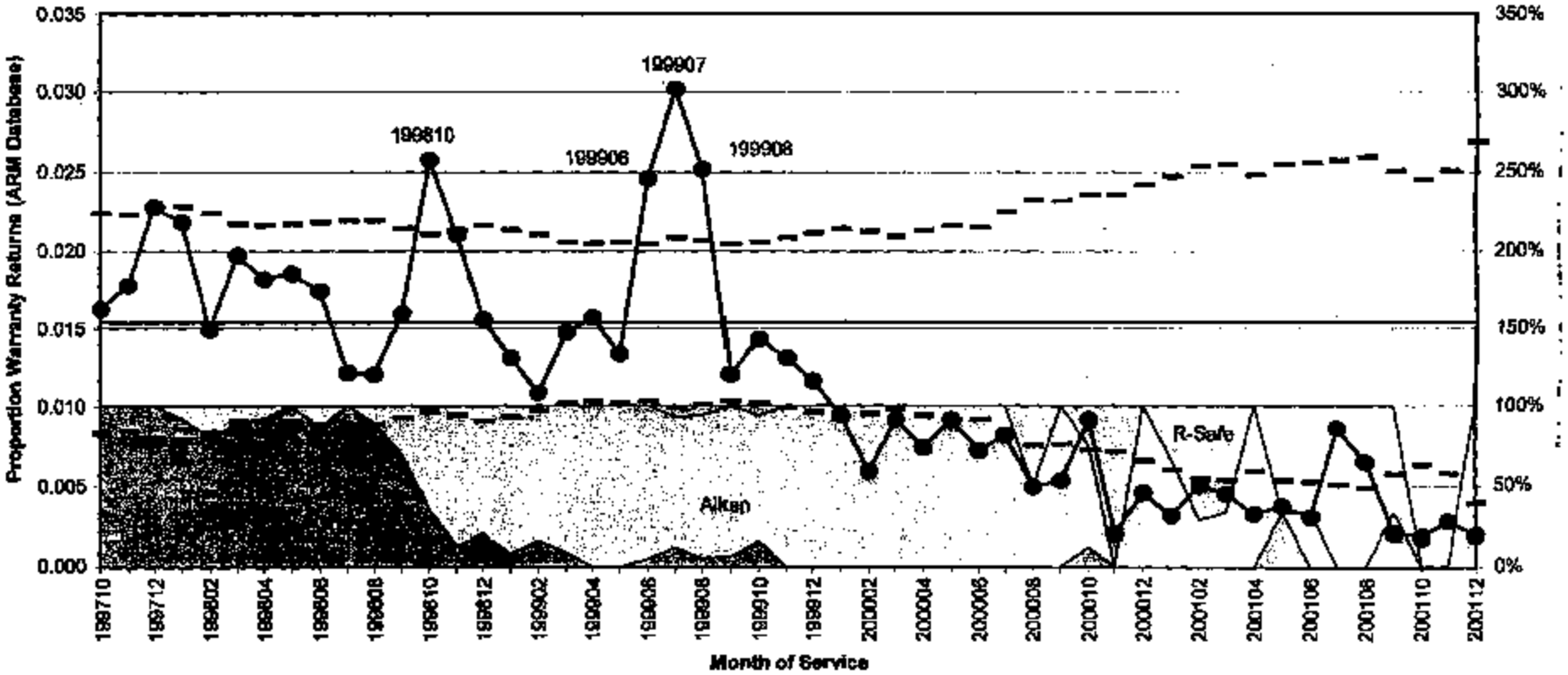
Mounting without rotating OR cause sheet

- **Cause:** Damage raceways during mounting
- **Effect:** Insufficient life for 1 million miles
- **Parts**
  - Affects units from 1997 through June 2001
- **Findings**
  - Nicks found on OR raceways during installation
  - Rotation is part of SKF mounting instructions
  - ARM introduced automatic rotation device in their assembly June 2001
- **Conclusions**
  - ARM introduction of automatic device was made to ensure proper mounting.
- **Recommendations**
  - Introduce pop-out bolt from Wabash

Improper replacement of Studs cause sheet

- **Cause:** Units damaged due to improper stud removal and insertion
- **Effect:** Insufficient life for 1 million miles
- **Parts**
  - Potentially affects certain percentage of units during life of the product
- **Findings**
  - Heavy marks on studs, suggesting they have been inserted with hammer / sledge hammer
- **Conclusions**
  - Potentially could introduce impact damages on the raceways
- **Recommendations**
  - More investigations needed
  - Use SKF maintenance procedure on how to do this.

P-Chart - All ARM Returns by Service Date



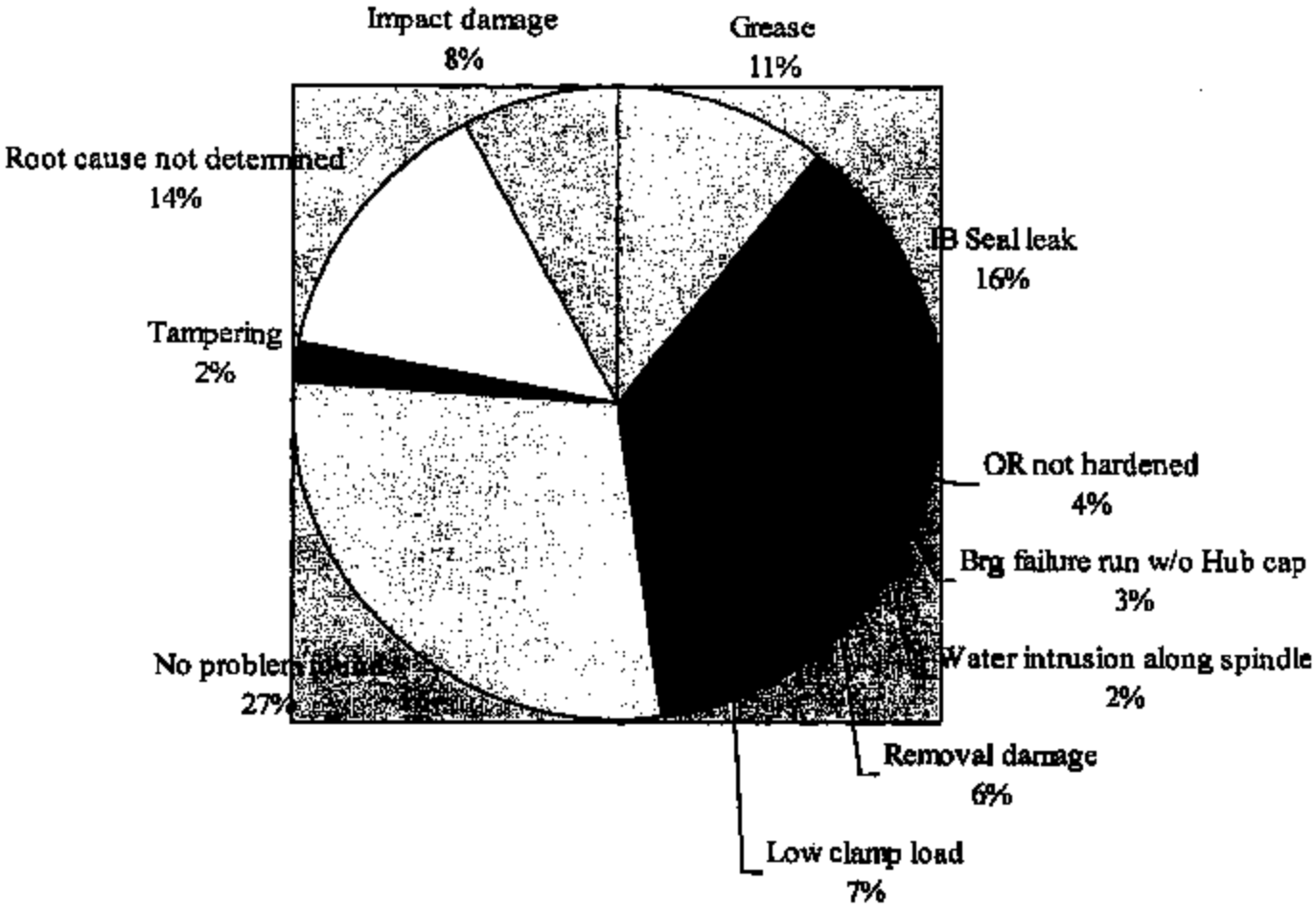
SKF 001857

SKF

Steer THU Warranty Return Percent of claims

(based on 530 claims in SKF database as of 12/31/2001)

To be updated



SKF 001858

SKF

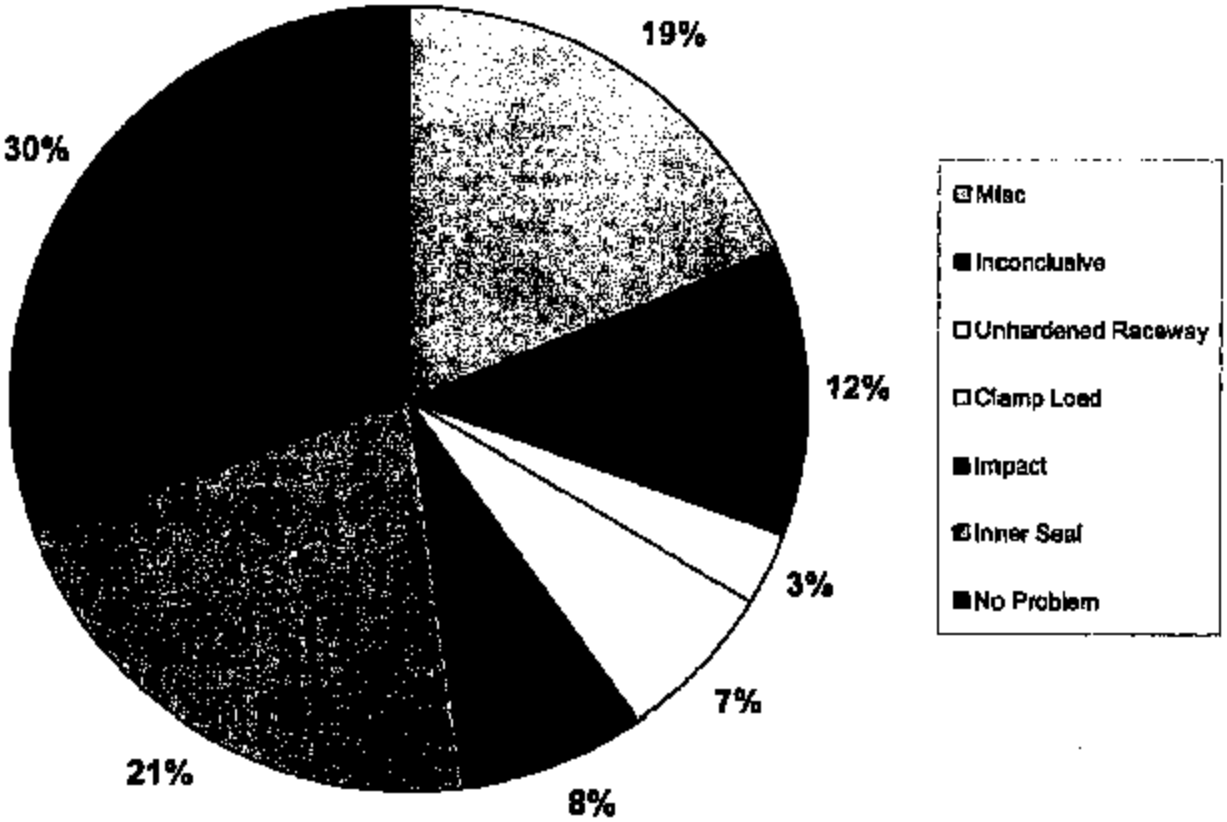
Response
to Main Document

Robert J Bondy/DET/SKF
05/31 09:05 AM

Subject:	Freightliner Discussion may 31 presentation
Response to:	☐ Report to ARM
Category:	Information

FLINER disc.ppt

- The Data
  - Returned Material Review



Miscellaneous:

- **5.1% Removal damage (reason for removal not given; not apparent**
- **2.9% Water intrusion along spindle**
- **2.2% hub cap lost**
- **2% inner come**
- **1.6% Tampering**
- **1.4% Oil separation**
- **1% Outboard seal**
- **Balance: end play, cup spall, corrosion, assembly, quality**

SKF 001660

SKF

Main failure causes identified

- **SKF**
  - CFW seal
  - R-safe seal
  - Stud hardness
- **ARM**
  - Mounting without rotating
  - Stud replacements

CFW seal
cause sheet

- **Cause:** IR Seal failure / not sealing properly
- **Effect:** Unacceptable higher indication on premature seal failure rate in North America environment.
- **Parts**
  - Affects CFW parts made 1997 through April 2000
  - Replaced by Improved R-safe from May 2000 onwards
- **Findings**
  - Grease used as fubricant. Less grease does not mean it can't perform what it was intended to do.
  - Grease fill (in cavity between lips) amount less in Aiken compared to Luechow
    - might lead to early failures due to less contamination resistance
      - Luechow fill 1.5 g (remain 0,8 g after assembly)
      - Aiken fill 0,3 g
    - No spec's on grease fill from Freudenberg
  - Grease fill is used primarily for reducing seal lip wear
  - Average seal life shorter in NA compared to Europe
    - Operating differences
    - Maintenance differences
  - CFW seal pumping action reduces effect over time
  - Failure rate <1% lead to change from CFW to R-Safe seal
  - >1 % water will break down the grease function
- **Conclusions**
  - Different grease fill
    - Study show no effect on seal wear
      - Statistics to support statement
    - water immersion will reduce life if
      - Statistics to support statement
  - Question to ARM: How much water will normally spray on the bearing ?
  - Question to ARM: What's the extent of high pressure cleaning
- **Recommendations**
  - Evaluate Retrofit pop-out bolt from Wabash (Plan timing TBD By 03 June 02)
    - To be checked by the driver min once per day
    - To be used in combination with ABS signal warning
  - R-Save Seal Axial VS Dirt Lip Design
  - Grease Change GWZ

R-safe seal
cause sheet

- **Cause:** IR Seal failure / not sealing properly
- **Effect:** Unacceptable higher indication on premature seal failure rate in North America environment.
- **Parts**
  - Affects R-Safe parts made after July 2000
- **Findings**
  - Molding defects (April 5, 2002)
    - fill not completed on one lip or both lips / de-flashing not complete
    - 10 claimed parts returned from ARM
      - 6 showed defects on both lips
      - The other 4 were not seal related
      - Water intrusion only possible when both lips are defect
    - Defects on the seal lips are run out under operation due to wear
      - heve seen on samples thet et least one lip is repaired within 100.000 miles
    - Defect rate found is < 2% of both lips
      - note: The findings are from inspection of the last production lot. However the scrap rate was the same for the other production lots Samples from the other production lots will be checked for verification.
    - 100 % air test already implemented in Elgin
- **Conclusions**
  - Water intrusion could happen if:
    - Both lips defected
    - Water flooding at early mileage (before lip repair itself)
  - Rig test on pre-damaged bearings shows residual life in excess of 80.000 miles.
- **Recommendations**
  - Evaluate the Retrofit of pop-out bolt (Plan Timing TBD by 03June02)
  - Implement 3 extra inspections
    - at 50, 100 and 150 thousand miles
  - Complete instrumental road test for verification
  - Continuous improvement with R-Safe +

SKF 001863

Stud hardness
cause sheet

- **Cause:** Studs with hardness out of spec, incl high hardness variation
- **Effect:** Fractures occurring at low mileages or during re-torque of wheel nuts
- **Parts**
  - Affects studs from supplier Ingersoll. Delivery started Feb 2001
- **Findings**
  - Bolts delivered outside SKF
  - SKF spec's in Vickers 0,3
    - NATC uses video monitoring equipment
    - Ingersoll measures with manual equipment
    - Correlation issues between NATC and Ingersoll
  - Affects shipment lot #4, and possibly #3 & #5 Verification by 14June02
  - Pending proper 8D report from Ingersoll Due 03 June 02
  - MascoTech bolts from 1997 with >500,000 miles up to 456 HV 0,3
- **Conclusions**
  - Ingersoll have not a capable HT process
  - Measurement principles different
    - SKF key spec on surface hardness
    - Ingersoll measurement principle focus core
    - Difficult translation between two meas. principles
- **Recommendations**
  - Temporary deviation to be issued to Ingersoll for slight increase in surface hardness
  - Revalidate Mascotech as supplier with new heat treat process
  - Long Term Effect Evaluation Study (Timing by 03 June 02)

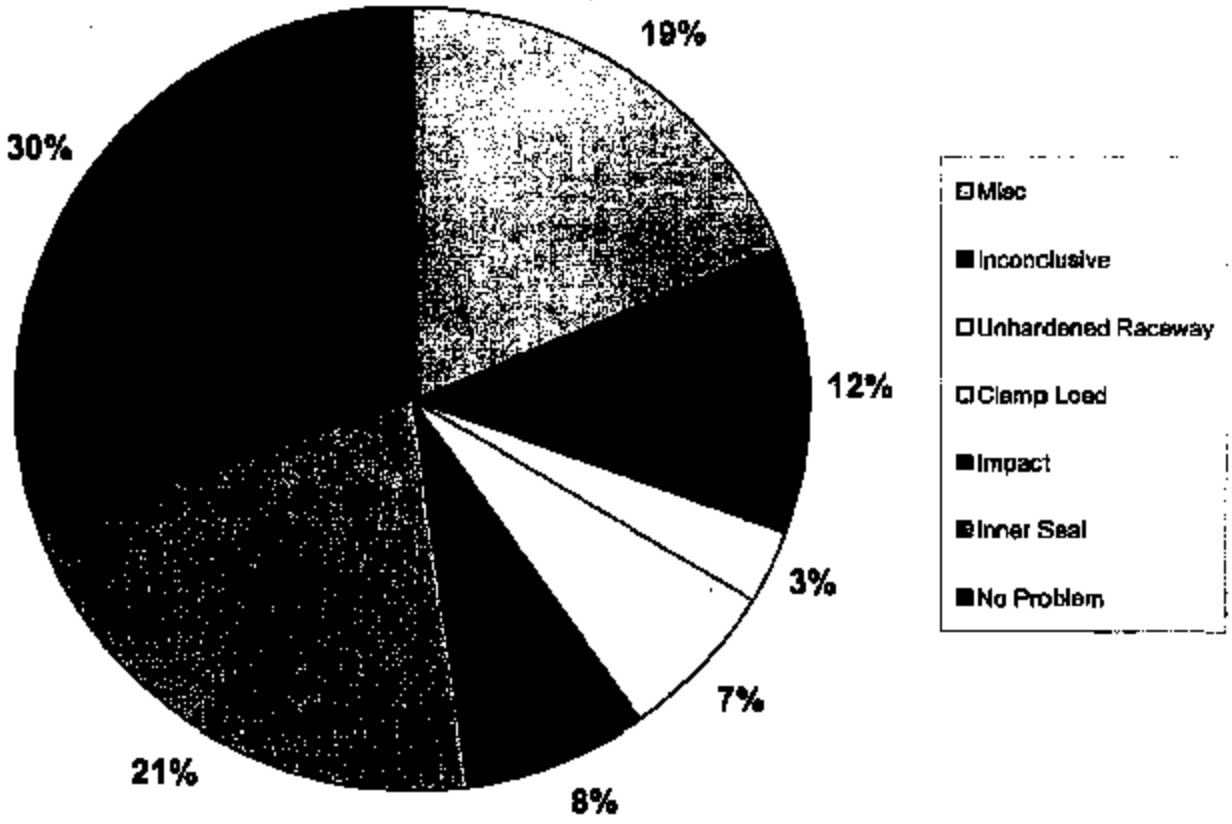
Unhardened IR raceway cause sheet

- **Cause:** Unhardened IR raceway
- **Effect:** Early spalling
- **Parts**
  - Affects bearings during Q1 1999 through Q2 2000
- **Findings**
  - 20 bearings were returned and evaluated with unhardened inner rings returned from field
    - Early spalling started
- **Conclusions**
  - Heat Treatment process not working properly for a short period of time
  - No further returns received after corrective actions.
  - Root cause identified and fixed.
- **Recommendations**
  - Case closed

Mounting without rotating OR cause sheet

- **Cause:** Damage raceways during mounting
- **Effect:** Insufficient life for 1 million miles
- **Parts**
  - Affects units from 1997 through April 2001
- **Findings**
  - Nicks found on OR raceways during installation
  - Rotation is part of SKF mounting instructions
  - ARM introduced Controlled rotation April 2001
- **Conclusions**
  - ARM introduction of automatic device was made to ensure proper mounting.
- **Recommendations**
  - Evaluate Detectability Device
  - Closed issue for current product

- The Data
  - Returned Material Review



Item Description	Corrective Action

SKF 001868

Discussion

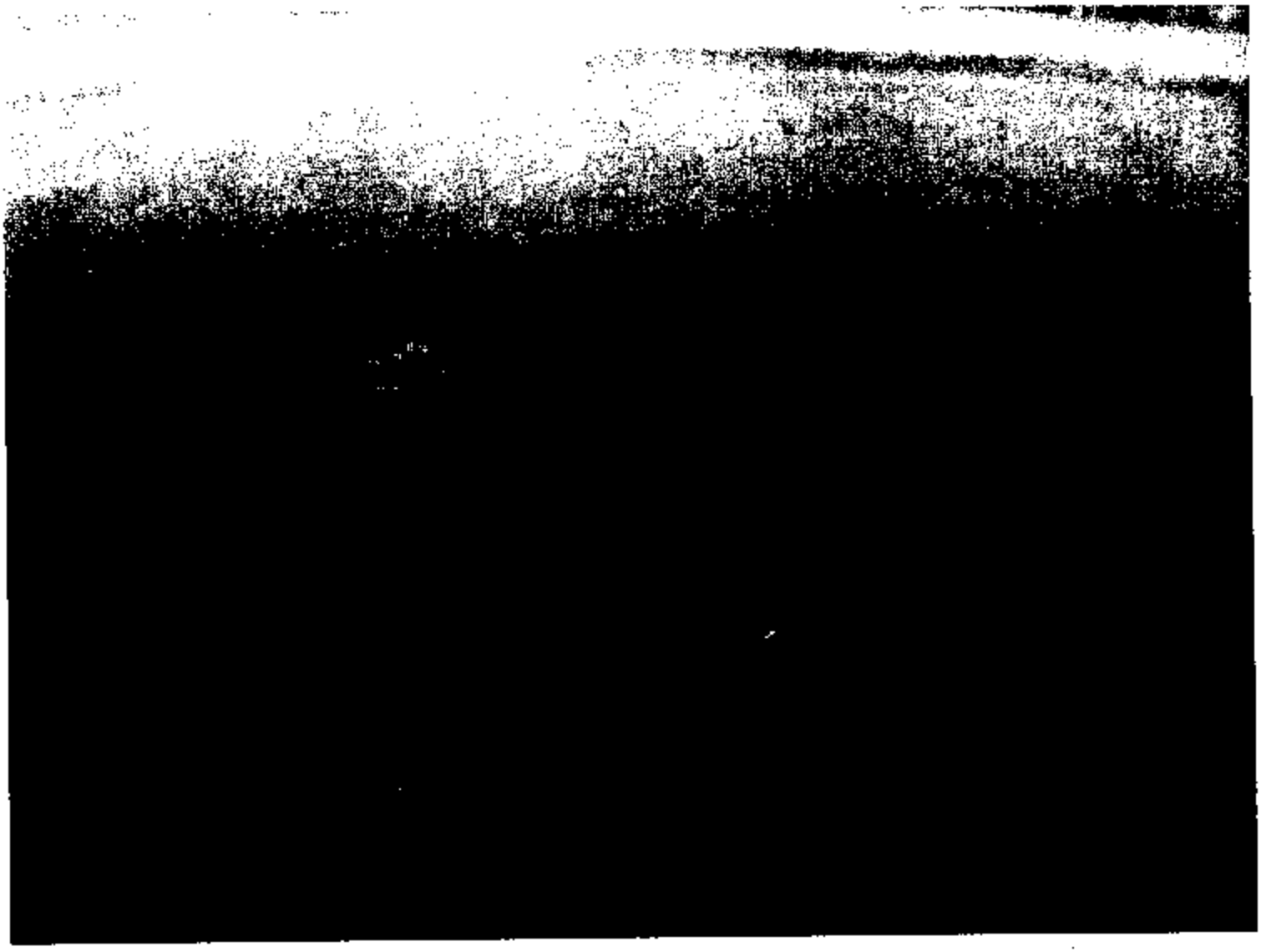
Main Topic

Bernd Stephan/SCH/SKF
06/30 04:59 AM

Subject: 50000 miles inspection intervall rig test,- pictures after completion

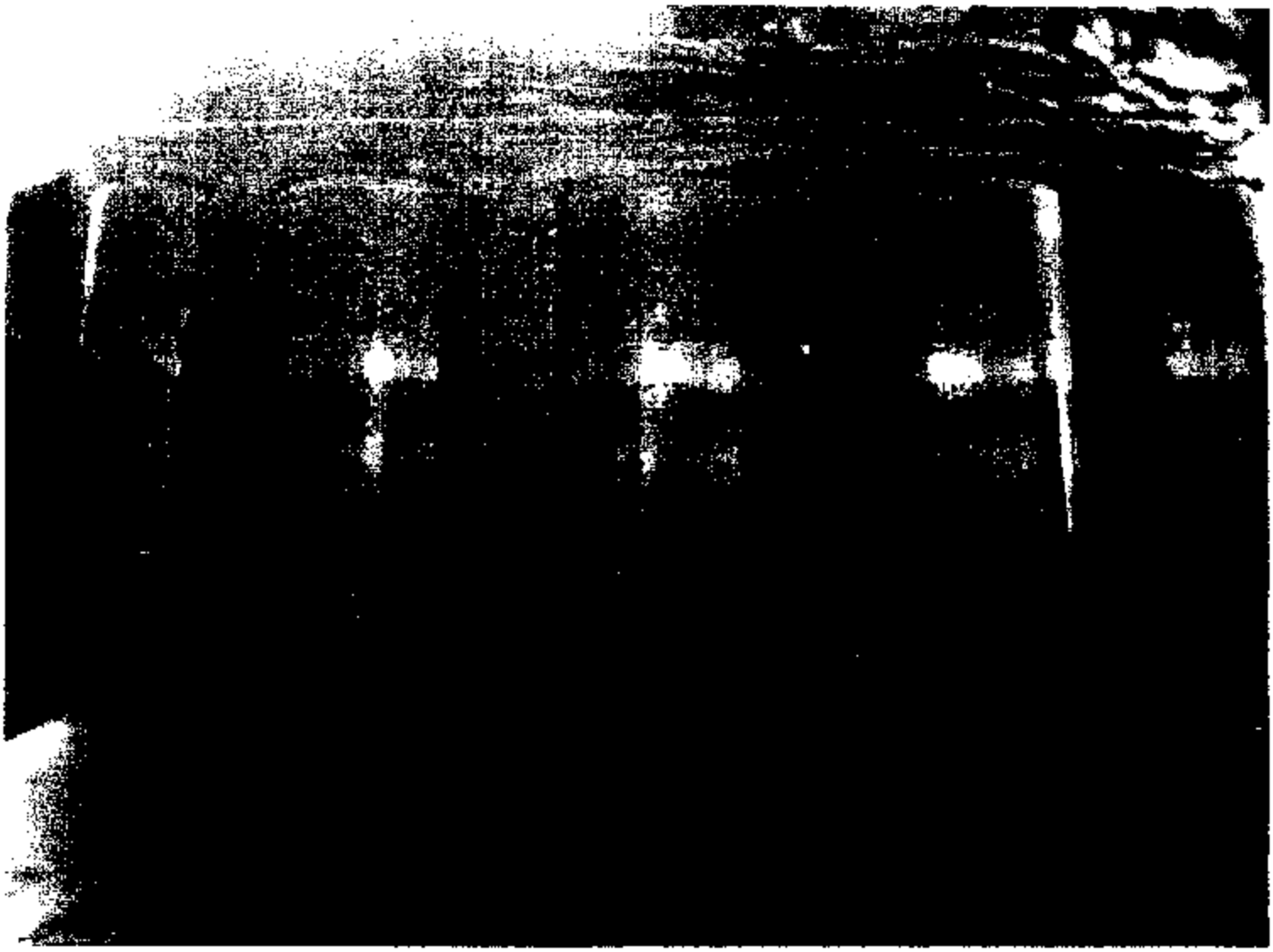
Category:

KIF_0529.JPG KIF_0523.JPG KIF_0524.JPG KIF_0525.JPG KIF_0526.JPG KIF_0522.JPG



SKF 001873

SKF 001874



SKF 001875

Discussion

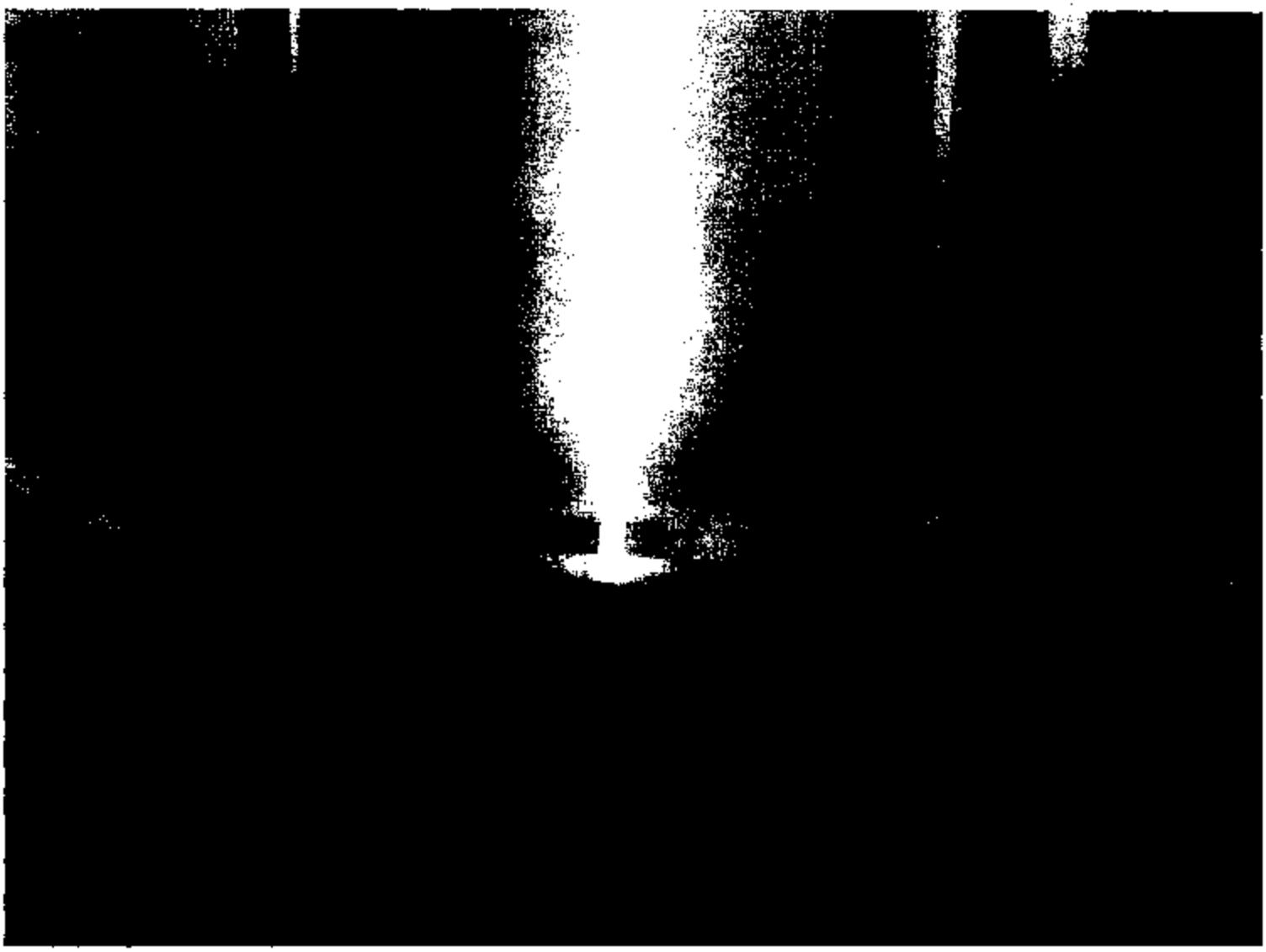
Main Topic

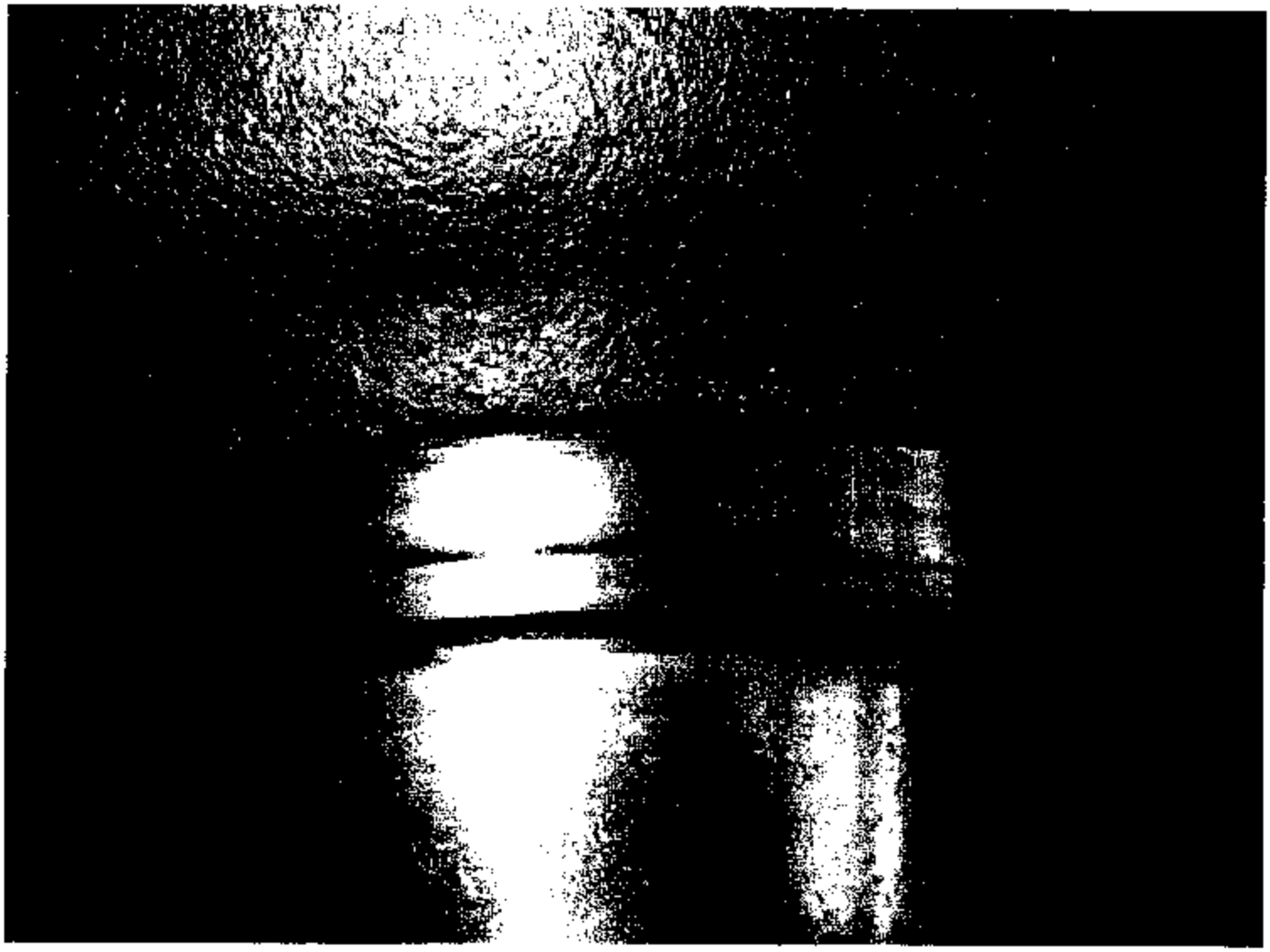
Bernd Stephan/SCH/SKF
05/30 04:56 AM

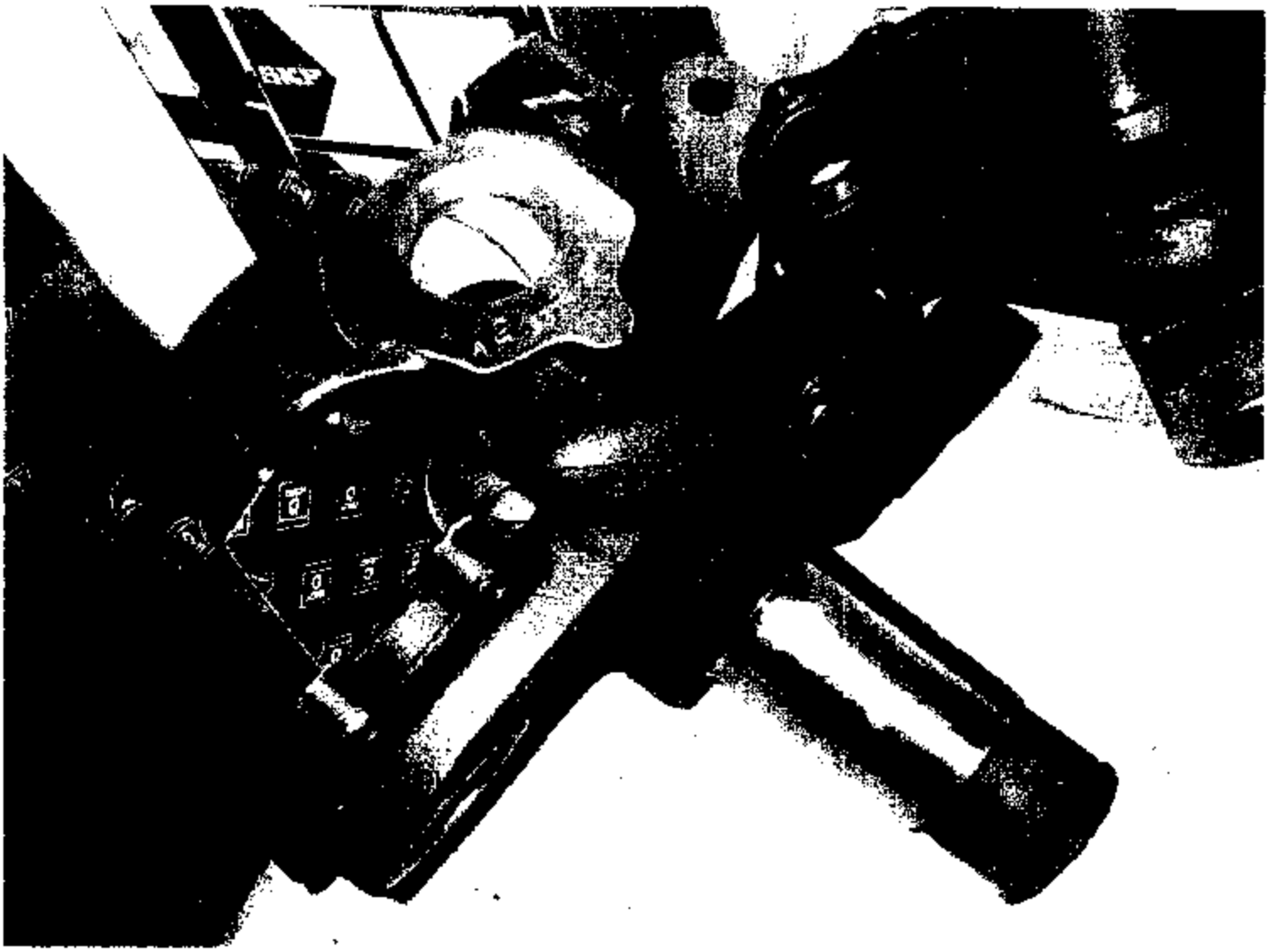
Subject: ARM Knuckle pictures

Category:

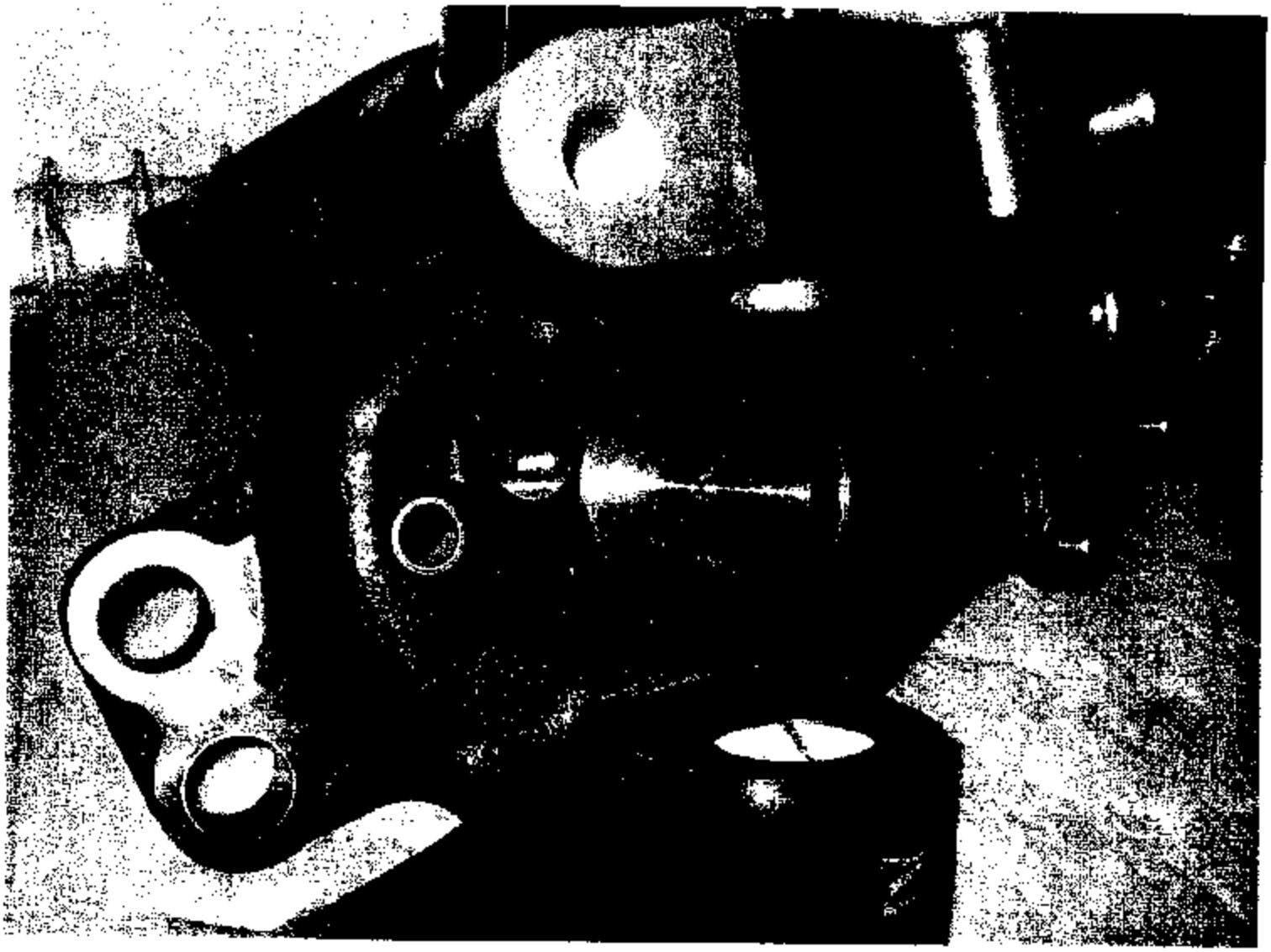
KIF_0533.JPG KIF_0516.JPG KIF_0530.JPG KIF_0531.JPG KIF_0532.JPG KIF_0515.JPG



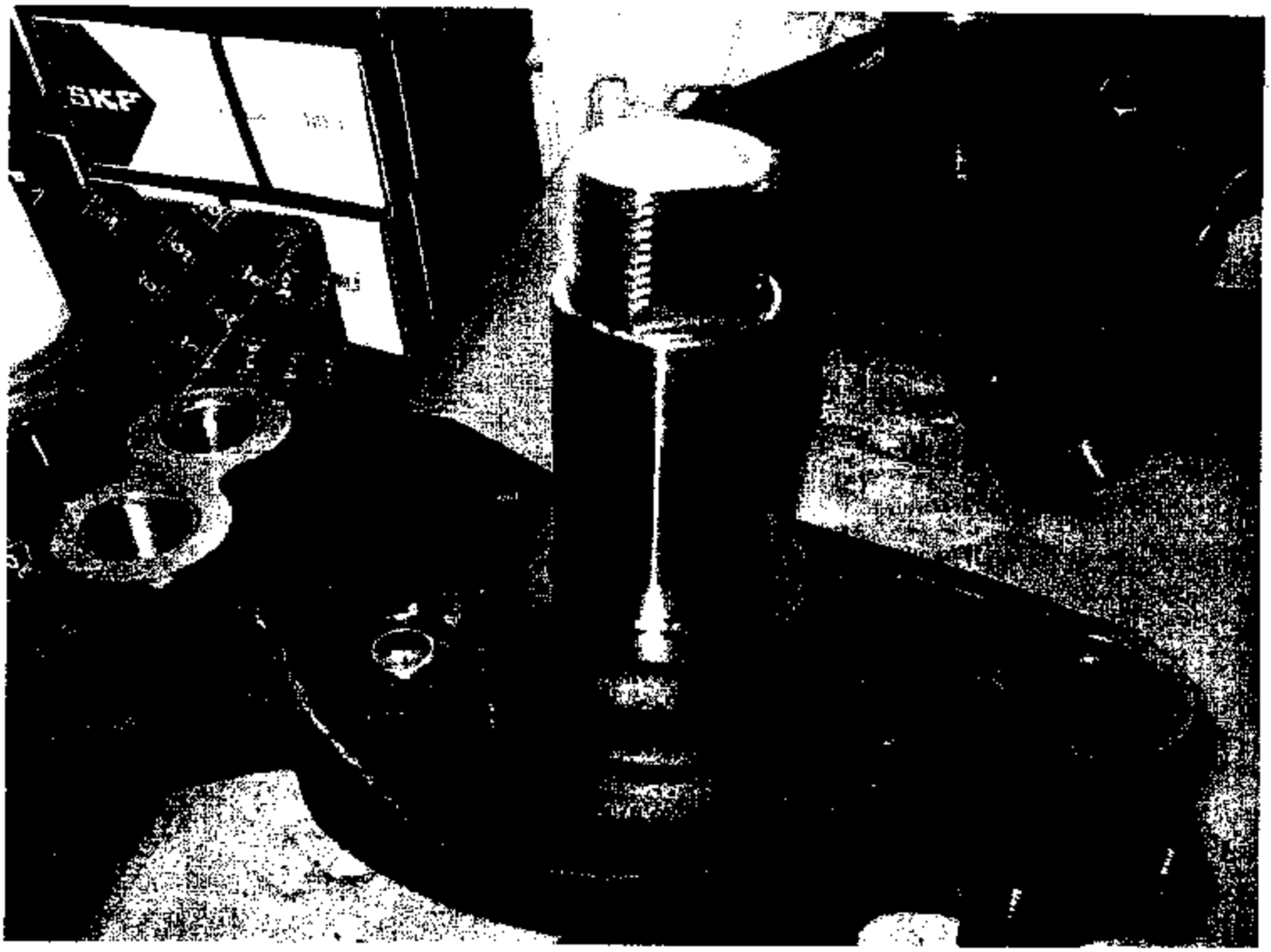


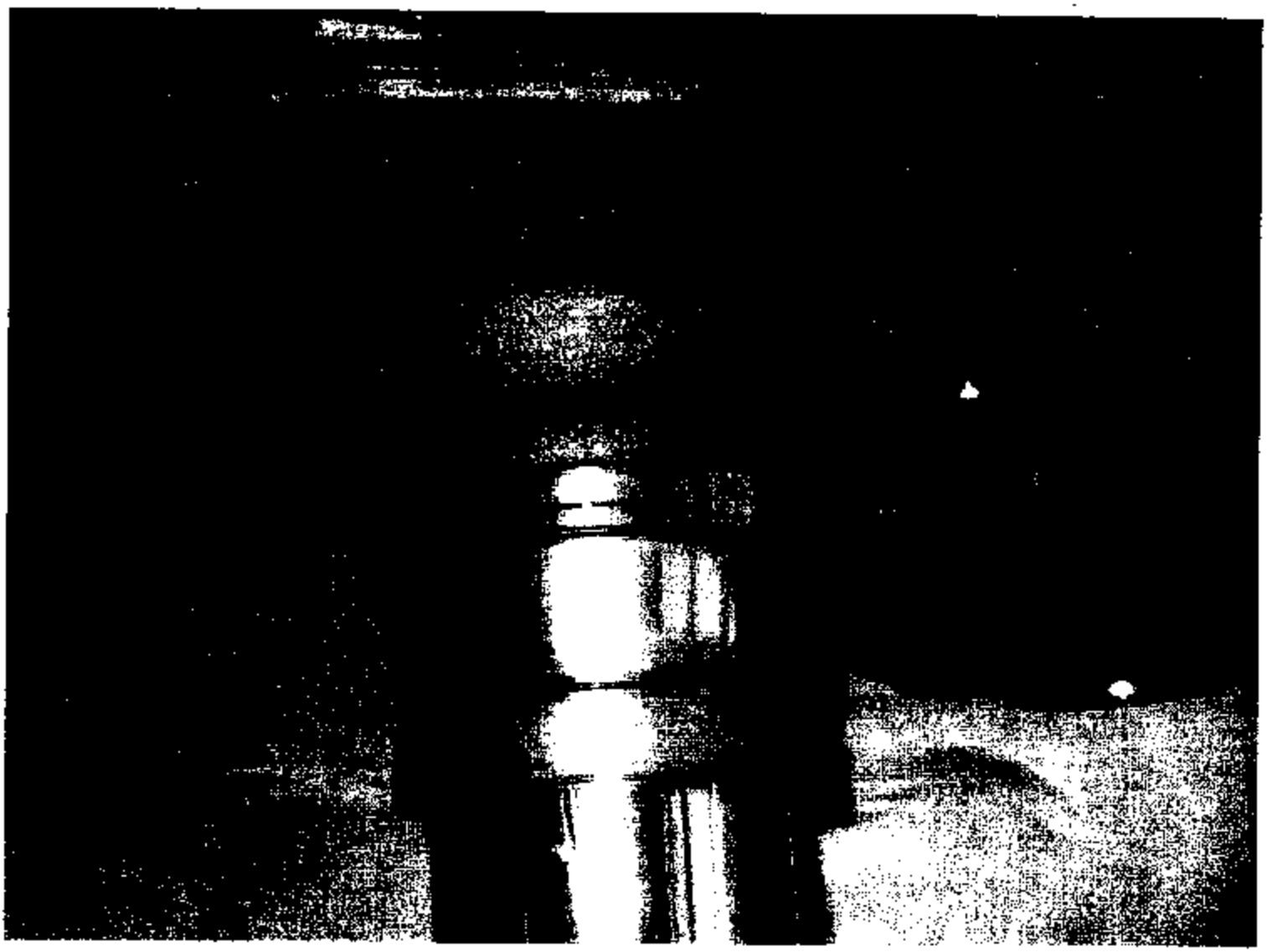


SKF 001679



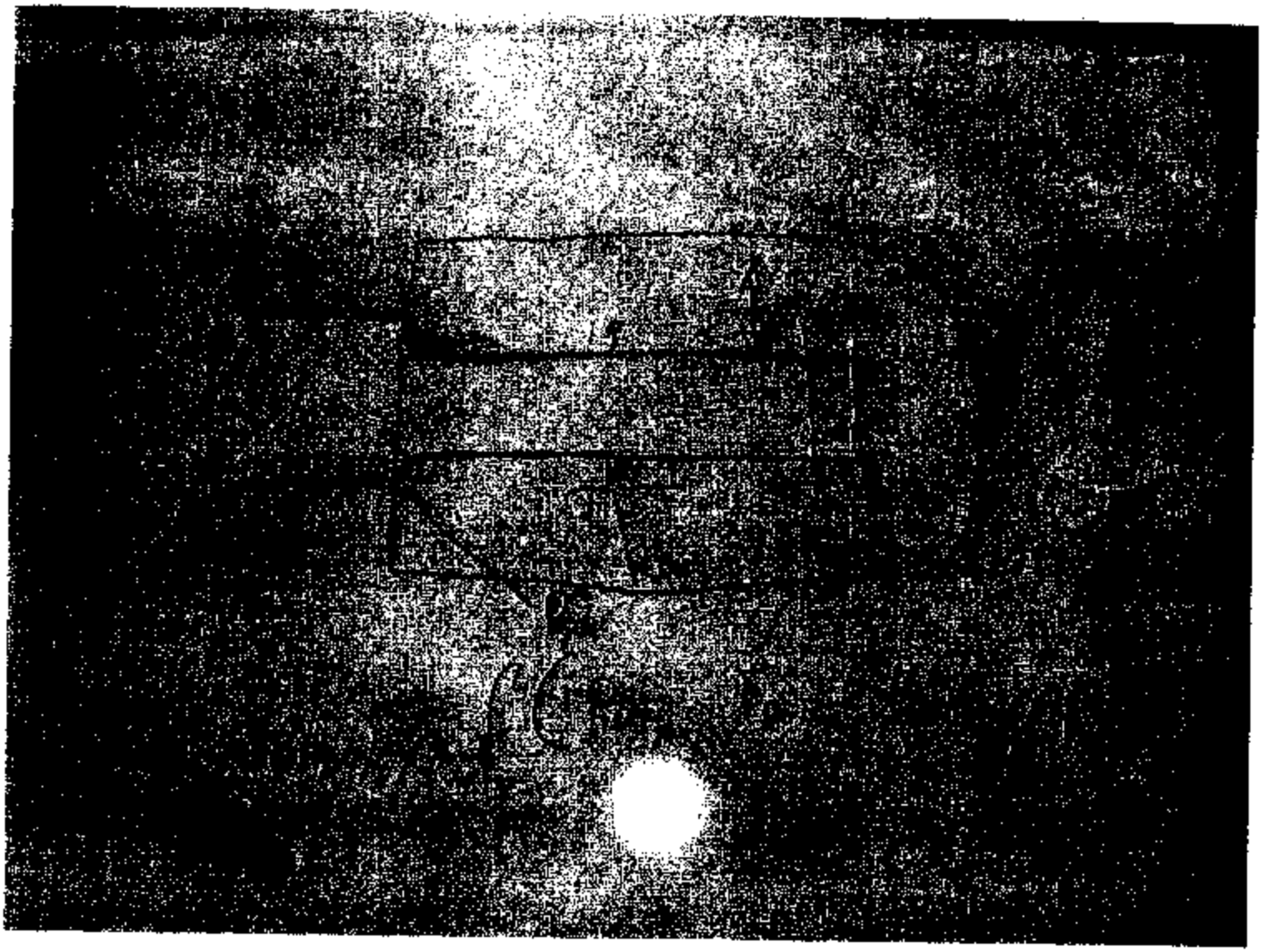
SKF 001880


SKF



Discussion Main Topic	Subject:	Main route cause "Water ingress along the spindle" and influencing parameters
Bernd Stephan/SCH/SKF 05/30 04:56 AM	Category:	

KIF_0543.JPG



SKF 001884

Discussion

Main Topic

Bernd Stephan/SCH/SKF
05/30 04:44 AM

Subject: pictures from field retured parts inspected at Schweinfurt

Category:

ARM THU2 without O-Ring but with R-Safe seal 109318 miles route cause "water ingress along spindle"

KIF_0522.JPG KIF_0523.JPG KIF_0524.JPG KIF_0525.JPG KIF_0526.JPG KIF_0529.JPG

ARM THU2 with O- Ring and R- safe seal 91572 miles route cause " water ingress through seal due to molding defects on both lips"

KIF_0478.JPG KIF_0479.JPG KIF_0480.JPG KIF_0481.JPG KIF_0514.JPG KIF_0484.JPG KIF_0485.JPG

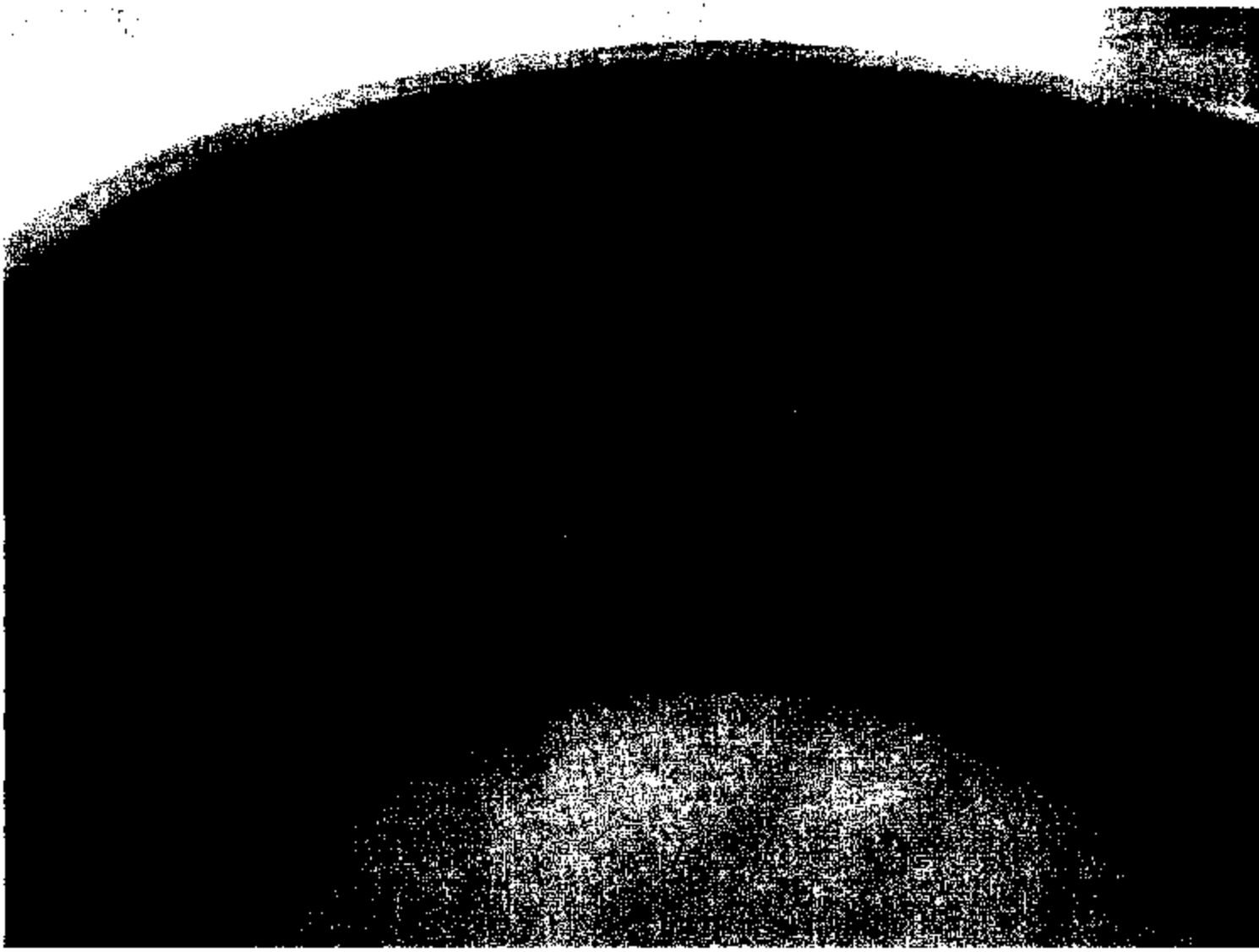
KIF_0509.JPG KIF_0510.JPG KIF_0511.JPG KIF_0483.JPG KIF_0482.JPG

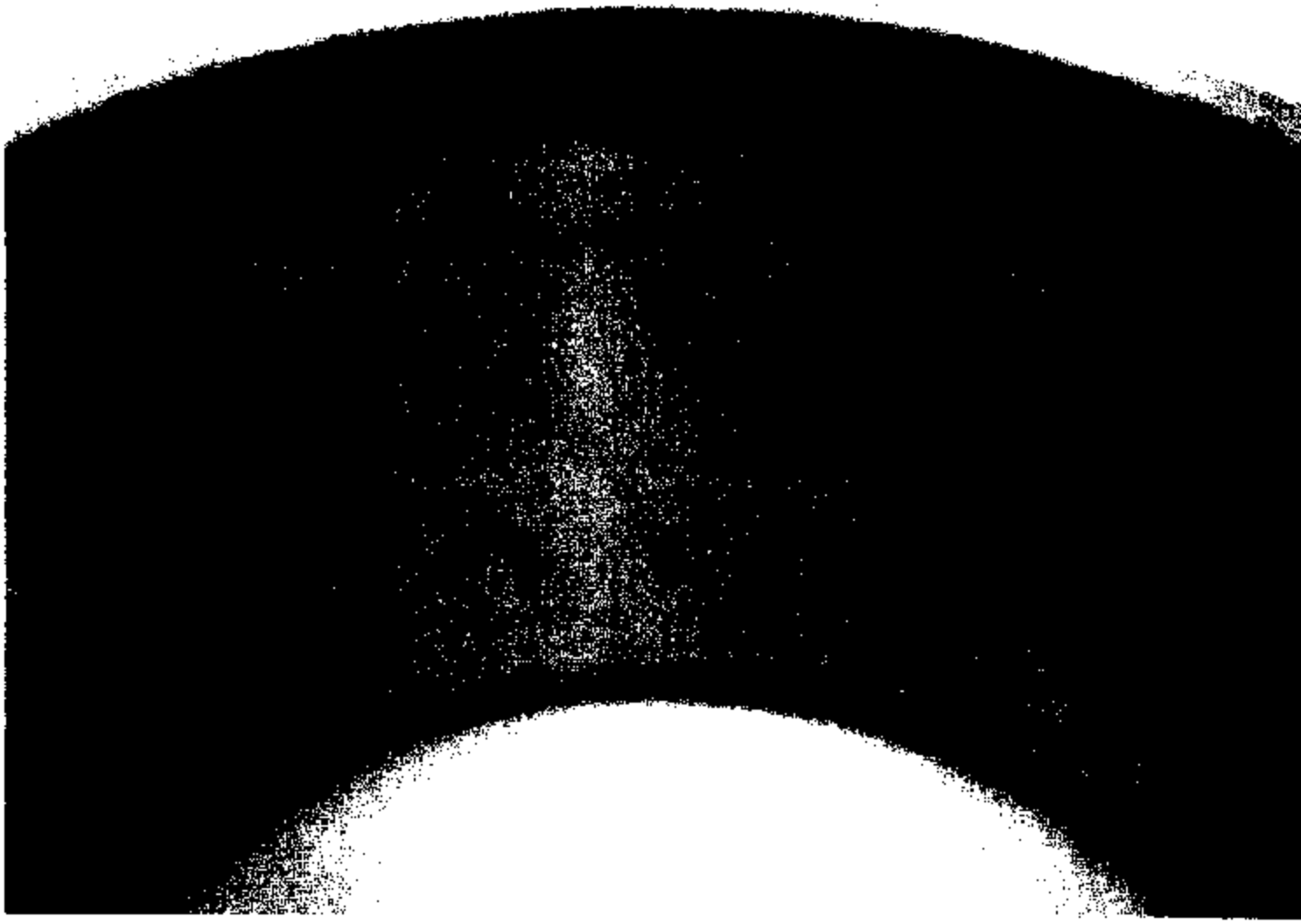
ARM THU2 #9 with CFW seal

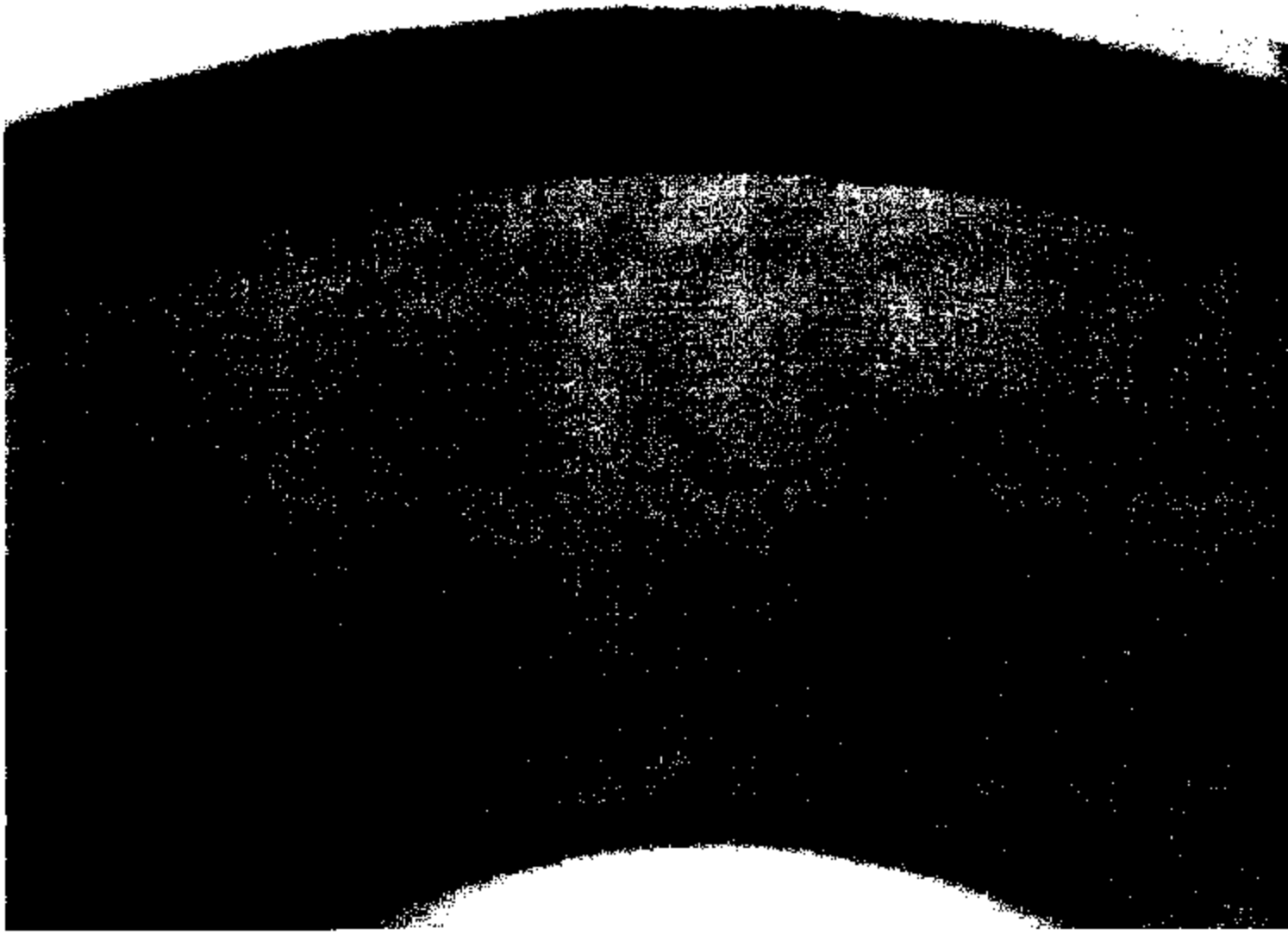
KIF_0508.JPG KIF_0487.JPG KIF_0488.JPG KIF_0489.JPG KIF_0490.JPG KIF_0491.JPG KIF_0492.JPG

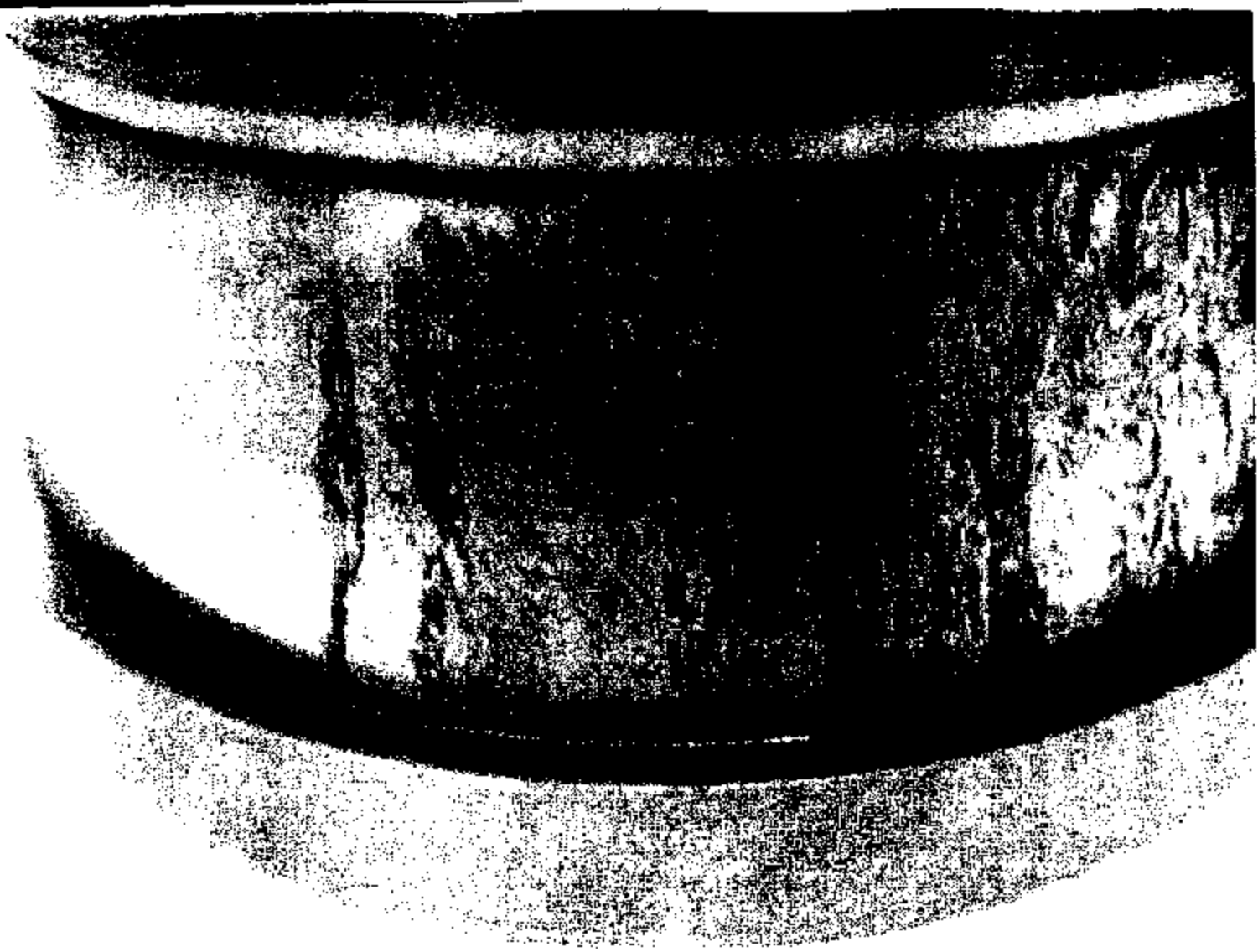
KIF_0493.JPG KIF_0494.JPG KIF_0495.JPG KIF_0498.JPG KIF_0497.JPG KIF_0505.JPG KIF_0506.JPG

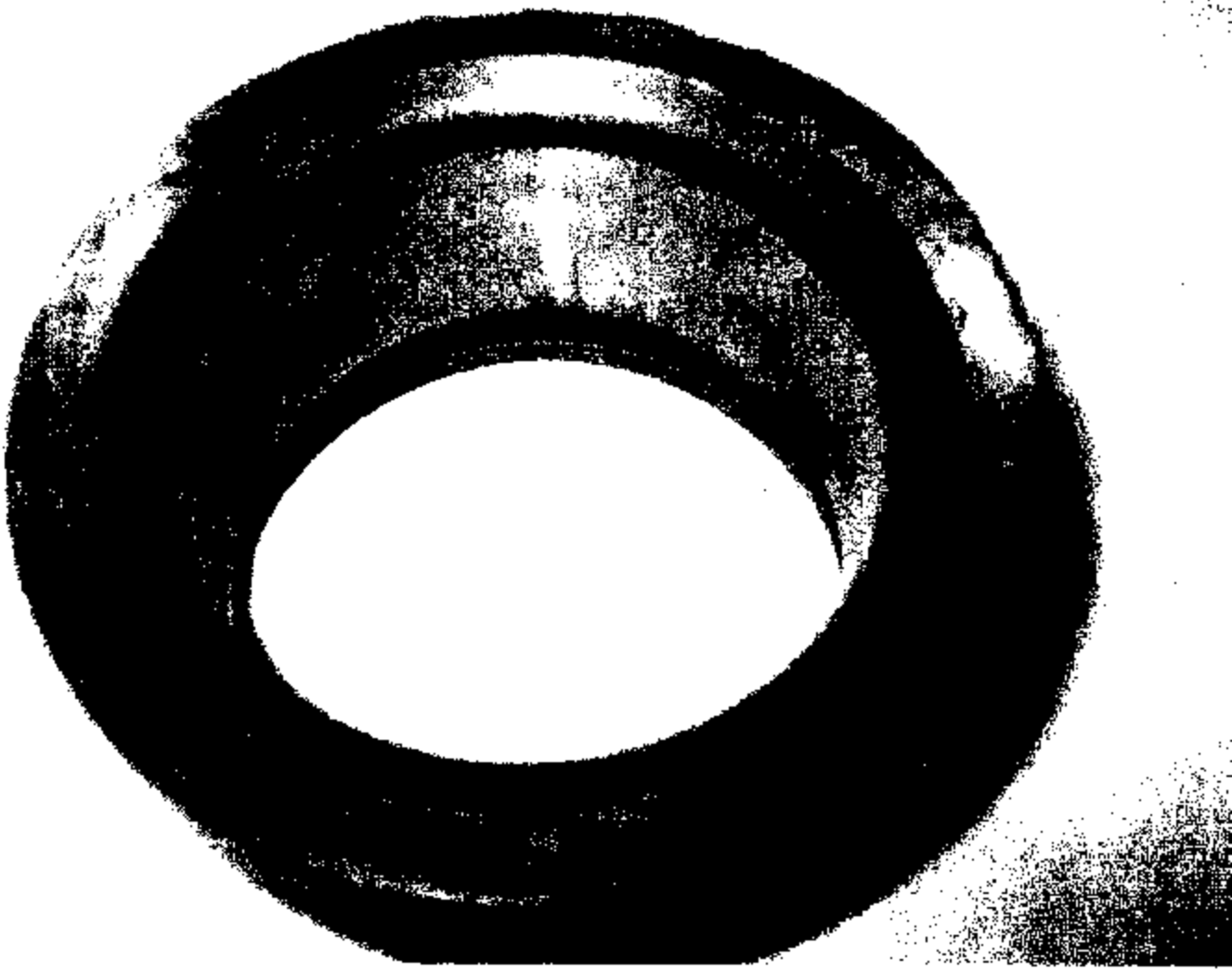
KIF_0507.JPG KIF_0486.JPG

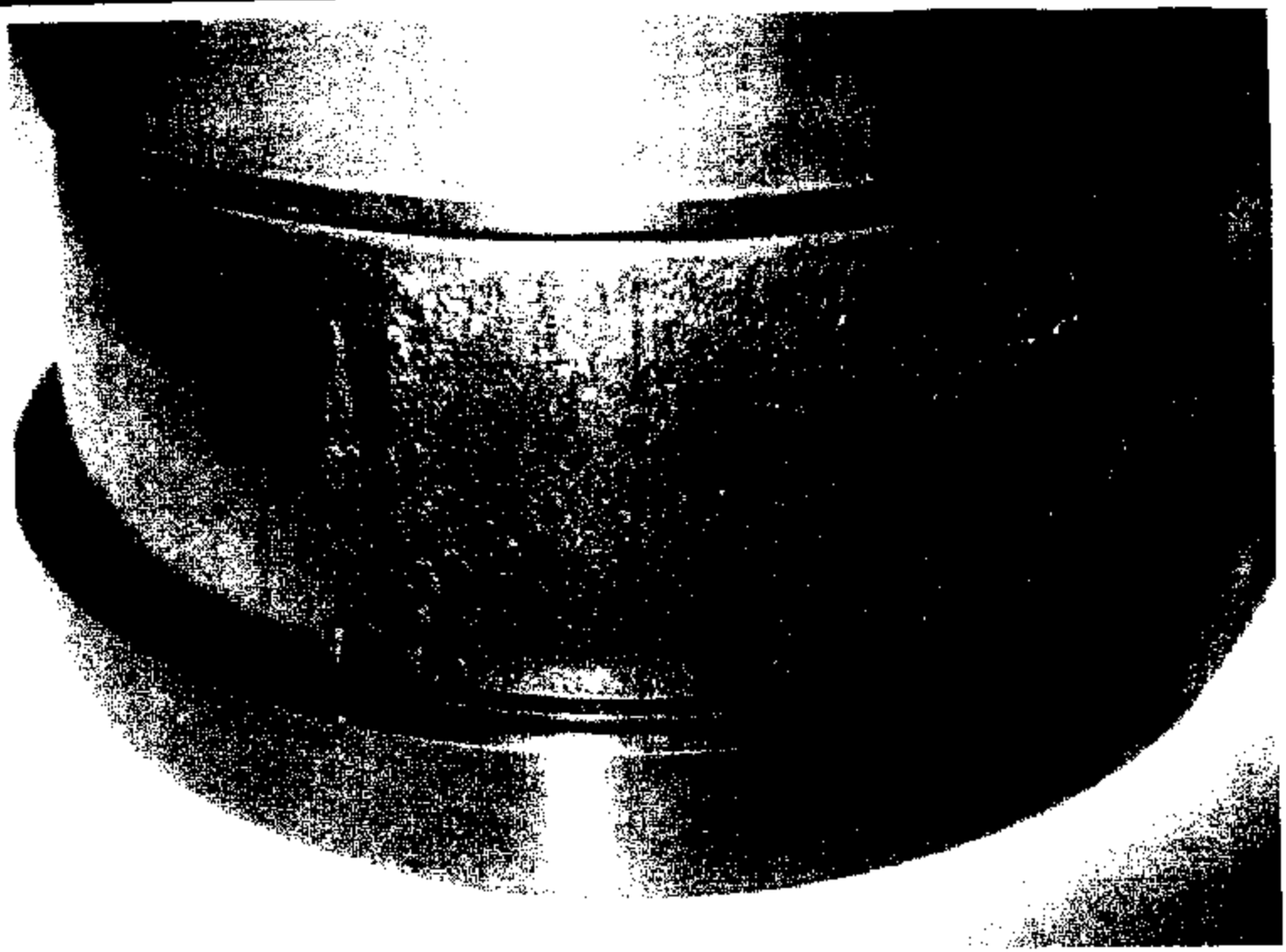


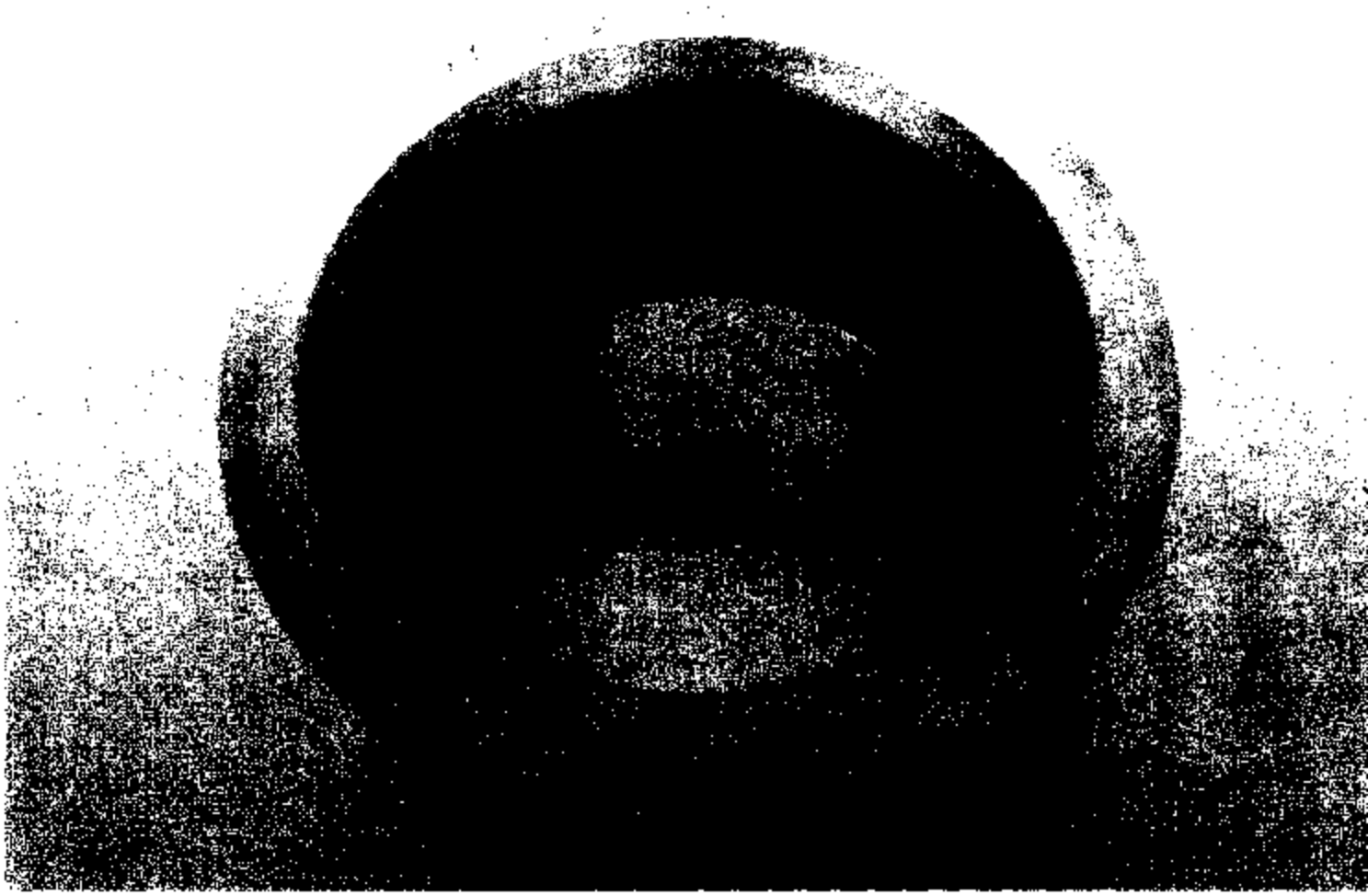


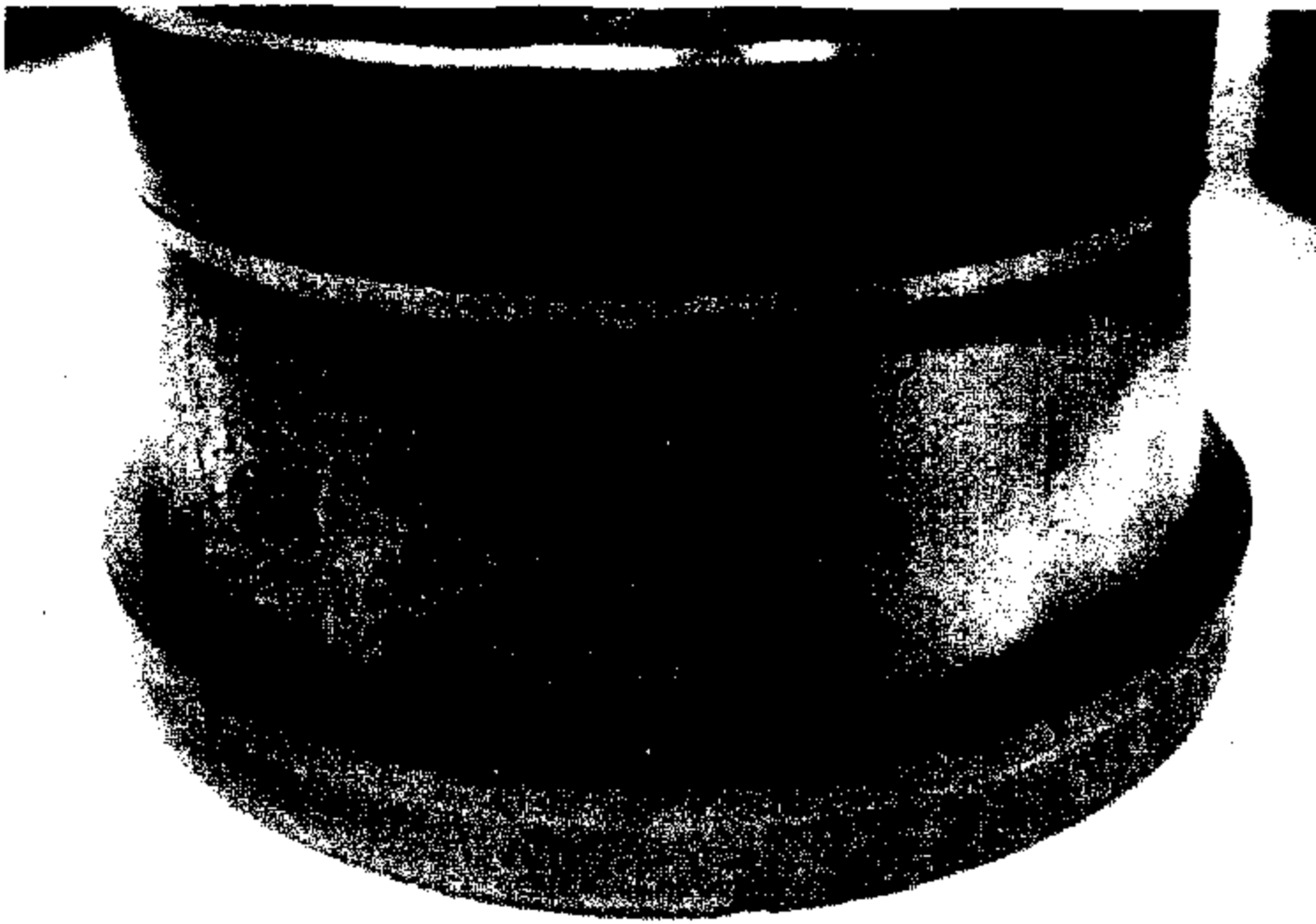


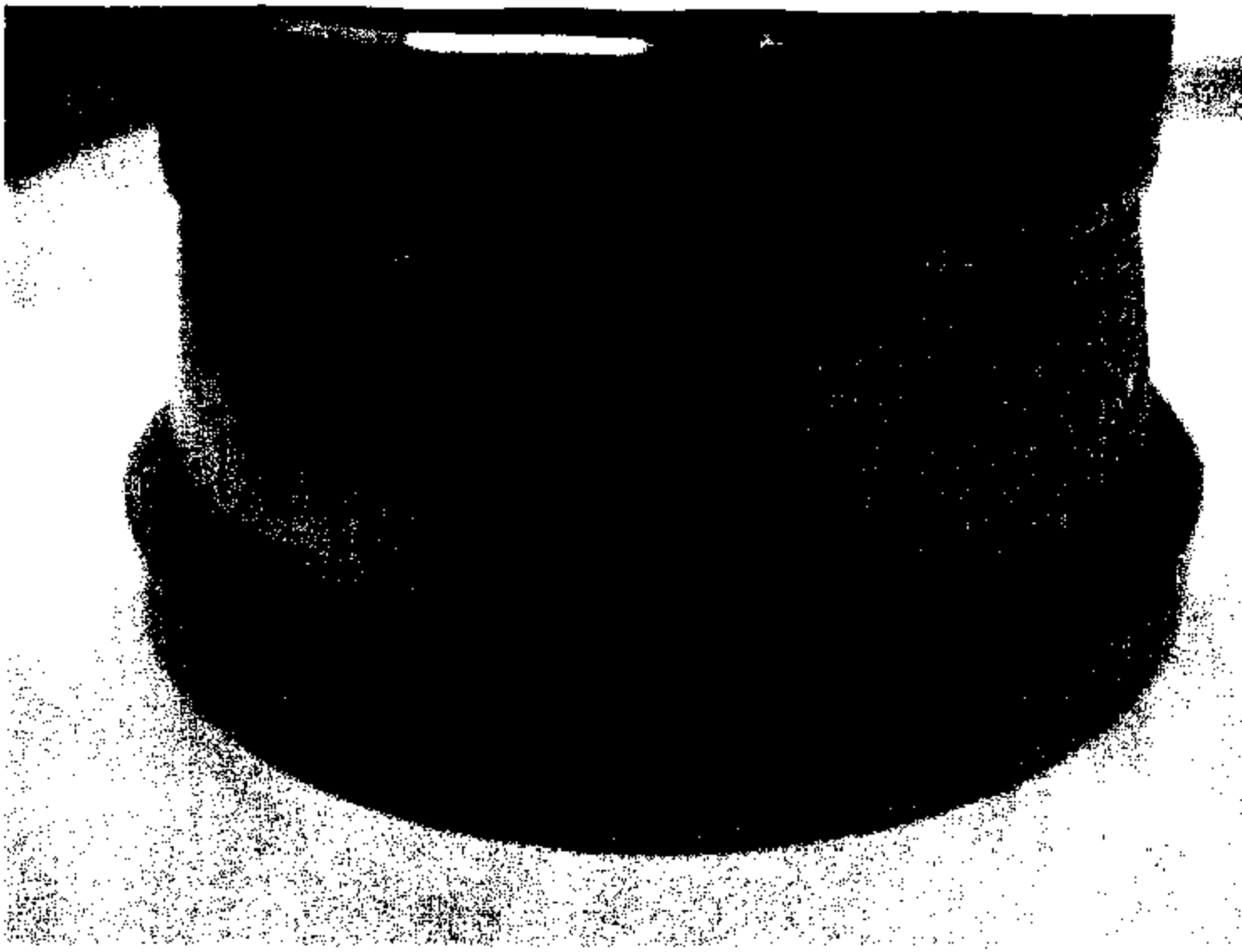


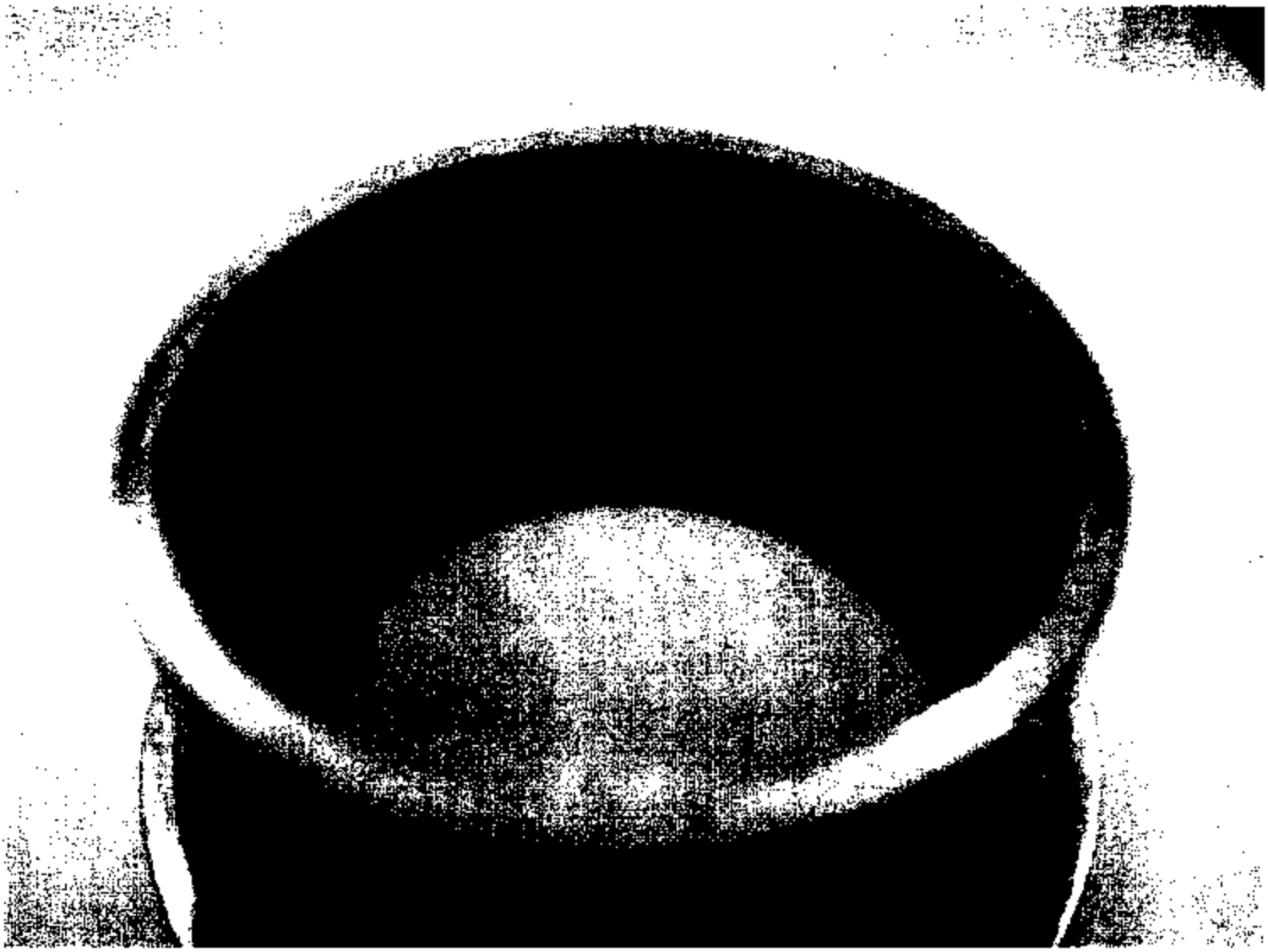


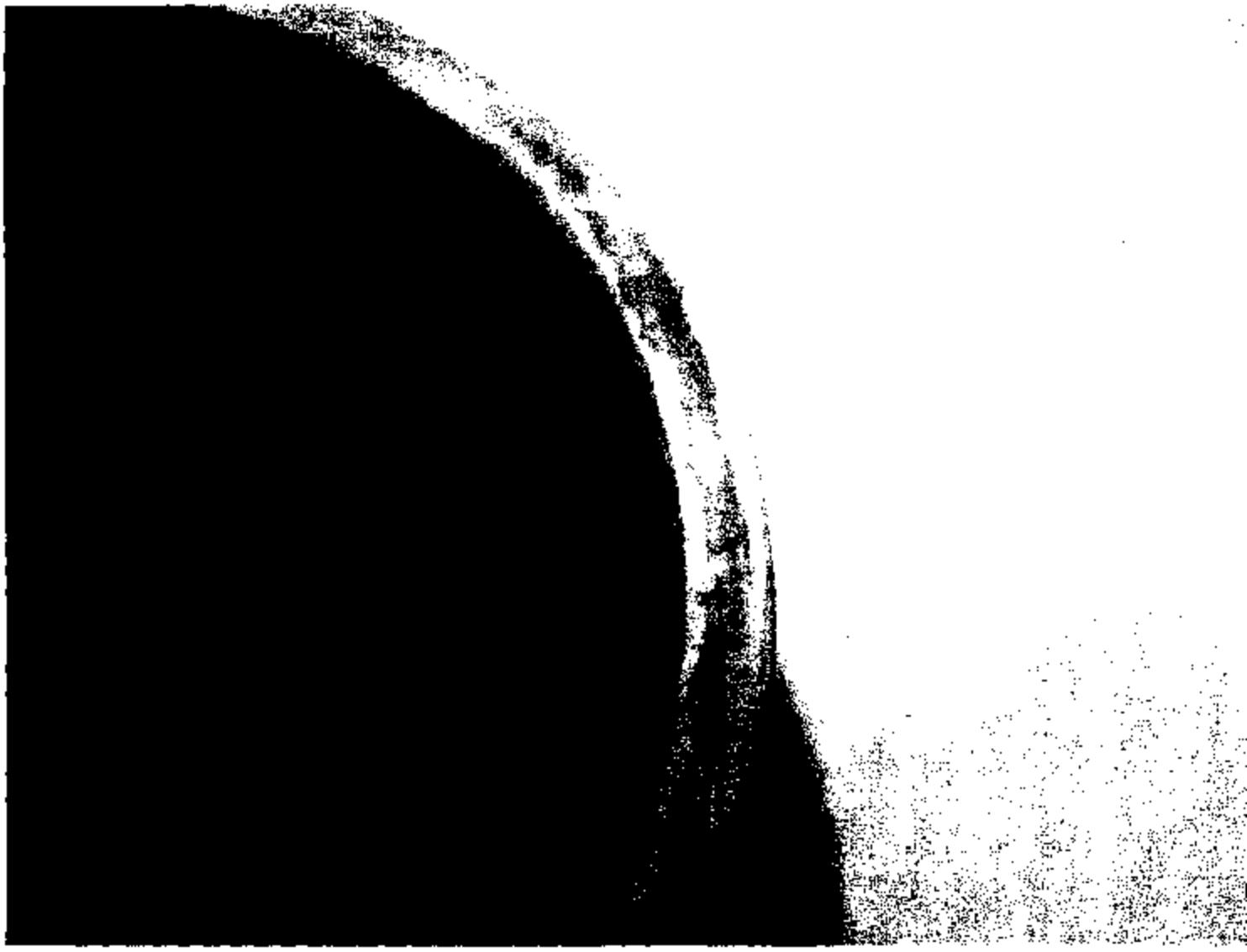


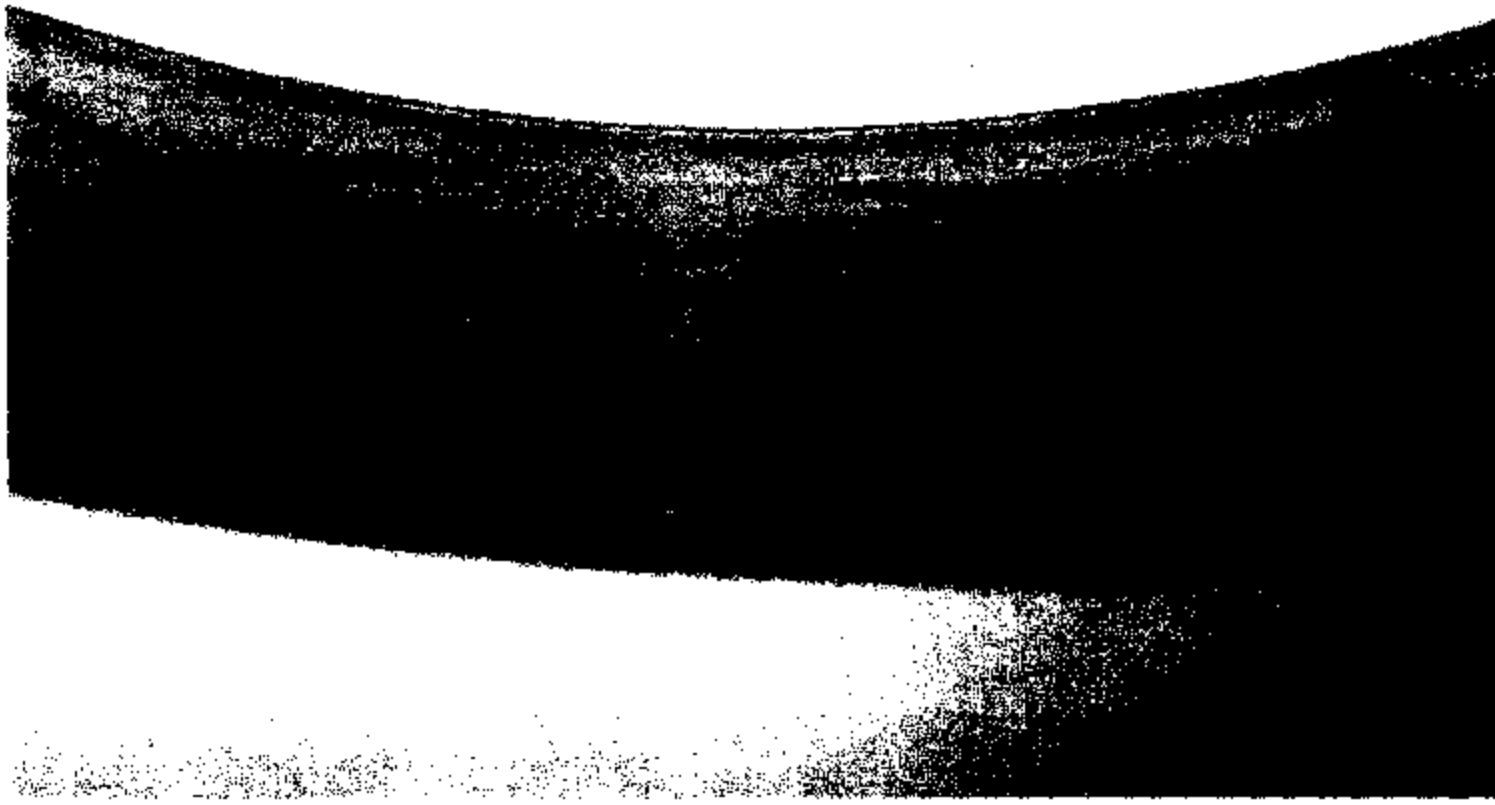












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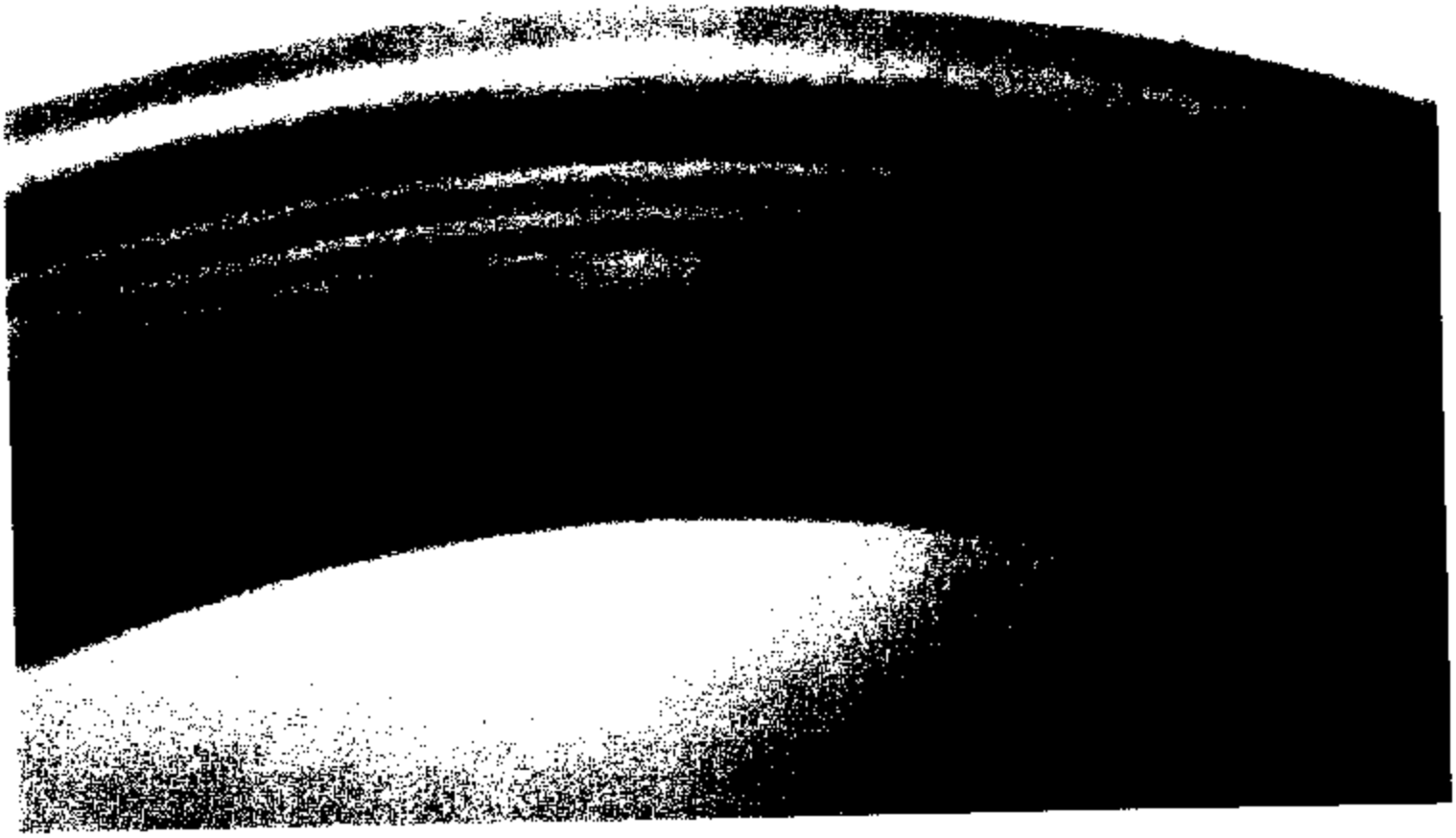
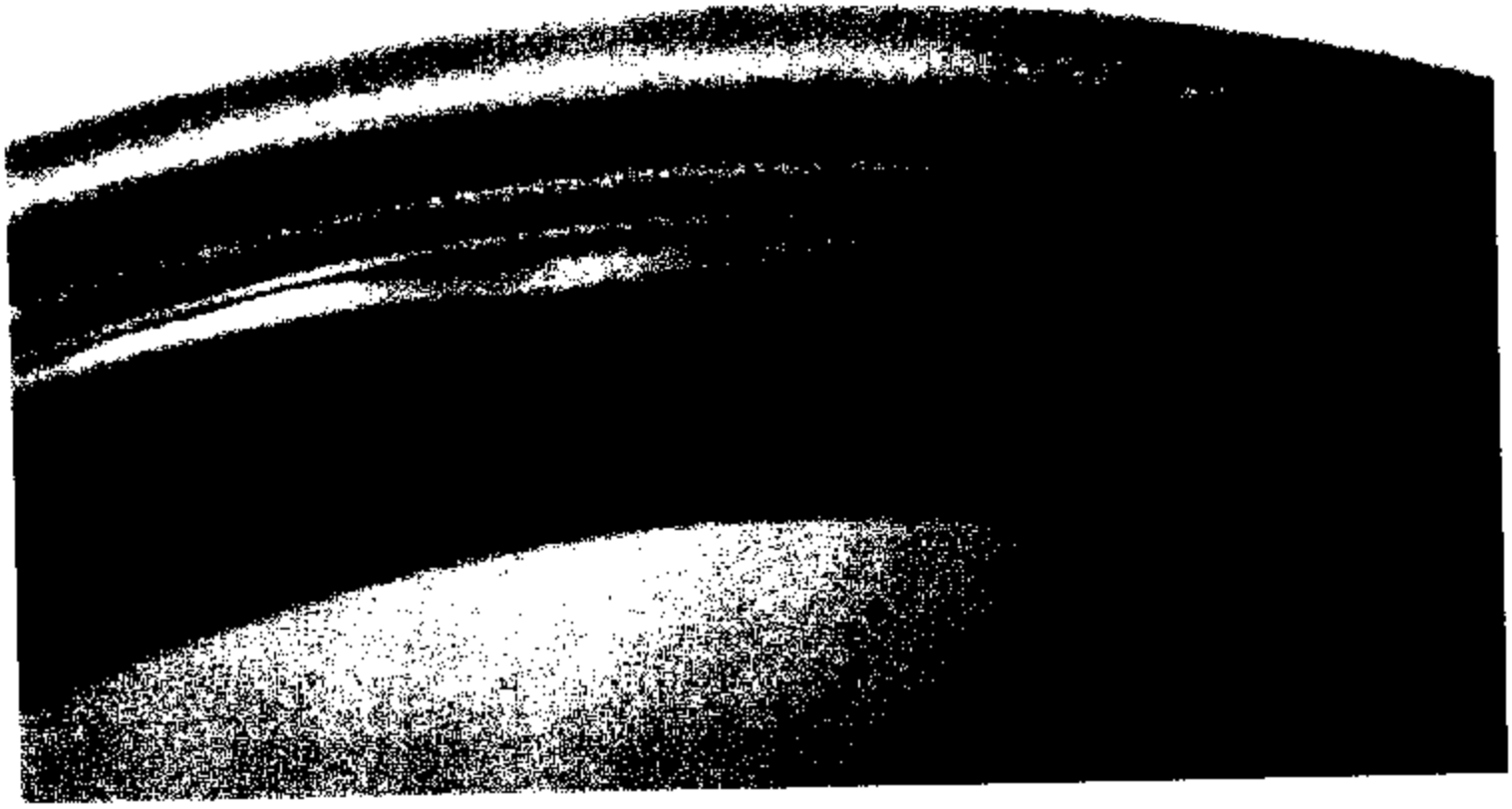
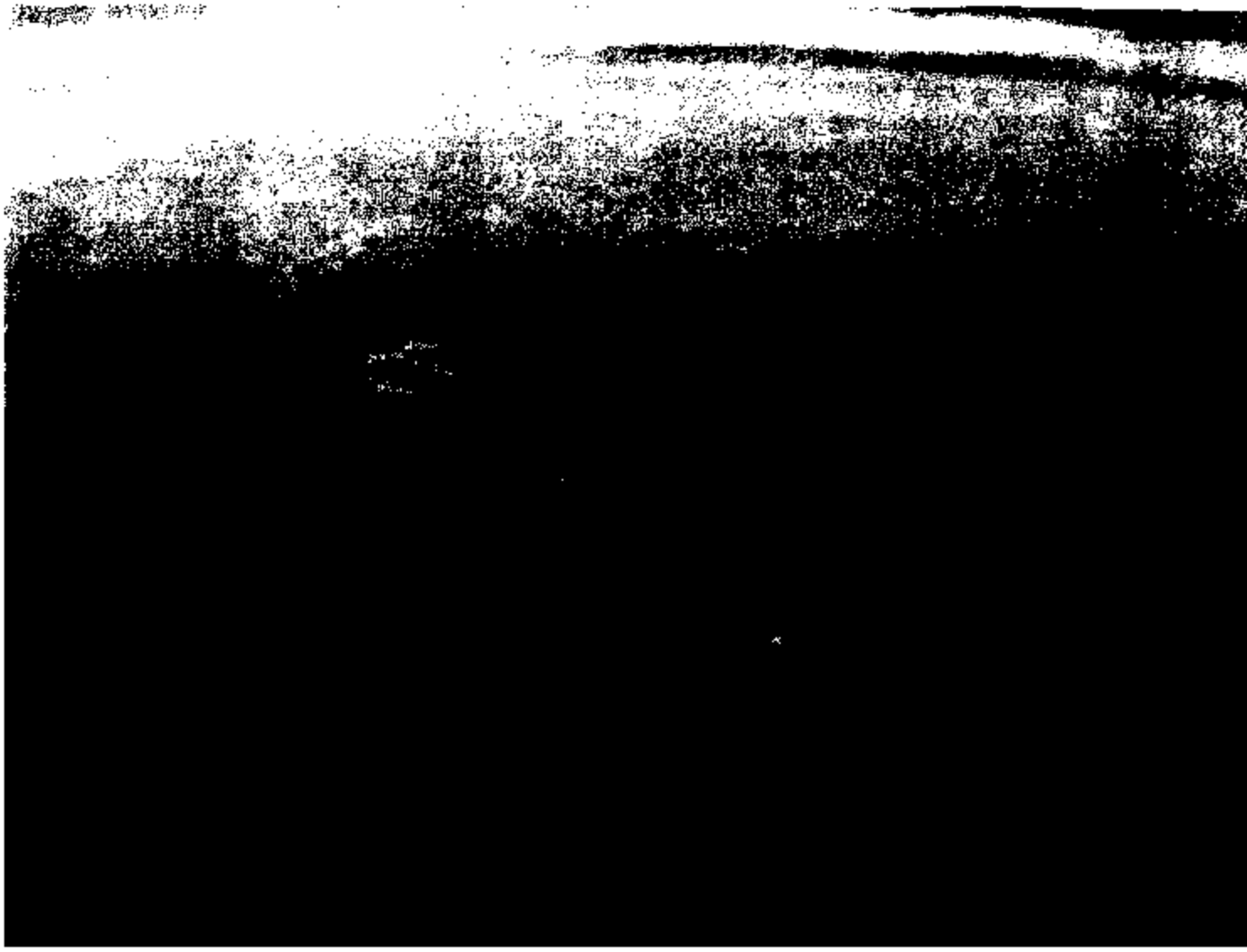






Discussion

Main Topic

Achim Mueller/SCH/SKF
05/29 10:39 AM

Subject: **Engineering Statement on THU Performance**

Category:

Attached document contains a statement of SKF BU Trucks Product Engineering about the potential performance of an SKF front wheel Truck Hub Unit (THU)

SKF Eng. Statement.do

SKF

28.05.2002

Engineering Statement about the design of the THU2-FF for ARM steer application

The bearing design, as it is today, is enable to operate maintenance free for 1 Mio miles under long haul conditions as long as all components are manufactured according the existing engineering specifications and according the manufacturing practice which is established at SKF Lüchow plant.

This is valid also for the seals, grease, grease distribution and the assembly process of the entire unit.

These statements are based on SKF's

- Beacon-Calculation
- X-Ray-Diffraction-Analysis of ARM units (after 560.000 miles in service)
- Raceway qualification testing on rigs
- Inspection of seal returns from field in US and Europe

under the following preconditions:

- No handling damage during transport from SKF to ARM assembly plant. Transport of axles from ARM to truck assembly plant.
- Correct installation on the wheel end spindle and correct application of the clamp load with rotating HUB during tightening of the central wheel nut.
- Correctly machined abutment parts.
- Installation of a sufficient static seal against water ingress along the spindle.
- Correctly secured central nut against loosening.
- No disassembly during operation or service.
- Replacement of studs has to follow strictly the procedure described in ARM's Bulletin. Using any other replacement method is strictly forbidden.

Concerning product improvements,
we see some potential:

1. Adding a third lip to the R-Safe and filling the free space with a water resistant grease like SKF:LGHB2.
2. To select a more wear resistant rubber material than our present FKM-formulation.
3. Further development of the grease for even longer service life.

Discussion

Main Topic

Class
Rehmberg/GHQ/GOT/SKF
05/26 10:18 AM

Subject: **Presentation to CEO May 26th**

Category: Information

The following presentation was made to SKF CEO Sune Carlson, to Thore Bertilsson and Lars Behn
by Claes Rehmberg
Also present was Tom Johnstone and Gunilla Nilsson

THU2 seal issue3.pp

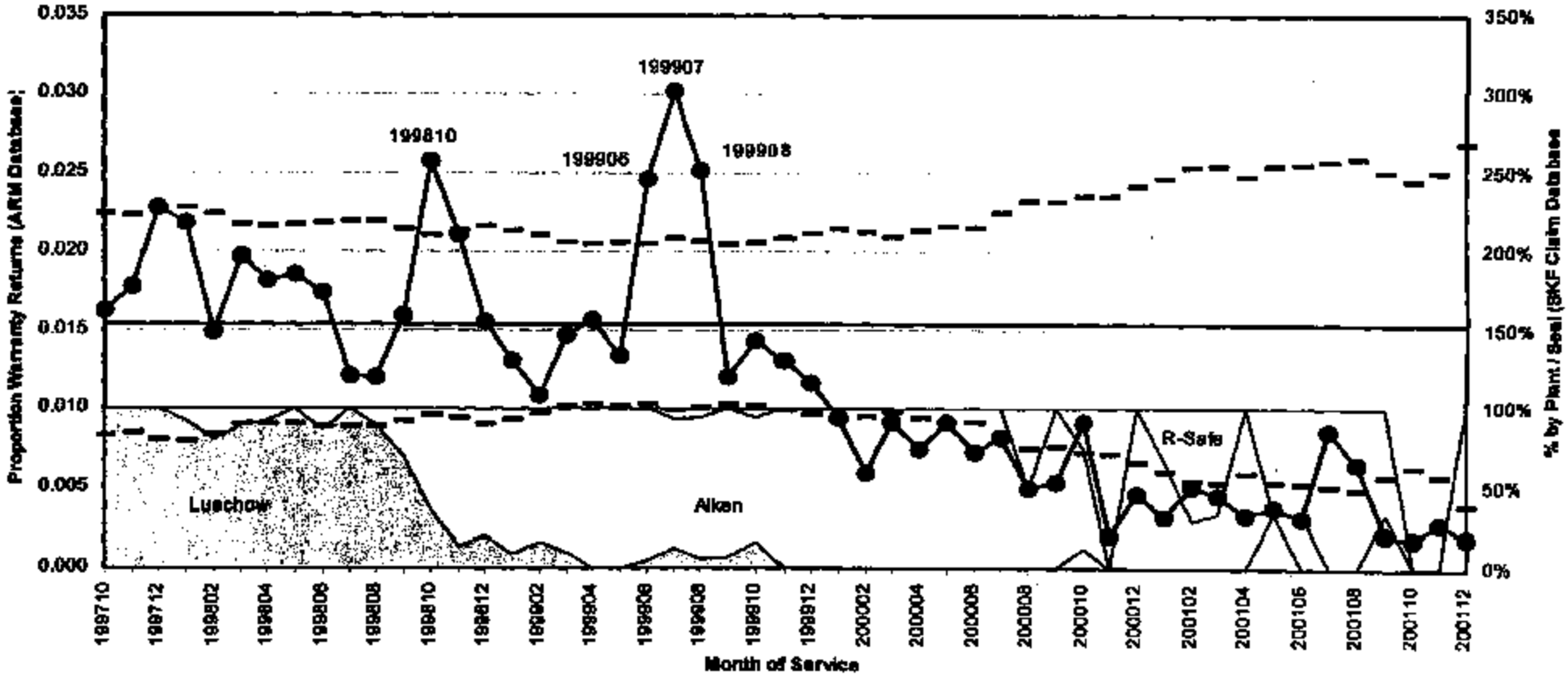
THU2 issue w. ARM

Facts

- Customer Arvin Meritor
- 400.000 bearings in the market
- Mainly steer axle (to some extent used also on trailers)
- SOP Luechow March 96
- SOP Aiken August 98
- Freudenberg seals used up till April 00 (340.000 units)
- RFT (R-safe) seals used from April 00 (61.000 units ytd)
- SKF notified March 14th on 15 wheel offs / fires since beginning of the year
- As of April 8th 18 wheel offs, incl. 3 trucks on fire
- ARM claiming 117 bearings as "severely advanced parts"

SKF

P-Chart - All ARM Returns by Service Date



SKF

THU2 seal issue

Facts

- **Typical seal failure mode:**

  Seal wear –>deteriorated sealing function --> contamination/ water ingress --> greasing function destroyed --> metallic contact/spalling etc. --> noise/vibration.

  - However:

  In this case in NA it continued in a few cases with:

  drastic heat/pressure increase-> melting/fire --> nut worn out --> wheel-off.
- **The Freudenberg seal used in RVI truck, without problems.**
- **Decision to treat the two seals as two cases:**
  - Freudenberg - high milage failures
  - RFTR-safe seals - early failures

SKF

Steer THU Warranty Return

3. Weeks 18 Mar 2002
530 Total Claims in SKF Database (as of 12/31/2001)

Corrective Actions Taken by SKF	Percent of Claims	
Switch to GW-Z Grease	10.4	
Grease Egress		
Switch to R-Safe Inboard Seal		
B Seal Leak – Contaminant Ingress	15.6	
Induction Hardening Equipment & Procedural Changes		
OR not hardened		3.8
Corrective Actions taken by ArvinMeritor		
Increased Hubcap Torque		
Bearing Failure – Run w/o Hub Cap	2.6	
Switch to MolyKote D Anti-fretting Compound/O-Ring Seal		
Removal Damage		5.7
Water Intrusion Along Spindle	1.9	
Rotation of Hub Unit during Torque		
Low Clamp Load		6.8
Field Bulletin on Inspection Techniques		
No problem found		27.6
Tampering		1.9

Total percent Claims Addressed by Corrective Actions 69.5

Claim Categories Not Directly Addressed	Percent of Claims	
Root Cause Not Determined	Total 14.0	
Returns too advanced to determine cause		
Customer Abuse	Total 7.5	
Impact Damage		7.5

Total Percent claims above 91.0

SKF

THU2 - ARM

Current status

- SKF related
  - **Freudenberg seal** (mfg 1997 to April 2000) 320000 units
    - Seal shorter life in NA comp. to Europe
      - Operating differences
      - Maintenance practices
    - All wheel-offs w. F. seals
    - Grease fill in cavity between lips - influence on functional performance ?
    - Detection method
      - Pop-out bolt
  - **RFTs R-safe** (mfg from April 2000) 61000 units
    - Incorrect moulding (2-3 %)
      - influence on life
    - Implement 3x50,000 miles inspection
    - Track test starting to verify these intervals
    - Confirm inspection & detection method as sufficient or advice alternatives

SKF

THU2 - ARM

Current status

- SKF related cont.
  - **Unhardened Raceway** (some 20 cases) spring 2000
    - Problem was identified, process changed
      - some few units could remain in the field
  - **Studs** (Supplier Ingersoll)
    - Hardness level (too high) and large hardness variation
    - Root cause analysis pending from supplier (limited response is a major concern)
    - Supplier HT process capability ?
    - Risk evaluation on studs in the field
  - **Overall**
    - Final decision to be made latest May 30th on action steps for SKF

SKF

THU2 - ARM

Current status

- ARM related
  - **Water ingress along spindle**
    - O-ring was implemented by ARM June 2001
      - No information as to wether retrofit to be made
  - **Raceway damage due to lack of rotation during clamping**
    - Influence on life
  - **Stud replacement**
    - procedure at truck manufacturers
    - Damage while changing

SKF

Discussion

Main Topic

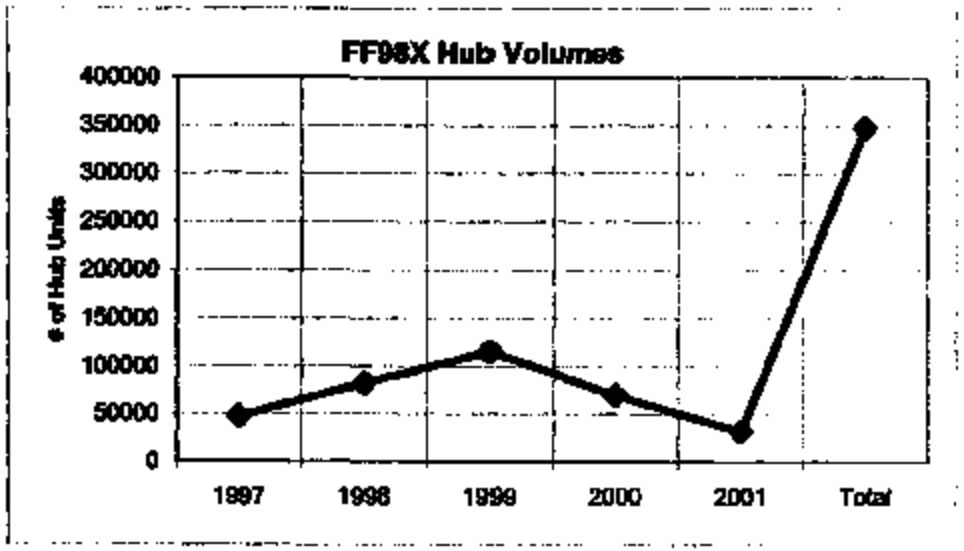
Close
Rahmberg/GHQ/GOT/SKF
05/13 12:44 PM

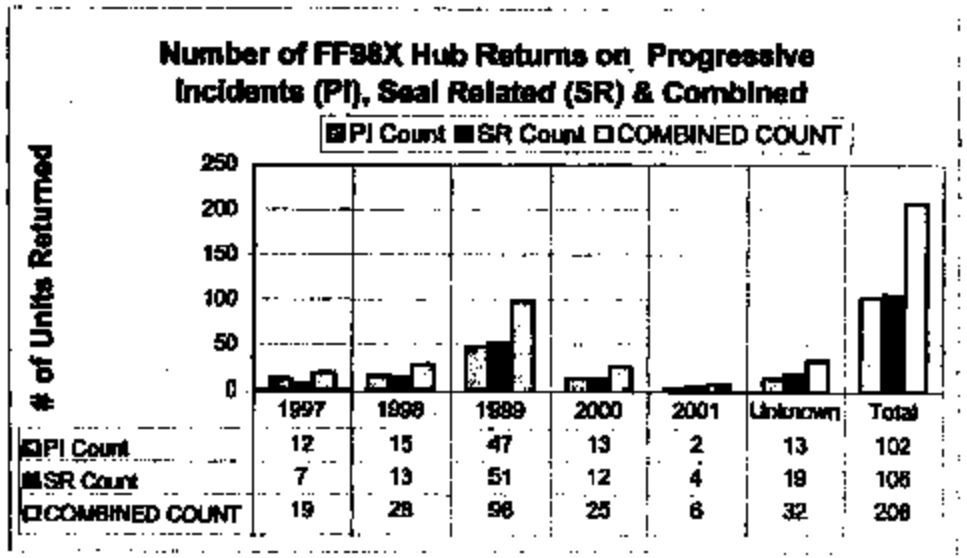
Subject: Statistical Evaluations

Category: Statistics

Response to Main Document Rick P Morrow/AMER/SKF 05/20 08:23 AM	Subject:	Hub data from ARM
	Response to:	☐ Statistical Evaluations
	Category:	Statistics

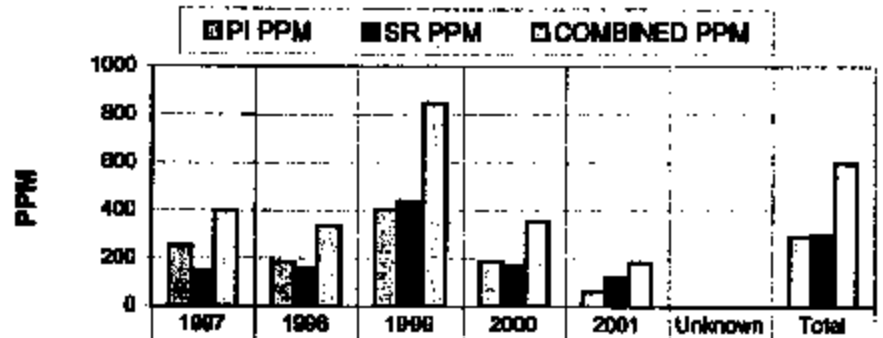
ff98x hub niran 4_15_02.x





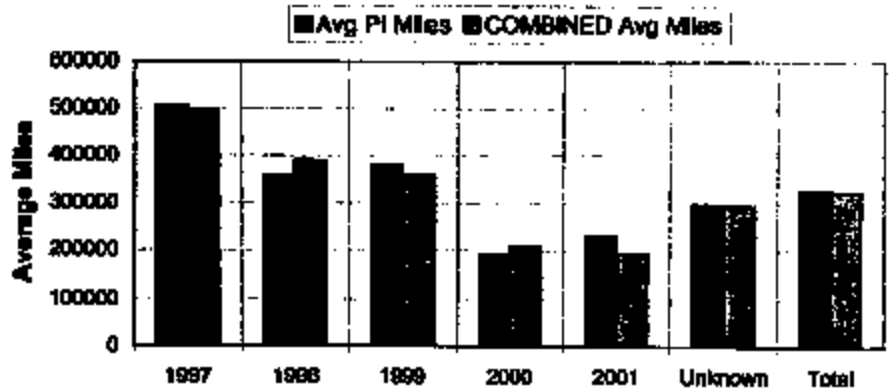
	1997	1998	1999	2000	2001	Unknown	Total
PI Count	12	15	47	13	2	13	102
SR Count	7	13	51	12	4	19	106
COMBINED COUNT	19	28	98	25	6	32	208

PPM Trend for FF98X Hubs



	1997	1998	1999	2000	2001	Unknown	Total
PI PPM	252.7488	182.2467	406.237	185.9374	81.70173		293.2636
SR PPM	147.4367	157.9472	440.6104	171.6345	123.4035		304.7841
COMBINED PPM	400.1853	340.1839	847.0474	357.5719	185.1052		598.0277

Average Miles FF98X Hub Returns Failed on Progressive Incidents (PI) & Combined



Response
to Main Document

Rick P Morrow/AMER/SKF
05/20 09:16 AM

Subject:	Analyses of ARM and SKF data
Response to:	Statistical Evaluations
Category:	Statistics

THU 2 Analysis Duane Gipe, Rick Morrow shor

THU 2 Analysis Duane Gipe, Rick Morrow

5/15/02

Valid Claims Only (Unless Otherwise Stated) 772 invalid, valid, inconclusive, open ARM claims analyzed by Bruce Weeks, Dave Zimmerman

Notes/Assumptions

- Only one root cause was listed per warranty return. May have multiple causes and/or interactions
- Missing data for some analysis was considerable
- Immature data is expected for years 2001 and beyond thus reducing the service life mean

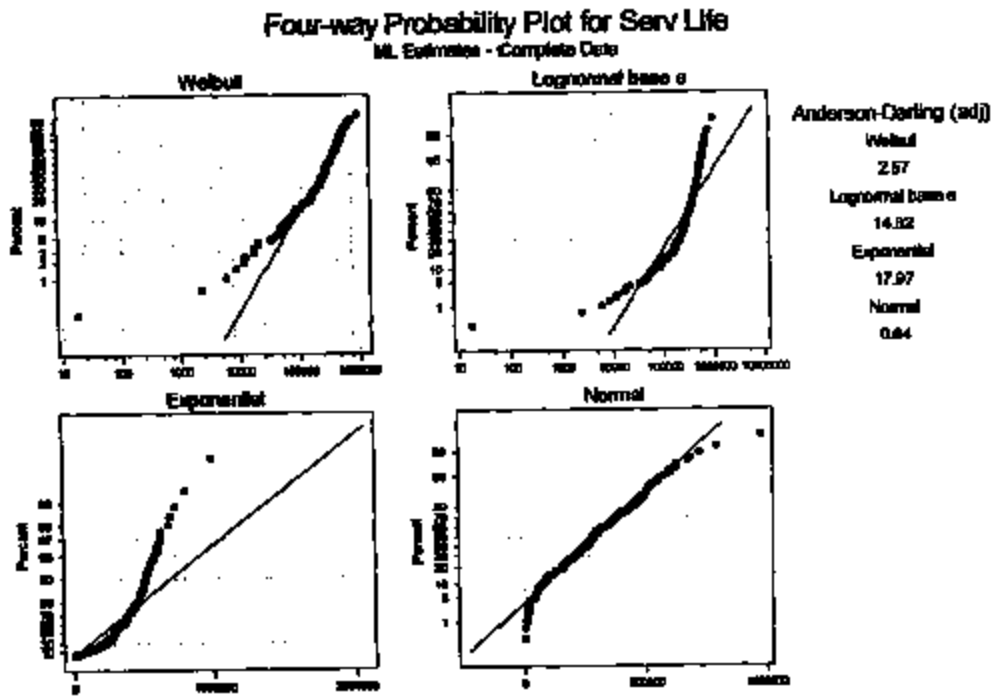
Count of Root Cause	
Root Cause	Total
NO PROBLEM FOUND	185
IB SEAL LEAK - INGRESS	150
UNKNOWN	73
IMPACT DAMAGE	50
LOW CLAMP LOAD	47
INSIGNIFICANT LEAK	42
REMOVAL DAMAGE	34
WATER INTRUSION ALONG SPINDLE	27
IB SEAL LEAK - EGRESS	23
OIL SEPARATION	23
UNHARDENED RW	20
HUB CAP LOST	16
INNER RING SPALL	14
IB SEAL DAMAGED	12
OPEN	11
TAMPERING	11
OB SEAL LEAK - EGRESS	7
ASSEMBLY DAMAGE	6
NOT RECEIVED	3
OUTER RING SPALL	3
COCKED SEAL	2
DIMENSIONAL ISSUE	2
ENDPLAY	2
INCONCLUSIVE	2
NO INFORMATION	2
ATTACHING HARDWARE ISSUE	1
CORROSION	1
LOW GREASE WEIGHT	1
OB SEAL LEAK - INGRESS	1
(blank)	
Grand Total	771

Count of Root Cause			
Root Cause	Total		
IB SEAL LEAK - INGRESS	38	34%	7%
NO PROBLEM FOUND	22	20%	6%
IMPACT DAMAGE	9	8%	4%
WATER INTRUSION ALONG SPINDLE	9	8%	4%
UNKNOWN	8	7%	4%
LOW CLAMP LOAD	6	5%	4%
IB SEAL LEAK - EGRESS	3	3%	3%
OIL SEPARATION	3	3%	3%
HUB CAP LOST	2	2%	2%
IB SEAL DAMAGED	2	2%	2%
OPEN	2	2%	2%
UNHARDENED RW	2	2%	2%
INCONCLUSIVE	1	1%	1%
INNER RING SPALL	1	1%	1%
OB SEAL LEAK - INGRESS	1	1%	1%
REMOVAL DAMAGE	1	1%	1%
TAMPERING	1	1%	1%
Grand Total	111		

In Service Miles by Root Cause

ByVar4	Mean4	StDev4	Sum4	Minimum4	Maximum4	N4
COCKED SEAL	271690	211127	543380	122401	420979	2
CORROSION	92944	*	92944	92944	92944	1
DIMENSIONAL ISSUE	142255	172905	284510	19993	264517	2
ENDPLAY	180414	30961	360827	158521	202306	2
IB SEAL LEAK - EGRESS	324260	160600	7133726	11821	627378	22
IB SEAL LEAK - INGRESS	340935	147001	47390033	21309	794820	139
INCONCLUSIVE	982591	*	982591	982591	982591	1
INNER RING SPALL	235484	143019	2354837	79766	528922	10
LOW GREASE WEIGHT	2325	*	2325	2325	2325	1
na	*	*	*	*	*	0
OB SEAL LEAK - EGRESS	213474	192456	1067369	18	503928	5
OB SEAL LEAK - INGRESS	151668	*	151668	151668	151668	1
OIL SEPARATION	307662	136292	6460892	34097	558646	21
OUTER RING SPALL	432888	160829	1298665	275686	597114	3
UNHARDENED RW	80515	80569	1610300	6000	304315	20
UNKNOWN	179003	99140	1611028	53489	384093	9

All Valid Claims



Infant mortality reduces fit of any distribution

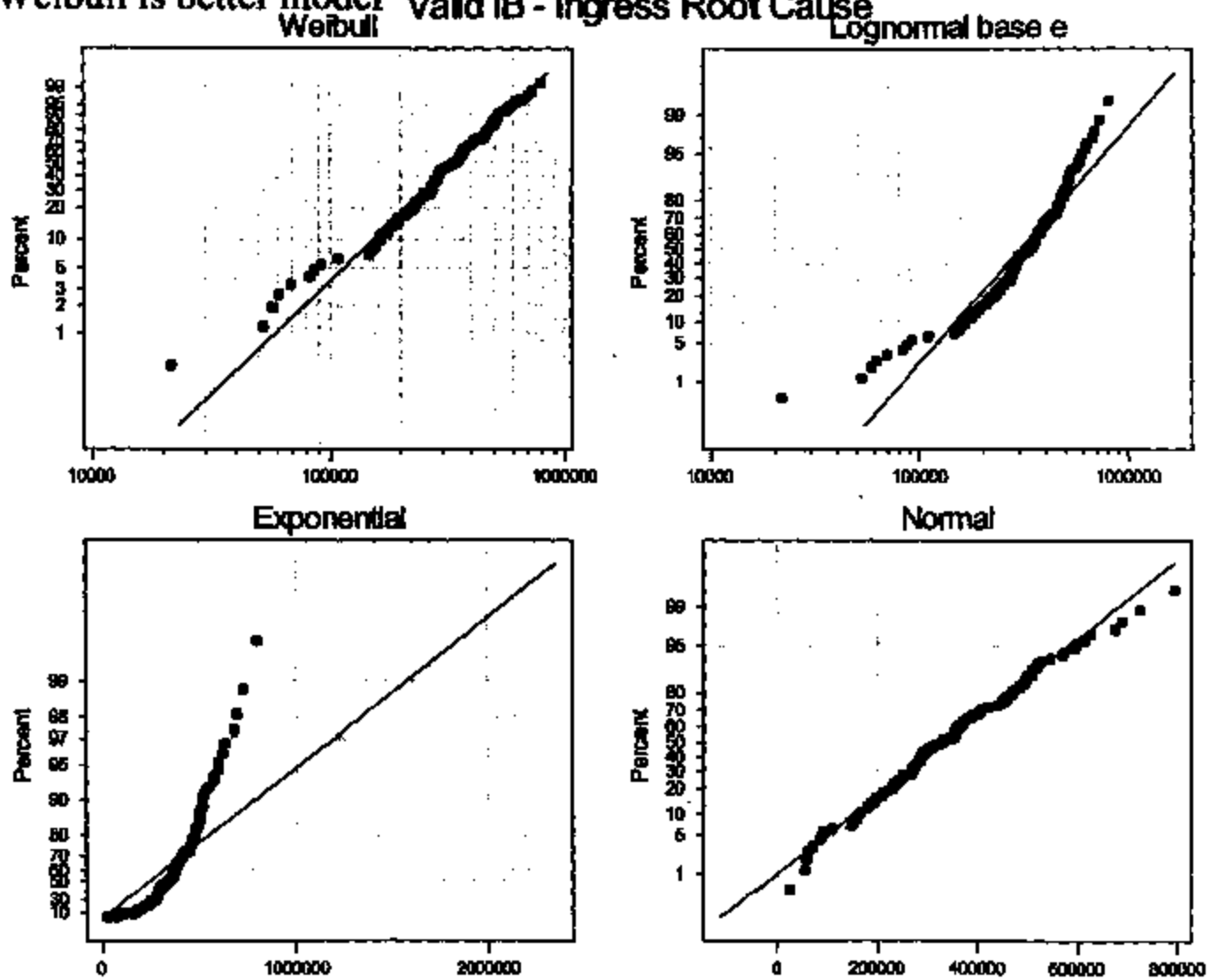
IB Seal Ingress Only

Weibull is better model

Four-way Probability Plot for Serv Life

ML Estimates - Complete Data

Valid IB - Ingress Root Cause



Anderson-Darling (adj)

Weibull

0.46

Lognormal base e

3.32

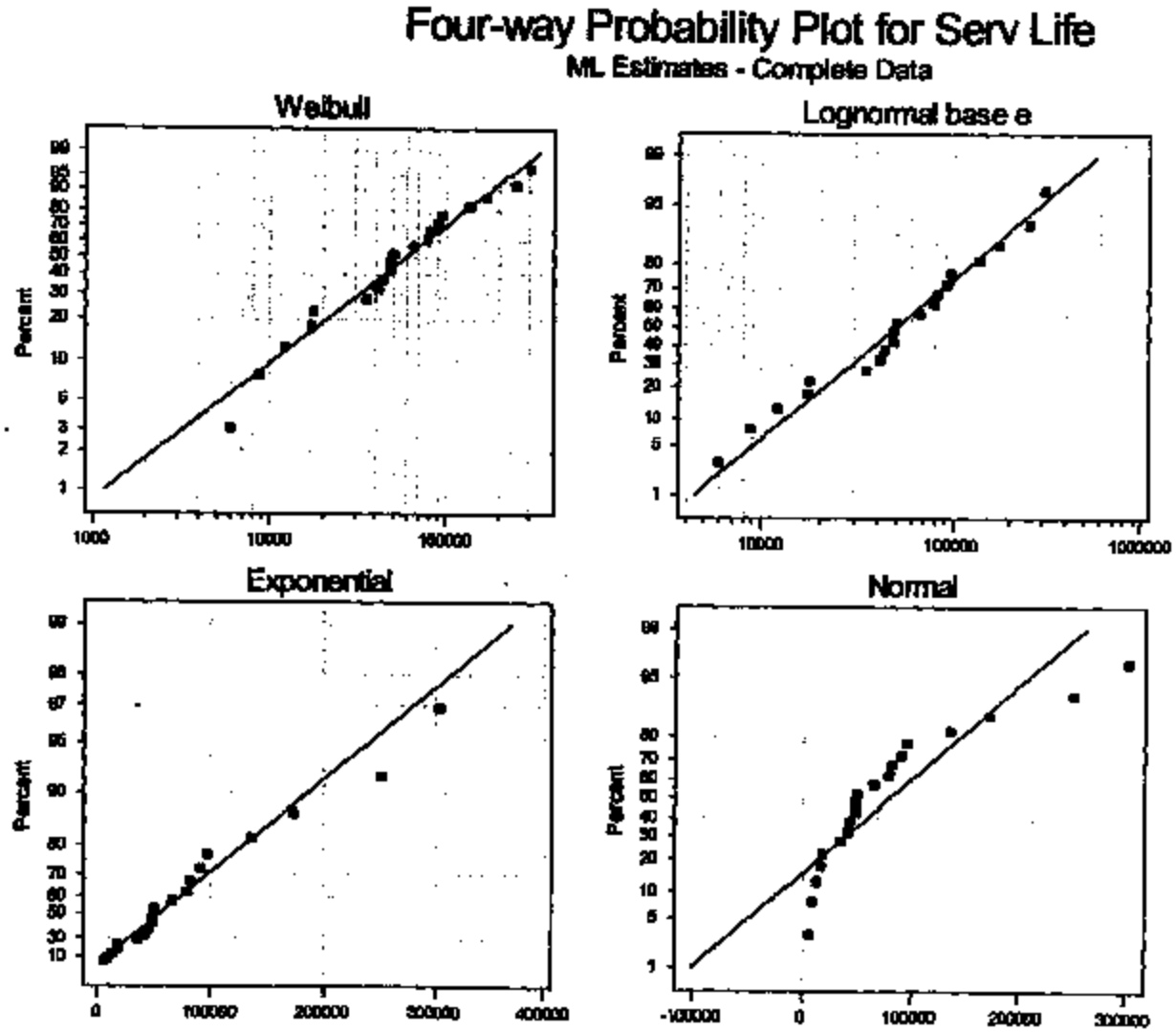
Exponential

20.42

Normal

0.51

Valid Unhardened Raceways only



Anderson-Darling (adj)

Weibull
0.775

Lognormal base e
0.760

Exponential
0.809

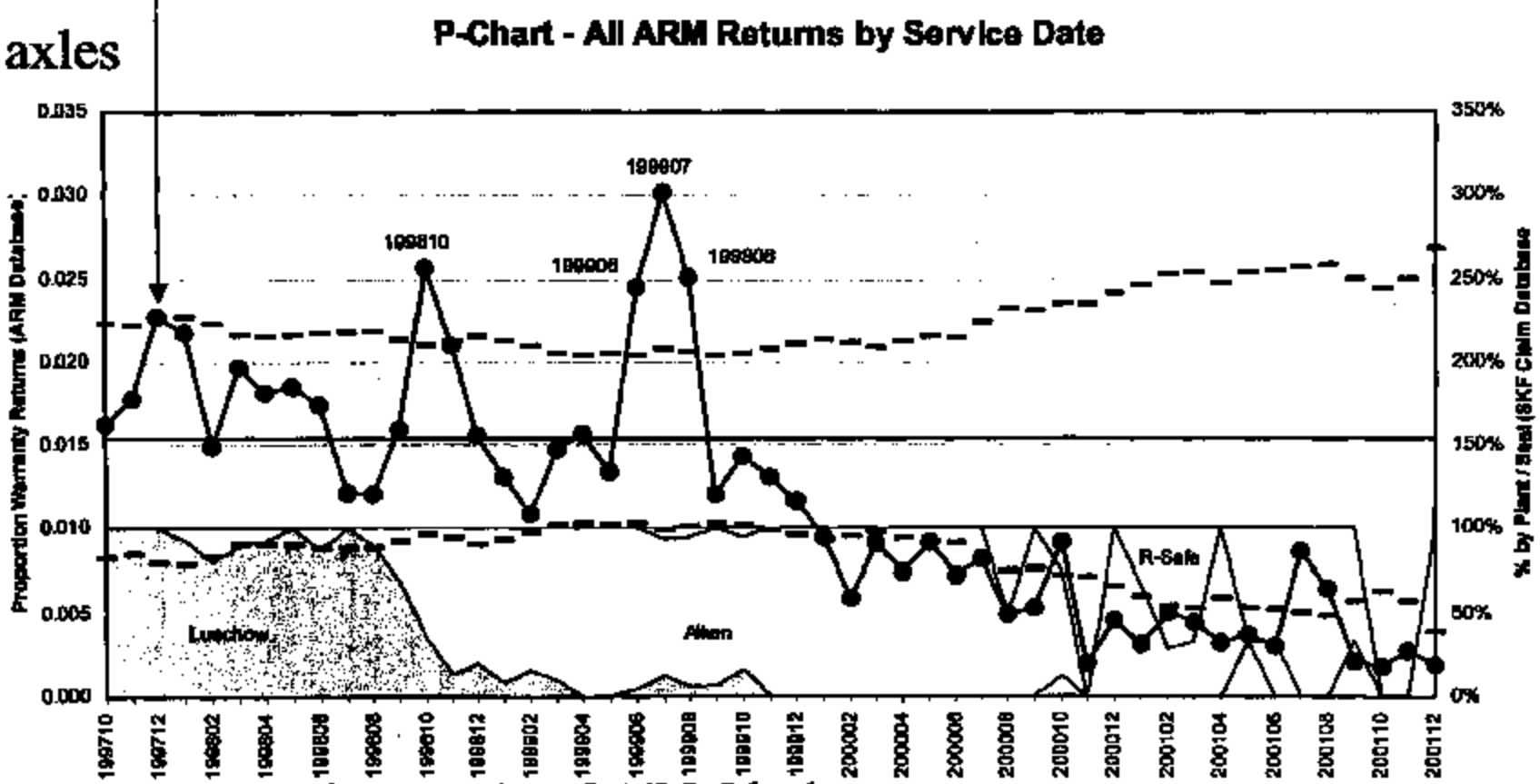
Normal
1.906

Analysis
5/15/02

Analysis from 2,122 ARM Returns and SKF Analyzed 771 claims

ARM 2,140 data

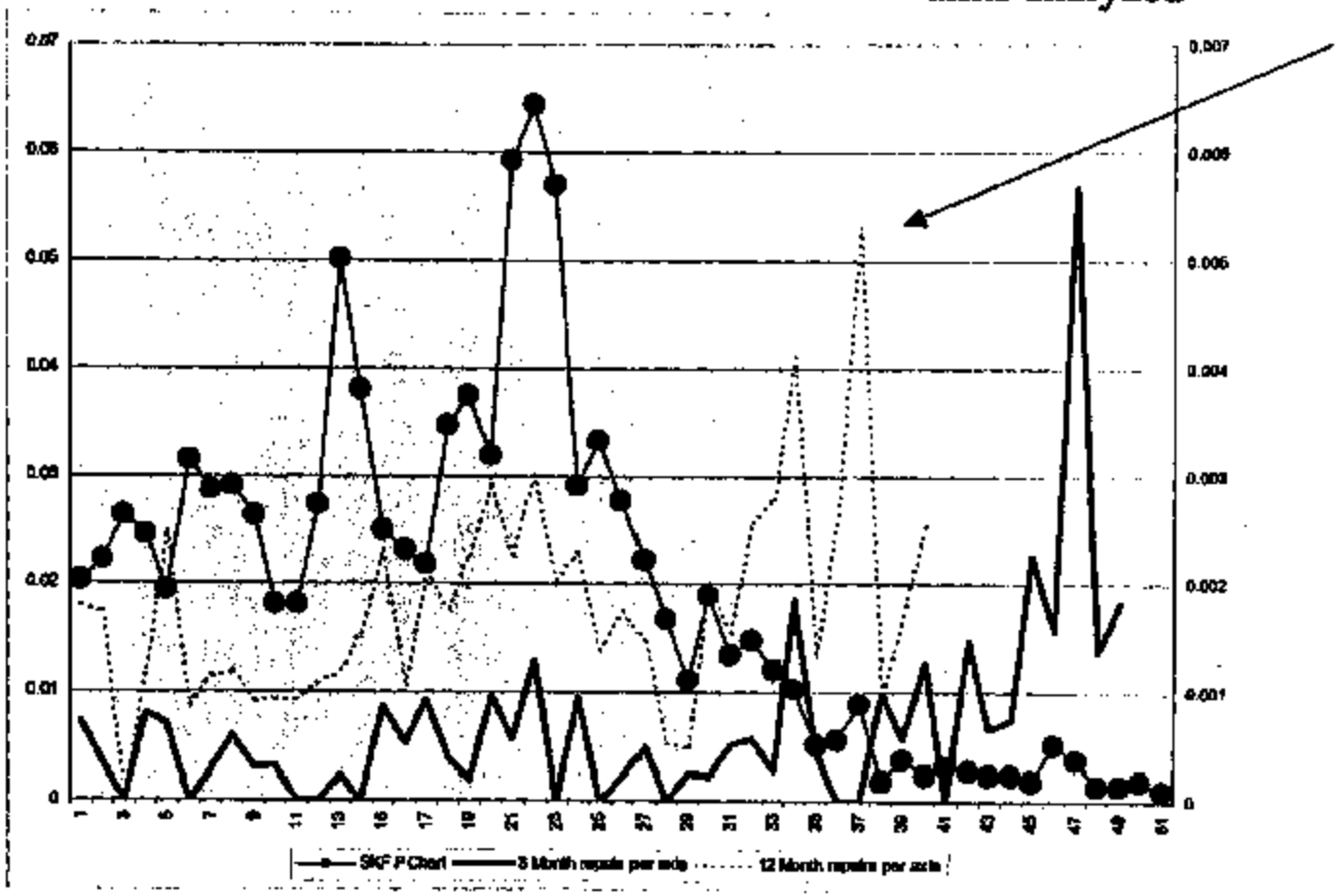
axles



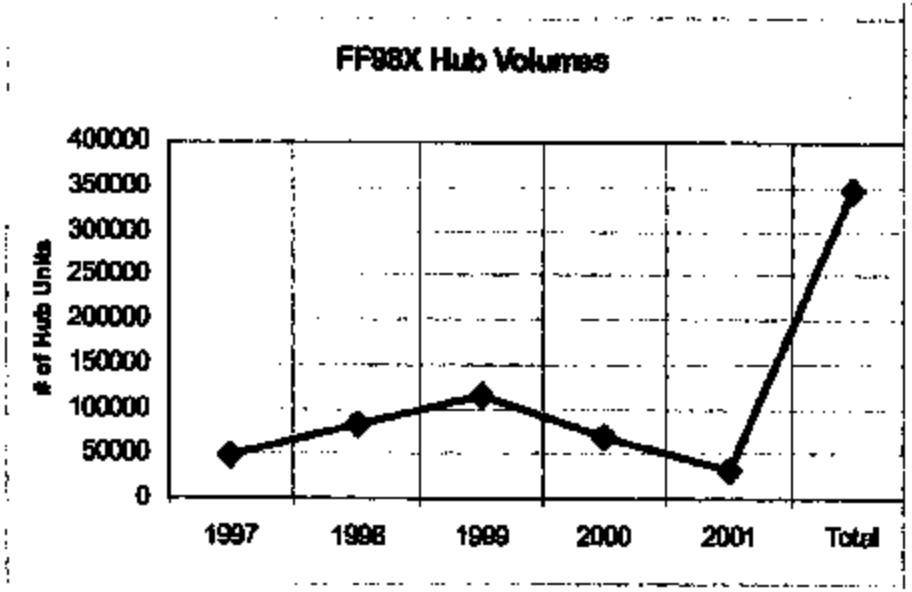
SKF 700 data = 1/6 of ARM hubs

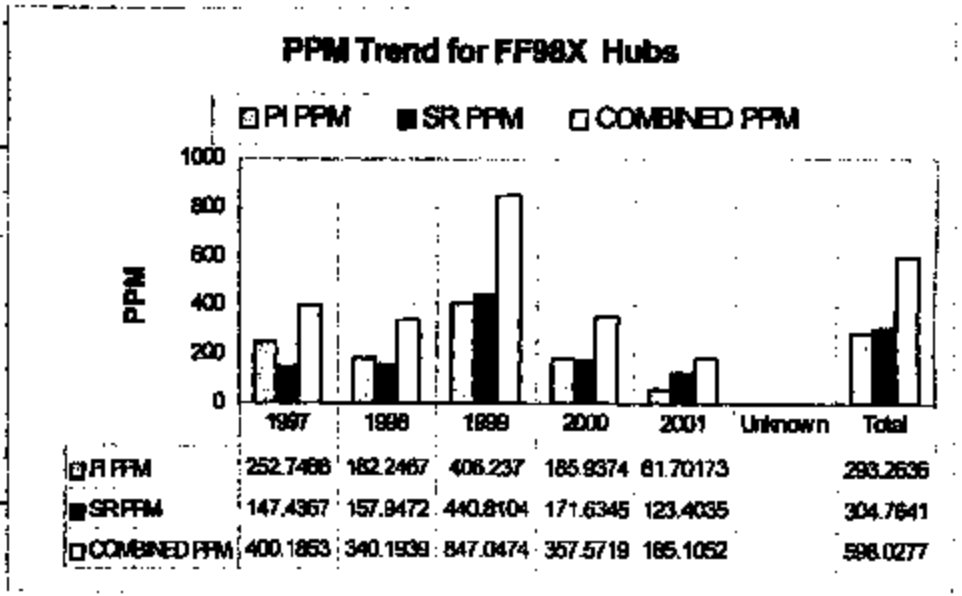
SKF 001943

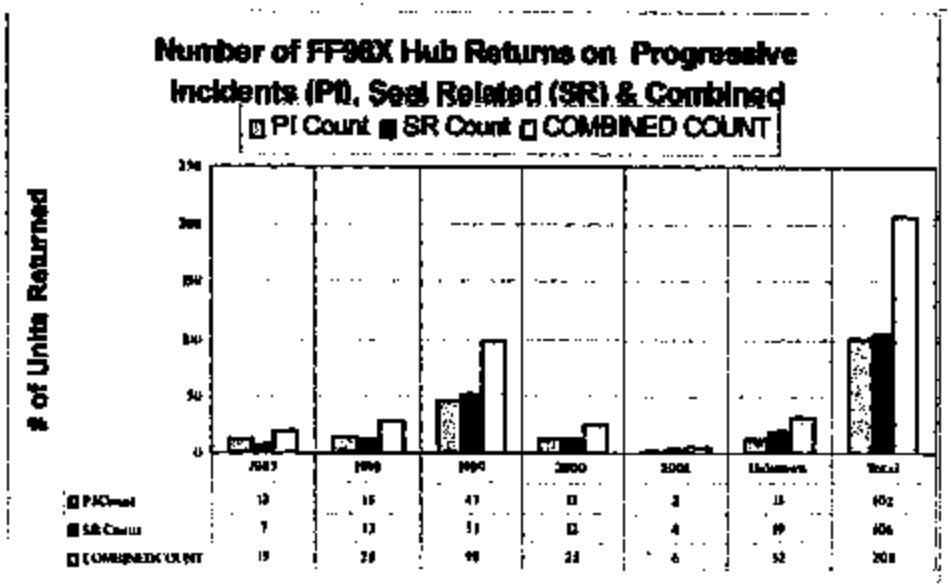
R-Safe data is immature. < 10 units analyzed

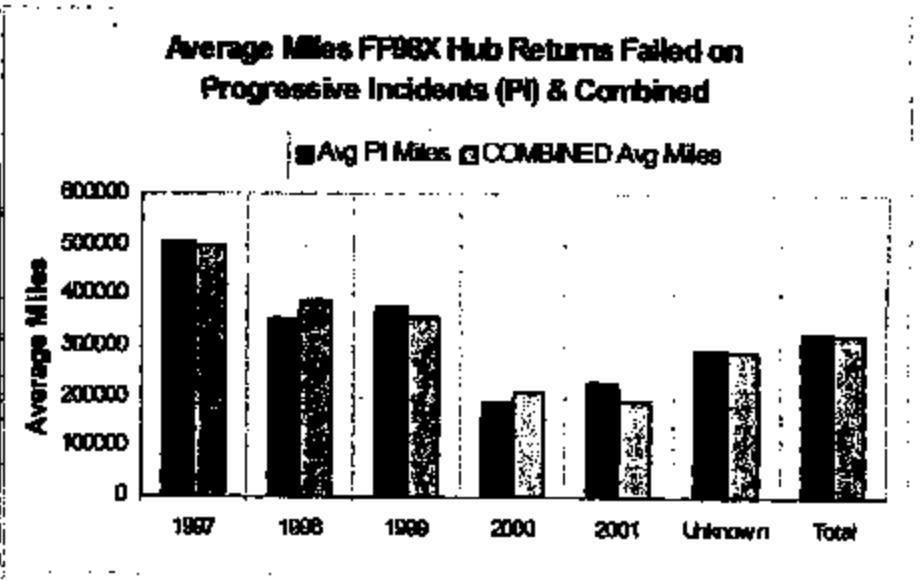


Source: ARM with DG, SKF


FF98X Hub Volumes
# of Hub Units
400000
350000
300000
250000
200000
150000
100000
50000
0
1997
1998
1999
2000
2001
Total


PPM Trend for FF98X Hubs
PI PPM
SR PPM
COMBINED PPM
PPM
1000
800
600
400
200
0
1997
1998
1999
2000
2001
Unknown
Total
PI PPM 252.7466 182.2467 406.237 185.9374 61.70173 293.2636
SR PPM 147.4367 157.9472 440.8104 171.6345 123.4035 304.7641
COMBINED PPM 400.1853 340.1939 847.0474 357.5719 185.1052 598.0277


Number of FF98X Hub Returns on Progressive Incidents (PI), Seal Related (SR) & Combined
PI Count
SR Count
COMBINED COUNT
# of Units Returned


Average Miles FF98X Hub Returns Failed on Progressive Incidents (PI) & Combined
Avg PI Miles
COMBINED Avg Miles
Average Miles
600000
500000
400000
300000
200000
100000
0
1997
1998
1999
2000
2001
Unknown
Total

Return Count by Month Places in Service (Period of R-Safe)

Count of MOS	Mile Cell											
MOS	50000	100000	150000	200000	250000	300000	350000	450000	550000	600000	650000	Grand Total
200008	2	1	1	1	2		4					11
200009	3		7	1		1						12
200010	1	3	3	8	3	1						19
200011	2		1	1								4
200012	1		1	1	2	3						8
200101	2		1	1			1					5
200102	2	2	1	1	1							7
200103	3	2		1								6
200104	1	1		3								5
200105	1	3						1				5
200106	2	1									1	4
200107		5	4	1					1			11
200108	5	2			1							8
200109	2	1										3
200110	2									1		3
200111	4											4
200112	2											2
200202	1											1
Grand Total	36	21	19	19	9	5	5	1	1	1	1	118

R-Safe Returns

Part No.	BTF-0065

Count of Root Cause	Root Cause			
Mileage Cell	⊞ SEAL LEAK - INGRESS	INNER RING SPALL	LOW GREASE WEIGHT	Grand Total
10000				
50000			1	1
100000	4			4
150000	1			1
200000				
250000				
300000				
350000				
400000				
450000				
500000				
550000				
600000				
650000				
700000				
750000				
800000				
1000000				
(blank)		1		1
Grand Total	5	1	1	7

Mean Time To Return imprecise due to only 7 data points. No Progressive Incidents.
1 return < 50,000 miles in service

FNOK Count by Root Cause by Mileage

Part No.	BTF-0052

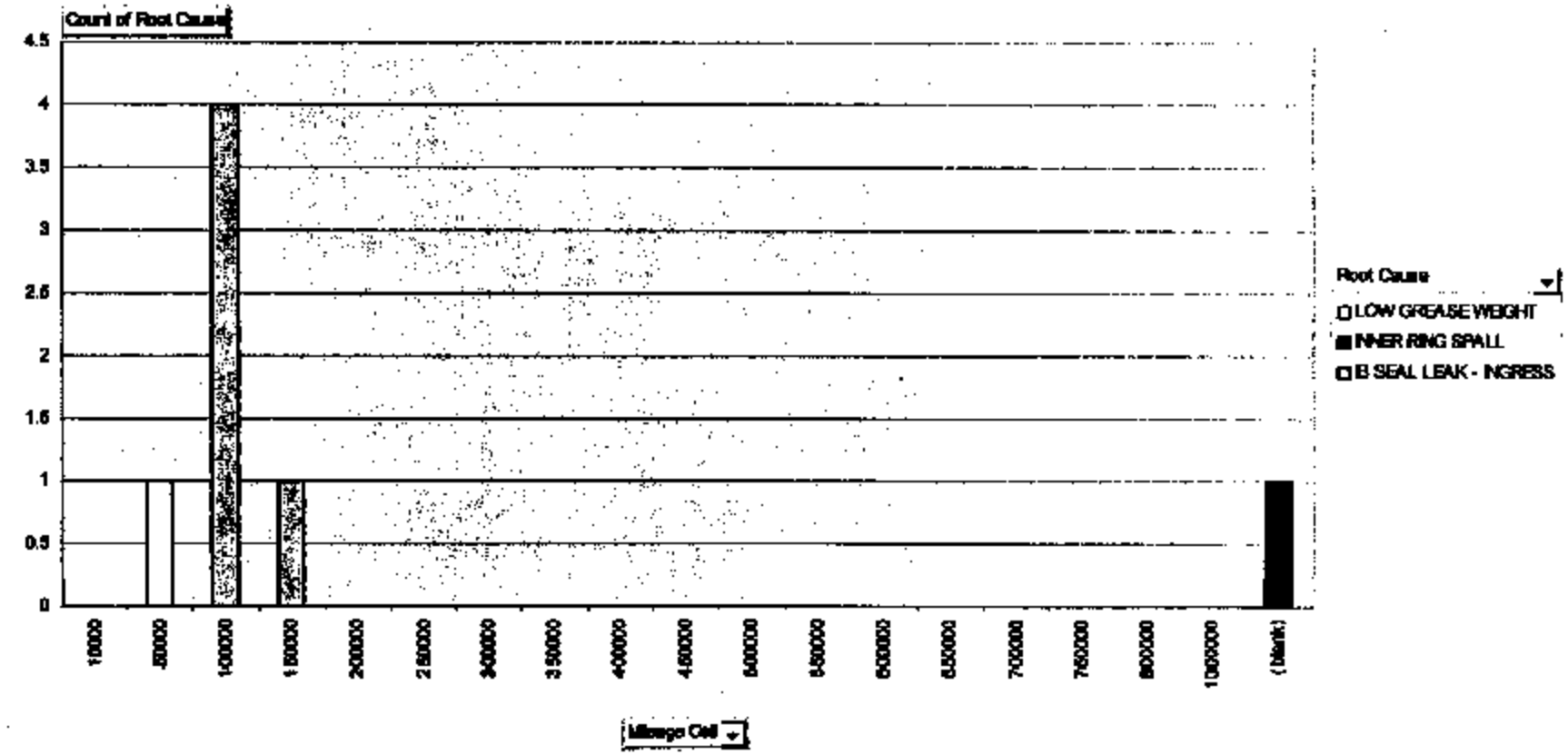
Count of Root Cause	Root Cause									
Mileage Ca	COCKED SEAL	DIMENSIONAL ISSUE	IB SEAL LEAK - EGRESS	IB SEAL LEAK - INGRESS	INNER RING SPALL	OB SEAL LEAK - EGRESS	OB SEAL LEAK - INGRESS	OIL SEPARATION	UNHARDENED RW	Grand Total
10000										
50000			1	1	1		1		1	8	13
100000				1	1	1	1			6	10
150000		1		1	1	1				1	5
200000					9		1	1		1	12
250000					11	1			4		16
300000			1		21		1		3	1	27
350000					6				2	1	9
400000					15				2		17
450000		1		1	5						7
500000					12				1		13
550000					5	1					6
600000					1				1		2
650000					1						1
700000					2						2
750000											
800000					1						1
1000000											
(blank)				1	6	3			1		11
Grand Tota		2	2	5	98	7	4	1	15	18	152

Count by Mfg Loc By Root Cause by Mileage BTF-0049 only

Part No. BTF-0049

Count of Root Cause	Root Cause	Mfg Loc														
	ENDPLAY	ENDPLAY Total	IB SEAL LEAK - EGRESS		IB SEAL LEAK - EGRESS Total	IB SEAL LEAK - INGRESS			IB SEAL LEAK - INGRESS Total	INNER RING SPALL		INNER RING SPALL Total	OUTER RING SPALL	OUTER RING SPALL Total	Grand Total
Mileage Cat	Luechow		Luechow	(blank)		Allen	Luechow	(blank)		Luechow	(blank)		Luechow		
10000															
50000															
100000								1	1						1
150000			1	1	2										2
200000			1		1						1	1			2
250000	1	1								1		1			2
300000													1	1	1
350000			1		1										1
400000			1		1										1
450000			4		4					1		1			5
500000			1		1		1		1						2
550000															
600000													1	1	1
650000															
700000															
750000															
800000															
1000000															
(blank)						1			1						1
Grand Total	1	1	9	1	10	1	1	1	3	2	1	3	2	2	19

R-Safe Return Count by Root Cause By Mileage in Service



Response

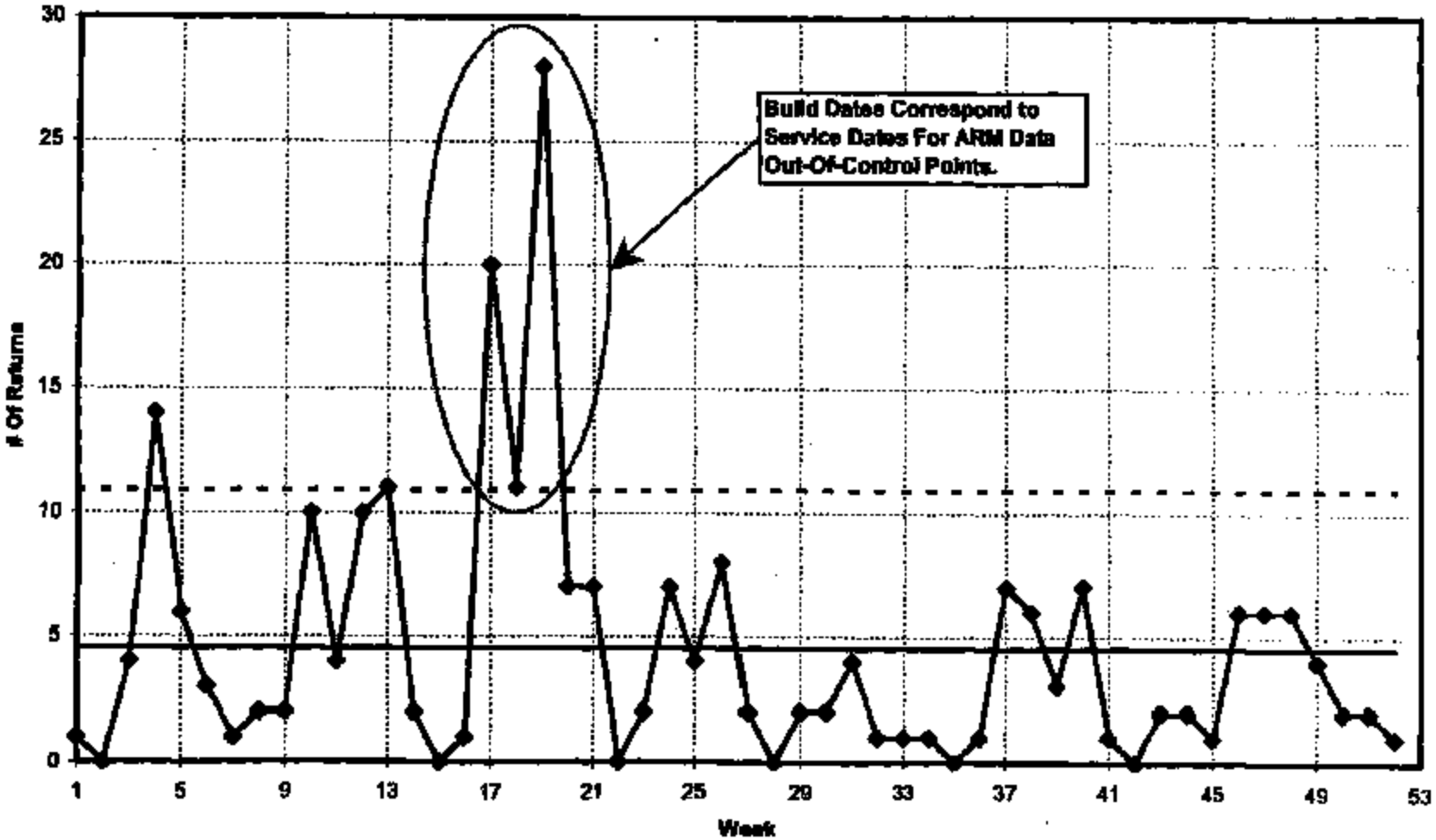
to Main Document

Rick P Morrow/AMER/SKF
05/24 09:27 AM

Subject:	C chart of claims by Alken Build Month
Response to:	Statistical Evaluations
Category:	Statistics

THU c-Chart.xls

C-Chart - # Returns By Week (Aiken Build Date) For 1999
SKF Analyzed Returns

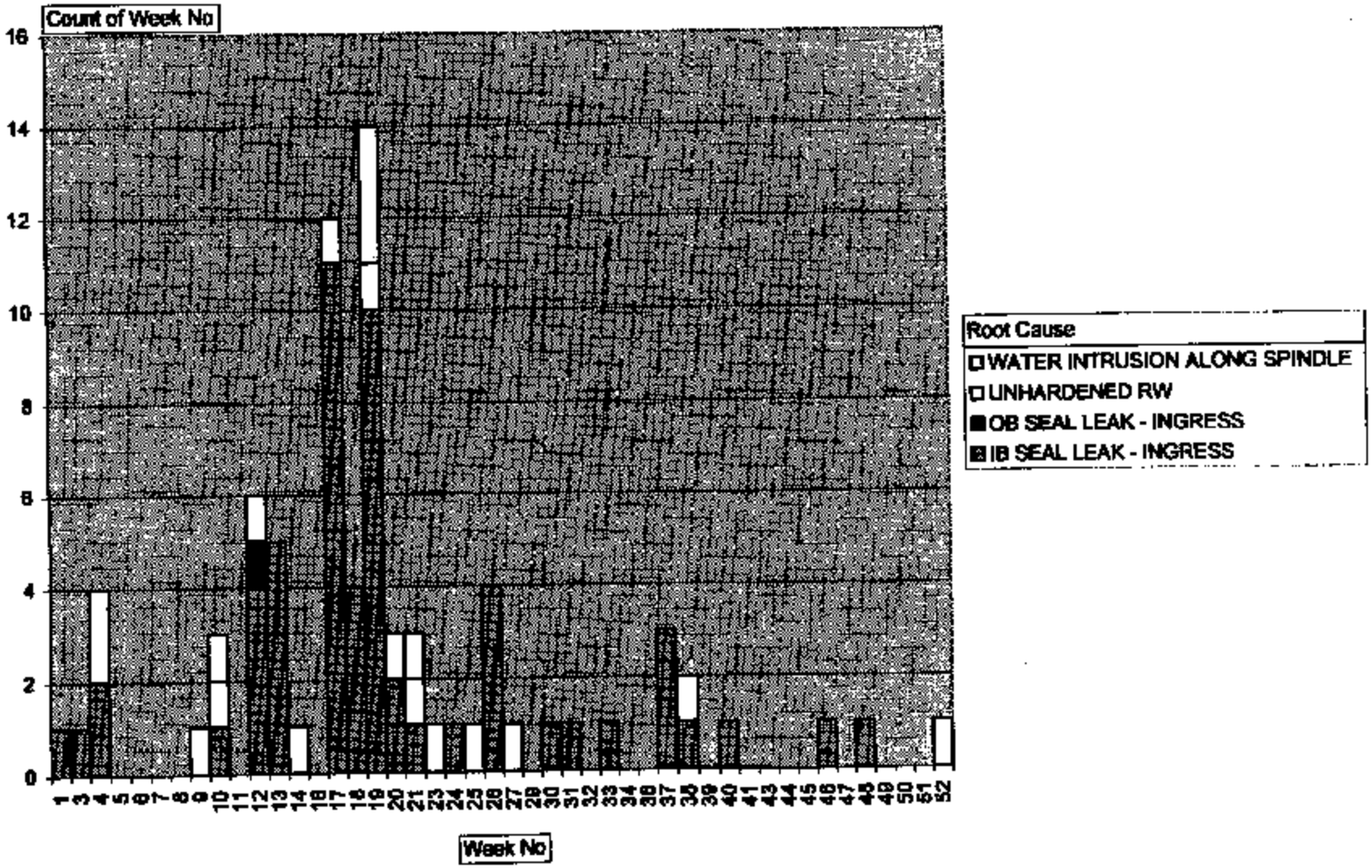


SKF 001952

1	1	4.519	10.9
2	0	4.519	10.9
3	4	4.519	10.9
4	14	4.519	10.9
5	6	4.519	10.9
6	3	4.519	10.9
7	1	4.519	10.9
8	2	4.519	10.9
9	2	4.519	10.9
10	10	4.519	10.9
11	4	4.519	10.9
12	10	4.519	10.9
13	11	4.519	10.9
14	2	4.519	10.9
15	0	4.519	10.9
16	1	4.519	10.9
17	20	4.519	10.9
18	11	4.519	10.9
19	28	4.519	10.9
20	7	4.519	10.9
21	7	4.519	10.9
22	0	4.519	10.9
23	2	4.519	10.9
24	7	4.519	10.9

25	4	4.519	10.9
26	8	4.519	10.9
27	2	4.519	10.9
28	0	4.519	10.9
29	2	4.519	10.9
30	2	4.519	10.9
31	4	4.519	10.9
32	1	4.519	10.9
33	1	4.519	10.9
34	1	4.519	10.9
35	0	4.519	10.9
36	1	4.519	10.9
37	7	4.519	10.9
38	6	4.519	10.9
39	3	4.519	10.9
40	7	4.519	10.9
41	1	4.519	10.9
42	0	4.519	10.9
43	2	4.519	10.9
44	2	4.519	10.9
45	1	4.519	10.9
46	6	4.519	10.9
47	6	4.519	10.9
48	6	4.519	10.9
49	4	4.519	10.9
50	2	4.519	10.9
51	2	4.519	10.9
52	1	4.519	10.9
	235		

Mileage Cell (All)



Milsage Cell	(All)

Count of Week No	Root Cause				
Week No	IB SEAL LEAK - INGRESS	OB SEAL LEAK - INGRESS	UNHARDENED RW	WATER INTRUSION ALONG SPINDLE	Grand Total
1	1				1
3	1				1
4	2		2		4
5					
6					
7					
8					
9			1		1
10	1		1	1	3
11					
12	4	1	1		6
13	5				5
14				1	1
16					
17	11			1	12
18	4				4
19	10		1	3	14
20	2			1	3
21	1		1	1	3
23			1		1
24	1				1
25				1	1
26	4				4
27				1	1
29					
30	1				1
31	1				1
32					
33	1				1
34					
36					
37	3				3
38	1		1		2
39					
40	1				1
41					
43					
44					
45					
46	1				1
47					
48	1				1
49					
50					
51					
52			1		1
Grand Total	57	1	10	10	78

Log #	Date Rec'd	Part No.	Ser No.	Bld Date	Week No	Bld Qty	Bld Yr	Bldg. Loc.	OEM	Fleet	Claim #	Claim Date	In Serv Date	MOS	RS Qty	RS Yr	Months In-Serv
1077	01/28/02	BTF-0052	6016428	01/01/99	1	1	1999	Allen	Fritz	Ryder	348298						
1456	03/26/02	BTF-0052	0076513	01/14/99	3	1	1999	Allen	Fritz	Wilcox Foods	E1702731	01/15/02	04/15/99	Apr-99	2	1999	34
1154	01/28/01	BTF-0052	0071618	01/14/99	3	1	1999	Allen	Navistar	Dedicated Fleet Log	0047802A	10/21/00	04/17/99	Apr-99	2	1999	18
1344	03/31/01	BTF-0052	0076287	01/14/99	3	1	1999	Allen	Navistar	RTC Trig	40951A	04/16/01	06/22/99	Jun-99	2	1999	22
1086		BTF-0052	0077055	01/15/99	3	1	1999	Allen	Fritz	Kentucky Truck Sales	E1430096	06/28/99	02/25/99	Feb-99	1	1999	6
1484	11/29/01	BTF-0052		01/17/99	4	1	1999	Allen	Fritz		E1699113	07/25/01	10/23/99	Oct-99			33
1148	12/01/00	BTF-0052	0076694	01/17/99	4	1	1999	Allen	Navistar	Walklart	0011499A	05/13/00	06/06/99	Jun-99	2	1999	11
1506	10/01/01	BTF-0052	0078460	01/17/99	4	1	1999	Allen	Navistar	Walklart	Unit 9575	09/10/01					
1581	09/18/01	BTF-0052	0076992	01/17/99	4	1	1999	Allen	Navistar	Walklart	UPS #231028298						0
1547	09/14/01	BTF-0052	00802009	01/18/99	4	1	1999	Allen	Fritz		NLF00001M951T	06/16/01	04/01/99	Apr-99	2	1999	27
1587	03/26/02	BTF-0052	058927	01/18/99	4	1	1999	Allen	Fritz		E1748087	08/19/02	08/25/99	Aug-99	3	1999	36
1216	06/17/01	BTF-0052	0073441	01/19/99	4	1	1999	Allen	Fritz	Ryder	Unit 333471						0
1322	11/29/01	BTF-0052	0080699	01/20/99	4	1	1999	Allen	Navistar	Walklart	WMT9689	11/21/00					
1275	11/29/01	BTF-0052	0081734	01/22/99	4	1	1999	Allen	Navistar	Walklart	WMT9671	10/20/01					
1298	11/29/01	BTF-0052	0081841	01/22/99	4	1	1999	Allen	Navistar	Walklart	WMT9680	09/18/01					
1367	09/18/01	BTF-0052	0081829	01/22/99	4	1	1999	Allen	Navistar	Walklart	UPS# 10025247						
1528	09/14/01	BTF-0052	83857	01/23/99	4	1	1999	Allen	Fritz	Jevic	HDM00001H097T 1/2		12/10/99	Dec-99	4	1999	
1531	09/14/01	BTF-0052	0082855	01/23/99	4	1	1999	Allen	Fritz	Jevic	HDM00001H098T 1/2		02/24/99	Feb-99	1	1999	
1534	09/14/01	BTF-0052	37087	01/23/99	4	1	1999	Allen	Fritz	Jevic	HDM00001H098T 2/2		02/24/99	Feb-99	1	1999	
1744	04/09/02	BTF-0052	105928	01/24/99	5	1	1999	Allen	Fritz	Merchant Dist	E1746998	01/17/02	05/12/99	May-99	2	1999	33
1389	11/29/01	BTF-0052		01/26/99	5	1	1999	Allen	Fritz		E1999180	08/14/01	10/21/99	Oct-99	4	1999	23
1438	11/29/01	BTF-0052	0089892	01/28/99	5	1	1999	Allen	Navistar	Arnco Transfer	1610087A	07/02/01					
1661	03/26/02	BTF-0052	83987	01/28/99	5	1	1999	Allen	Fritz	RSX	E1752420	12/06/01	04/01/99	Apr-99	2	1999	33
1439	03/26/02	BTF-0052	0087884	01/29/99	5	1	1999	Allen			Y2AR02A0797						0
1388	08/27/01	BTF-0052	0084640	01/27/99	5	1	1999	Allen	Mack	Autoclave Lease	AB4802V05821	11/07/00	06/30/99	Jun-99	2	1999	17
1399	03/26/02	BTF-0049	008879	02/01/99	5	1	1999	Lansdowne	Fritz		CWA06704	09/27/01	07/01/99	Jul-99	3	1999	26
1124	08/22/00	BTF-0052	0087968	02/02/99	6	1	1999	Allen	Fritz	Prime Inc	TNFD 10A715	07/12/00	04/01/99	Apr-99			18
1582	09/18/01	BTF-0052	0015139	02/05/99	6	1	1999	Allen	Fritz	Recor Intl	KDM00001A097T	05/10/01	11/13/99	Nov-99	4	1999	16
1616	11/29/01	BTF-0052	0222566	02/13/99	7	1	1999	Allen	Fritz		E1699309	03/08/01	03/17/00	Mar-00			12
1186	05/01/01	BTF-0052	0092591	02/18/99	8	1	1999	Allen	Fritz	New Prime	312906	02/28/01	04/23/99	Apr-99	2	1999	22
1804	04/03/00	BTF-0052	92864	02/19/99	8	1	1999	Allen	Navistar	Grimes Leasing	0038570A	11/05/99	09/02/99	Sep-99	3	1999	2
1962		BTF-0052	0094366	02/24/99	9	1	1999	Allen	Freightliner	Houston Freightliner	E1449307	07/13/99	05/03/99	May-99	2	1999	2
1274	06/21/01	BTF-0052	0097991	02/26/99	9	1	1999	Allen	Navistar	Mabana Trucking	1023180A	02/22/01	04/14/99	Apr-99	2	1999	23
1321	03/26/02	BTF-0052	0098787	03/02/99	10	1	1999	Allen	Fritz		E1752729	01/14/02	04/30/99	Apr-99	2	1999	33
1746	04/09/02	BTF-0052	08764	03/02/99	10	1	1999	Allen	Fritz		CWA16307	02/05/02	05/10/99	May-99	2	1999	33
1722	03/26/02	BTF-0052	0128073	03/03/99	10	1	1999	Allen	Fritz		E1730986	02/07/02	01/06/99	Jan-99	1	1999	36
1789	04/09/02	BTF-0052	99849	03/03/99	10	1	1999	Allen	Fritz		E1674427	06/30/01	04/16/99	Apr-99	2	1999	27
1784	04/09/02	BTF-0052	100148	03/03/99	10	1	1999	Allen	Fritz		E1674424	06/30/01	04/16/99	Apr-99	2	1999	27
1293	01/16/02	BTF-0052	0099398	03/03/99	10	1	1999	Allen	Fritz		E1708580	04/09/01	05/06/99	May-99	2	1999	23
1308	05/27/01	BTF-0052	0099876	03/03/99	10	1	1999	Allen	Navistar	Todd W. Sisler Trkg	0038072A	04/13/01	10/06/99	Oct-99	4	1999	19
1185	11/29/01	BTF-0052	0101993	03/05/99	10	1	1999	Allen	Fritz		E1991993	06/15/01	03/19/99	Mar-99	1	1999	39
1288	10/29/00	BTF-0052	0101131	03/05/99	10	1	1999	Allen	Navistar	Cannon Express	0121073B	06/04/00	07/30/99	Jul-99	3	1999	12
1804		BTF-0052	0101947	03/06/99	10	1	1999	Allen	Fritz	Dick Simon	Kalkins						0
1398	12/18/01	BTF-0052	0151384	03/08/99	11	1	1999	Allen	Mack	Worldwide Equip	CWA04346	09/13/01	09/20/99	Sep-99	3	1999	24
1505	11/29/01	BTF-0052	0103037	03/09/99	11	1	1999	Allen			996996	09/27/01	01/01/01	Jan-01			9
1670	12/18/01	BTF-0052	0104693	03/11/99	11	1	1999	Allen	Navistar	Walklart	WMT9647	05/18/01	04/06/99	Apr-99	2	1999	29
1287	11/29/01	BTF-0052	0104904	03/11/99	11	1	1999	Allen	Navistar	Walklart	RO R1898636						0
1175	04/02/01	BTF-0052	0110671	03/14/99	12	1	1999	Allen	Navistar	Wise Khaldaise	0006205A	03/16/00	06/30/99	Jun-99	2	1999	15
1378	06/25/01	BTF-0052	0108084	03/15/99	12	1	1999	Allen	Fritz	Midwest Transit	P6FD0001D260T 2/2	08/02/01	08/20/99	Aug-99	3	1999	22
1863		BTF-0052	105832	03/16/99	12	1	1999	Allen	Fritz	Truck Centers, Inc.	E1452285	05/02/99	05/10/99	May-99	2	1999	3
1599	10/01/01	BTF-0052	0106545	03/16/99	12	1	1999	Allen	Fritz	Midwest Transit	7602	05/17/01	08/20/99	Aug-99	3	1999	21
1383	09/03/01	BTF-0052	0108041	03/16/99	12	1	1999	Allen	Fritz	Midwest Transit	P6FD0001D098T 1/2	05/05/01	07/10/00	Jul-00	3	2000	11
1408	09/05/01	BTF-0052	0108070	03/16/99	12	1	1999	Allen	Fritz	Midwest Transit	P6FD0001D098T 2/2	05/05/01	07/10/00	Jul-00	2	2000	11
1414	09/06/01	BTF-0052	0108088	03/16/99	12	1	1999	Allen	Fritz	Midwest Transit	P6FD0001C945T 2/2	05/30/01	07/14/00	Jul-00	3	2000	11
1398	09/06/01	BTF-0052	0108099	03/16/99	12	1	1999	Allen	Fritz	Midwest Transit	P6FD0001C945T 1/2	05/30/01	07/14/00	Jul-00	2	2000	11
1198	04/09/02	BTF-0052	1031787	03/16/99	12	1	1999	Allen	Fritz	Prime	E1704737	09/21/01	06/05/99	Jun-99	2	1999	26
1367	05/29/02	BTF-0052	0108887	03/18/99	12	1	1999	Allen	Fritz	Ryder	E1717534	10/30/01	07/01/99	Jul-99	3	1999	26
1439	11/29/01	BTF-0052	0108836	03/21/99	13	1	1999	Allen	Fritz		E1999198	05/17/01	03/06/99	Jun-99	2	1999	24
1727	04/09/02	BTF-0052	110102	03/23/99	13	1	1999	Allen	Fritz		E1985840	09/04/01	01/13/00	Jan-00	1	1999	20
1123	08/22/00	BTF-0052	0110144	03/23/99	13	1	1999	Allen		Prime, Inc							0
1377	03/26/02	BTF-0052	0109322	03/24/99	13	1	1999	Allen		Ryder	CWA10777	02/11/02	05/14/99	May-99	2	1999	33
1788	04/09/02	BTF-0052	110538	03/24/99	13	1	1999	Allen	Fritz	Galaxy Trans	E1752204	02/06/02	06/11/99	Aug-99	3	1999	30
1489	11/29/01	BTF-0052	0111984	03/26/99	13	1	1999	Allen	Navistar	Walklart	WMT9660	10/26/01	06/21/99	May-99	2	1999	32
1775	05/08/02	BTF-0052	0111738	03/26/99	13	1	1999	Allen		Ryder	335051	12/13/01	06/21/99	Jun-99	2	1999	30
1996	10/01/01	BTF-0052	0119969	03/29/99	13	1	1999	Allen	Navistar	Walklart	Unit 9968	09/07/01					
1848	03/26/02	BTF-0052	111601	03/29/99	13	1	1999	Allen		Ryder	33820						
1291	11/29/01	BTF-0052	0111982	03/29/99	13	1	1999	Allen	Navistar	Walklart	UPS#3-1003-829-0						0
1596	09/29/02	BTF-0052	0112373	03/27/99	13	1	1999	Allen		Ryder	33016	02/06/02	05/15/99	May-99	2	1999	33

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1000	10/01/01	BTF-0052	0112206	03/30/99	14	1	1999	Allen	Navistar	Five Star	DM177 2/3	09/01/01	09/01/99	Jun-99	2	1999	27
1001	03/30/02	BTF-0052	114223	03/31/99	14	1	1999	Allen	Friter	Prime	E1762428	01/17/00	07/01/99	Jul-99	3	1999	7
1149	01/09/01	BTF-0049	M214548	04/18/99	16	2	1999	Luechow	Navistar		R014620	06/22/00	09/30/99	Sep-99	3	1999	24
1576	09/28/01	BTF-0052	0127704	04/18/99	17	2	1999	Allen	Navistar	Walbert	Unit 91069	07/14/01	09/01/99	Jun-99			29
1572	09/28/01	BTF-0052	0127946	04/18/99	17	2	1999	Allen	Navistar	Walbert	Unit 91711	07/16/01	09/01/99	Jun-99			29
1479	03/26/02	BTF-0052	0128013	04/18/99	17	2	1999	Allen	Navistar	Trucks Inc. of Janesville	CWA08200	12/12/01	02/07/00	Feb-00	1	2000	22
1880	10/04/01	BTF-0052	0127703	04/20/99	17	2	1999	Allen	Navistar	Walbert	Unit 91858	08/04/01	09/01/99	Jun-99			27
1882	03/28/02	BTF-0052	0127740	04/20/99	17	2	1999	Allen	Friter	KLLM	E1744815	12/20/01	09/01/99	Jun-99	2	1999	31
1307	09/27/01	BTF-0052	0128002	04/20/99	17	2	1999	Allen	Volvo	FM-Mor Express	CWA01797	04/01/01	09/16/99	Jun-99	2	1999	23
1354	03/28/02	BTF-0052	0121402	04/20/99	17	2	1999	Allen		Ryder	Ryder Unit # 557287	01/18/02	09/24/99	Jun-99	2	1999	31
1548	03/28/02	BTF-0052	0122648	04/20/99	17	2	1999	Allen	Friter	Ryder	E1734228	01/10/02	07/01/99	Jul-99	3	1999	31
1463	08/10/01	BTF-0052	M121826	04/20/99	17	2	1999	Luechow	Friter		3FPD0001A1827		08/18/01	May-01	2	2001	
1167	11/29/01	BTF-0052	0122112	04/20/99	17	2	1999	Allen	Navistar	Walbert	WMT91482 2/2	09/09/00					
1263	11/29/01	BTF-0052	0122140	04/20/99	17	2	1999	Allen	Navistar	Walbert	WMT91482 1/2	09/09/01					
1799	11/29/01	BTF-0052	0122124	04/20/99	17	2	1999	Allen	Navistar	Walbert	WMT91580	09/09/01					
1440	01/28/02	BTF-0052	0122039	04/21/99	17	2	1999	Allen	Friter	Ryder	34899		09/01/99	Jun-99	2	1999	
1723	04/28/02	BTF-0052	122538	04/21/99	17	2	1999	Allen	Friter	Heartland Express	E1662168	07/27/01	09/03/99	Jun-99	2	1999	29
1862	03/28/02	BTF-0052	0122546	04/21/99	17	2	1999	Allen	Friter	Heartland Express	E1720701	11/14/01	09/16/99	Jun-99	2	1999	29
1319	03/28/02	BTF-0052	0122998	04/21/99	17	2	1999	Allen	Friter		CWA08699	01/08/02	09/16/99	Jun-99	2	1999	31
1849	08/28/03	BTF-0052	0123027	04/21/99	17	2	1999	Allen		Ryder	35023	02/17/02	07/10/99	Jul-99	3	1999	32
1598	10/01/01	BTF-0052	0123081	04/22/99	17	2	1999	Allen	Navistar	Walbert	Unit 91267	08/16/01	09/01/99	Aug-99			29
1497	08/10/01	BTF-0052	0123372	04/22/99	17	2	1999	Allen	Navistar	Fleet Pride	Unit 3036						
1434	03/28/02	BTF-0052	0123528	04/22/99	17	2	1999	Allen		Ryder Unit 33474B	35014	02/27/02	09/22/99	Jun-99	2	1999	33
1599	08/31/01	BTF-0052	0123156	04/22/99	18	2	1999	Allen	Navistar	Otis Trucking	0083567A	01/31/01	09/09/99	Jun-99	2	1999	20
1711	03/28/02	BTF-0052	123502	04/26/99	18	2	1999	Allen	Friter	B & B Trucking	E1744715	10/22/01	09/29/99	Jun-99	2	1999	28
1191	09/01/01	BTF-0052	0123546	04/26/99	18	2	1999	Allen	Friter	Interstate	RO 66846	03/16/01	09/29/99	Jun-99	2	1999	21
1068	01/09/00	BTF-0052	123128	04/26/99	18	2	1999	Allen	Navistar	G T Groupe	02310779	12/07/99	09/03/99	Sep-99	3	1999	3
1313	07/09/01	BTF-0052	0123094	04/26/99	18	2	1999	Allen	Friter	Interstate	189121 3/2	02/05/01					
1227	03/28/02	BTF-0052	0123525	04/26/99	18	2	1999	Allen									
1228	03/28/02	BTF-0052	0123791	04/26/99	18	2	1999	Allen		Bowlbow Tilg	Unit #1380						
1488	03/28/02	BTF-0052	0122143	04/26/99	18	2	1999	Allen	Friter	Bond Transfer Company	CCL99499	01/31/02	09/01/99	Jun-99	2	1999	33
1109	01/09/01	BTF-0049	M214549	04/30/99	18	2	1999	Luechow	Navistar		R014629	06/22/00	09/30/99	Sep-99	3	1999	24
1311	07/09/01	BTF-0052	0127652	04/30/99	18	2	1999	Allen	Friter	Interstate	189121 1/2	02/05/01					
1454	08/09/01	BTF-0052	0127246	04/30/99	18	2	1999	Allen	Navistar	Interstate	Unit 3188						0
1609	03/28/02	BTF-0052	0128025	05/03/99	18	2	1999	Allen	Friter		E1745128						
1825	11/28/01	BTF-0052	0128110	05/03/99	18	2	1999	Allen	Friter		66762	09/30/01	09/01/99	Jun-99	2	1999	30
1714	03/28/02	BTF-0052	128139	05/03/99	18	2	1999	Allen	Friter	Empire Truck Sales	CWA08849	10/22/01	09/16/99	Jun-99	2	1999	29
1640	11/28/01	BTF-0052	0128018	05/03/99	18	2	1999	Allen	Friter		E1662210	10/01/01	09/23/99	Aug-99	3	1999	25
1019	03/28/02	BTF-0052	0128480	05/03/99	19	2	1999	Allen		Mckenzie Tank Lines	R.O. 49442	12/06/01	09/01/99	Sep-99			26
1700	03/28/02	BTF-0052	128621	05/03/99	19	2	1999	Allen	Friter		E1741061	09/04/02	12/27/01	Dec-01	4	2001	1
1853	03/28/02	BTF-0052	128663	05/03/99	19	2	1999	Allen	Friter		CWA07458						
1898	06/28/00	BTF-0052	0128948	05/04/99	19	2	1999	Allen	Friter	Tim Mallard/CA England	E1625650	05/04/00	01/28/98	Jun-99	1	1999	28
1704	03/28/02	BTF-0052	128449	05/04/99	19	2	1999	Allen	Friter	Queen Pulpe	E1762449	12/28/01	09/16/99	Jun-99	2	1999	31
1755	04/28/02	BTF-0052	128653	05/04/99	19	2	1999	Allen	Friter	Revoll Transport	CWA07038	11/05/01	09/22/99	Jun-99	2	1999	28
1745	04/28/02	BTF-0052	128661	05/04/99	19	2	1999	Allen	Friter	Revoll Transport	CWA07039	11/05/01	09/22/99	Jun-99	2	1999	28
1749	04/28/02	BTF-0052	129277	05/04/99	19	2	1999	Allen		Martin Lipe	86108	01/14/02	09/22/99	Jun-99	2	1999	31
1771	04/28/02	BTF-0052	129802	05/04/99	19	2	1999	Allen	Friter		E1674449	07/02/01	07/21/99	Jul-99	3	1999	21
1471	11/28/01	BTF-0052	0170219	05/04/99	19	2	1999	Allen	Mack	Tom Bailey Motors	CWA04355	09/23/01	07/26/99	Jul-99	3	1999	28
1280	01/18/02	BTF-0052	0129180	05/04/99	19	2	1999	Allen		KLLM							0
1340	07/31/01	BTF-0052	084338	05/05/99	19	2	1999	Luechow	Friter		NEFD0001B1437 1/2		09/01/99	Aug-99			0
1622	11/28/01	BTF-0049	0130049	05/05/99	19	2	1999	Allen	Friter		E1699451	08/17/01	07/16/99	Jul-99	2	1999	26
1748	03/28/02	BTF-0052	130513	05/05/99	19	2	1999	Allen	Friter	Bar Nunn	E1699022	08/16/01	07/21/99	Jul-99	3	1999	24
1719	03/28/02	BTF-0052	0129049	05/05/99	19	2	1999	Allen	Friter	New Prime	E1700047	01/22/02	07/29/99	Jul-99	3	1999	30
1331	10/29/01	BTF-0052	0130097	05/05/99	19	2	1999	Allen	Navistar	James Little	0013499A	01/25/00	09/27/99	Aug-99	3	1999	11
1232	12/18/01	BTF-0052	0130092	05/05/99	19	2	1999	Allen	Ford		CWA07461	10/01/01	07/07/99	Jul-99	2	1999	27
1213	11/28/01	BTF-0052	0131022	05/05/99	19	2	1999	Allen	Navistar		0042065	07/11/01	07/19/99	Jul-99	3	1999	24
1369	11/28/01	BTF-0052	0130018	05/05/99	19	2	1999	Allen	Friter		E1662211	08/15/01	07/23/99	Jul-99	3	1999	28
1699		BTF-0052	0130097	05/05/99	19	2	1999	Allen	Navistar	Hazmat Environmental	CCU00571	09/21/99	07/27/99	Jul-99	3	1999	2
1654	03/28/02	BTF-0052	130862	05/06/99	19	2	1999	Allen	Friter	Harjit Singh	E1762522	03/11/02	10/27/99	Oct-99	3	1999	29
1443	08/16/01	BTF-0052	0134078	05/06/99	19	2	1999	Allen	Friter	CSS Transp	3FPD0001M6871		12/20/01	Dec-01	4	2001	
1781	04/28/02	BTF-0049	130822	05/06/99	19	2	1999	Allen	Friter		E1699133						
1632	03/28/02	BTF-0052	131239	05/07/99	19	2	1999	Allen	Friter		E1762364	01/28/02	09/24/99	Aug-99	3	1999	30
1165	01/28/02	BTF-0052	0132110B	05/11/99	20	2	1999	Allen	Ryder	Ryder	39985		07/01/99	Jul-99	3	1999	
1586	10/01/01	BTF-0052	0132139	05/11/99	20	2	1999	Allen	Navistar	Bullock Express	VIN 022609	07/31/01	09/16/99	Aug-99	3	1999	24
1290	01/18/02	BTF-0052	0132047	05/11/99	20	2	1999	Allen		Milwaukie Truck Sales	CWA02668	10/16/01	07/27/99	Jul-99	3	1999	27
1431	05/09/01	BTF-0052	0132035	05/11/99	20	2	1999	Allen		Walmart	0374080	12/13/01	09/21/99	Aug-99	3	1999	29
1252	01/18/02	BTF-0052	0132976	05/11/99	20	2	1999	Allen	Mack	Mail Contractor	F160 01003311	10/22/01	02/21/01	Feb-01	1	2001	8
1870	03/28/02	BTF-0052	132862	05/11/99	20	2	1999	Allen		Ryder							
1803	09/18/01	BTF-0052	0134010	05/13/99	20	2	1999	Allen	Navistar	Walbert	Unit 91263	08/16/01	09/01/99	Aug-99			25
1980	09/18/01	BTF-0052	0133980	05/13/99	21	2	1999	Allen	Navistar	Walbert	Unit 91357	07/17/01	09/01/99	Aug-99			24

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1735	04/08/02	BTF-0052	[illegible]	08/18/99	27	2	1999	Allen		Ryder	355212	02/08/02	08/26/99	Jun-00	2	1999	32
1617	11/29/01	BTF-0052	0139608	05/14/99	21	2	1999	Allen	Navistar	Wallkart	VRUT91402	09/19/00					
1303	08/27/01	BTF-0052	0158517	05/19/99	21	2	1999	Allen		R&R Transport	Unit 947		11/01/99	Nov-99			0
1958	03/02/01	BTF-0052	0135886	05/14/99	21	2	1999	Allen	Volvo		004221-01	11/24/00	07/01/99	Jul-99			17
1129	10/02/00	BTF-0052	0137861	05/20/99	21	2	1999	Allen	Navistar	Carriage Express	0058844A	07/09/00	10/26/99	Oct-99	4	1999	9
1482	03/05/02	BTF-0052	0139701	05/21/99	21	2	1999	Allen	Freightliner	Prime	E1750087	01/10/02	08/13/99	Aug-99	3	1999	29
1110	09/08/00	BTF-0052	0150611	06/02/99	23	3	1999	Allen	Navistar	All Star International	0026268A	01/05/00	12/12/99	Dec-99	4	1999	1
1371	07/31/01	BTF-0052	0144858	06/03/99	23	2	1999	Allen	Navistar	Yowell Transp.	0133570A	05/23/01	12/20/99	Dec-99	4	1999	17
1537	03/08/02	BTF-0052	146542	06/07/99	24	2	1999	Allen	Freightliner		E1755422	03/15/02	08/17/99	Aug-99	3	1999	31
1514	11/29/01	BTF-0052	0144493	06/07/99	24	2	1999	Allen	Freightliner		E1700884	10/22/01	08/30/99	Sep-99	3	1999	28
1586	05/30/00	BTF-0052	0148071	06/07/99	24	2	1999	Allen	Navistar	Capital Atlantic Transit	0021677A	03/06/00	10/23/99	Oct-99	4	1999	5
1470	11/29/01	BTF-0052	0146917	06/08/99	24	2	1999	Allen	Freightliner		E1695251 22	08/08/01	08/19/99	Aug-99	3	1999	24
1533	01/25/02	BTF-0052	0146958	06/09/99	24	2	1999	Allen	Freightliner		E1720614	07/08/01	09/27/99	Sep-99	3	1999	22
1467	01/16/02	BTF-0052		06/09/99	24	2	1999	Allen	Kenworth	BLM Dist Sys	CWA06312	01/08/02	02/01/00	Feb-00	1	2000	24
1301	08/27/01	BTF-0052	0148194	06/10/99	24	2	1999	Allen	Freightliner	Interstate	DWFD01F438	04/09/01	09/01/99	Sep-99			18
1217	09/17/01	BTF-0052	0149652	06/14/99	25	2	1999	Allen	Freightliner	Ryder	Unit 365360						0
1797	04/08/02	BTF-0052	151437	06/17/99	25	3	1999	Allen	Freightliner	Great Coastal	E1705861	09/21/01	08/19/99	Aug-99	3	1999	25
1282	08/27/01	BTF-0052	0153602	06/18/99	25	2	1999	Allen		Knight Transportation	Jack Worrell	05/29/01					
1631	11/28/01	BTF-0052	0128613	06/19/99	26	2	1999	Allen	Freightliner		E1882145	10/01/01	07/30/99	Jul-99	3	1999	26
1510	11/28/01	BTF-0052	0153025	06/20/99	26	2	1999	Allen	Navistar		8238188D	06/07/01	11/08/99	Nov-99	4	1999	21
1102	06/04/00	BTF-0052	0158432	06/21/99	26	2	1999	Allen	Mack	Klingers	R94605Y91271	01/31/00	11/09/99	Nov-99	4	1999	3
1081	06/06/00	BTF-0052	0154048	06/22/99	26	2	1999	Allen	Navistar	Reynolds Oil	0210748	01/27/00	09/30/99	Sep-99	3	1999	4
1355	01/29/01	BTF-0052	0154983	06/23/99	26	2	1999	Allen	Navistar	American Eagle Courier	018117A	10/09/00	05/17/99	May-99	2	1999	17
1707	08/28/02	BTF-0052	165704	06/23/99	26	2	1999	Allen	Freightliner	R A Bliss	E1780939	08/13/01	06/30/99	Jun-99	3	1999	24
1513	09/10/01	BTF-0052	0153273	06/24/99	26	2	1999	Allen	Freightliner	New Prime	BKFD0001F1027		10/20/99	Oct-99	4	1999	
1660	11/28/01	BTF-0052	0158423	06/24/99	26	2	1999	Allen	Freightliner		E1888424	06/30/01					
1427	03/28/02	BTF-0052	0158188	06/25/99	26	2	1999	Allen	Freightliner	Winco Foods	E1782729	01/15/02	01/24/00	Jan-00	1	2000	24
1448	09/18/01	BTF-0052	0158824	06/30/99	27	2	1999	Allen	Freightliner		VF6MD0010G991T						0
1062	06/30/00	BTF-0052	0159155	07/01/99	27	2	1999	Allen	Navistar	N Central Fiera Lines	0074197A	10/15/99	02/28/99	Feb-99	1	1999	8
1179	04/06/01	BTF-0052	0161255	07/14/99	28	3	1999	Allen	Navistar	Capital Atlantic Transit	0024812B	01/02/01	10/22/99	Oct-99	4	1999	15
1575	10/01/01	BTF-0052	0162984	07/16/99	28	2	1999	Allen	Navistar	Wallkart	Unit 00888	07/06/01	04/01/00	Apr-00			18
1608	09/13/01	BTF-0052	0164958	07/21/99	30	3	1999	Allen	Navistar	Wallkart	Unit 91659	06/21/01	12/01/99	Dec-99			21
1111	09/05/00	BTF-0052	0165879	07/23/99	30	3	1999	Allen	Navistar	Superior Carriers	0082956A	05/15/00	12/27/99	Dec-99	4	1999	5
1374	09/03/01	BTF-0052	0167195	07/25/99	31	3	1999	Allen	Freightliner		SFFD0001A930T	05/21/01	04/06/00	Apr-00	2	2000	15
1334	07/31/01	BTF-0052	0166747	07/26/99	31	3	1999	Allen	Navistar	Combined Transp.	123159A	03/23/01	05/10/00	May-00	2	2000	11
1540	03/29/02	BTF-0052	169715	07/29/99	31	3	1999	Allen	Freightliner		E1765599	10/23/01	09/27/99	Sep-99	3	1999	25
1709	03/29/02	BTF-0052	169716	07/29/99	31	2	1999	Allen	Freightliner	Prime	E1755590	10/23/01	09/27/99	Sep-99	3	1999	25
1139	12/01/00	BTF-0052	0010786	08/06/99	32	3	1999	Allen	Navistar	Carlos Estrada	0258685A	08/18/00	04/30/99	Apr-99	2	1999	17
1488	03/28/02	BTF-0052	0012702	08/13/99	33	3	1999	Allen	Freightliner	Rocht Transport	CWA07832	12/07/01	10/07/99	Oct-99	4	1999	39
1419	11/28/01	BTF-0052	0012612	08/17/99	34	3	1999	Allen	Navistar	J & R Tilg	90139558	05/08/01					
1198	4/28/02	BTF-0052	0161785	08/01/99	36	3	1999	Allen	Freightliner								
1319	08/05/00	BTF-0052	0153213	08/07/99	37	3	1999	Allen	Navistar	Lewis Trucking	8304325A	06/02/00	10/25/99	Oct-99	4	1999	7
1663	09/18/01	BTF-0052	164994	08/08/99	37	3	1999	Allen	Navistar	Wallkart	Unit 91776 22	06/31/01	01/01/00	Jan-00			20
1588	09/13/01	BTF-0052	0154482	08/09/99	37	3	1999	Allen	Navistar	Wallkart	Unit 91946	06/25/01	12/01/99	Dec-99			21
1581	09/18/01	BTF-0052	0164117	08/09/99	37	3	1999	Allen	Navistar	Wallkart	Unit 91775 22	06/31/01	01/01/00	Jan-00			20
1360	11/29/01	BTF-0052	0128472	08/10/99	37	3	1999	Allen	Navistar	Dakota Cartage			10/04/99	Oct-99	4	1999	
1597	09/13/01	BTF-0052	0164510	08/16/99	37	3	1999	Allen	Navistar	Wallkart	Unit 91834	06/08/01	12/20/99	Dec-99	4	1999	18
1668	09/18/01	BTF-0052	0164509	08/16/99	37	3	1999	Allen	Navistar	Wallkart	Unit 91835	06/25/01	01/01/00	Jan-00			16
1599	09/18/01	BTF-0052	0164071	08/18/99	38	3	1999	Allen	Navistar	Wallkart	Unit 91734	03/31/01	11/23/99	Nov-99	4	1999	16
1625	12/18/01	BTF-0052	0165412	08/19/99	38	3	1999	Allen	Navistar	Dakota Cartage	RO 49860	06/27/01	10/04/99	Oct-99	4	1999	24
1128	05/29/00	BTF-0052	0166711	08/17/99	38	3	1999	Allen	Navistar	GB Trucking	0041467A	05/23/00	10/24/99	Oct-99	4	1999	7
1302	03/28/02	BTF-0052	0167400	08/17/99	38	3	1999	Allen	Freightliner		E7751474	01/16/02	01/23/00	Jan-00	1	2000	24
1280	05/31/01	BTF-0052	0167284	08/18/99	38	3	1999	Allen	Volvo		E1646208	04/26/01	12/22/99	Dec-99	4	1999	16
1651	11/28/01	BTF-0052	0167646	08/18/99	38	3	1999	Allen	Navistar	Grand Rapids Transp.	0071554A	05/27/01					
1668	04/03/00	BTF-0052	167347	08/18/99	38	3	1999	Allen		OM Dominion							0

1347	03/29/02	BTF-0052	0186890	09/22/99	39	3	1999	Allen	Frbw	F.Gough Trucks	E1750095	01/28/02	04/14/98	Apr-98	2	1998	48
1397	11/28/01	BTF-0052	0188894	09/23/99	39	3	1999	Allen	Frbw		E1695650	09/07/01	11/26/99	Nov-99	4	1999	22
1144	01/16/02	BTF-0052	0192051	09/28/99	40	3	1999	Allen	Navistar	Mansfield Inc.	00635238 1/2	02/20/01	08/08/00	Sep-00	3	2000	6
1477	01/16/02	BTF-0052	0192062	09/28/99	40	3	1999	Allen	Navistar	Mansfield Inc.	00635238 2/2	02/20/01	08/08/00	Sep-00	3	2000	6
1461	11/28/01	BTF-0052	0191943	09/28/99	40	3	1999	Allen	Frbw		E1681983 2/2	07/12/01	11/26/99	Nov-99	4	1999	20
1464	11/28/01	BTF-0052	0192229	09/29/99	40	3	1999	Allen	Frbw		E1681983 1/2	07/12/01	11/26/99	Nov-99	4	1999	20
1444	11/28/01	BTF-0052	0192695	09/29/99	40	3	1999	Allen	Navistar	Dion International	CWA04341 1/2	07/25/01	01/01/00	Jan-00			19
1445	11/28/01	BTF-0052	0191153	09/29/99	40	3	1999	Allen	Navistar	Dion International	CWA04341 1/2	07/25/01	01/01/00	Jan-00			19
1710	03/29/02	BTF-0052	192256	09/30/99	40	3	1999	Allen	Frbw		E1752365	01/22/02	09/14/00	Sep-00	3	2000	17
1772	04/09/02	BTF-0052	194352	10/08/99	41	4	1999	Allen	Frbw		E1679890	07/03/01	12/13/99	Dec-99	4	1999	19
1256	01/16/02	BTF-0052	0196663	10/20/99	43	4	1999	Allen	Volvo		CWA08341	09/25/01	10/04/00	Oct-00	4	2000	12
1384	06/18/01	BTF-0052	0200583	10/21/99	43	4	1999	Allen	Frbw	KLLM	SFFD0001A986T						
1398	08/28/01	BTF-0052	02353175	10/27/99	44	4	1999	Allen	Frbw	Arrow	SHFD0001Z268T	03/30/01	12/10/99	Dec-99	4	1999	16
1286	05/01/01	BTF-0052	0203088	10/27/99	44	4	1999	Allen	Navistar	Gamble Foods	0600987A	03/19/01	01/31/00	Jan-00	1	2000	13
1891	09/16/01	BTF-0052	0200007	10/31/99	45	4	1999	Allen	Frbw	Foss Trkg	FTTFD91B 7A						0
1182	11/28/01	BTF-0052	0636471	11/07/99	46	4	1999	Allen	Frbw		E1689480	08/08/01	01/06/99	Jan-99	1	1999	32
1287	05/01/01	BTF-0052	0208552	11/08/99	46	4	1999	Allen	Navistar	Coosa River Express	0219631A 2/2	02/22/01	01/12/00	Jan-00	1	2000	14
1338	07/31/01	BTF-0052	0208880	11/08/99	46	4	1999	Allen	Frbw		JTFD0001TD06T 2/2		02/01/00	Feb-00			0
1496	11/28/01	BTF-0052	0208674	11/10/99	46	4	1999	Allen	Frbw		E1705189	10/01/01	02/05/00	Feb-00	1	2000	20
1208	05/01/01	BTF-0052	0208707	11/11/99	46	4	1999	Allen	Navistar	Coosa River Express	0219631A 1/2	01/22/01	01/12/00	Jan-00	1	2000	13
1469	08/10/01	BTF-0052	0208698	11/11/99	46	4	1999	Allen	Frbw		HBFD0001C121T						0
1189	11/28/01	BTF-0052	0210569	11/15/99	47	4	1999	Allen	Navistar		0235863A	07/20/01	02/21/00	Feb-00	1	2000	17
1439	05/28/02	BTF-0052	0211136	11/19/99	47	4	1999	Allen	Frbw		E1748218	01/07/02	12/28/00	Dec-00	4	2000	13
1478	11/28/01	BTF-0052	0213262	11/19/99	47	4	1999	Allen	Frbw	Raw Pikna	E1684903	07/20/01	01/25/00	Jan-00	1	2000	18
1587	05/28/02	BTF-0052	199075	11/19/99	47	4	1999	Allen	Frbw	Pable Canneries	E1752728	01/28/01	10/27/00	Oct-00	4	2000	3
1512	11/28/01	BTF-0052	0216089	11/20/99	47	4	1999	Allen	Frbw		E1680919	08/28/01	07/28/99	Jul-99	3	1999	25
1284	03/28/02	BTF-0052	0199602	11/20/99	47	4	1999	Allen		Ryder Sugarmaker, N.C.	PSL# 325						
1685	08/28/02	BTF-0052	214528	11/23/99	48	4	1999	Allen	Frbw	Seminole Express	E1752660	01/20/02	01/20/00	Jan-00	1	2000	24
1687	08/28/02	BTF-0052	214430	11/23/99	48	4	1999	Allen	Frbw	Prime	E1750069	01/02/02	04/10/00	Apr-00	2	2000	21
1262	01/16/02	BTF-0052	0214312	11/23/99	48	4	1999	Allen	Navistar	Holt Walker	0050265A	10/24/01	04/28/00	Apr-00	2	2000	18
1138	01/16/02	BTF-0052	222546	11/29/99	48	4	1999	Allen	Frbw	BLM Dist Sys	CWA07074	11/28/01	06/23/00	Jun-00	2	2000	17
1765	04/09/02	BTF-0052	13407	11/29/99	48	4	1999	Allen	Frbw		E1685966						
1180	03/28/02	BTF-0052	0202971	11/27/99	48	4	1999	Allen	Frbw	Winco Foods	E1752730	01/10/02	10/21/99	Oct-99	4	1999	27
1620	11/28/01	BTF-0052	0216668	12/07/99	49	4	1999	Allen	Frbw		E1704903 1/2	09/24/01	03/04/00	Mar-00	1	2000	19
1621	11/28/01	BTF-0052	0216667	12/07/99	49	4	1999	Allen	Frbw		E1704903 2/2	09/24/01	03/04/00	Mar-00	1	2000	18
1286	01/16/02	BTF-0052	0216766	12/07/99	49	4	1999	Allen	Navistar	Holt Walker	0050172C 2/2	10/12/01	04/28/00	Apr-00	2	2000	18
1284	01/16/02	BTF-0052	0216764	12/07/99	49	4	1999	Allen	Navistar	Holt Walker	0050172C 1/2	10/12/01	04/28/00	Apr-00	2	2000	18
1381	06/03/01	BTF-0052	0220719	12/10/99	50	4	1999	Allen	Frbw	Gerth Transport	SMCD0001601T 1/2	05/03/01	04/18/00	Apr-00	2	2000	15
1408	06/06/01	BTF-0052	0220704	12/10/99	50	4	1999	Allen	Frbw	Gerth Transport	SMCD0001601T 2/2	05/03/01	04/18/00	Apr-00	2	2000	13
1580	09/18/01	BTF-0052	0210867	12/12/99	51	4	1999	Allen	Frbw	Doyle Sims Trkg	H18318	07/12/01	04/17/00	Apr-00	2	2000	15
1553	08/14/01	BTF-0052	0220960	12/13/99	51	4	1999	Allen	Frbw		SFFD0001B104T	06/11/01	04/28/00	Apr-00	2	2000	14
1491	06/18/01	BTF-0052	0225436	12/27/99	52	4	1999	Allen	Frbw	Brian Cox	SFFD0001A86T	05/25/01	04/09/01	Apr-01	2	2001	2

Comp_Cell	Level 1	CRITICAL	Serv Life	Mileage Cell	Root Cause	Other (Comment)	Dispose	Disp Date
NO INFO			258087	500000	IB SEAL LEAK - INGRESS	End play 0.000", smooth quiet rotation, OB row G, IB row debris dents, IB	Valid	01/29/02
NOISE/VIBRATION			422040	450000	NO PROBLEM FOUND	S.O.R. OB rollers, raceway good, IB rollers, raceway good, seal good N	Invalid	04/01/02
LOOSE BEARING			154296	250000	NO PROBLEM FOUND	EP 0.000", smooth rotation, no problem found	Invalid	01/01/28
END PLAY LOOSE			158836	250000	IB SEAL LEAK - INGRESS	Endplay 0.040", noisy, OB row milky rusty grease, IB row rusty free wate	Valid	07/31/01
LEAK			84897	50000	OIL SEPARATION	Oil separation leaked past seal is cast OS of hub unit.	Valid	01/31/00
BINDSTICK			318877	300000	IMPACT DAMAGE	Endplay 0.000", IB IR line spalls at rollers spacing(Troy Lab determinati	Invalid	11/28/01
LOOSE			198168	180000	UNHARDENED RW	Endplay 0.032", low noise, IB raceway heavily eroded	Valid	12/01/00
NON-SPECIFIC			368878	450000	NO PROBLEM FOUND	Endplay 0.000", smooth quiet rotation, IB & OB flows VG, IB seal functio	Invalid	10/01/01
NO INFO					IB SEAL LEAK - INGRESS	Endplay 0.022", noisy, IB seal lips worn out, OB seepage<0.5g, IB dry, I	Valid	09/16/01
BROKEN/SEPARATED BEARING	X	X	282788	300000	UNHARDENED RW	Rec'd diesem, no internal components, OB row badly eroded, unhardene	Valid	08/20/01
LEAK			284601	350000	NO PROBLEM FOUND	OB & IB G, no internal distress	Invalid	04/18/02
NO INFO					IB SEAL LEAK - INGRESS	Endplay 0.020", noisy, IB cage melted, IB seal wear ~2.0 mm, corrosion	Valid	05/17/01
LEAK			290778	250000	INSIGNIFICANT LEAK	No internal distress, very little seepage(Troy Lab determination)	Invalid	11/29/01
LEAK			214386	250000	INSIGNIFICANT LEAK	No internal distress, very little seepage(Troy Lab determination)	Invalid	11/29/01
LEAK			342808	300000	INSIGNIFICANT LEAK	No internal distress, very little seepage(Troy Lab determination)	Invalid	11/29/01
NO INFO					IMPACT DAMAGE	Endplay 0.022", noisy, OB row rusty debris dented cage starting to melt,	Invalid	08/18/01
LEAK			244172	250000	INSIGNIFICANT LEAK	OB seepage <0.5g, IB nil-some minor oil separation	Invalid	08/14/01
LEAK			290812	300000	INSIGNIFICANT LEAK	OB seepage <0.5G, IB <0.0g	Invalid	08/14/01
LEAK			290812	300000	INSIGNIFICANT LEAK	OB seepage <0.5g, IB <0.5g	Invalid	08/14/01
NOISE/VIBRATION			280814	300000	LOW CLAMP LOAD	Silver anti sieze IB bolts, OB row VG, IB row filet, Debris, OR row fine	Invalid	04/23/02
BROKEN			298108	300000	NO PROBLEM FOUND	Endplay 0.000", smooth rotation, no internal distress(Troy Lab determine	Invalid	11/29/01
MISSING/BROKEN HUBCAP			148631	150000	HUB CAP LOST	Endplay 0.000", smooth rotation, OB brg row corrosion(Troy Lab determi	Invalid	11/29/01
BROKEN/SEPARATED BEARING			343882	350000	INSIGNIFICANT LEAK	OB row VG, IB row VG, IB seal OK, no internal distress	Invalid	04/18/02
NO INFO					NO PROBLEM FOUND	No claim, S.O.R. OB rollers, raceway good, IB rollers, raceway good, se	Invalid	04/01/02
NOISE/VIBRATION			208	40000	LOW CLAMP LOAD	Endplay 0.000", spins freely no noise, severe clip scratches IR side face	Invalid	08/27/01
NOISE/VIBRATION			150028	200000	IMPACT DAMAGE	Slight noise, OB row VG, IB metal debris - no rust, line spalls/roller spa	Invalid	04/01/02
NON-SPECIFIC			187597	200000	UNKNOWN	Rec'd diesem, no rim, seals, gns, damage obscures evidence, cannot	Inconclusive	09/20/00
BINDSTICK			288803	300000	UNKNOWN	Rec'd diesem, no seals-grease-cages or rollers, cannot accurately deter	Inconclusive	08/18/01
LOOSE			78800	100000	NO PROBLEM FOUND	No internal distress(Troy Lab determination)	Invalid	11/28/01
SEIZED	X	X	288882	300000	UNKNOWN	Rec'd diesem/dirt, OB IR easy rotating, some rust in hubcap thds	Inconclusive	05/01/01
LEAK			7488	50000	INSIGNIFICANT LEAK	OB Purge 0.2 g, insignificant, within acceptable limits	Invalid	04/11/00
SEIZED		X	12000	50000	UNHARDENED RW	IB OR raceway heavily eroded - Unhardened Raceway	Valid	02/29/00
NO INFO			185820	200000	REMOVAL DAMAGE	Rec'd diesel, IB IR turn missing, OB brg row VG, IB OR RW VG	Invalid	06/21/01
NOISE/VIBRATION			408781	400000	IB SEAL LEAK - INGRESS	0.045 end play, noisy and rough rotation, OB & IB rollers &raceways spa	Valid	04/01/02
NOISE/VIBRATION			360348	400000	WATER INTRUSION ALONG SPINDLE	OB row OR RW spalls - rusty, IR small side faces rusty, IB row good,	Invalid	04/23/02
LEAK			405828	450000	IB SEAL LEAK - EGRESS	IB seal LEAK, seal appears functional	Valid	04/01/02
LEAK			233196	250000	INSIGNIFICANT LEAK	Copper anti seize on bolts, OB row G Weight oxidation, IB row VG, N	Invalid	04/23/02
LEAK			233196	250000	INSIGNIFICANT LEAK	Copper anti sieze on bolts, OB row VG, IB row VG, IB seal functional	Invalid	04/23/02
LEAK			307858	350000	NO PROBLEM FOUND	Both brg rows VG, signs of low clamp load but no failure	Invalid	01/16/02
SEIZED		X	144958	200000	IMPACT DAMAGE	Rec'd diesemen, IB rollers missing, clip ring noses pulled, IB IR line spa	Invalid	08/27/01
BINDSTICK			398209	400000	NO PROBLEM FOUND	Endplay 0.000", smooth rotation, no internal distress (Troy Lab determi	Invalid	11/29/01
NOISE/VIBRATION			187888	200000	NO PROBLEM FOUND	Endplay 0.000", smooth rotation, Lat & Rad RFO <0.005", no problem fo	Invalid	10/20/00
FIRE		X	17050	50000	UNHARDENED RW	Brake drag heat deteriorated grease causing bearing failure, brake fire	Valid	01/11/00
NOISE/VIBRATION			450000	450000	IMPACT DAMAGE	IB OR single line spall, IB seal VG, grease VG w/o signs of contaminatio	Invalid	
NO INFO			403329	150000	LOW CLAMP LOAD	Endplay 0.005",	Invalid	01/23/02
NO INFO			328874	350000	IMPACT DAMAGE	Endplay 0.000", rough rotation, IB IR RW line spalls at roller spacing	Invalid	12/19/01
LEAK					NO PROBLEM FOUND	No internal distress(Troy Lab determination)	Invalid	11/29/01
LEAK			181888	300000	OB SEAL LEAK - INGRESS	Endplay 0.007", hard to rotate, lots of water in bearing, seals look good,	Valid	04/12/01
LOOSE HUB	X	X	886012	700000	NO PROBLEM FOUND	OB seepage nil, IB <0.5g, endplay 0.000", smooth quiet rotation	Invalid	08/03/01
FIRE		X	43601	65000	UNHARDENED RW	IB roller get slaged, heavily eroded RW - Unhardened Raceway	Valid	02/29/00
NOISE/VIBRATION			447000	450000	TAMPERING	Re-greased with fan greaze, noisy, IB IR RW spalls, endplay 0.000"	Invalid	10/01/01
LOOSE			365412	400000	IB SEAL LEAK - INGRESS	OB Seepage <0.5g, IB <0.5g, Endplay 0.000", Noisy, OB G, IB OR RW	Valid	08/03/01
LOOSE			365412	400000	NO PROBLEM FOUND	OB seepage <0.5g, IB dry, endplay 0.000", smooth quiet rotation	Invalid	08/08/01
LOOSE HUB			361374	400000	IB SEAL LEAK - INGRESS	OB seepage ~1.0g, IB dry, endplay 0.000", noisy rotation, OB row G, IB	Valid	08/04/01
LOOSE HUB			361374	400000	NO PROBLEM FOUND	OB seepage ~1.0g, IB <0.5g, endplay 0.000", smooth quiet rotation	Invalid	08/04/01
BROKEN/SEPARATED BEARING			327880	350000	IB SEAL LEAK - INGRESS	OB row VG, IB row VG, no internal	Valid	04/23/02
BINDSTICK			297851	300000	IB SEAL LEAK - INGRESS	Noisy rotation, water, heat, ingress, dirt lip torn away.	Valid	04/01/02
NON-SPECIFIC			490198	400000	NO PROBLEM FOUND	Endplay 0.000", smooth rotation, no internal distress(Troy Lab determine	Invalid	11/29/01
LOOSE BEARING			268194	300000	IB SEAL LEAK - INGRESS	Noisy, OB row black & shard, IB row cage melted, IB OR spalling - IB	Valid	04/23/02
NO INFO	X	X			LOW CLAMP LOAD	Rec'd Diesemen, no rim, seals, gns, circ marks on IR faces, clip ring gro	Invalid	09/22/00
LOOSE HUB			304086	350000	IMPACT DAMAGE	Noisy, No end play OB roller saw slight heat, IB rollers spaulg/roller spa	Invalid	04/01/02
NOISE/VIBRATION			371104	400000	IB SEAL LEAK - INGRESS	OB row has corrosion spalling, IB row IR & OR rusty & corrosion spalls,	Valid	04/23/02
BEARING FAILURE			281080	300000	NO PROBLEM FOUND	Endplay 0.000", smooth rotation, no internal distress(Troy Lab determine	Invalid	11/29/01
NO INFO			488188	600000	IB SEAL LEAK - INGRESS	OB row good, OR RW corrosion spalls, IB dust dip turn away 90 degrees	Valid	04/01/02
MISSING/BROKEN HUBCAP			228013	250000	NO PROBLEM FOUND	Rusty hubcap threads, endplay 0.000", rusty wet joints, rust stains small	Invalid	10/01/01
NO INFO			482016	500000	IB SEAL LEAK - INGRESS	IB shallow spalls, IB ring cage broken, IB seal worn out	Valid	04/18/02
NO INFO					NO PROBLEM FOUND	No internal distress(Troy Lab determination)	Invalid	11/29/01
NO INFO			251190	250000	IB SEAL LEAK - INGRESS	End play 0.041, very noisy, OB row metallic debris, IB row cage melted -	Valid	04/01/02

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NOISE/VIBRATION			314708	350000	WATER INTRUSION ALONG SPINDLE	Endplay 0.008", noisy & rough, OB row slight heat oxidation, rust stains	Invalid	10/01/01
NOISE/VIBRATION			486076	300000	OIL SEPARATION	OB row light heat, IB also, oily grease	Valid	04/16/02
BROKEN/SEPARATED BEARING			265161	300000	REMOVAL DAMAGE	EP 0.000", rollers smooth, clip ring missing, damaged during removal F	Invalid	01/01/00
NOISE/VIBRATION			300000	300000	IB SEAL LEAK - INGRESS	Endplay 0.008", noisy, OB rollers darkened at RW ctr, IB OR RW spalls	Valid	10/08/01
ENDPLAY/LOOSE			346240	350000	LOW CLAMP LOAD	Wet rusty bores, endplay 0.000", OB row VG, IR small side faces chc w	Invalid	09/15/01
NOISE/VIBRATION			277008	300000	IB SEAL LEAK - INGRESS	Rec'd clean, OB row G, IB rusty, IN seal worn out	Valid	04/01/02
NOISE/VIBRATION			298151	300000	IB SEAL LEAK - INGRESS	Endplay 0.008", noisy, OB row rusty and heat indications, IB row corrosi	Valid	10/08/01
LEAK			304000	300000	NO PROBLEM FOUND	Endplay 0.006", smooth quiet rotation, IB & OB big rows VG, IB seal fun	Invalid	04/01/02
NOISE/VIBRATION			389000	400000	IMPACT DAMAGE	Rec'd dissassm., OB row rusty, hubcap threads rusty, IB IR line spalls a	Invalid	05/27/01
NO INFO					IB SEAL LEAK - INGRESS	OB row corrosion, rusty, metallic debris, IB also	Valid	04/01/02
DIPSTICK			586622	400000	UNKNOWN	No Circular end Bars. Recorded dis-assmb. Cannot Actually determ. Fail	Inconclusive	04/01/02
NO INFO					NO PROBLEM FOUND	OB seepage <0.5g, IB <0.5g, rusty hubcap threads, endplay 0.000", smo	Invalid	09/10/01
BEARING FAILURE			146540	150000	IB SEAL LEAK - INGRESS	Rec'd dissgm, no IB IR or seal, IB OR corrosion spalls - SUBMERGED?	Valid	11/29/01
BEARING FAILURE			146548	150000	IMPACT DAMAGE	IB IR line spalls at roller spacing, clip ring broken(Troy Lab determinati	Invalid	11/29/01
BEARING FAILURE			190309	200000	IB SEAL LEAK - INGRESS	IB OR RW corrosion spalls, IB seal appears functional - SUBMERGED?	Valid	11/29/01
NO INFO			991544	400000	IB SEAL LEAK - INGRESS	Endplay 0.000", smooth rotation, OB & IB IR debris denting, IB row slight	Valid	01/29/02
NOISE/VIBRATION			340402	350000	WATER INTRUSION ALONG SPINDLE	Noisy, OB row flat. Debris - rusty. IB row G. IB seal functional, rusty b	Invalid	04/25/02
LEAK			311918	350000	IB SEAL LEAK - INGRESS	OB row corrosion, rusty, metallic debris, IB also	Valid	04/01/02
NOISE/VIBRATION			391884	400000	IB SEAL LEAK - INGRESS	Very noisy & rough, IB seal worn out.	Valid	04/01/02
NO INFO			618034	400000	IB SEAL LEAK - INGRESS	OB row VG, IB row slight line corrosion & spall OB IR RW, seal OK	Valid	04/19/02
NOISE/VIBRATION			280100	300000	IMPACT DAMAGE	Rec'd dissasm, OB row debris dented, IB IR RW line spalls at roller spac	Invalid	10/01/01
BROKEN/SEPARATED BEARING					UNKNOWN	Rec'd dissasm, badly damaged, No rollers-cages-grease or seals, cannot	Inconclusive	09/10/01
NO INFO			326445	400000	IB SEAL LEAK - INGRESS	Noisy, rough rotation, OB rollers raceway good, IB rollers race way spa	Valid	04/01/02
NOISE/VIBRATION			192003	200000	NO PROBLEM FOUND	Endplay 0.006", smooth rotation, no problem found	Invalid	05/31/01
NOISE/VIBRATION			298748	300000	IB SEAL LEAK - INGRESS	Slight noise on rotation, OB row slight darking center 3/4, IB row OR R	Valid	04/16/02
WHEEL OFF		X	300000	300000	IB SEAL LEAK - INGRESS	Endplay 0.021", noisy rotation, IB seal main lip badly worn, grease dark	Valid	05/01/01
MISSING/BROKEN HUBCAP			38234	50000	HUB CAP LOST	Heavy Rust in cap ffds, no problem found, unit replaced as precaution	Invalid	04/11/00
NOISE/VIBRATION			342627	350000	IB SEAL LEAK - INGRESS	Endplay 0.006", smooth rotation, rusty & wet bores, IB OR RW line spall	Valid	07/30/01
NO INFO					OIL SEPARATION	IB seal functional - oil seepage	Valid	04/01/02
NO INFO					NO PROBLEM FOUND	Endplay 0.000", smooth quiet rotation, IB & OB big rows VG, IB seal fun	Invalid	04/01/02
BEARING FAILURE			329411	400000	IB SEAL LEAK - INGRESS	IB outer ring - spalling, cartoon, IB ring slight corrosion spall	Valid	04/01/02
BROKEN/SEPARATED BEARING			265161	300000	REMOVAL DAMAGE	EP 0.000", rotation smooth, clip ring broken, damaged during removal fo	Invalid	01/01/00
NOISE/VIBRATION			342627	350000	NO PROBLEM FOUND	Endplay 0.000", smooth rotation, internal components VG, IB seal main	Invalid	07/08/01
NO INFO			376574	400000	NO PROBLEM FOUND	OB seepage <1.0g, IB < 1.5g, endplay 0.000", smooth quiet rotation	Invalid	06/08/01
NO INFO						OB row very good, IB low rusty OR row IB spalls - corrosion, seal worn o	Valid	04/01/02
NO INFO			279906	300000	IMPACT DAMAGE	IB big row pitted, seal looks good, no grease leakage (Troy Lab determi	Invalid	11/29/01
BEARING FAILURE			355007	400000	IB SEAL LEAK - INGRESS	Noisy, OB row dark, IB small and, IB met, Debris, OR RW spalling, Ing	Valid	04/16/02
CORROSION/RUST			279908	300000	IB SEAL LEAK - INGRESS	Rec'd dissasm, cut w/ torch, OR RW's heavily spalled - corrosion(Troy La	Valid	11/29/01
NOISE/VIBRATION			208797	250000	IB SEAL LEAK - INGRESS	OB row VG, IB OR RW corrosion spalls, IB seal appears functional	Valid	04/01/02
NOISE/VIBRATION			391302	400000	TAMPERING	Noisy, filled with red grease	Invalid	04/16/02
NO INFO					UNKNOWN	Rec'd dissassmbled, ORA IR only, cement wear. Determine failure of	Invalid	04/16/02
ENDPLAY/LOOSE	X	X	304315	350000	UNHARDENED RW	IB OR raceway heavily eroded - Unhardened RW - 304315 MILES - RE	Valid	08/30/00
BROKEN/SEPARATED BEARING			346000	350000	UNKNOWN	No bearings returned, inner outer ring severe damage, damage in race	Invalid	04/16/02
NOISE/VIBRATION			284287	300000	IB SEAL LEAK - INGRESS	Noisy, OB row rusty. Wickers denting, OR RW shallow spalls, IB row	Valid	04/23/02
NOISE/VIBRATION			284287	300000	WATER INTRUSION ALONG SPINDLE	OB row G, IB IR RW 2 wide spaced spalls, IR small side faces rusty	Invalid	04/23/02
NOISE/VIBRATION			400081	400000	OPEN	Noisy, OB row cage broken - Mat. Debris - OR spalls, IB rusty Mat.	OPEN	04/23/02
DIPSTICK			191181	200000	WATER INTRUSION ALONG SPINDLE	Slight bearing up roughness, OB row OR RW spalls & corrosion, rusty b	Invalid	04/25/02
LEAK			261048	300000	IB SEAL DAMAGED	IB seal dust lip torn away, contaminant ingress into bearing(Troy Lab de	OTHER	11/29/01
NO INFO					UNKNOWN	IB IR cracked, OB IR spun, rollers not pegged, cages seals grease gone	Inconclusive	01/16/02
LEAK			331748	350000	NO PROBLEM FOUND	OB seepage <1.0g, IB <1.0g, endplay 0.000", smooth quiet rotation	Invalid	07/31/01
BROKEN			396388	350000	LOW CLAMP LOAD	Endplay 0.010", rough rotation, clip ring grooved, (Troy Lab determinatio	Invalid	11/29/01
BROKEN/SEPARATED BEARING			278908	250000	IB SEAL LEAK - INGRESS	Rec'd dissasm, OB row missing, IB IR RW spalls, clip ring broken, IB O	Valid	04/23/02
LOOSE HUB			386207	400000	IB SEAL LEAK - INGRESS	Hub received was not together, OB rollers raceway good, IB rollers sac	Valid	04/01/02
NOISE/VIBRATION			146718	150000	NO PROBLEM FOUND	Endplay 0.000", smooth rotation, no problem found	Invalid	10/20/00
BEARING FAILURE			294476	350000	UNKNOWN	Rec'd dissasm, OR & IR's only, rusty/pitted accurately determine failure	Inconclusive	12/18/01
WORN BEARING/HUB			199861	200000	IB SEAL LEAK - INGRESS	Rec'd dissasm, clip ring broken, IB big row corrosion, OB low G(Troy Lab	Valid	11/29/01
DIPSTICK			298787	300000	LOW CLAMP LOAD	Endplay 0.020", rough rotation, clip ring grooved, (Troy Lab determinatio	Invalid	11/29/01
LEAK			11821	50000	IB SEAL LEAK - INGRESS	IB Seal was damaged, lip torn about 1" long	Valid	01/31/00
WORN BEARING/HUB			402200	450000	IB SEAL LEAK - INGRESS	Noisy, clicks, OB grease thin and dark - debris denting, IB cage broke	Valid	04/16/02
BEARING FAILURE			348177	350000	WATER INTRUSION ALONG SPINDLE	OB seepage 0.5g, IB ~1.0g, endplay 0.000", rough noisy rot, OB row de	Invalid	08/10/01
NO INFO					IB SEAL LEAK - INGRESS	Noisy, OB row VG, IB row rusty -OR spalls - IB seal worn out	Valid	04/23/02
NOISE/VIBRATION			396388	350000	IB SEAL LEAK - INGRESS	Noisy, OB row G, IB row flat debris-rust, IB seal completely gone, wet	Valid	04/16/02
NO INFO			482056	500000	IMPACT DAMAGE	Rec'd dissasm, IB IR line spalls at roller spacing	Invalid	01/29/02
NOISE/VIBRATION			247184	250000	IMPACT DAMAGE	Endplay 0.000", rough rotation, IB IR RW line spalls at roller spacing, no	Invalid	10/01/01
BEARD		X	300208	400000	IB SEAL DAMAGED	OB row G, IB seal dust lip gone, IB row narrow spall lines	OTHER	
ENDPLAY/LOOSE			386396	400000	IB SEAL LEAK - INGRESS	Jerky rotation, OB row good, IB OR RW corrosion spalls, IB seal worn o	Valid	04/01/02
NOISE/VIBRATION			439	50000	WATER INTRUSION ALONG SPINDLE	OB row debris denting, IB row rust. Debris, IB OR corrosion spalls, IB s	Invalid	01/15/02
NO INFO					IB SEAL LEAK - INGRESS	Rec'd dissassmbled, IB IR fractured, clip ring broken, IB seal main lip	Valid	04/18/02
NOISE/VIBRATION			386396	350000	IMPACT DAMAGE	Endplay 0.000", jerky rotation, OB row VG, IB row IR line spalls at roller	Invalid	09/16/01
ENDPLAY/LOOSE			279908	350000	WATER INTRUSION ALONG SPINDLE	Very wet rusty bores, endplay 0.000", noisy, OB row debris dented, IB o	Invalid	08/16/01

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NO INFO			457912	500000	IB SEAL LEAK - INGRESS	Rec'd Diesters, OB row G, IB row debris dusting & shallow spalls, IB r	Valid	04/23/02
LEAK			168874	200000	INSIGNIFICANT LEAK	No internal distress, very little seepage(Troy Lab determination)	Invalid	11/29/01
LEAK			230500	250000	NO PROBLEM FOUND	Endplay 0.000", smooth rotation, internal components VG	Invalid	08/27/01
LEAK			171[illegible]	300000	NO PROBLEM FOUND	EP 0.000", smooth rotation, no problem found	Invalid	02/22/01
BEARING FAILURE			76976	100000	UNHARDENED RW	IB OR raceway heavily smeared - Unhardened raceway	Valid	10/25/00
LEAK			280488	300000	NO PROBLEM FOUND	S.O.R. OB rollers, raceway good, IB rollers, raceway good, seal good. N	Invalid	04/01/02
SEIZED	X	X	69887	100000	UNHARDENED RW	IB OR raceway heavily smeared - Unhardened Raceway	Valid	09/06/00
NOISE/VIBRATION			181769	200000	IMPACT DAMAGE	Endplay 0.000", Slightly noisy rat., line spalls @ roller spacing inboard zo	Invalid	08/13/01
LEAK			694527	600000	OIL SEPARATION	Hub poly, OB row VG, IB row VG, IB seal OK, grease poly	Valid	04/16/02
WINDSTICK	X	X	369284	400000	UNKNOWN	Rec'd diesers, turn up(Troy Lab determination)	Inconclusive	11/29/01
MISSING/BROKEN HUBCAP			62111	100000	NO PROBLEM FOUND	0 endplay, smooth rotation, brg OK. Cap was loose in chrome cap	Invalid	08/30/00
LEAK			3[illegible]	500000	NO PROBLEM FOUND	Endplay 0.000", smooth rotation, no internal distress(Troy Lab determina	Invalid	11/29/01
LEAK			311922	500000	OIL SEPARATION	Endplay 0.000", smooth quiet rotation, IB & OB rows VG, IB seal functio	Valid	01/29/02
NOISE/VIBRATION			594514	400000	IB SEAL LEAK - INGRESS	IB IR & OR corrosion spalling, OB row corrosion	Valid	01/16/02
BROKEN HUB	X	X	228499	250000	UNKNOWN	Rec'd diesesers., IB OR RW badly deformed, metallurgy confirms was R	Inconclusive	09/29/01
NO INFO					INNER RING SPALL	Endplay 0.000", noisy, IB IR spall 120 degrees	Valid	05/17/01
BEARING FAILURE			334[illegible]	300000	WATER INTRUSION ALONG SPINDLE	Slightly noisy, OB row G, IB row OR RW spalls - Mat, Debris - IR RW	Invalid	04/23/02
NO INFO			299[illegible]	250000	INNER RING SPALL	Cap ring unclipped from IB IR, seals very clean, endplay 0.000", noisy, R	Valid	09/27/01
BROKEN			215[illegible]	250000	NO PROBLEM FOUND	Endplay 0.000", smooth rotation, no internal distress(Troy Lab determina	Invalid	11/29/01
NOISE/VIBRATION			241795	250000	IB SEAL LEAK - INGRESS	Endplay 0.000", smooth rotation, IB brg row corrosion, OB row G(Troy L	Valid	11/29/01
LEAK			18	50000	OB SEAL LEAK - EGRESS	Endplay 0.000", smooth rotation, OB seal leak >1.0g	Valid	06/04/00
SHOPLAY/LOOSE			64[illegible]	100000	IB SEAL LEAK - EGRESS	IB seal ~1.5g, 0 endplay, smooth rotation	Valid	06/30/00
NOISE/VIBRATION			26336	50000	NO PROBLEM FOUND	EP 0.001", smooth rotation, no problem found	Invalid	01/01/29
WINDSTICK			482347	700000	IB SEAL LEAK - INGRESS	Noisy & clunks, OB row rusty dessel. Debris - grease hard, IB cage brok	Valid	04/15/02
BROKEN/SEPARATED BEARING			224108	250000	IMPACT DAMAGE	OB seepage <0.5g, IB nil, endplay 0.000", rough noisy rat, clip ring dislo	Invalid	08/10/01
WINDSTICK			675874	700000	IB SEAL LEAK - INGRESS	Corrosion throughout bearing(Troy Lab determination)	Valid	11/29/01
NOISE/VIBRATION			585687	400000	IB SEAL LEAK - INGRESS	Noisy, OB good, IB fine spalls @ roller spacing	Valid	04/01/02
NO INFO					WATER INTRUSION ALONG SPINDLE	OB seepage ~2.0g, IB dry, rusty wet bores, IB & OB rows VG, grease ru	Invalid	08/10/01
NOISE/VIBRATION			48[illegible]	100000	NO PROBLEM FOUND	0 endplay, smooth rotation, 0.002" lateral and radial runout - RECALL R	Invalid	06/30/00
SMOKING/HOT BEARING/HUB		X	589469	300000	LOW CLAMP LOAD	Endplay 0.000, smooth rotation, circular scratches on IR and faces and	Invalid	04/12/01
NOISE/VIBRATION			198[illegible]	300000	NO PROBLEM FOUND	Endplay 0.002", smooth quiet rotation, IB & OB Rows VG, IB seal functio	Invalid	10/01/01
BEARING FAILURE			241200	250000	IMPACT DAMAGE	Wet rusty bores, endplay 0.000", noisy, OB row VG, IB debris dented, IB	Invalid	08/18/01
SMOKING/HOT BEARING/HUB	X	X	21308	00000	IB SEAL LEAK - INGRESS	Inboard seal water/contaminant ingress	Valid	08/00/00
WORN BEARING/HUB			114488	150000	NO PROBLEM FOUND	OB seepage nil, IB nearly dry, endplay 0.000", smooth quiet rotation, IB	Invalid	08/03/01
LEAK			118188	150000	INSIGNIFICANT LEAK	OB seepage <0.5g, IB nil	Invalid	07/31/01
BROKEN/SEPARATED BEARING			439808	400000	IB SEAL LEAK - INGRESS	OB row VG, IB debris denting - no spalling, IB seal worn	Valid	04/16/02
BROKEN/SEPARATED BEARING			438508	450000	INSIGNIFICANT LEAK	OB row VG, IB row VG, IB seal functional, no internal distress	Invalid	04/16/02
LEAK			287712	200000	OB SEAL LEAK - EGRESS	OB seal leak >2.0 g	Valid	12/01/00
NOISE/VIBRATION			377608	400000	IB SEAL LEAK - INGRESS	Slight vibration, IB seal worn out	Valid	04/01/02
LEAK			135274	150000	NO PROBLEM FOUND	Endplay 0.000", smooth rotation, no internal distress(Troy Lab determine	Invalid	11/29/01
NO INFO					NO PROBLEM FOUND	BOR, No end play, no internal distress	Invalid	04/01/02
LEAK			129829	150000	INSIGNIFICANT LEAK	SHOPLAY 0.000", SMOOTH ROTATION, LEAK <0.8G	Invalid	09/05/00
NOISE/VIBRATION			229305	250000	IB SEAL LEAK - INGRESS	Rusty bore, OB seepage <0.5g, IB dry, endplay 0.025", noisy, IB seal da	Valid	09/16/01
NOISE/VIBRATION			299740	300000	IB SEAL LEAK - INGRESS	Endplay 0.001", noisy, IB OR RW corrosion spalling, IB seal dust lip wor	Valid	09/16/01
NOISE/VIBRATION			229308	300000	NO PROBLEM FOUND	OB seepage nil, IB <0.5g, endplay 0.000", smooth quiet rotation, IB & OB	Invalid	09/16/01
BROKEN/SEPARATED BEARING	X	X	258608	300000	LOW CLAMP LOAD	Hub brg cone burn up (Troy Lab determination)	Invalid	11/29/01
SEIZED		X	68[illegible]32	200000	UNKNOWN	Rec'd diesers, IR's badly battered and spun, soi conclusive due to dama	Inconclusive	09/16/01
NOISE/VIBRATION			181422	200000	IB SEAL LEAK - INGRESS	Wet rusty bores, OB seepage removed, IB unusual slap, endplay 0.018	Valid	09/16/01
WORN BEARING/HUB			165789	300000	UNKNOWN	Rec'd diesers, OR only covered of grease, IB & OB rows debris dented,	Inconclusive	09/16/01
WHEEL OFF		X	25[illegible]	300000	UNKNOWN	Fell started in IB row, IR's cracked spun & loosted off, jagged rollers, c	Inconclusive	12/19/01
BURNT BEARING		X	48512	00000	UNHARDENED RW	IB OR raceway heavily smeared - Unhardened raceway	Valid	10/20/00
BEARING FAILURE			368217	200000	UNKNOWN	Cannot accurately determine failure origin	Valid	04/01/02
NOISE/VIBRATION			163168	200000	IB SEAL LEAK - INGRESS	Endplay 0.000", rough rotation, IB seal wear ~3.0 mm, IB grease dark m	Valid	05/31/01
NO INFO			200588	250000	NO PROBLEM FOUND	Endplay 0.000", smooth rotation, no internal distress(Troy Lab determina	Invalid	11/29/01
NO INFO					REMOVAL DAMAGE	Disassembled, clip ring worst pulled, suspect removal damage, no info	Invalid	04/11/00

LEAK			585218	600000	NO PROBLEM FOUND	Hub received was not together, OB, IB rollers, raceways, seal good. No	Invalid	04/01/02
NOISE/VIBRATION			249650	250000	IMPACT DAMAGE	IB brg row fine spalls, OB row VG(Troy Lab determination)	Invalid	11/29/01
LOOSE			36044	50000	NO PROBLEM FOUND	Endplay 0.000", smooth quiet rotation, both brg rows VG	Invalid	01/16/02
LOOSE			25044	50000	NO PROBLEM FOUND	Endplay 0.000", smooth quiet rotation, both brg rows VG	Invalid	01/16/02
BINDSTICK			228864	250000	NO PROBLEM FOUND	Endplay 0.000", smooth rotation, no internal distress (Troy Lab determin	Invalid	11/29/01
BINDSTICK			228864	250000	NO PROBLEM FOUND	Endplay 0.000", smooth rotation, no internal distress (Troy Lab determin	Invalid	11/29/01
NO INFO			348235	350000	HUB CAP LOST	Endplay 0.000", smooth rotation, IB brg row VG, OB row corrosion, hubc	Invalid	11/29/01
NO INFO			348235	350000	HUB CAP LOST	Endplay 0.000", smooth rotation, IB brg row VG, OB row corrosion, hubc	Invalid	11/29/01
NOISE/VIBRATION			273721	300000	IB SEAL LEAK - INGRESS	Noisy, OB row VG, IB row debris dending, grease clotted at large end,	Valid	04/16/02
LOOSE BEARING			123401	180000	COCKED SEAL	OB row VG, IB row debris dendingh - IB seal dust lip worn one side only	Valid	04/23/02
NOISE/VIBRATION			339951	250000	IMPACT DAMAGE	OB row debris dending, IB UR fine spalls @ roller spacing	Invalid	01/16/02
NO INFO					UNKNOWN	Rec'd disbrow, no internal components, IB row appears to be failure orig	Inconclusive	08/10/01
LOOSE			128586	150000	IB SEAL LEAK - EGRESS	OB seepage <0.5g, IB >2.0g, endplay 0.000", smooth quiet rotation, OB	Valid	08/08/01
BEARING FAILURE			184963	200000	IMPACT DAMAGE	EP 0.000", jerky rotation, IB row fine spalls @ roller spacing	Invalid	08/01/01
NO INFO					UNKNOWN	Rec'd disbrow, no rollers-grease-cages-seals, IB IR GF no cycloids, spall	Inconclusive	08/16/01
BINDSTICK	X	X	486458	500000	IB SEAL LEAK - INGRESS	Rec'd disbrow, corrosion throughout bearing, worse at IB row(Troy Lab d	Valid	11/29/01
NOISE/VIBRATION			100000	150000	NO PROBLEM FOUND	EP 0.000", smooth rotation, no internal distress	Invalid	05/01/01
LEAK			199081	200000	INSIGNIFICANT LEAK	OB nil, IB <0.5g	Invalid	07/31/01
BINDSTICK	X	X	308982	350000	UNKNOWN	Rec'd OR only, no internal components, cannot determine origin of failur	Inconclusive	11/29/01
NOISE/VIBRATION			100000	150000	NO PROBLEM FOUND	EP 0.000", smooth rotation, no internal distress	Invalid	05/01/01
NO INFO					IMPACT DAMAGE	OB seepage <1.0g , IB ~1.5g, endplay 0.005", possible noise, fine spalls	Invalid	08/10/01
BEARING FAILURE			157720	200000	IMPACT DAMAGE	IB brg row pitted, seal looks good, no grease leakage (Troy Lab determi	Invalid	11/29/01
LEAK			291139	300000	NO PROBLEM FOUND	S.D.R. OB rollers, raceway good, IB rollers, raceway good, seal good. N	Invalid	04/01/02
BEARING FAILURE			399908	400000	LOW CLAMP LOAD	Rec'd disbrow, spindle worn, clip ring grooved, (Troy Lab determination)	Invalid	11/29/01
LEAK			257639	300000	OIL SEPARATION	OB seal very dirtow, IB purge>2.0G, IB OR rows VG, IB seal dust lip p	Valid	04/16/02
NOISE/VIBRATION			322801	250000	LOW CLAMP LOAD	Endplay 0.010", rough rotation, circ scratches on IR small side faces(Tro	Invalid	11/29/01
NO INFO					LOW CLAMP LOAD	Noisy, OB row circular scratches both seal faces, IB row circular scratchi	Invalid	04/01/02
LEAK			276525	300000	OIL SEPARATION	OB row VG, some oil at OB seal, IB row VG, IB seal functional, lub off	Valid	04/16/02
NOISE/VIBRATION			287203	300000	IB SEAL LEAK - INGRESS	Very noisy, IB purge >, OB row VG, IB row G, IB seal worn out	Valid	04/16/02
LEAK			299777	300000	INSIGNIFICANT LEAK	Both brg rows VG, IB seal functional, OB seal leak <2.0G	Invalid	01/16/02
NOISE/VIBRATION			203497	250000	IB SEAL DAMAGED	IB row corrosion, IB seal dust lip torn away, OB brg row good condition	OTHER	01/16/02
NO INFO					NO PROBLEM FOUND	OB row G, IB row G, IB seal G, no internal distress	Invalid	04/23/02
NOISE/VIBRATION			395017	400000	OIL SEPARATION	SOR, oil separation	Valid	04/01/02
LEAK			271964	300000	NO PROBLEM FOUND	Endplay 0.000", smooth rotation, no internal distress (Troy Lab determi	Invalid	11/29/01
LEAK			271904	300000	NO PROBLEM FOUND	Endplay 0.000", smooth rotation, no internal distress (Troy Lab determin	Invalid	11/29/01
LEAK			272597	300000	INSIGNIFICANT LEAK	Both brg rows VG, IB seal functional, OB seal leak <2.0G	Invalid	01/16/02
LEAK			272597	300000	OB SEAL LEAK - EGRESS	Both brg rows VG, IB seal functional, OB seal leak >2.0G	Valid	01/16/02
WORN BEARING/HUB			118658	150000	NO PROBLEM FOUND	OB seepage nil, IB dry, endplay 0.000", smooth quiet rotation	Invalid	08/13/01
WORN BEARING/HUB			110468	150000	NO PROBLEM FOUND	OB seepage >1.0g, IB dry, endplay 0.000", smooth quiet rotation	Invalid	08/09/01
ENDPLAY/LOOSE			113337	150000	UNKNOWN	Wet pitty bore, endplay 0.000", smooth quiet rotation, OB Seepage slig	Inconclusive	11/01/01
NOISE/VIBRATION			242098	250000	NO PROBLEM FOUND	OB seepage <0.5g, IB <0.5g, endplay 0.000", smooth quiet rotation	Invalid	08/14/01
NBS LIGHT			17519	60000	UNHARDENED RW	OB seepage nil, IB slight, endplay 0.016", noisy, IB OR RW worn suivee	Valid	08/21/01

Response
to Main Document

Richard W Frett/ELG/SKF
05/29 01:28 PM

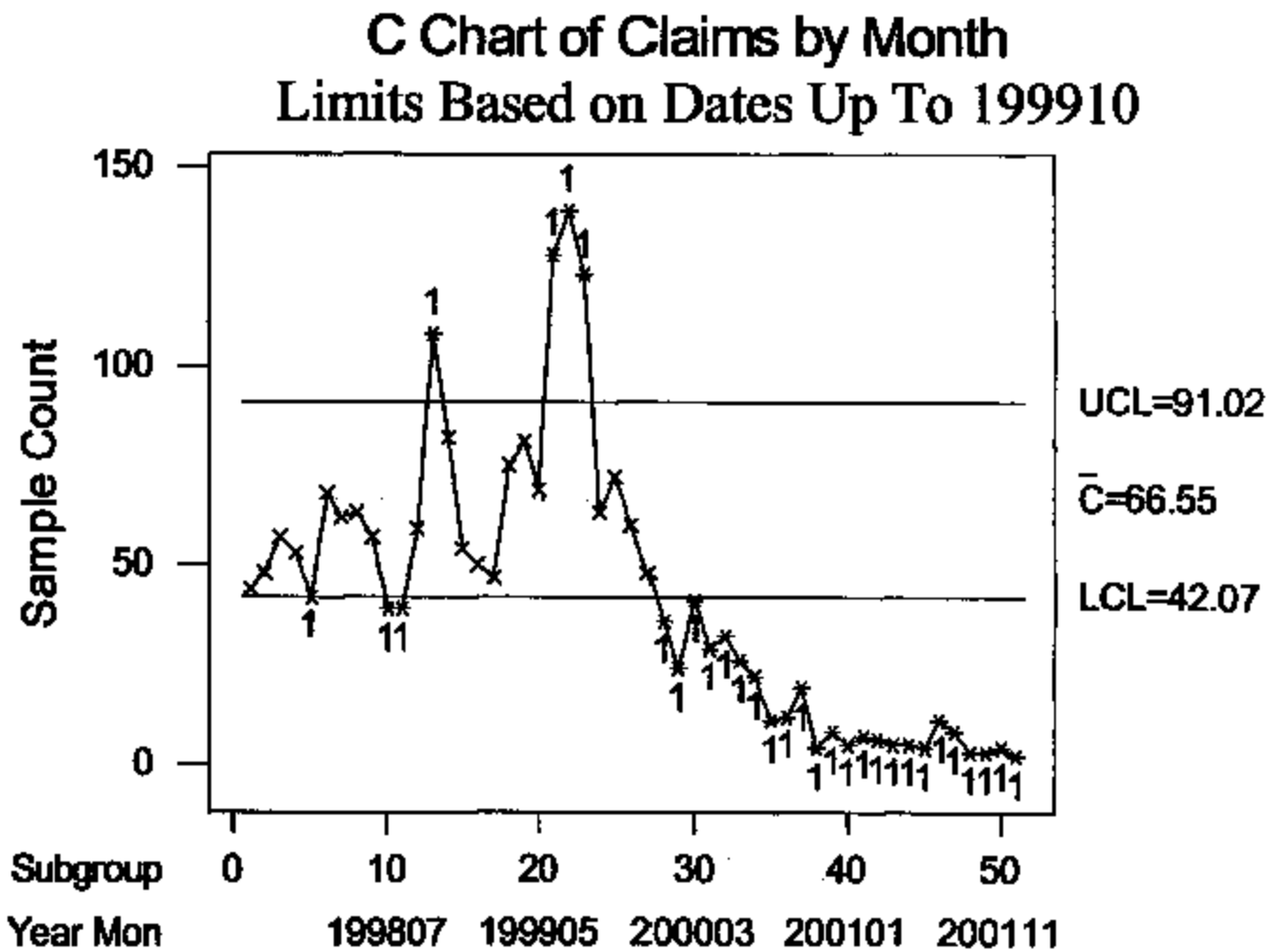
Subject:	ARM Data for P and C Charts of Claims Per production Quantity or "In Service" Qty
Response to:	Statistical Evaluations
Category:	Statistics

P and C Charts from ARM Claims Against Production & Ser

P & C Charts

Using Number of Claims Compared To Product Quantity and Quantity to Be Placed In Service (Calculated from ARM Formula) By Month

Source is ARM Database Used to Add to Duane Gipe's Proportion Analysis


C Chart of Claims by Month
Limits Based on Dates Up To 199910
Sample Count
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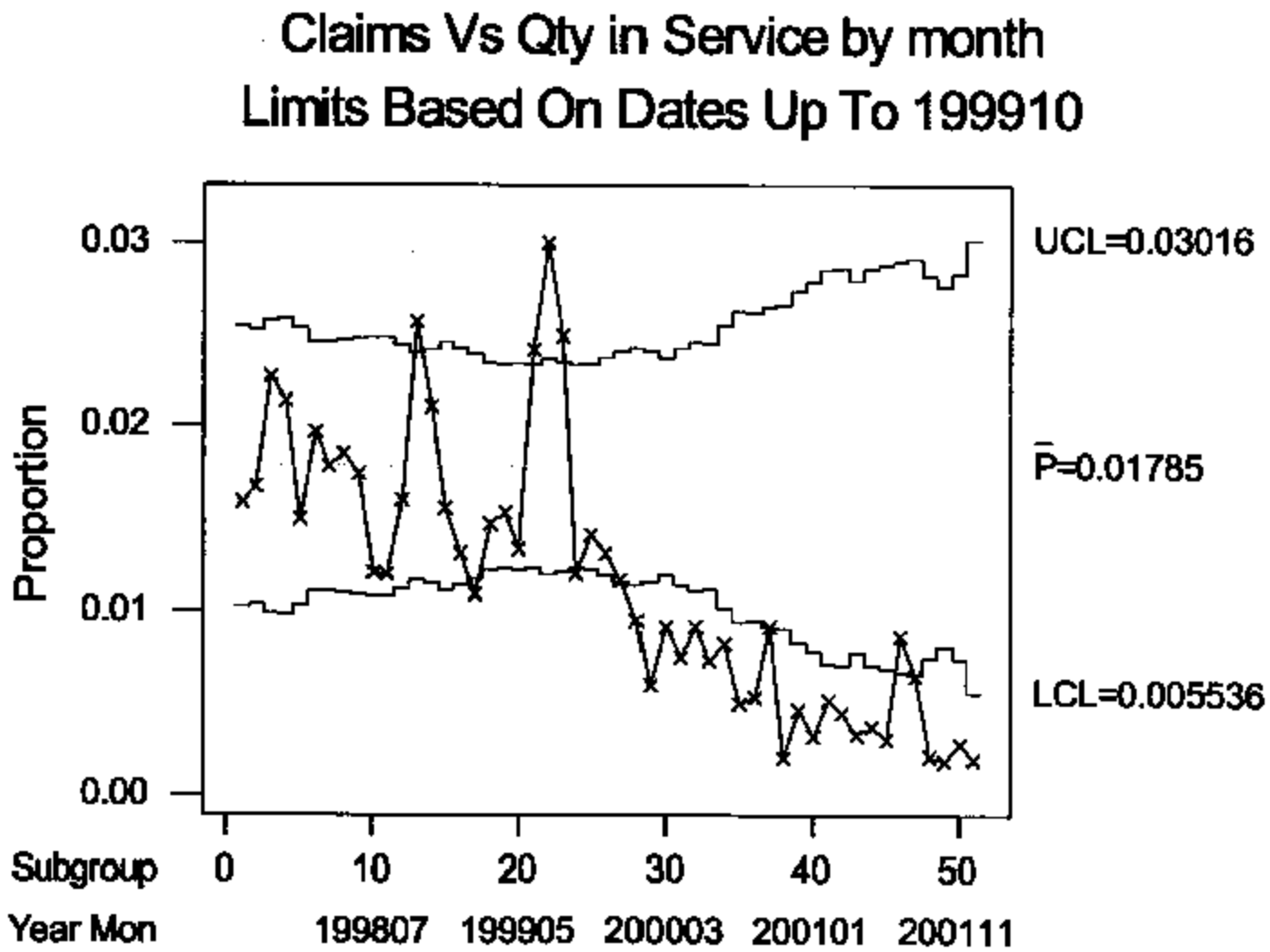
100
50
0
UCL=91.02
C̄=66.55
LCL=42.07
Subgroup
0
10
20
30
40
50
Year Mon
199807
199905
200003
200101
200111

SKF 001967


Claims Vs Qty in Service by month
Limits Based On Dates Up To 199910
Proportion
0.03
0.02
0.01
0.00
UCL=0.03016
P̄=0.01785
LCL=0.005536
Subgroup
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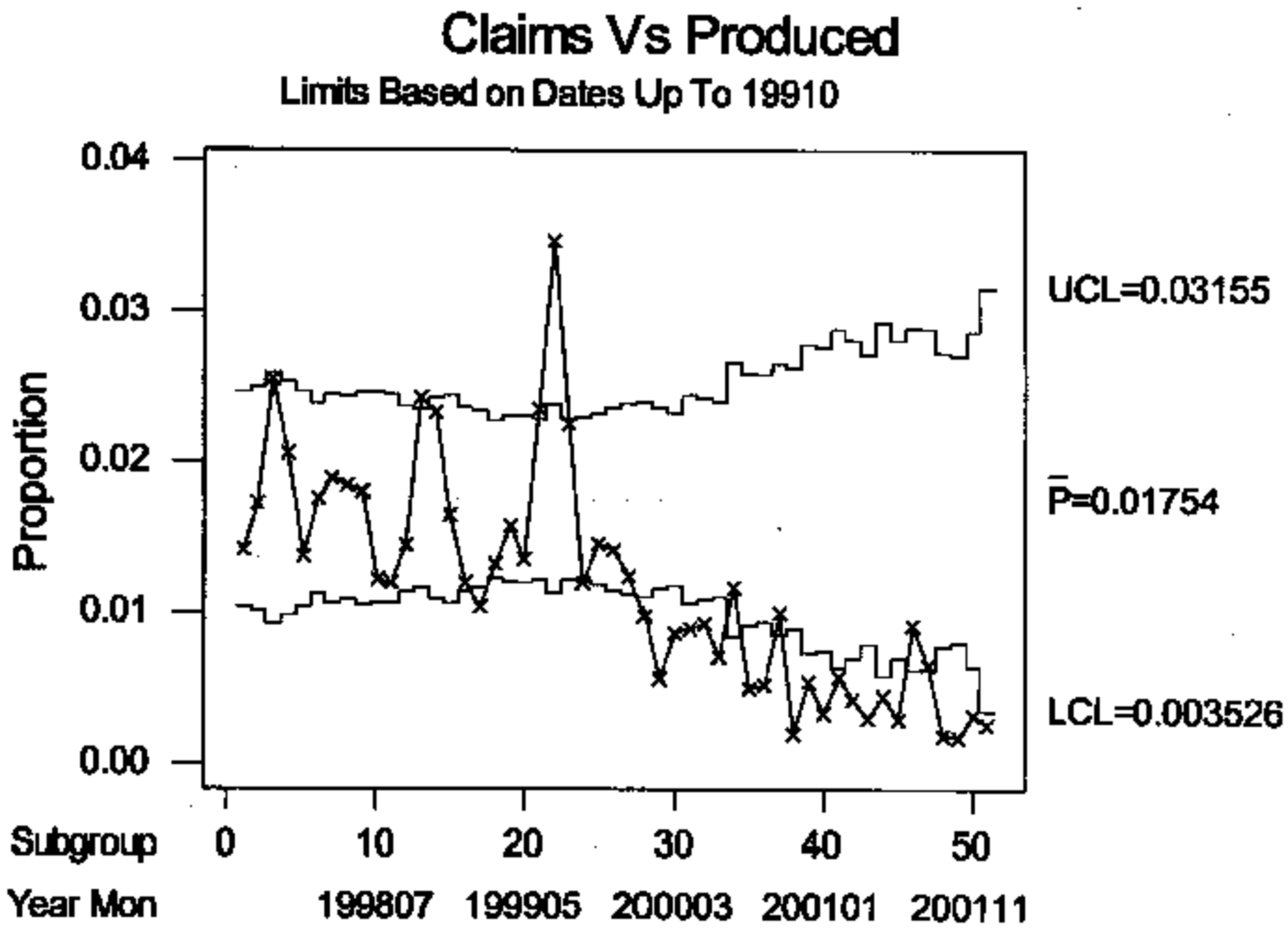
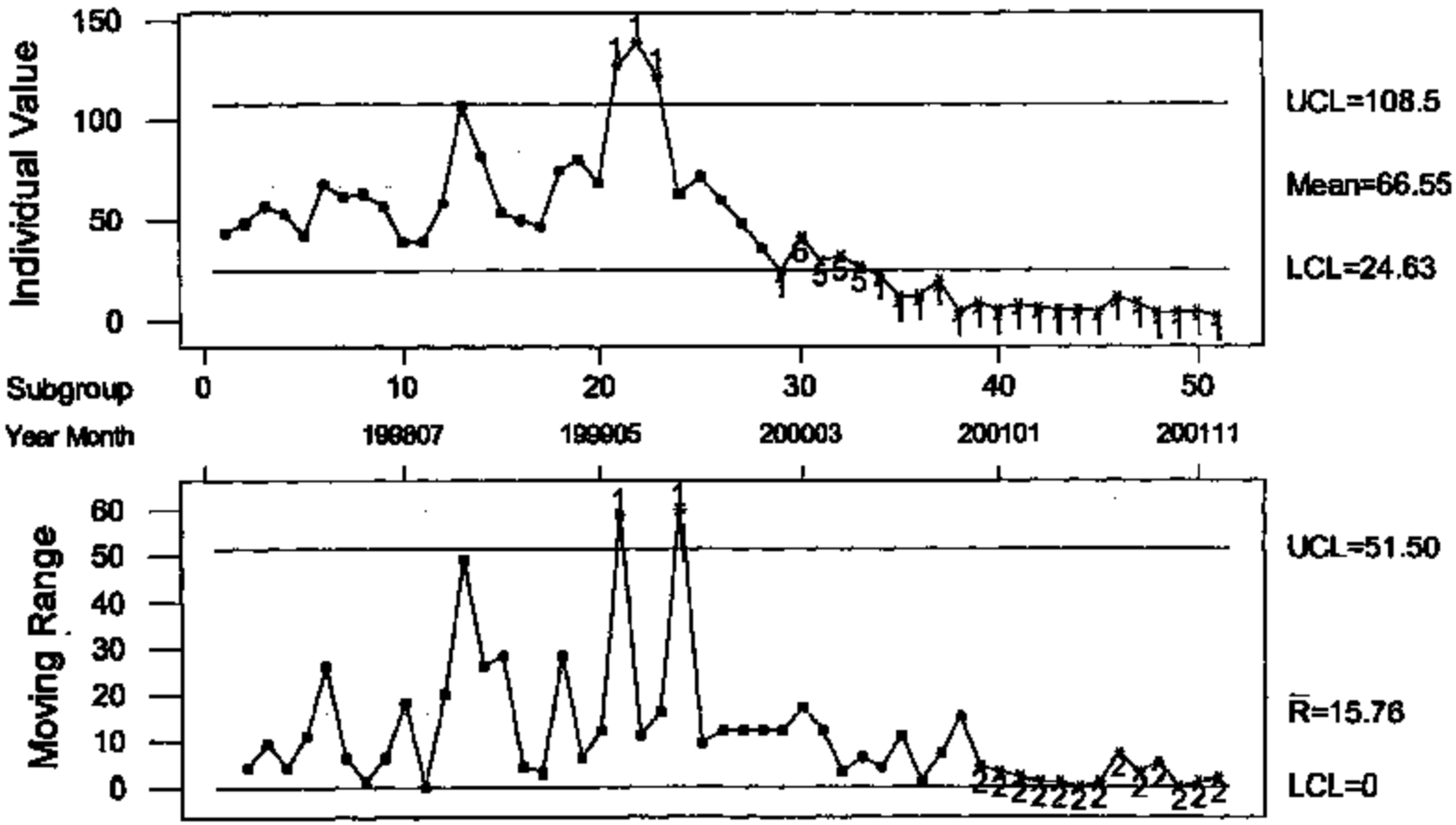
10
20
30
40
50
Year Mon
199807
199905
200003
200101
200111

SKF 001968


Claims Vs Produced
Limits Based on Dates Up To 19910
Proportion
0.04
0.03
0.02
0.01
0.00
UCL=0.03155
P̄=0.01754
LCL=0.003526
Subgroup
0
10
20
30
40
50
Year Mon
199807
199905
200003
200101
200111

SKF 001969

Claims by Month Limits Based on Dates Up To 199910



SKF 001970

Response
to Main Document

Rick P Morrow/AMER/SKF
05/29 05:12 PM

Subject: THU Stud hardness by Stu and IR

Response to: ☐ Statistical Evaluations

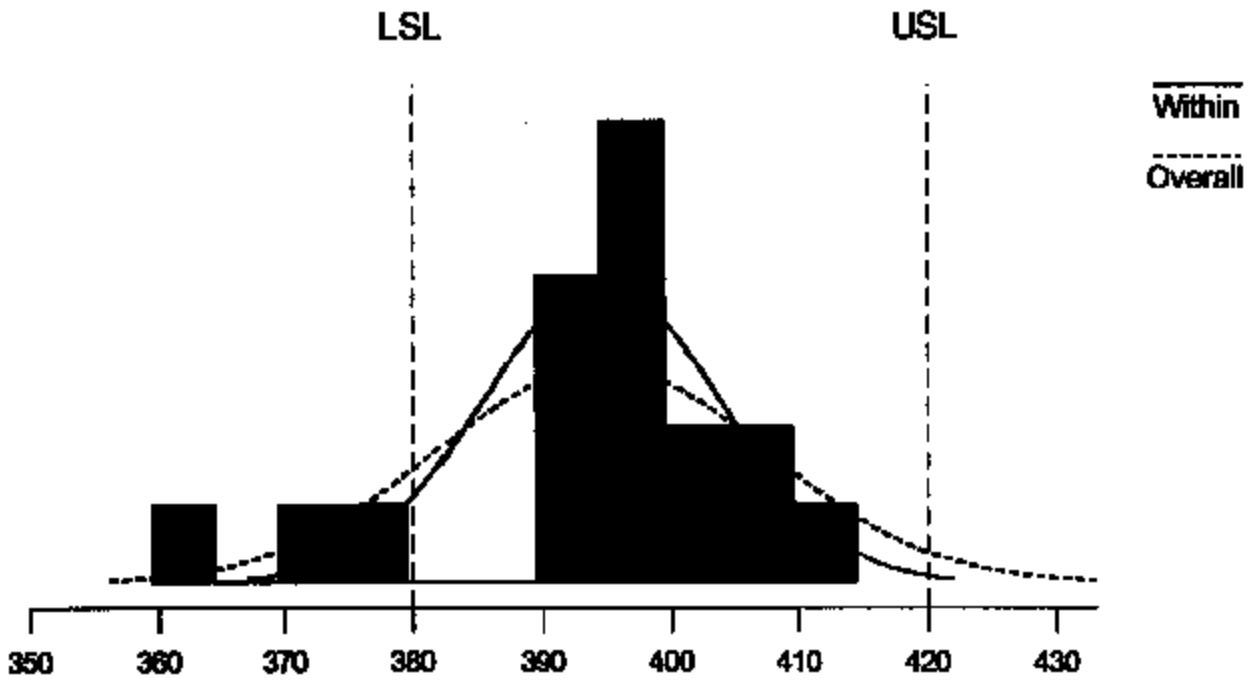
Category: Statistics

THU Stud Hardness.pp

Process Capability Analysis for IR

Process Data	
USL	420.000
Target	*
LSL	380.000
Mean	394.611
Sample N	18
StDev (Within)	9.1761
StDev (Overall)	12.8067

Potential (Within) Capability	
Cp	0.73
CPU	0.92
CPL	0.53
Cpk	0.53
Cpm	*



Overall Capability	
Pp	0.52
PPU	0.86
PPL	0.38
Ppk	0.38

Observed Performance	
PPM < LSL	166666.67
PPM > USL	0.00
PPM Total	166666.67

Exp. "Within" Performance	
PPM < LSL	55698.31
PPM > USL	2835.38
PPM Total	58533.69

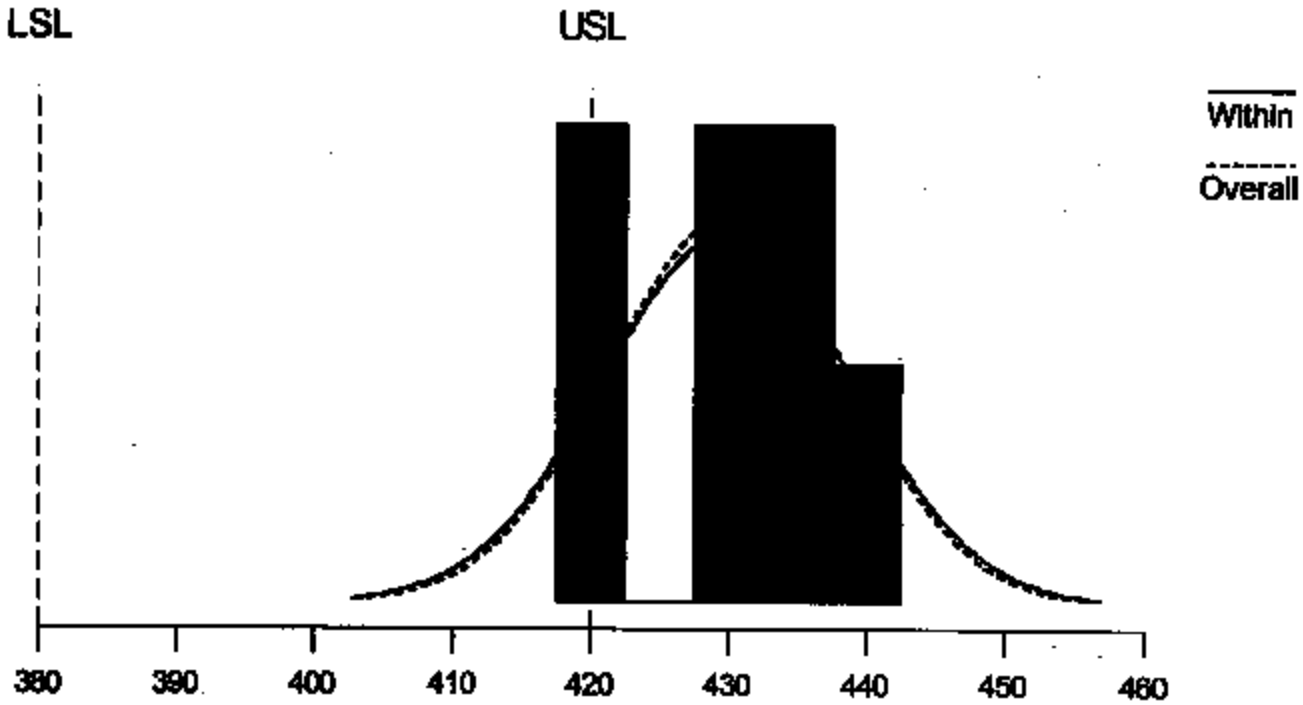
Exp. "Overall" Performance	
PPM < LSL	126993.77
PPM > USL	23730.71
PPM Total	150724.48

SKF 001972

Process Capability Analysis for Stu

Process Data	
USL	420.000
Target	*
LSL	380.000
Mean	429.857
Sample N	7
StDev (Within)	9.01300
StDev (Overall)	8.62550

Potential (Within) Capability	
Cp	0.74
CPU	-0.36
CPL	1.84
Cpk	-0.36
Cpm	*



Overall Capability	
Pp	0.77
PPU	-0.38
PPL	1.93
Ppk	-0.38

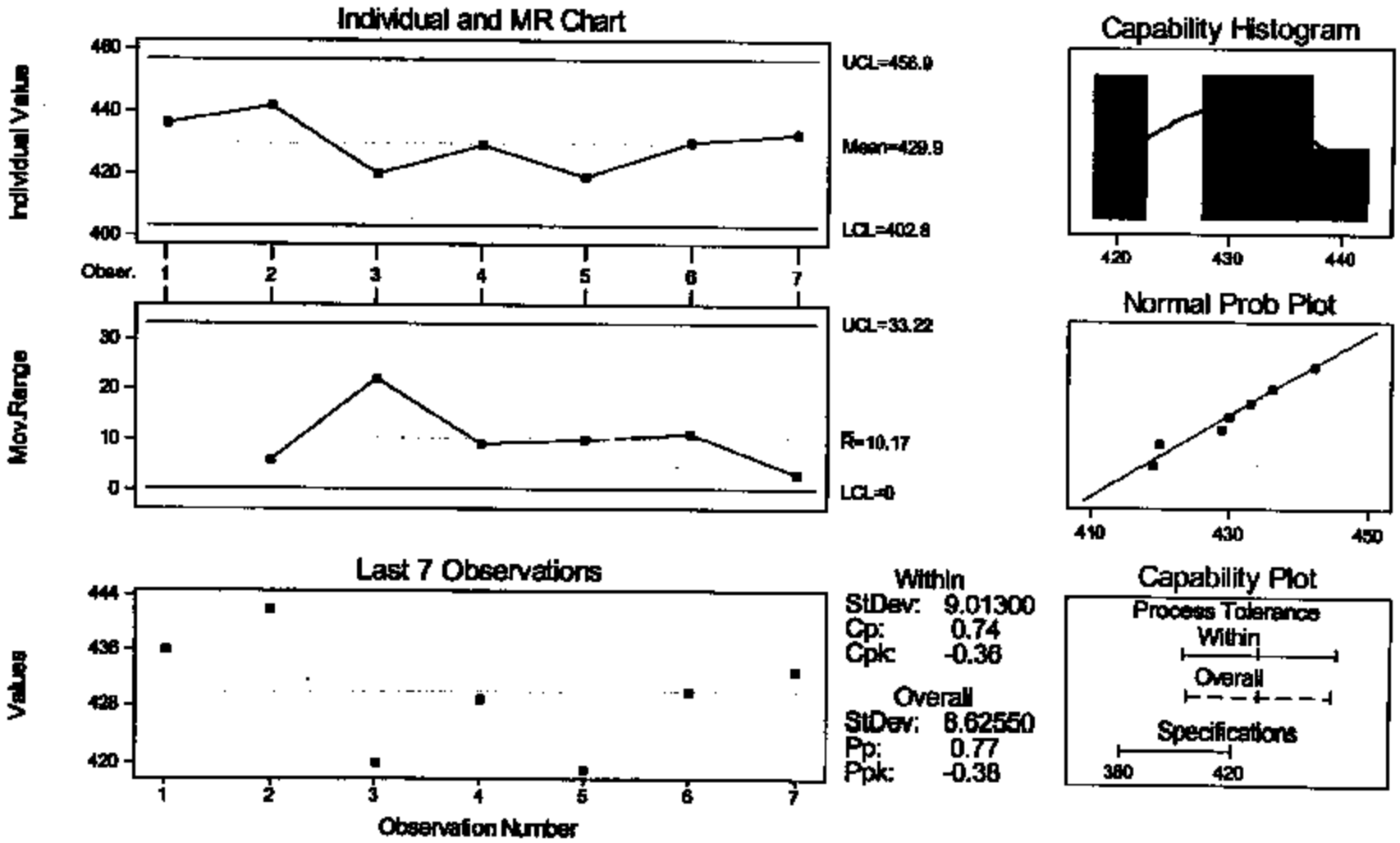
Observed Performance	
PPM < LSL	0.00
PPM > USL	714285.71
PPM Total	714285.71

Exp. "Within" Performance	
PPM < LSL	0.02
PPM > USL	862947.51
PPM Total	862947.52

Exp. "Overall" Performance	
PPM < LSL	0.00
PPM > USL	873437.32
PPM Total	873437.32

SKF 001973

Process Capability Sixpack for Stu



SKF 001974

Response
to Main Document

Robert J Bendy/DET/SKF
05/30 08:42 AM

Subject: breakdown of Databases by model number Freightliner and International

Response to: Statistical Evaluations

Category: Statistics

MeritorClaimsByOEMYrModelProblemPT SKFClaimsByOEMYrModelProblemPT

ArvinMeritor Claims Database
Number of Claims by Yr, Model, Problem

Number of Claims			YrOfSale						
OEM	Model	ProblemDescr	1997	1998	1999	2000	2001	2002	Grand Total
		BEARING FAILURE	6	23	48	15	4		96
		BRKN/CHIP/CRACKED/RUPTRD		1	4		1	1	7
		CHATTER/NOISY/VIBRATION		1		1			2
		EXCESSIVE ENDPLAY	4	10	4	2			20
		HUB SEIZED TO SPINDLE	2	6		1			9
		IMPROPER FIT/ALIGNMENT				1			1
		INEFFECT/INOPER/WORN OUT	1	4	10	5	1		21
		LEAKING				1			1
		LOOSE			2				2
		OTHER		3	4	1			8
		SEIZED/LOCKED UP	1	2	6	1	1		11
		STUD FRACTURED			1				1
	Total		16	50	79	26	7	1	181
Total			16	50	79	26	7	1	181
FreightLiner	C112	BRKN/CHIP/CRACKED/RUPTRD				1			1
		LEAKING				1			1
	C112 Total					2			2
	C120	BRKN/CHIP/CRACKED/RUPTRD				7	1		8
		CHATTER/NOISY/VIBRATION				1			1
		CORRODED/RUSTY				3			3
		IMPROPER FIT/ALIGNMENT				2			2
		INEFFECT/INOPER/WORN OUT				1			1
		LEAKING				3			3
		SEIZED/LOCKED UP				4	1		5
	C120 Total					21	2		23
	Century class 112 Conventional	BEARING FAILURE		5		1			6
		BRKN/CHIP/CRACKED/RUPTRD		10	10				20
		CHATTER/NOISY/VIBRATION		3					3
		CORRODED/RUSTY		1					1
		IMPROPER FIT/ALIGNMENT		4	4				8
		INEFFECT/INOPER/WORN OUT	4	9	4				17
		LEAKING	2	1	1				4
		OTHER	1						1
		SEIZED/LOCKED UP		6	6				12
	Century class 112 Conventional Total		7	39	25	1			72
	Century class 120 Conventional	BEARING FAILURE	11	67	44	2			124
		BENT/TWISTED			1				1
		BRKN/CHIP/CRACKED/RUPTRD	26	76	105	12			219
		BROKEN		1					1
		BURNED/OVERHEATED		1					1
		CHATTER/NOISY/VIBRATION	2	11	29	4			46

ArvinMeritor Claims Database
Number of Claims by Yr, Model, Problem

Number of Claims			YrOfSale						
OEM	Model	ProblemDescr	1997	1998	1999	2000	2001	2002	Grand Total
		CORRODED/RUSTY		6	6	1			13
		EXCESSIVE ENDPLAY	1	2					3
		HUB SEIZED TO SPINDLE	6	12	3				21
		IMPROPER FIT/ALIGNMENT	7	31	31	6			75
		INEFFECT/INOPER/WORN OUT	12	42	38	8			102
		LEAKING	13	61	58	9			139
		OTHER	3	19	8				30
		OUT OF POSITION		1					1
		SEIZED/LOCKED UP	11	57	90	8			166
			1						1
	Century class 120 Conventional Total		85	387	414	51			945
	Columbia 120	BRKN/CHIP/CRACKED/RUPTRD				2	3		5
		CHATTER/NOISY/VIBRATION				1	2		3
		CORRODED/RUSTY					1		1
		LEAKING				1	2		3
	Columbia 120 Total					4	8		12
	CST 120 Conventional	IMPROPER FIT/ALIGNMENT				1			1
	CST 120 Conventional Total					1			1
	FL70	IMPROPER FIT/ALIGNMENT				1			1
	FL70 Total					1			1
	FL70 Conventional	BRKN/CHIP/CRACKED/RUPTRD	1						1
	FL70 Conventional Total		1						1
	FL80 Conventional	SEIZED/LOCKED UP		1					1
	FL80 Conventional Total			1					1
	FL80 Glider	BENT/TWISTED					1		1
		IMPROPER FIT/ALIGNMENT				1			1
	FL80 Glider Total					1	1		2
	FLB High COE	BEARING FAILURE		1					1
	FLB High COE Total			1					1
	FLC112SD Med. Conventional,	CORRODED/RUSTY				1			1
	FLC112SD Med. Conventional, Steel Cab, Const (up to 1998 Model Year) Total					1			1
	FLD112	IMPROPER FIT/ALIGNMENT					2		2
		LEAKING				1			1
		LOOSE					1		1
		SEIZED/LOCKED UP				2	1		3
	FLD112 Total					3	4		7
	FLD112SD Med. Conv, Alumina	INEFFECT/INOPER/WORN OUT		1					1
	FLD112SD Med. Conv, Aluminum Cab, Const Total			1					1
	FLD112SD Medium Conv, Alum	BEARING FAILURE		4	4	1			9
		BRKN/CHIP/CRACKED/RUPTRD	1	2	2	1			6
		CHATTER/NOISY/VIBRATION			1	1			2

ArvinMeritor Claims Database
Number of Claims by Yr, Model, Problem

Number of Claims			YrOfSale						
OEM	Model	ProblemDescr	1997	1998	1999	2000	2001	2002	Grand Total
		EXCESSIVE ENDPLAY		2					2
		IMPROPER FIT/ALIGNMENT		4	1				5
		INEFFECT/INOPER/WORN OUT		17	2				19
		LEAKING		3	1	2			6
		SEIZED/LOCKED UP	1	4	6	1			12
	FLD112SD Medium Conv, Aluminum Cab, Hwy Total		2	36	17	6			61
	FLD120	BEARING FAILURE				1			1
		BRKN/CHIP/CRACKED/RUPTRD					2		2
		CHATTER/NOISY/VIBRATION				1	1		2
		IMPROPER FIT/ALIGNMENT					1		1
		INEFFECT/INOPER/WORN OUT					2		2
		LEAKING				1			1
		LOOSE				3			3
		PART - EXTRA/OMITTED/WRONG				1			1
		SEIZED/LOCKED UP				3			3
	FLD120 Total					10	6		16
	FLD120SD Long Conventional,	BRKN/CHIP/CRACKED/RUPTRD		1					1
		IMPROPER FIT/ALIGNMENT		2					2
		LEAKING			1				1
		OTHER		2					2
	FLD120SD Long Conventional, Construction Total			5	1				6
	FLD132 XL Classic	BEARING FAILURE				2			2
		BRKN/CHIP/CRACKED/RUPTRD				1			1
		EXCESSIVE ENDPLAY				1			1
		HUB SEIZED TO SPINDLE				1			1
		IMPROPER FIT/ALIGNMENT				1	1		2
		LEAKING				1			1
		OTHER				1			1
	FLD132 XL Classic Total					8	1		9
	FLH Argosy High COE	BRKN/CHIP/CRACKED/RUPTRD			2				2
		IMPROPER FIT/ALIGNMENT			1				1
		LEAKING			2				2
		SEIZED/LOCKED UP				1			1
	FLH Argosy High COE Total				5	1			6
	FLT-COE (1988 Model Year)	BEARING FAILURE			1				1
		BRKN/CHIP/CRACKED/RUPTRD			1				1
		IMPROPER FIT/ALIGNMENT		1					1
		INEFFECT/INOPER/WORN OUT		1					1
		SEIZED/LOCKED UP		1					1
	FLT-COE (1988 Model Year) Total			3	2				5
	L7500 series	BRKN/CHIP/CRACKED/RUPTRD			1				1

ArvinMeritor Claims Database
Number of Claims by Yr, Model, Problem

Number of Claims			YrOfSale						
OEM	Model	ProblemDescr	1997	1998	1999	2000	2001	2002	Grand Total
	L7500 series Total				1				1
	Long Conventional USF-1E, Hay	BEARING FAILURE	2	16	36	1			55
		BRKN/CHIP/CRACKED/RUPTRD	8	12	27	2			47
		BURNED/OVERHEATED			1				1
		CHATTER/NOISY/VIBRATION	1	7	13	4			25
		EXCESSIVE ENDPLAY	2	3	6	1			12
		HUB FRACTURED	1						1
		HUB SEIZED TO SPINDLE		1	1				2
		IMPROPER FIT/ALIGNMENT	4	3	19	3			29
		INEFFECT/INOPER/WORN OUT	1	7	21	3			32
		LEAKING		14	16	2			32
		LOOSE			3	2			5
		OTHER	1	7	2				10
		OUT OF POSITION		1	1				2
		SEIZED/LOCKED UP	1	18	50	7			74
		STUD FRACTURED			1				1
	Long Conventional USF-1E, Hay Total		19	67	197	25			328
	Long Conventional XL	BEARING FAILURE	1	5	8				14
		BRKN/CHIP/CRACKED/RUPTRD		4	7	1			12
		CHATTER/NOISY/VIBRATION		1	2	1			4
		EXCESSIVE ENDPLAY			2				2
		HUB SEIZED TO SPINDLE		1					1
		IMPROPER FIT/ALIGNMENT	1	2	4				7
		INEFFECT/INOPER/WORN OUT		2	5				7
		LEAKING		3	4				7
		OTHER			1				1
		SEIZED/LOCKED UP		3	11	1			15
	Long Conventional XL Total		2	21	44	3			70
	ST120	BEARING FAILURE					2		2
		BRKN/CHIP/CRACKED/RUPTRD				1	7		8
		CHATTER/NOISY/VIBRATION				1	1		2
		CORRODED/RUSTY					1		1
		IMPROPER FIT/ALIGNMENT					1		1
		INEFFECT/INOPER/WORN OUT					4		4
		LEAKING				1	2		3
		SEIZED/LOCKED UP					3		3
	ST120 Total					3	21		24
	XC Chassis	OTHER		1					1
	XC Chassis Total			1					1
		BEARING FAILURE				4	4		8
		BRKN/CHIP/CRACKED/RUPTRD				16			16

ArvinMeritor Claims Database
Number of Claims by Yr, Model, Problem

Number of Claims			YrOfSale						
OEM	Model	ProblemDescr	1997	1998	1999	2000	2001	2002	Grand Total
		CHATTER/NOISY/VIBRATION				3			3
		CORRODED/RUSTY				1	1		2
		EXCESSIVE ENDPLAY					1		1
		IMPROPER FIT/ALIGNMENT				8	1		9
		INEFFECT/INOPER/WORN OUT				5			5
		LEAKING				6			6
		SEIZED/LOCKED UP				7	1		8
	Total					30	6		66
Freightliner Total			124	582	706	192	51		1655
Navistar Int	4700 4X2	OTHER			1				1
	4700 4X2 Total				1				1
	6100 4X2	BEARING FAILURE	1						1
		OTHER		2					2
	6100 4X2 Total		1	2					3
	6100 6X4	BEARING FAILURE	1		1				2
		EXCESSIVE ENDPLAY		1					1
		INEFFECT/INOPER/WORN OUT		1					1
	6100 6X4 Total		1	2	1				4
	9100 I SBA 4X2	BEARING FAILURE				1			1
	9100 I SBA 4X2 Total					1			1
	9100 I SBA 6X4	BEARING FAILURE				1			1
		OTHER				1			1
		SEIZED/LOCKED UP					1		1
	9100 I SBA 6X4 Total					2	1		3
	9100 SBA 4X2	OTHER		1					1
	9100 SBA 4X2 Total			1					1
	9100 SBA 6X4	BEARING FAILURE		6	1				7
		EXCESSIVE ENDPLAY		1					1
		IMPROPER FIT/ALIGNMENT		2					2
		OTHER		1					1
		SEIZED/LOCKED UP			1				1
	9100 SBA 6X4 Total			10	2				12
	9200 6X4 SBA	BEARING FAILURE	2	16	48				66
		EXCESSIVE ENDPLAY		4	3				7
		HUB SEIZED TO SPINDLE	3		3				6
		INEFFECT/INOPER/WORN OUT		2	3	2			7
		LEAKING			1				1
		OTHER		6	1				7
		SEIZED/LOCKED UP		1	1				2
	9200 6X4 SBA Total		5	29	60	2			96
	9200 I SBA 4X2	INEFFECT/INOPER/WORN OUT				1			1

ArvinMeritor Claims Database
Number of Claims by Yr, Model, Problem

Number of Claims			YrOfSale						
OEM	Model	ProblemDescr	1997	1998	1999	2000	2001	2002	Grand Total
	6200 I SBA 4X2 Total					1			1
	6200 I SBA 6X4	BEARING FAILURE			16	7	1		24
		EXCESSIVE ENDPLAY			2	1			3
		HUB SEIZED TO SPINDLE				5			5
		INEFFECT/INOPER/WORN OUT			3	1			4
		OTHER			1	1			2
	6200 I SBA 6X4 Total				22	16	1		38
	6300 6X4	BEARING FAILURE	1	12	2				15
		BRKN/CHIP/CRACKED/RUPTRD		2					2
		EXCESSIVE ENDPLAY		2	1				3
		OTHER			1				1
		SEIZED/LOCKED UP		1					1
	6300 6X4 Total		1	17	4				22
	6400 4X2	BEARING FAILURE			1				1
		EXCESSIVE ENDPLAY			1				1
	6400 4X2 Total				2				2
	6400 6X4	BEARING FAILURE	5	22	15				42
		BRKN/CHIP/CRACKED/RUPTRD		3	1				4
		EXCESSIVE ENDPLAY		1	1				2
		HUB SEIZED TO SPINDLE		2					2
		INEFFECT/INOPER/WORN OUT			1				1
		OTHER			3				3
		SEIZED/LOCKED UP		2	2				4
	6400 6X4 Total		5	30	23				58
	6400 I SBA 6X4	BEARING FAILURE			6	4			10
		EXCESSIVE ENDPLAY			1				1
		INEFFECT/INOPER/WORN OUT			1	3			4
		OTHER			1				1
		SEIZED/LOCKED UP			1				1
	6400 I SBA 6X4 Total				10	7			17
	6600 SFA 6X4	BEARING FAILURE		3					3
	6600 SFA 6X4 Total			3					3
	6200 I SFA 6X4	ABNORMAL/EXCESSIVE WEAR					2		2
		BEARING FAILURE			6	8			14
		CHATTER/NOISY/VIBRATION			1				1
		EXCESSIVE ENDPLAY			3				3
		HUB SEIZED TO SPINDLE			1				1
		INEFFECT/INOPER/WORN OUT				3			3
		LOOSE				1			1
		OTHER			2				2
		SEIZED/LOCKED UP				1	1		2

ArvinMeritor Claims Database
Number of Claims by Yr, Model, Problem

Number of Claims			YrOfSale						
OEM	Model	ProblemDesc	1997	1998	1999	2000	2001	2002	Grand Total
	9900 I SFA 6X4 Total				13	13	3		29
	9900 ix SFA 6X4	BEARING FAILURE				1			1
		INEFFECT/INOPER/WORN OUT			1				1
		OTHER				1			1
	9900 ix SFA 6X4 Total				1	2			3
	9900 SFA 6X4	BEARING FAILURE			17				17
		BRKN/CHIP/CRACKED/RUPTRD			1				1
		CHATTER/NOISY/VIBRATION			1				1
		EXCESSIVE ENDPLAY		2	8				10
		INEFFECT/INOPER/WORN OUT			5				5
		LEAKING				1			1
		OTHER			2				2
		SEIZED/LOCKED UP			3				3
	9900 SFA 6X4 Total			2	37	1			40
		BEARING FAILURE			1				1
	Total				1				1
Navistar International Total			13	96	177	44	5		335
Grand Total			153	728	962	264	63	1	2171

SKF Claims Database
Number of Claims by Yr, Model, Problem

Number of Claims			BldYr								
OEM	Model	FailureMode	1996	1997	1998	1999	2000	2001	2002	(blank)	Grand Total
						1				24	25
		ASSEMBLY DAMAGE								2	2
		CORROSION								1	1
		DIMENSIONAL ISSUE			1						1
		ENDPLAY								1	1
		HUB CAP LOST								2	2
		IB SEAL DAMAGED				2				2	4
		IB SEAL LEAK - EGRESS								1	1
		IB SEAL LEAK - INGRESS			12	13				18	43
		IB SEAL LEAK INGRESS								1	1
		IB SEAL LEAK-EGRESS			1						1
		IMPACT DAMAGE			1	7				10	18
		INNER RING SPALL				2		1		4	7
		INSIGNIFICANT LEAK			3	8				3	14
		LOW CLAMP LOAD	1		5	4		1		4	15
		NO INFORMATION								2	2
		NO PROBLEM FOUND	1	1	7	12		6		19	46
		NOT RECEIVED								3	3
		OB SEAL LEAK - EGRESS				1				3	4
		OIL SEPARATION		1		1				2	4
		OPEN								1	1
		OUTER RING SPALL			1						1
		REMOVAL DAMAGE			2	1		1		7	11
		TAMPERING			1					4	5
		UNHARDENED RW								2	2
		UNKNOWN			2	9	1			14	26
		WATER INTRUSION ALONG SPINDLE				4		1		2	7
	Total		2	2	38	65	1	10		132	248
Total			2	2	38	65	1	10		132	248
FreightLiner	C112	NO PROBLEM FOUND					1				1
	C112 Total						1				1
	Century class 112 Conventiona	HUB CAP LOST			1						1
		IB SEAL LEAK - INGRESS				1					1
		IMPACT DAMAGE			1	1					2
		NO PROBLEM FOUND			2						2
		REMOVAL DAMAGE		2	1						3
	Century class 112 Conventional Total			2	5	2					9
	Century class 120 Conventiona	ASSEMBLY DAMAGE						1			1
		HUB CAP LOST			1						1
		IB SEAL LEAK - EGRESS				2					2
		IB SEAL LEAK - INGRESS			5	11					16

SKF Claims Database
Number of Claims by Yr, Model, Problem

Number of Claims			BldYr								
OEM	Model	FailureMode	1996	1997	1998	1999	2000	2001	2002	(blank)	Grand Total
		IMPACT DAMAGE			1	1					2
		INSIGNIFICANT LEAK				2					2
		LOW CLAMP LOAD			1	2					3
		NO PROBLEM FOUND			8	15	2	1			26
		OIL SEPARATION				4					4
		OPEN			1			1			2
		REMOVAL DAMAGE			1						1
		TAMPERING				1					1
		UNHARDENED RW				3		1			4
		UNKNOWN			6	4		1			11
		WATER INTRUSION ALONG SPINDLE			1						1
	Century class 120 Conventional Total				25	48	2	5			77
	Columbia 120	IB SEAL LEAK - INGRESS						1			1
	Columbia 120 Total							1			1
	FLB High COE	UNKNOWN			1						1
	FLB High COE Total				1						1
	FLD112	IB SEAL LEAK - INGRESS					1				1
		NO PROBLEM FOUND					1				1
		OPEN					1				1
	FLD112 Total						3				3
	FLD112SD Medium Conv, Alu	IMPACT DAMAGE			1						1
		UNKNOWN				1					1
	FLD112SD Medium Conv, Aluminum Cab, Hwy Total				1	1					2
	FLD120	LOW GREASE WEIGHT						1			1
		NO PROBLEM FOUND					2				2
	FLD120 Total						2	1			3
	Long Conventional USF-1E, Hw	IB - GREASE EGRESS			1						1
		IB SEAL DAMAGED				1					1
		IB SEAL LEAK - INGRESS			5	14					19
		IMPACT DAMAGE			3	1					4
		INNER RING SPALL			2						2
		LOW CLAMP LOAD			1	1					2
		NO PROBLEM FOUND			1	7		1			9
		OIL SEPARATION				2					2
		OPEN			1						1
		REMOVAL DAMAGE			2						2
		TAMPERING				1					1
		UNHARDENED RW				2					2
		UNKNOWN			2	1		1			4
		WATER INTRUSION ALONG SPINDLE			3						3
	Long Conventional USF-1E, Hwy Total				21	30		2			53

SKF Claims Database
Number of Claims by Yr, Model, Problem

Number of Claims			BldYr								
OEM	Model	FailureMode	1996	1997	1998	1999	2000	2001	2002	(blank)	Grand Total
	Long Conventional XL	HUB CAP LOST			1						1
		IMPACT DAMAGE				2					2
		LOW CLAMP LOAD				1					1
		NO PROBLEM FOUND			4						4
		OIL SEPARATION				1					1
		OPEN			1						1
		UNKNOWN				1					1
		WATER INTRUSION ALONG SPINDLE			1						1
	Long Conventional XL Total				7	5					12
	ST120	IB SEAL LEAK - INGRESS							1		1
		IMPACT DAMAGE					1				1
		NO PROBLEM FOUND					1				1
	ST120 Total						2		1		3
		ASSEMBLY DAMAGE						2			2
		ENDPLAY								1	1
		HUB CAP LOST								1	1
		IB SEAL LEAK - EGRESS								10	10
		IB SEAL LEAK - INGRESS								18	18
		IMPACT DAMAGE								7	7
		INCONCLUSIVE								2	2
		INNER RING SPALL								2	2
		INSIGNIFICANT LEAK						1		11	12
		LOW CLAMP LOAD								11	11
		NO PROBLEM FOUND				1	1	4		39	45
		OB SEAL LEAK - EGRESS								1	1
		OIL SEPARATION				1				5	6
		REMOVAL DAMAGE								10	10
		TAMPERING								1	1
		UNHARDENED RW								2	2
		UNKNOWN								18	18
		WATER INTRUSION ALONG SPINDLE								4	4
	Total					2	1	7		143	153
	Long Conv XL, 48RR (1994 Mo	UNHARDENED RW				1					1
	Long Conv XL, 48RR (1994 Model Year) Total					1					1
	FLA High COE, USF-1E	NO PROBLEM FOUND			1		2				3
		OIL SEPARATION					1				1
		UNHARDENED RW						1			1
	FLA High COE, USF-1E Total				1		3	1			5
	MB 50 Conventional (never bu	NO PROBLEM FOUND				1					1
		UNKNOWN				1					1
	MB 50 Conventional (never built any) Total					2					2

SKF Claims Database
Number of Claims by Yr, Model, Problem

Number of Claims			BldYr								
OEM	Model	FailureMode	1996	1997	1998	1999	2000	2001	2002	(blank)	Grand Total
FreightLiner Total				2	61	88	14	17	1	143	326
Navistar Inte	9100 4X2	DIMENSIONAL ISSUE						1			1
		NO PROBLEM FOUND					1				1
	9100 4X2 Total						1	1			2
	9100 6X4	HUB CAP LOST			1						1
	9100 6X4 Total				1						1
	9100 I SBA 4X2	IB SEAL LEAK - INGRESS				1					1
		LOW CLAMP LOAD				1					1
	9100 I SBA 4X2 Total					2					2
	9100 I SBA 6X4	NO PROBLEM FOUND					1				1
	9100 I SBA 6X4 Total						1				1
	9100 SBA 6X4	IB SEAL DAMAGED			1						1
		IMPACT DAMAGE				1					1
		INSIGNIFICANT LEAK				1					1
	9100 SBA 6X4 Total				1	2					3
	9200 6X4 SBA	HUB CAP LOST				2					2
		IB SEAL LEAK - EGRESS			1						1
		IB SEAL LEAK - INGRESS			1	3					4
		IMPACT DAMAGE				3					3
		LOW CLAMP LOAD			1	1					2
		NO PROBLEM FOUND			1	4		1			6
		OIL SEPARATION			1						1
		REMOVAL DAMAGE			1						1
		UNHARDENED RW				2					2
		WATER INTRUSION ALONG SPINDLE				1					1
	9200 6X4 SBA Total				6	18		1			23
	9200 I SBA 4X2	UNHARDENED RW						1			1
	9200 I SBA 4X2 Total							1			1
	9200 I SBA 6X4	HUB CAP LOST				2					2
		IB SEAL LEAK - INGRESS				3		1	1		5
		IMPACT DAMAGE				1					1
		INNER RING SPALL						1			1
		NO PROBLEM FOUND				2		3			5
		OPEN					1				1
		UNHARDENED RW				2					2
		UNKNOWN				2					2
	9200 I SBA 6X4 Total					12	1	5	1		19
	9300 6X4	LOW CLAMP LOAD			1						1
		NO PROBLEM FOUND			1						1
		REMOVAL DAMAGE				2					2
		UNKNOWN			1						1

SKF Claims Database
Number of Claims by Yr, Model, Problem

Number of Claims			BldYr								
OEM	Model	Failuremode	1996	1997	1998	1999	2000	2001	2002	(blank)	Grand Total
	9300 6X4 Total				3	2					5
	9400 6X4	HUB CAP LOST			1						1
		IB SEAL LEAK - EGRESS				1					1
		INNER RING SPALL			1						1
		LOW CLAMP LOAD			2						2
		NO PROBLEM FOUND			2	2					4
		OB SEAL LEAK - EGRESS				1					1
		OB SEAL LEAK - INGRESS				1					1
		UNKNOWN			1						1
		WATER INTRUSION ALONG SPINDLE				1					1
	9400 6X4 Total				7	6					13
	9400 I SBA 6X4	ATTACHING HARDWARE ISSUE						1			1
		IMPACT DAMAGE				2					2
		INSIGNIFCANT LEAK						1			1
		LOW CLAMP LOAD				1					1
		NO PROBLEM FOUND			1	6					7
		OPEN					1				1
		UNKNOWN						1			1
	9400 I SBA 6X4 Total				1	9	1	3			14
	9800 SFA 6X4	NO PROBLEM FOUND			1						1
	9800 SFA 6X4 Total				1						1
	9900 I SFA 6X4	IB SEAL LEAK - EGRESS				1					1
		IB SEAL LEAK - INGRESS				1					1
		IMPACT DAMAGE					1				1
		INSIGNIFICANT LEAK				1					1
		NO PROBLEM FOUND				2					2
	9900 I SFA 6X4 Total					5	1				6
	9900 Ix SFA 6X4	INSIGNIFICANT LEAK				3					3
		OB SEAL LEAK - EGRESS				1					1
	9900 Ix SFA 6X4 Total					4					4
	9900 SFA 6X4	IB SEAL LEAK - INGRESS				2					2
		IMPACT DAMAGE				2					2
		NO PROBLEM FOUND				1					1
		REMOVAL DAMAGE				1					1
	9900 SFA 6X4 Total					6					6
		ASSEMBLY DAMAGE								1	1
		HUB CAP LOST								2	2
		IB SEAL DAMAGED								4	4
		IB SEAL LEAK - INGRESS				3				18	21
		IMPACT DAMAGE								2	2
		INNER RING SPALL								1	1

SKF Claims Database
Number of Claims by Yr, Model, Problem

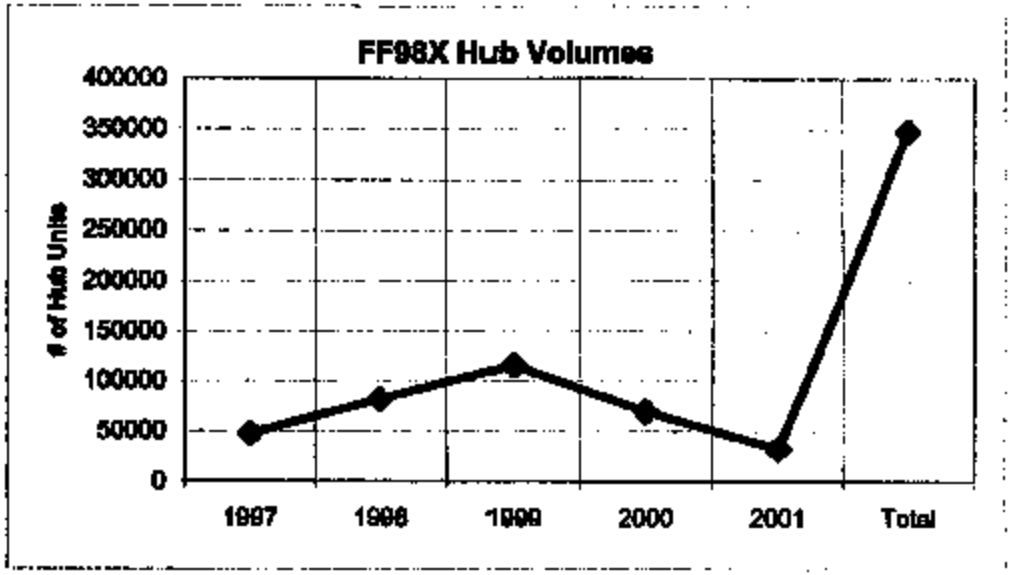
Number of Claims			Bld Yr								
OEM	Model	FailureMode	1996	1997	1998	1999	2000	2001	2002	(blank)	Grand Total
		INSIGNIFICANT LEAK								3	3
		LOW CLAMP LOAD								6	6
		NO PROBLEM FOUND			1					5	6
		OIL SEPARATION								1	1
		OPEN								1	1
		OUTER RING SPALL								2	2
		REMOVAL DAMAGE								3	3
		TAMPERING								3	3
		UNHARDENED RW								1	1
		UNKNOWN								6	6
		WATER INTRUSION ALONG SPINDLE								4	4
	Total				1	3				63	67
	9300 4X2	NO PROBLEM FOUND				1					1
		UNHARDENED RW			1						1
	9300 4X2 Total				1	1					2
	9300 GLIDER	IB SEAL LEAK - INGRESS				1					1
		IMPACT DAMAGE				1					1
	9300 GLIDER Total					2					2
Navistar International Total					22	70	5	11	1	63	172
(blank)	(blank)	(blank)									
	(blank) Total										
(blank) Total											
Grand Total			2	4	118	223	20	38	2	338	745

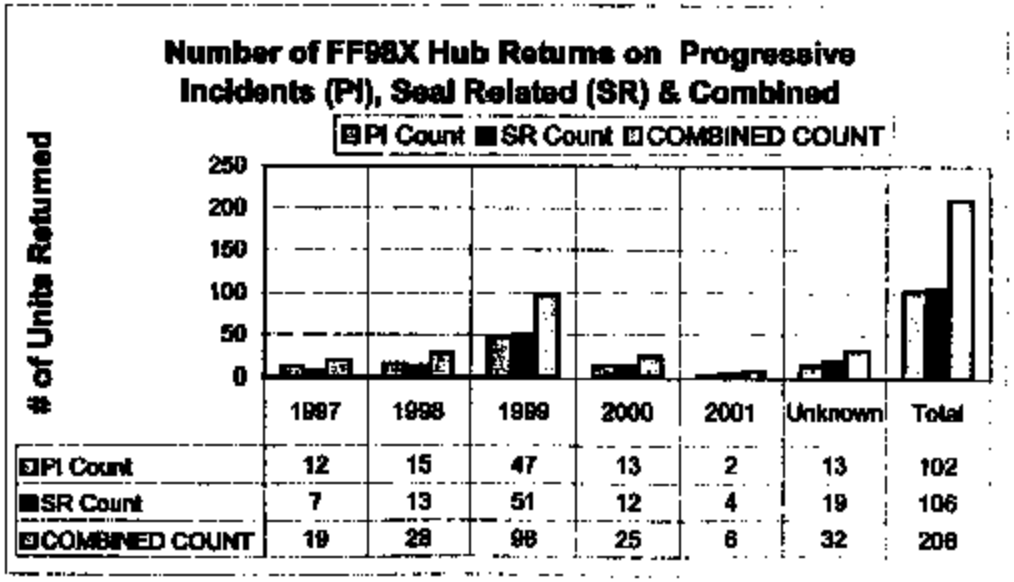
Response
to Main Document

Robert J Bondy/DET/SKF
05/30 08:57 AM

Subject:	Dale Bell's graph
Response to:	Statistical Evaluations
Category:	Statistics

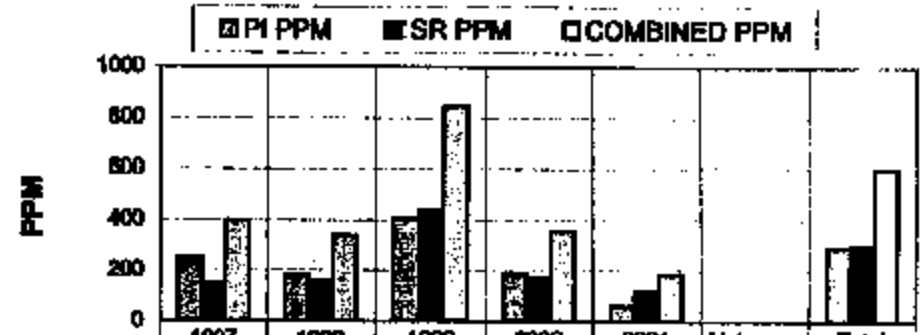
ff98x hub nlran 4_15_02.x





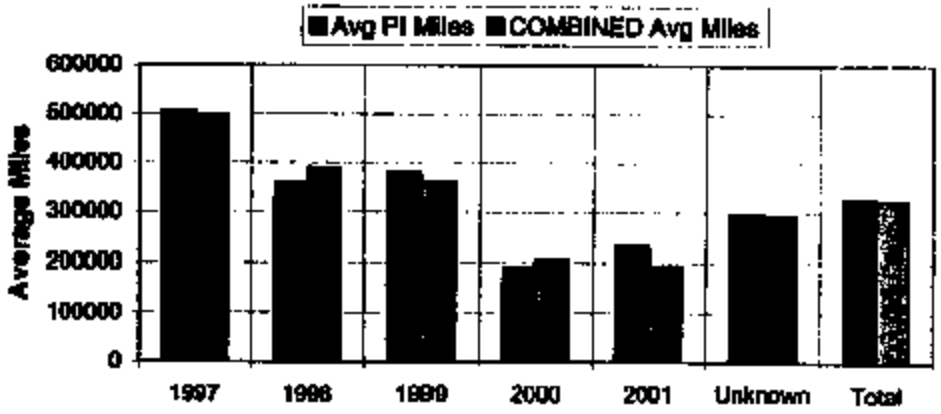
	1997	1998	1999	2000	2001	Unknown	Total
PI Count	12	15	47	13	2	13	102
SR Count	7	13	51	12	4	19	106
COMBINED COUNT	19	28	98	25	6	32	208

PPM Trend for FF98X Hubs



	1997	1998	1999	2000	2001	Unknown	Total
PI PPM	252.7486	182.2467	406.237	185.9374	61.70173		293.2636
SR PPM	147.4367	157.9472	440.8104	171.6345	123.4035		304.7641
COMBINED PPM	400.1853	340.1939	847.0474	357.5719	185.1052		598.0277

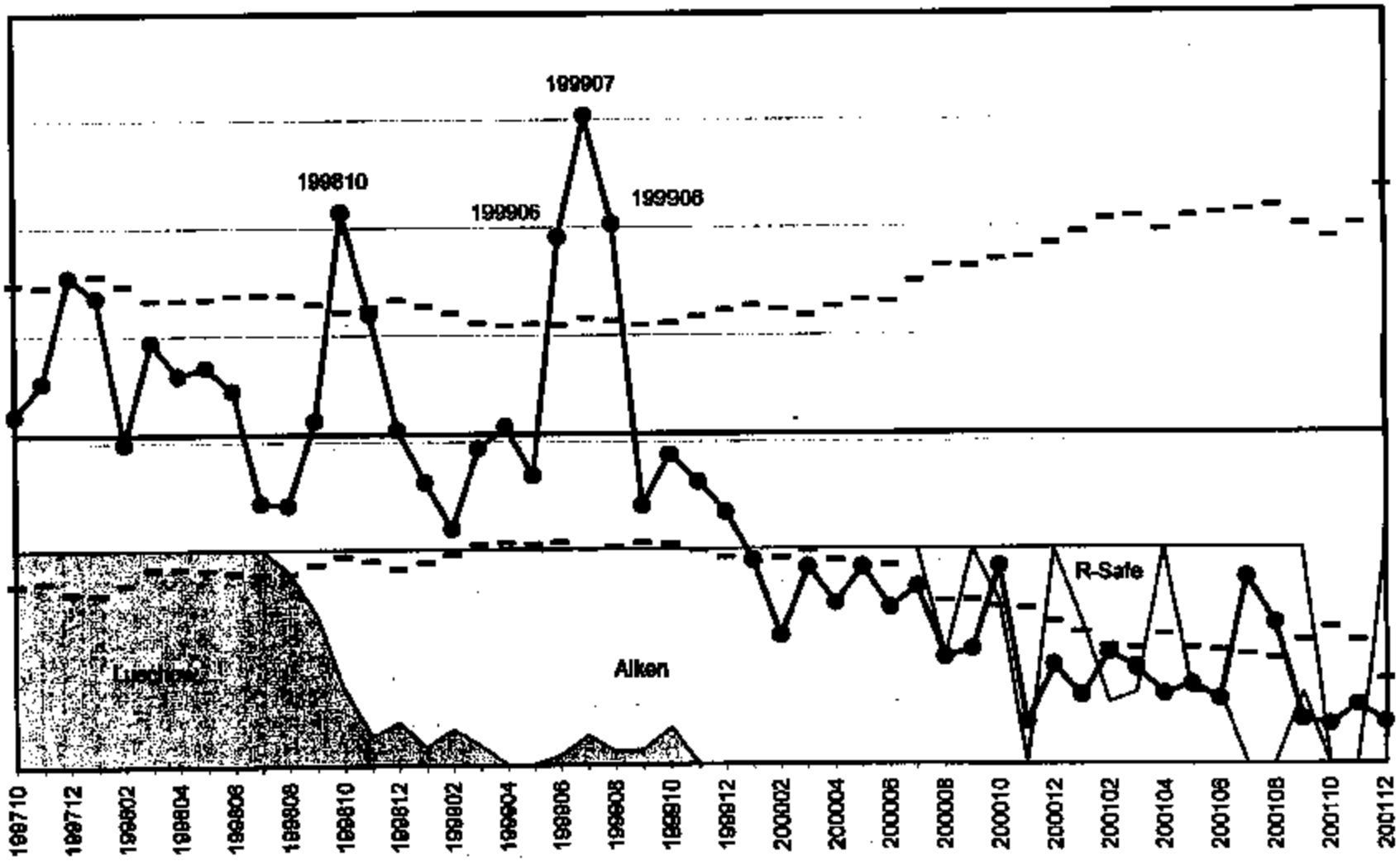
Average Miles FF98X Hub Returns Failed on Progressive Incidents (PI) & Combined



Response **to Main Document**	**Subject:**	**Additional Proportion and count charts using ARM data from DG analysis**
Rick P Morrow/AMER/SKF 06/30 09:53 AM	**Response to:**	Statistical Evaluations
	Category:	Statistics

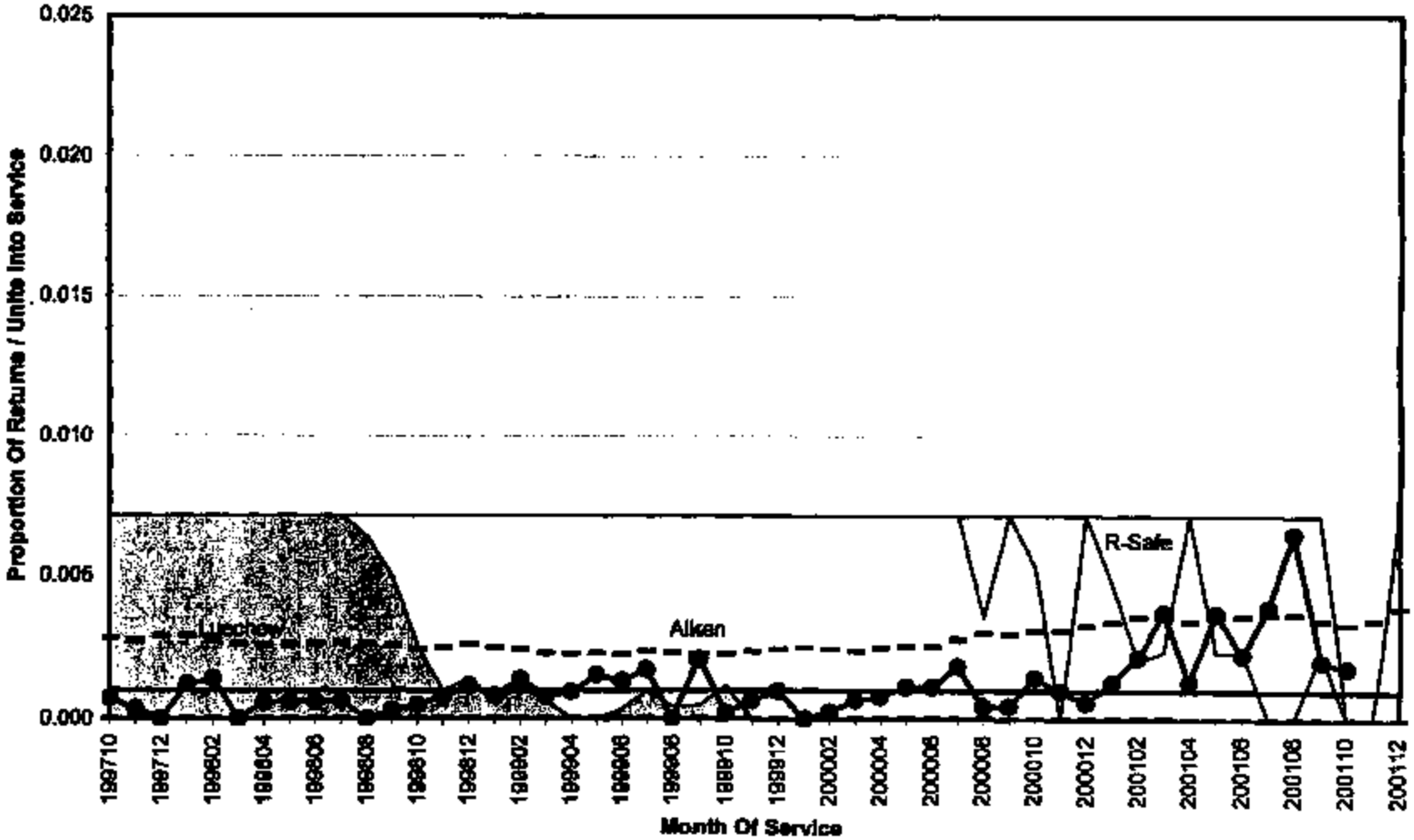
THU Charts P, C and Mfg Location.

P-Chart - All ARM Returns by Service Date



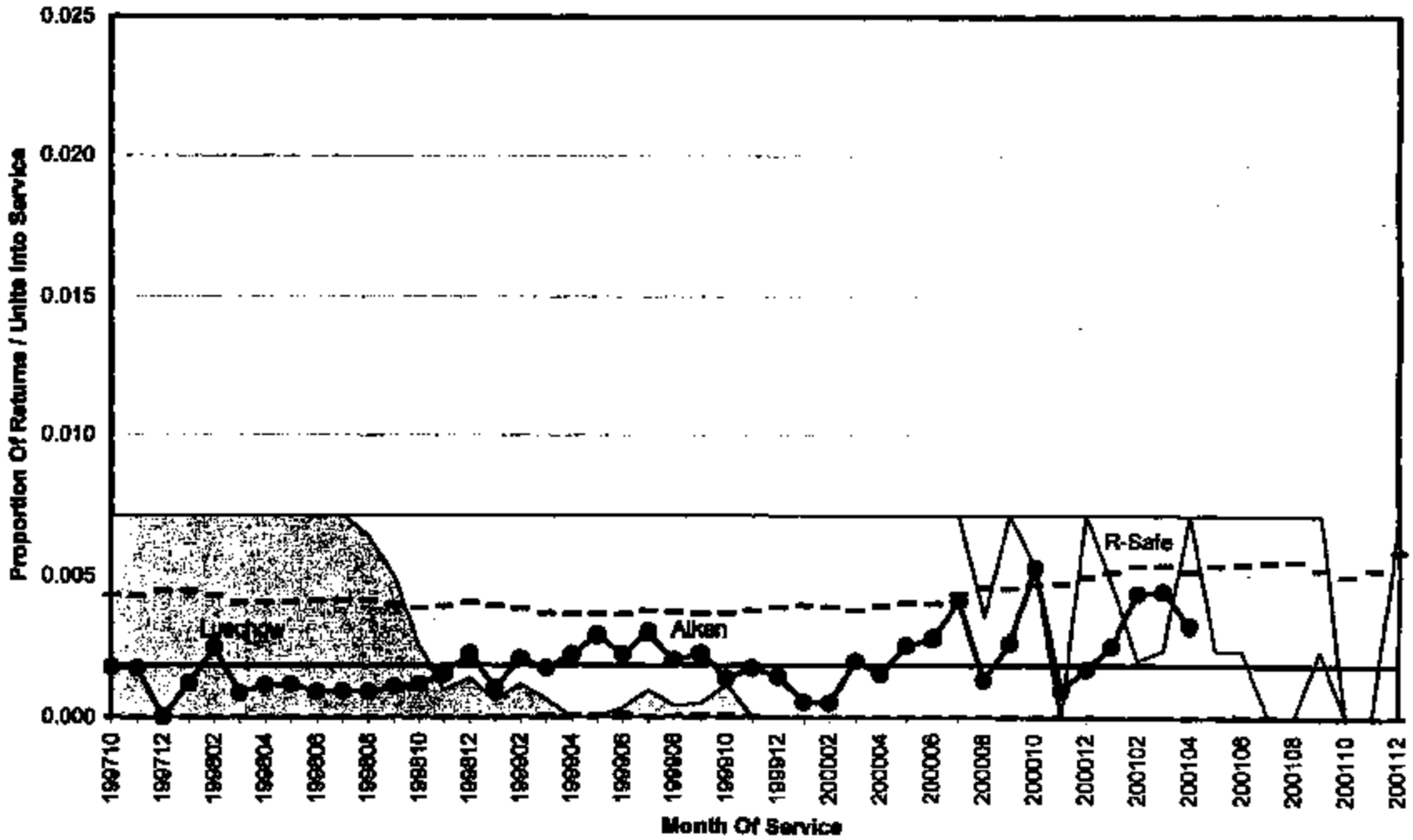
SKF 001993

P-Chart - ARM Returns (6 Months Cumulative)



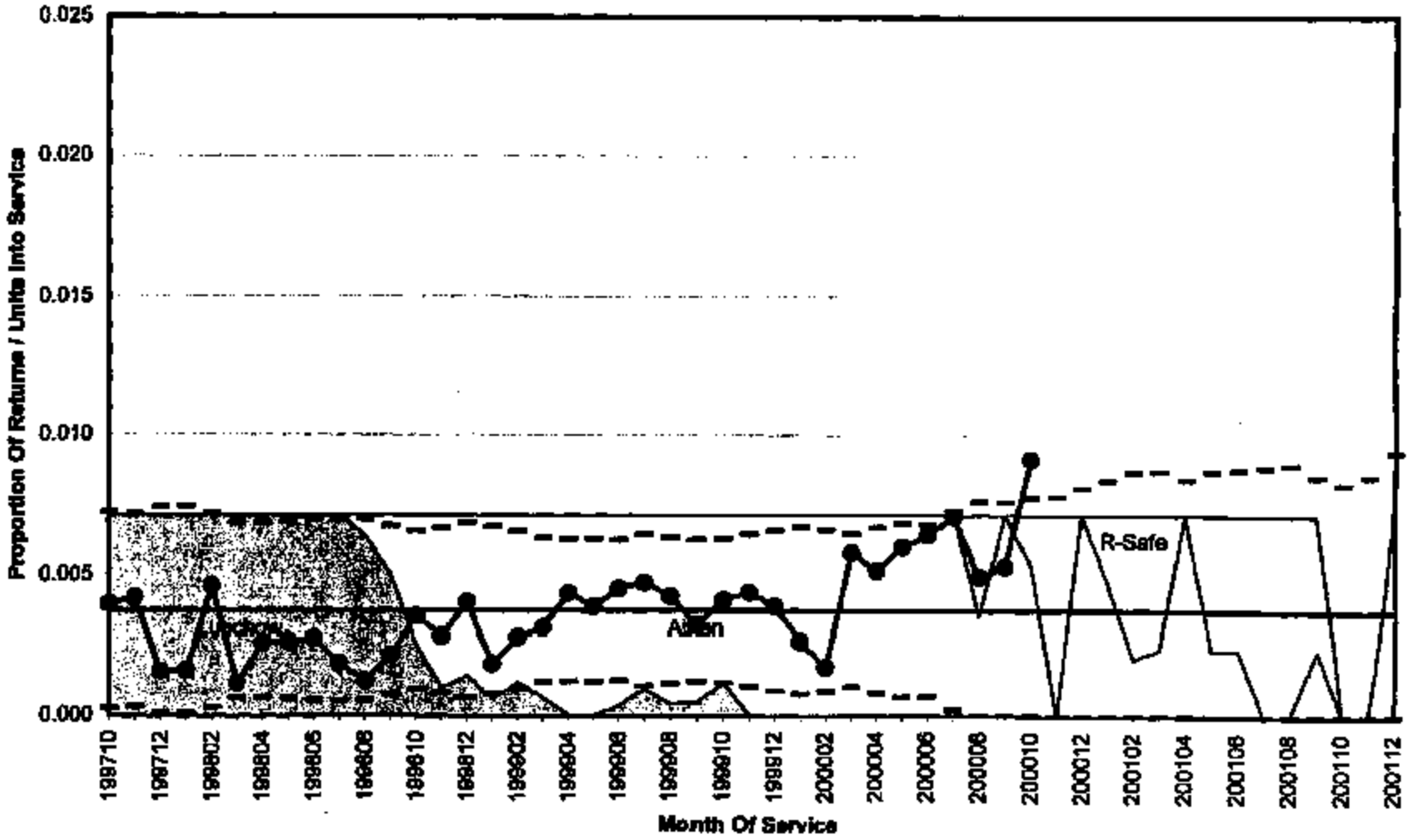
SKF 001994

P-Chart - ARM Returns (12 Months Cumulative)



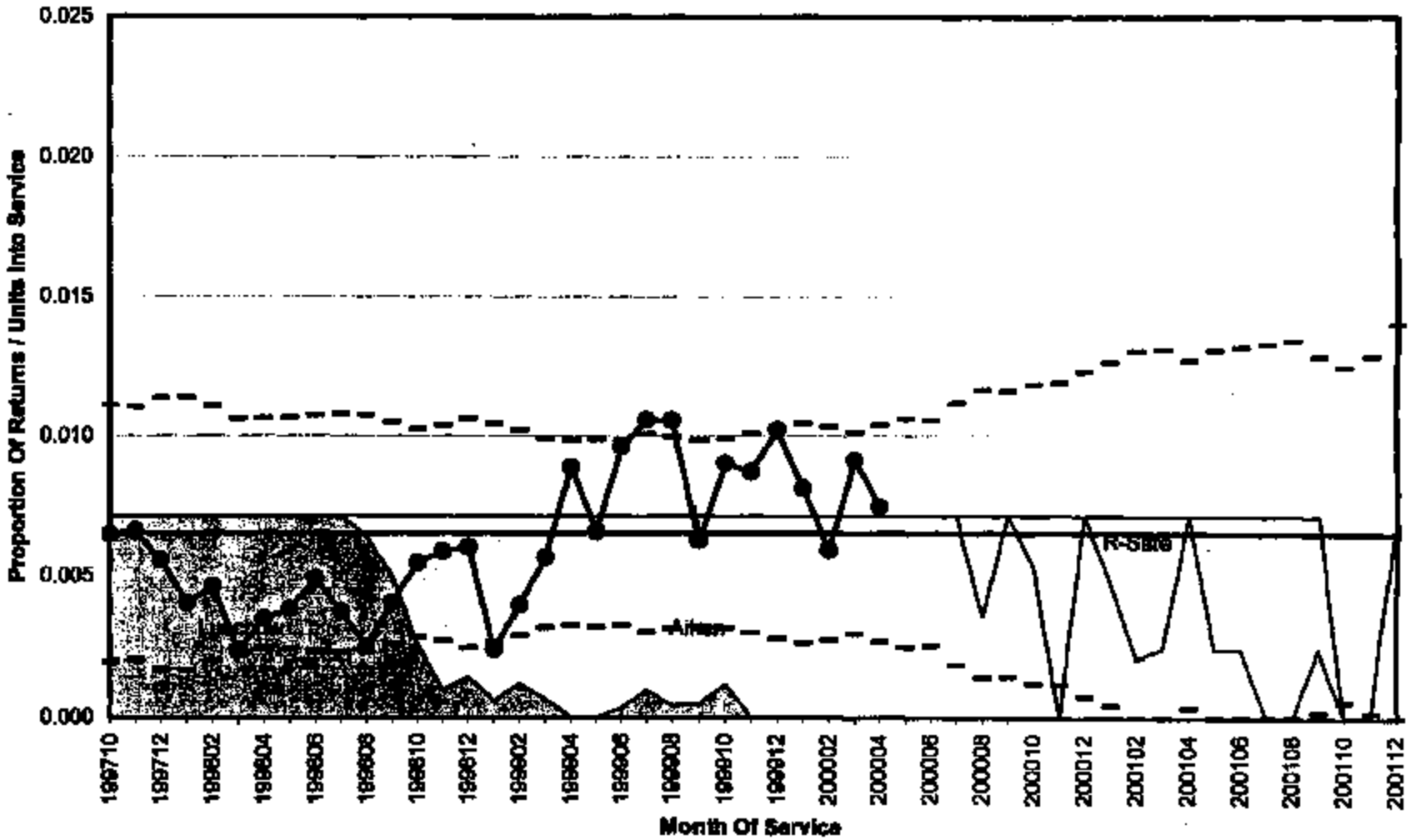
SKF 001995

P-Chart - ARM Returns (18 Months Cumulative)



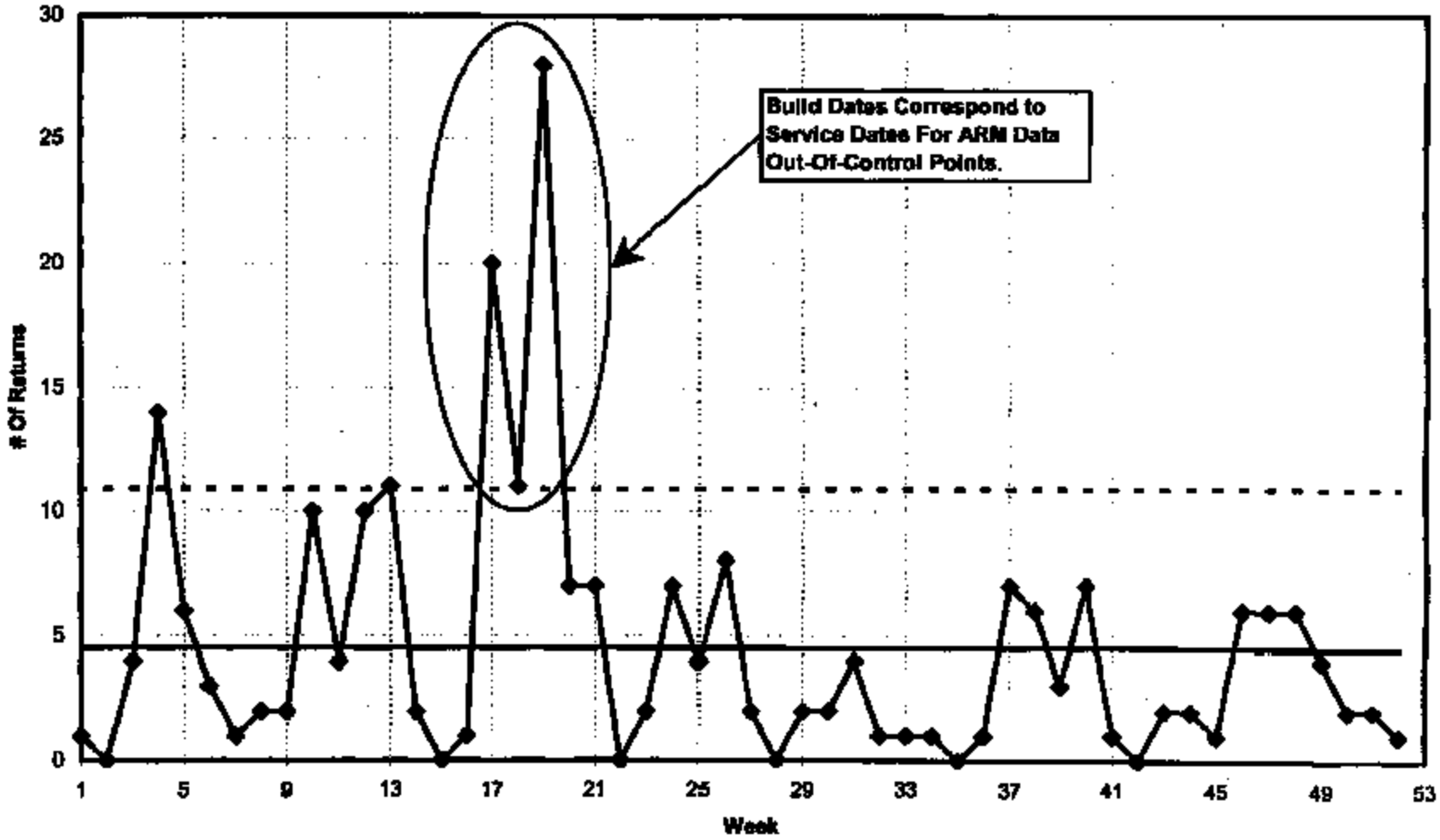
SKF 001996

P-Chart - ARM Returns (24 Months Cumulative)



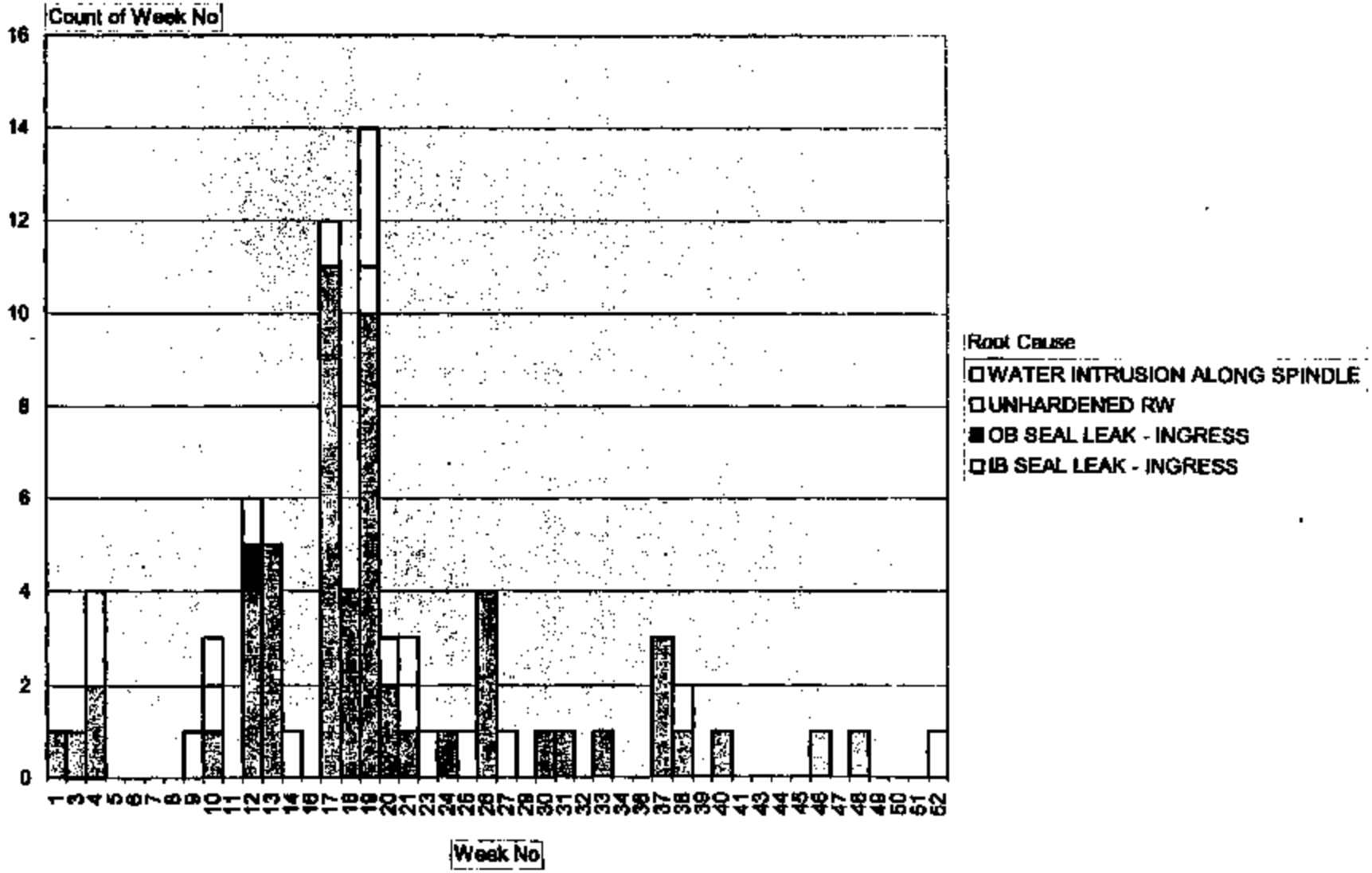
SKF 001997

C-Chart - # Returns By Week (Aiken Build Date) For 1999
SKF Analyzed Returns



SKF 001999

Mileage Call (All)



Response
to Main Document

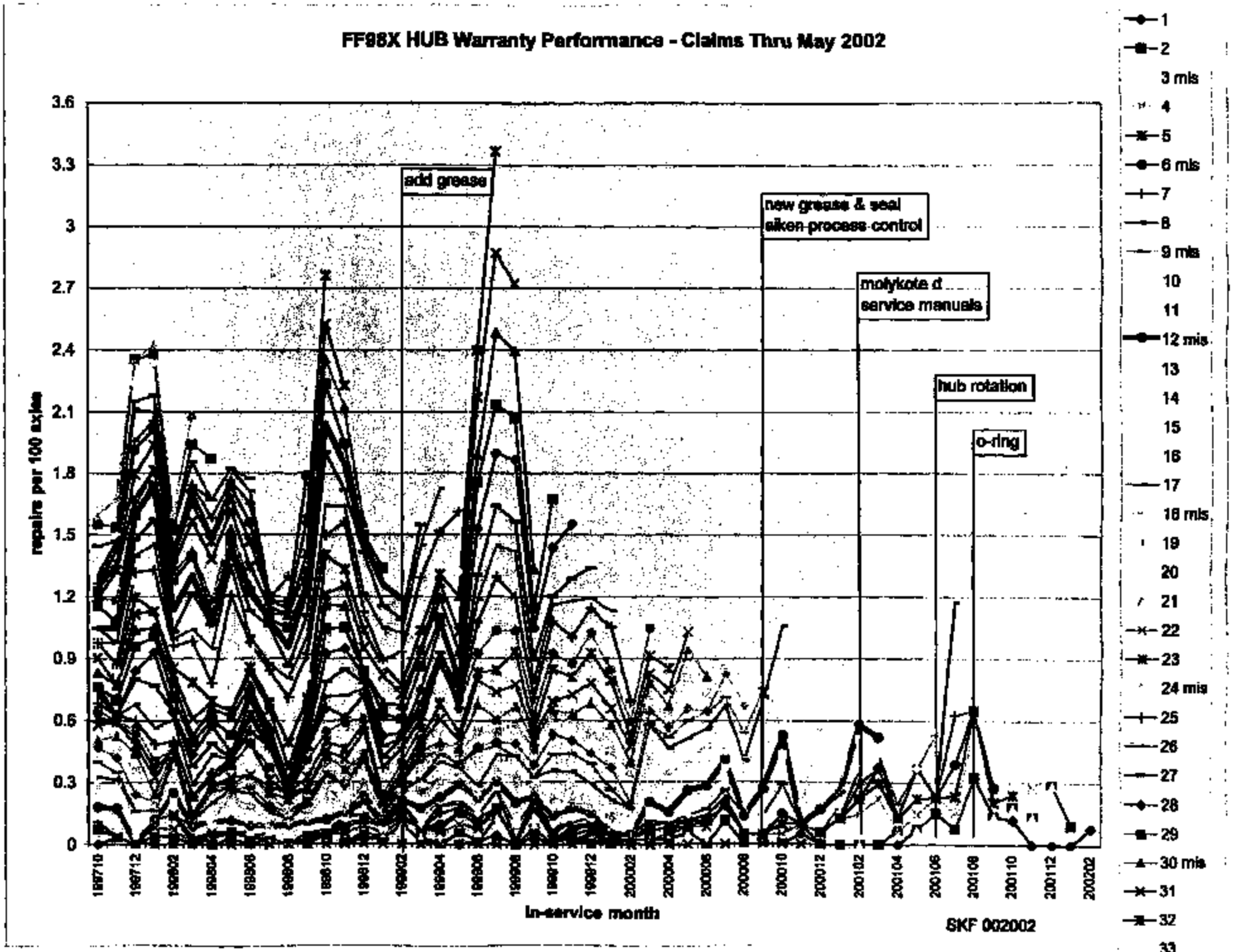
Robert J Bondy/DET/SKF
06/06 05:34 PM

Subject: Dale Bells Updated graphs as of June 5, 2002

Response to: ☐ Statistical Evaluations

Category: Statistics

ff98x hub r100 may02 data.s ff98x hud warr comp data.s


FF98X HUB Warranty Performance - Claims Thru May 2002
repairs per 100 axles
3.6
3.3
3
2.7
2.4
2.1
1.8
1.5
1.2
0.9
0.6
0.3
0
add grease
new grease & seal
aiken process control
molykote d
service manuals
hub rotation
o-ring
In-service month
SKF 002002
1
2
3 mls
4
5
6 mls
7
8
9 mls
10
11
12 mls
13
14
15
16
17
18 mls
19
20
21
22
23
24 mls
25
26
27
28
29
30 mls
31
32
33

Ryder Hubs Returned for Analysis - End of May 2002

SKF 002065

SKF SERIAL #	VIN #	CLAIM #	IN SERVICE DATE	MILES	R / L	Comments
19399-0160367	1FUDDYB3YPG13975	918276	11/14/99	610,074	L	No debris denting present; some oil separation from grease; load zone is visible on cones; IB seal lip wear ~2mm
19399-0160362	"	"	"	"	R	Load zone visible on cones: IB seal lip wear ~2mm; some oil separation from grease; no debris denting
16599-0149091	1FUDDYB9YPF25769	348790	08/07/99	671,884	L	IB seal wear ~1.5mm;dust lip wear ~2mm; some oil separation from grease; load zone visible on cones; no debris denting
16599-0149084	"	"	"	"	R	IB seal lip wear ~1.2mm;dust lip wear ~2mm; load zone visible on cones; some oil separation form grease; no debris denting
20499-0165637	G13981	918282		472,258	L	Jerky during rotation; OB outer race spalled; IB components are debris dented; some oil separation from the grease
20399-0157216	"	"		"	R	Bearings have polished appearance; OB has minor finish; IB seal lip wear ~1mm;dust lip ~1.75mm;minor fretting on ID of cones; some oil separation from grease
18199-0158206	G13973	918274		444,064	L	Some oil separation from grease; OB race load zone discolored; OB cone and rollers discolored; IB components not discolored; IB seal lip wear ~3mm no groove in clip ring
18199-0190193	"	"		"	R	Both inner cone faces polished; signs of cones creeping on spindle; some oil separation from grease; no debris denting; IB seal lip worn;
99092-M279237-00819	G13988	918289		589,477	L	Seal purge acceptable; some separation of oil separation; grease is migrating to large end of rollers, IB and OB; IB seal wear ~2mm; normal fretting on cone bores
00742-M279257-99030	"	"		"	R	Tone ring missing; inner cone face show circular marks on top of machining witness; IB seal wear ~3mm; bearing surfaces polished
25899-0185414	G13939	918290		559,290	R	Some oil separation from grease; OB race and rollers are highly polished; IB seal wear~1.5mm; no groove in clip ring
98152-M214550-001732	A63983	317568		596,346	R	OB seal shows light lube purge; no groove in clip ring
20399-0164730	1FUDDYB5YPG13976	918277	11/04/99	606,019	L	Some oil separation from grease; IB seal wear ~3mm
13099-0131801	1FUDDYB1YPG13991	918292	12/28/99	488,150	L	Wear on IB race and ends of rollers; IB rollers show slight discoloration; OB race shows wear at center
20399-0165276	G13982	918283		615,873	L	No visual damage to brgs; Load zone visible on OB cone and roller; Inner cones have been creeping
20399-0165273	"	"	"		R	Minor debris denting on IB inner cone on bottom half only; Inner cones show signs of creep; Some oil separation from grease
20499-0165636		918284		565,044	L	No visual damage to brg cones; some oil separation from grease
20499-0165631	"	"		"	R	Jerky rotation, OB outer race spalled; no visual damage on IB cone or race; grease on OB cone and race look oxidized
26099-0186261	G53870	362038		484,506	L	Some oil separation from grease; IB cone race and rollers are in good condition. OB cone has signs of creeping on spindle also stain on load zone; OB rollers are polished on load zone; OB race heavy stain on load zone and stain starting to flake; clip ring in good condition
26099-0186236	"	"		"	R	IB cone, race and rollers are in good condition; OB cone and race are in good condition; OB rollers are highly polished; clip ring no groove
98271-272-14222432	A63987	317572		660,228	L	IB cone, race and rollers are in good condition; OB cone, race and rollers are in good condition; clip ring, slight groove
001153-98271-M222432	"	"		"	R	Some oil separation from grease; IB cone and rollers are in good condition; IB race stain at load zone; OB oil separation from grease is more apparent; OB cone and rollers are in good condition; OB race heavy stain at load zone; clip ring in good condition
19399-0160341	G13974	918275		556,934	L	IB and OB cone and rollers are in good condition; IB and OB races are darkened at load zone; clip ring no groove; some oil separation from grease
19399-0160340	"	"		"	R	IB cone debris denting at load zone; IB rollers are stained and show signs of debris, denting; IB race (2) spalls, OB cone stained at load zone; OB rollers stained at load zone; OB race stained at load zone; clip ring slight groove, IB seal lip worn
20299-0164294	G13979	918280		466,773	L	IB & OB cones races & rollers are in good condition; clip ring no groove

Ryder Hubs Returned for Analysis - End of May 2002

SKF SERIAL #	VIN #	CLAIM #	IN SERVICE DATE	MILES	R / L	Comments
20299-0164562	"	"		"	R	Did not open; suspect spalling; jerky during rotation
20499-0165728		918288		551,028	L	IB & OB cones, races & rollers are in good condition; clip ring no groove
20499-0165728	"	"		"	R	IB & OB cones, races & rollers are in good condition; clip ring slight groove
30699-0205531		362037		568,199	L	Some oil separation from grease; all brg parts have a mirror finish; no visual damage
30699-0205533	"	"		"	R	Some oil separation from grease; all brg parts have a mirror finish; no debris dent or visual damage
22698-0013062		918281		605,219	L	Inner cones were creeping; IB cone has corrosion between seal lips; some oil separation from grease; IB rollers look dry
20499-0165652	"	"		"	R	Inner cones were creeping; IB cone has corrosion between seal lips; some oil separation from grease; no visual damage to brgs
25198-0019215	A63984	317588		593,208	L	OB cone, race & rollers show signs of staining on load zone; IB cone, race & rollers are in good condition; clip ring slight groove
23998-0016020	"	"		"	R	IB & OB cones races & rollers are in good condition; clip ring no groove
20599-0166593	G10386	918287		591,711	L	OB some oil separation from grease; OB cone, race & rollers are in good condition; IB cone oil seal grease lip very large; IB cone, race & rollers are in good condition; clip ring slight groove
20599-0166587	"	"		"	R	OB cone, race & rollers show load zone/ IB cone, race & rollers are in good condition
20399-0164728		918279		596,184	L	Load zone visible on inner cones; no visual damage to brgs; some oil separation from grease
20399-0164732		"		"	R	Load zone visible on inner cones & rollers; no visual damage to brgs; some oil separation from grease
25198-0019216	A63985	317570		567,711	L	Did no open up; jerky during rotation; suspect spalled IB outer race
23998-0015764	"	"		"	R	Did not open; suspect spalled race; jerky during rotation
20499-0165635		918285		561,925	?	Heavy fretting on ID of inner cones; some oil separation from grease; no visual damage to brgs
20499-0165630		918285		"	?	Some oil separation from grease; load zone visual on both brgs; load zone has a mirror finish; no spalling
003816-98169-M214550	A63982	317567		527,060	L	Inner cones were creeping; some oil separation from grease; tone ring is caked with oils & dirt from IB seal purge; no visual damage to brgs
001730-98152-M214550	"	"		"	R	Inner cones were creeping; tone ring is caked with oil & dirt from IB seal purge; some oil separation from grease; no visual damage to brgs
001049-98271-M222432	A63988	317573		543,562	L	Inner cones were creeping; some oil separation from grease; no visual damage to brgs; load zone visual out OB
001062-98271-M222432	"	"		"	R	Some oil separation from grease; no visual damage to brgs
003473-98166-M214550	A63987	317568		596,348	L	IB & OB cones, races & rollers are in good condition; clip ring no groove
18099-0122089	1FUYSDYB3YLF46193	33897	12/29/99	397,804	?	Wheel off, inner & outer nuts burned up; drum & hub still mounted to wheel
07899-0108959	1FUYSDYBLYLF36962	E1775956	07/01/99	579,730	R	Rac hub & knuckle; both burnt up
09199-0414274	1FUYDDYB4YDF45696	033670	07/24/99	395,799		Progressive Incident Level 1; (1) Bearing was cut in half by cutting torch was spinning on spindle/ other bearing cone also cut of with torch but to rusty to tell if it was spinning on spindle.
N/A Aiken	1FUYDDYB6YLB64025	33892	05/26/99	443,272		Clip ring groved and broken; IB cone heavy pitting and spalling on load zone; IB race pitting and spalling; IB rollers heavy debree denting; OB cone heavy stain on load zone; OB race gold tint on load zone; OB rollers dark discoloration
11299-0123089	1FUYDDYB1YLF30842	33955	06/07/99	359,724		IB and OB race pitted and spalled due to corrosion caused by water ingress; IB cone was seized to spindle and had to be cut off with cutting torch; OB cone debree denting and stain on load zone; OB rollers debree denting and stain on load zone; Contamination
3349-19099-M298330	1FUY3MDB4XPA7711t	33894	07/20/98	284,153		IB cone large area heavy pitting and spalling due to corrosion caused by water ingress; IB race and rollers stained on load zone and heavy debree denting; OB cone, race and rollers are in good condition; clip ring no groove; contamination

Ryder Hubs Returned for Analysis - End of May 2002

SKF 002067

SKF SERIAL #	VIN #	CLAIM #	IN SERVICE DATE	MILES	R / L	Comments
	1FUYDSEB6YLF44980	033885	07/01/99	557,298		Inner cones were rotating; inner cone faces and back faces show witness marks; ID of inner cones are polished; some oil separation from grease; rollers look visually dry; All brg parts starting to have a mirror finish
	4V4ND2JF1YN242517	33836	09/28/99	277,232		IB rollers have wear on large end of rollers; debris denting on all IB cone parts; inner cones have witness marks from creeping; load zone visuelbe on IB parts also; IB seal lip wear present; IB cone looks very dry; some oil separation from grease.
25598-0020587	1FUYDDYB5XDB57288	0356743	04/06/98	403,575		Some oil separation from grease; IB race has a spall; IB cone and rollers are in good condition; clip ring slight groove.
07499-0106326	1FUYDXYB7XLA77264	33839	12/01/99	740,386		OB race several spalling and gouge marks; IB race heavy stain on load zone; spalling came first and gouging was secondary; hub was magnaflux and found no cracks; IB cone, race and rollers are in good condition; OB cone stained on load zone; grease discoloration
07499-0106326	1FUYDXYB7XLA77264	33839	12/01/99	740,386		IB and OB cones, races and roller are in good condition; clip ring no groove
26898-0024432	1FUYBXYB3XLA77262	33887	12/01/98	898,950		IB one line around cone show signs of debree denting; IB rollers light stain at load zone; IB race light pitting and one spall starting around load zone; OB light pitting and one heavy spall at load zone; OB race (1) 1 inch spall across load zone; heavy dark stain at large rollers end; OB rollers how debree dangtin clip ring groved
01999-0079551	1FUYDXYB8XLF38021	0359848	03/29/99	551,881		IB cone, race and rollers are all stained pitted, spalled; due to grease break down caused by water ingress; Ib seal caked with hard grease; OB cone, race and rollers are stained clip ring slight groove; contamination
01499-0077359	1FUYDDYB6XDB57275	033861	03/27/99	442,040		OB race has four evenly speced roller spall marks; OB cone debree denting and stain at load zone; OB rollers debree denting and stain at load zone; IB cone, race and roller are in good conditon; clip ring no groove.
99140 "S" M209649	1FUYSXYBXXLA78339	6852442	08/26/98	599,082		IB race one inch spall; IB cone and rollers show signs of debree denting also light stain at load zone; OB and IB cones are highly polished on ID; OB cone, race and rollers slight stain and are in good condition; clip ring slight groove.
11099-0121936	M268510	33854	6/1799			IB cone heavy spalling on roller spacing at bottom; IB race pitting and spalling IB rollers debree denting and stain at load zone; OB cone, race and rollers are in good condition; clip ring broken when removing hub
004825-98172-M214556	1FUY3WD80XLA30418	0469470	06/10/98	581,185		IB and OB cone, races and rollers are in good condition; clip ring grooved; no problems found
004365-98171-M214530	1FUY3WDB3XLA30364	0468862	06/17/98	568,289		IB and OB cones, race and rollers are in good condition; clip ring slight groove; no problems found
000213-98148-M214550	1FUY3WD82XLA30369	0473242	08/13/98	566,432		IB and OB cones, races and rollers are in good condition; clip ring no groove; no problem found
0033774-98169-M214550	XLA85561	CWA10337	09/01/98	623,549		Grease separation present on both cones; all brg parts have a mirro finish; IB seal lip wear excessive; ID of cones have no fretting and have a polished look from creeping.
11298-0123790	1FUYDSEB6YLF44957	0033884	07/01/99	531,192		Load zone visuelle on both brgs; all brg parts besides load zone have a mirro finish; the load zone is a than color; grease separation present on both cones
	1FUYDDYB7YMG90351	33895	03/01/00	255,291		No visual damage to brgs; IB inner cone has corrosion between seal lips; excessive wear on IB seal; no sign of water contamination but dirt has made grease on back face of IB seal gritty
Too rusty - Luechow	1FUYDWDB5XL98440	33770	05/23/98	485,822		Only hub was returned; HPI no inner cones or rollers; tone ring missing also
Too rusty - Aiken	1FUYDDYB0XLA70929	0358717	10/14/98	274,741		OB race spalled at one location about 3 inches long the whole width of race; all OB brg parts have a mirror finish; grease has a rouse color; no visual damage to the IB brg; some oil separation from grease
001929-98076-M203099	4VGJDEJF5X N885091	33698	07/17/98	194,124		No visual damage on brgs; some oil separation from grease; IB seal purge excessive
77700 0265331	1FUJAHB091PH70783	033890	07/06/00	417,606		No visual damage to brgs; some oil separation from grease; clip ring was fractured; excessive damage was caused by a hammer when trying to remove hub; brg surfaces starting to look polished.

Ryder Hubs Returned for Analysis - End of May 2002

SKF SERIAL #	VIN #	CLAIM #	IN SERVICE DATE	MILES	R / L	Comments
24698-0018287	1FUYDDYBXXLA70940	0034011	10/19/98	654692		IB race one large & several small spalls on load zone; IB cone ok; seal lip dia 2.16 mm; med stain & debris denting; IB rollers stain & Debris denting on load zone; IB bearing all damaged due to corrosion caused by water ingress; OB race flaking; stain on load zone; OB cone & roller stain @ load zone; clip ring slight groove; contamination
1119-0122693	4V4ND1JE8YN703196	0034097	06/18/99	593,443		IB cone spalling on one side evenly spalled; IB race heavy stain & pitting; IB rollers tained & debris denting; OB cone race & rollers in good condition; clip ring no groove; Impact loading
00400-0227542	1FUYSDYB8YLG80337	E1778403	05/01/00	234,967		IB & OB cones, races & rollers are in good condition; clip ring slight groove
29599-0201278	1FUYSDZB8YLG16379	0034124	12/21/99	363,881		IB cone heavy spalling in one area due to corrosion caused by water ingress; IB race & rollers debris denting; OB cone race & rollers in good condition; clip ring slight groove; contamination
25098-0018603	1FUYDXYB5XLA77263	0034116	02/11/99	606,244	? of 2	IB race discoloration on load zone where large and small ends of rollers ride; IB cone two spalls on surface where roller (large end) rides; IB cone one small pit mark on surface where roller (small end) rides; OB cone, race, and rollers are in good condition; IB rollers debris denting and heavy stain on small end; Contamination
024398-0018160	1FUYDXYB5XLA77263	0034116	02/11/99	606,244	? of 2	IB oil seal lip 1.73 mm; IB cone heavy spalling in one area caused by corrosion due to water ingress; IB race and roller heavy stain and debris denting; IB grease around rollers very hard; OB cone, race and rollers are stained but are in good condition; clip ring slight groove; Contamination
11199-0122649	1FUYDLYB4YMF48084	33626	07/27/99	330,650		Hub returned disassembled; only 13 rollers & both inner cones returned; clip ring is fractured; IB inner cones spalled on bottom half; guiding flange on both inner cones show excessive wear; both outer races have line spalling
16599-0149089	1FUYDDYB7YPF25768	E1793326	09/01/99	667,193	B	REC AXLE WITH BURNED UP BEARING SEIZED TO SPINDLE; REC HUB; WHEEL OFF-5/17/02
16599-0149087	1FUYDDYB7YPF25768	E1793326	09/01/99	667,193	B	IB RACE HEAVY SPALLING AND DISCOLORATION ON LOAD ZONE; SPALLING AND PITTING AND HEAVY DISCOLORATION ON LOAD ZONE; IB ROLLERS HEAVY DEBRIS DENTING AND DISCOLORATION ON LOAD ZONE; O/B CONE AND RACE PITTING WHERE ROLLERS MEET RACE; INBOARD OIL SEAL LEAKAGE WATER INGRESS; CONTAMINATION
24698-0017258	1FUYSDYB2XLB25645	0034387	12/17/98	458,000		REC, DRUM, HUB, KNUCKLE AND CD BRAKE SHOE KNUCKLE INNER AND OUTER CONES SEIZED TO SPINDLE; HUB RACES BURN UP
98038-1795438-035243	1FUYSDYB9XLA29066	33836	05/01/98	481,834		IB OIL SEAL LIP 2.21MM; IB CONE HEAVY SPALLING ON ONE SECTION; DISCOLORATION ON LOAD ZONE; IB RACE PITTING AND DISCOLORATION; IB ROLLERS SHOW SIGNS OF DEBRIS DENTING;IB CAUSED BY WATER INGRESS; O/B CONE, RACE AND ROLLERS ARE STAINED AND SHOW SIGNS OF DEBRIS DENTING AND CLIP RING SLIGHT GROOVE; CONTAMINATION
26198-0022388	1FUYSDYB2XLB08912	0034224	11/07/98	469,306		IB CONE, RACE AND ROLLERS LIGHT DISCOLORATION ON LOAD ZONE; O/B CONE PITTING, POLISHING AND DISCOLORATION ON LOAD ZONE; O/B RACE AND ROLLERS SIGNS OF DEBRIS DENTING; ALL CAUSED BY WATER INGRESS; CLIP RING SLIGHT GROOVE; INBOARD OIL SEAL WATER INGRESS; CONTAMINATION-5/22/02
RUSTY-AIKEN	1FUYDDYB9YLF29330	0380960	06/19/99	325,961		IB RACE HEAVY SPALLING DISCOLORATION, VERY THICK GREASE;IB OIL SEAL LIP 1.55 MM;IB CONE PITTING AND HEAVY DISCOLORATION ON LOAD ZONE; RUBBING ON FLANGE GUIDE; IB ROLLERS SIGNS OF DEBRIS DENTING; ALL CAUSED BY CORROSION DUE TO WATER INGRESS; O/B BEANING IN GOOD CONDITION; INBOARD SEAL WATER INGRESS; CONTAMINATION-5/28/02
25799-0151140		34229	06/28/99			IB RACE 1/2" SPALL, THE REST OF THE RACE IS IN GOOD CONDITION; IB CONE AND ROLLERS ARE IN GOOD CONDITION; O/B, RACE, CONE AND ROLLERS ARE IN GOOD CONDITION; CLIP RING SLIGHT GROOVE; IB OIL SEAL LIP 1.34 MM- 5/29/02
11099-0126467	1FUYDDYB7YLF50669	34098	06/04/99	443,137		REC HUB, INNER SEAL, BEARING GREASE VERY THICK; IB RACE HEAVY SPALLING ALL AROUND RACE LOAD ZONE; IB SEAL THICK GREASE; O/B RACE DISCOLORATION ON LOAD ZONE; INCONCLUSIVE-5/28/02

Ryder Hubs Returned for Analysis - End of May 2002

SKF SERIAL #	VIN #	CLAIM #	IN SERVICE DATE	MILES	R / L	Comments
33099-0211572	1FUYDXYBXYLG32936	0034125	06/04/99	293,562		IB & O/B CONES, RACES AND ROLLERS ARE IN GOOD CONDITION; CLIP RING-NO GROOVE; NO PROBLEM FOUND-5/29/02
00384-? Luechow	1FUYSDYB9XLA29068	33835	05/01/98	481,834		HEAVY HAMMER MARKS, CLIP RING WAS BROKEN REMOVING HUB; O/B CONE TOO HEAVY SPALLS 1" LONG; DISCOLORATION DUE TO HEAT ON GUIDE FLANGE; O/B RACE AND ROLLERS SIGNS OF DEBRIS DENTING; IB CONE SPALL 3/4" LONG, IB RACE AND ROLLERS SIGNS OF DEBRIS DENTING-5/24/02
37498-0071317	1FUYDSEBXXP870849	E1785941	04/01/99	643,529		LIGHT OIL SEPARATION O/B, IB CONE HEAVY SPALLING ON LOAD ZONE; IB RACE, HEAVY GULLING ALL AROUND RACE ON LOAD ZONE; IB ROLLERS, HEAVY DEBRIS DENTING; IB GREASE AROUND ROLLERS VERY THICK;O/B CONE, RACE AD ROLLERS ARE IN GOOD CONDITION; CLIP RING AND GROOVE; CONTAMINATION-5/24/02
16599-0349244	1FUYDDYB3YLP50433	0034225	09/09/99			REC HUB & KNUCKLE AND O/B CONE; O/B CONE AND RACE HEAVY PITTING AND SPALLING; IB RACE HEAVY DAMAGE; INBOARD SEAL LEAKING WATER INGRESS; CONTAMINATION
27598-0026196	1FUYDMEB3XPA63966	0034353	01/25/99	572,492	B	O/B SEAL OIL SEPARATION FROM SEAL; IB AND O/B CONES, RACES AND ROLLERS ARE IN GOOD CONDITION; CLIP RING NO GROOVE; NO PROBLEM FOUND-5/23/02
25196-0019199	1FUYDMEB3XPA63966	0034353	01/25/99	572,942	B	IB CONE, RACE AND ROLLERS ARE IN GOOD CONDITION; O/B CONE, AND ROLLERS DISCOLORATION ON LOAD ZONE; O/B RACE HEAVY SIGNS OF PEELING CLIP RING- NO GROOVE; NO PROBLEM FOUND-5/23/02
Too rusty - Alkan	1FUYDCYB4YDF45505	000033886	08/15/99			HUB RETURNED DISASSEMBLED; IB INNER CONE SPALLED ON BOTTOM HALF; GREASE IS A BLACK TINT; CLIP RING FRACTURED DURING REMOVAL; NO VISUAL DAMAGE TO O/B BRG.
13899-0135839	1FUYDCYB8YL1F38160	33837	06/23/99	367,484		IB CONE LIGHT PITTING AND DISCOLORATION ON LOAD ZONE; IB RACE PITTING AND DISCOLORATION ON LOAD ZONE, IB ROLLER STAIN ON LOAD ZONE; O/B CONE LIGHT DISCOLORATION ON LOAD ZONE; O/B RACE HEAVY DISCOLORATION AN FLAKING ON LOAD ZONE; O/B ROLLERS LIGHT STAIN ON LOAD ZONE; CLIP RING-NO GROOVE-5/10/02
N/A Luechow	1FUYSDYB6XPA27789	33622	05/15/98	340,588		IB AND O/B CONES, RACES AND SEALS ARE IN GOOD CONDITION; CLIP RING NO GROOVE; NO PROBLEM FOUND
01001-0326386	1FUYSDYB8XLB08901	6860797	12/09/98	343,851		IB CONE, RACE AND ROLLERS ARE IN GOOD CONDITION; O/B RACE HEAVY DISCOLORATION ON LOAD ZONE; O/B CONE AND ROLLERS ARE IN GOOD CONDITION; CLIP RING NO GROOVE; C.R. SEAL; NO PROBLEM FOUND
22901-0351862	1FUYBXYB2XLF38015	33612	03/24/99	546,135		C.R. SEAL; IB AND O/B CONES, RACES AND ROLLERS ARE IN GOOD CONDITION; CLIP RING NO GROOVE; NO PROBLEM FOUND
Too rusty - Alkan		E1749214				Hub returned with I/B brg disassembled - spalling and contamination present; sent to SKF
14299 0138959		Unit 349313	03/01/99			Sent to SKF
004518 98171 M214550	X1A95561	CWA10337				Sent to SKF

Response
to Main Document

Rick P Morrow/AMER/SKF
06/06 09:06 PM

Subject:	Sample Size for R-Safe in field
Response to:	Statistical Evaluations
Category:	Statistics

Sample size THU.doc

Duane and I have considered sample sizes to estimate if the 2% of seals with axial AND primary lip failures occurred in all Bethlehem batches. We had estimated that 2% of the seals from the last batch of Bethlehem production exhibited both defects on the same seal.

The sample sizes are large to get any degree of confidence. We provide the sample sizes based on how confident we want to be with a margin of error and probability of saying the percentage is higher when it is not. One can see the change in sample size based on the proportion of seals defective being greater than 4% and 6%. (Alternative proportion in the table below).

Testing proportion = 0.02 (versus > 0.02)
Alpha = 0.01 99% Confidence Level

Alternative Proportion	Sample Size	Target Power	Actual Power
4.00E-02	1060	0.9500	0.9500
4.00E-02	802	0.8000	0.8001
6.00E-02	321	0.9500	0.9501
6.00E-02	173	0.8000	0.8007

For example, a sample size of 173 hubs would need to be pulled across all production to have a 99% confidence level that the population of seals having both defects is no greater than 4% (2% with 2% error). The quantities should be stratified using the quantity per batch.

Another way of considering sample size is to estimate the probability in a sample of 10 hubs to find 1 or more seals with both defects. This result is 18%.
In other words, one would have to sample much more than 10 hubs to have any confidence of the true population proportion.

The purpose is to have confidence of the probability of a hub having both defects in the seal AND all other factors being present (Water at the seal prior to enough wear to repair the defect with static tolerance band).

We should consider the possibility of deducing from Bethlehem's records due to the large sample sizes suggested.

Rick

Additional Power and Sample Size

Test for One Proportion

Testing proportion = 0.02 (versus > 0.02)
Alpha = 0.2 80% Confidence level

Alternative Proportion	Sample Size	Target Power	Actual Power
4.00E-02	485	0.9500	0.9502
4.00E-02	200	0.8000	0.8001
6.00E-02	162	0.9500	0.9503
6.00E-02	64	0.8000	0.8027

Response
to Main Document

Rick P Morrow/AMER/SKF
06/28 04:00 AM

Subject:	Hub High Warranty Periods Tested
Response to:	Statistical Evaluations
Category:	Statistics

Steer THU RM Short 6 27 only picture.

Chuck believes Aiken produced hubs went through two and maybe three periods of higher than normal failure rates. Julian dates 12098 -27398, 11099 - 14099 and possibly Aug and Sep 1999.

His hypothesis is an axial clearance gage cycled into a wear pattern after recalibrating. This gage was eventually permanently corrected and the higher than normal failure rates ceased. He believes this permanent correction occurred in November.

He described a peak and valley cycle in the axial clearance.

Null Hypotheses

Ho1: No time periods correlate with significantly higher warranty claims Vs Production Quantities

Ho2: Axial clearance gage performance does not affect proportion of claims

Analysis

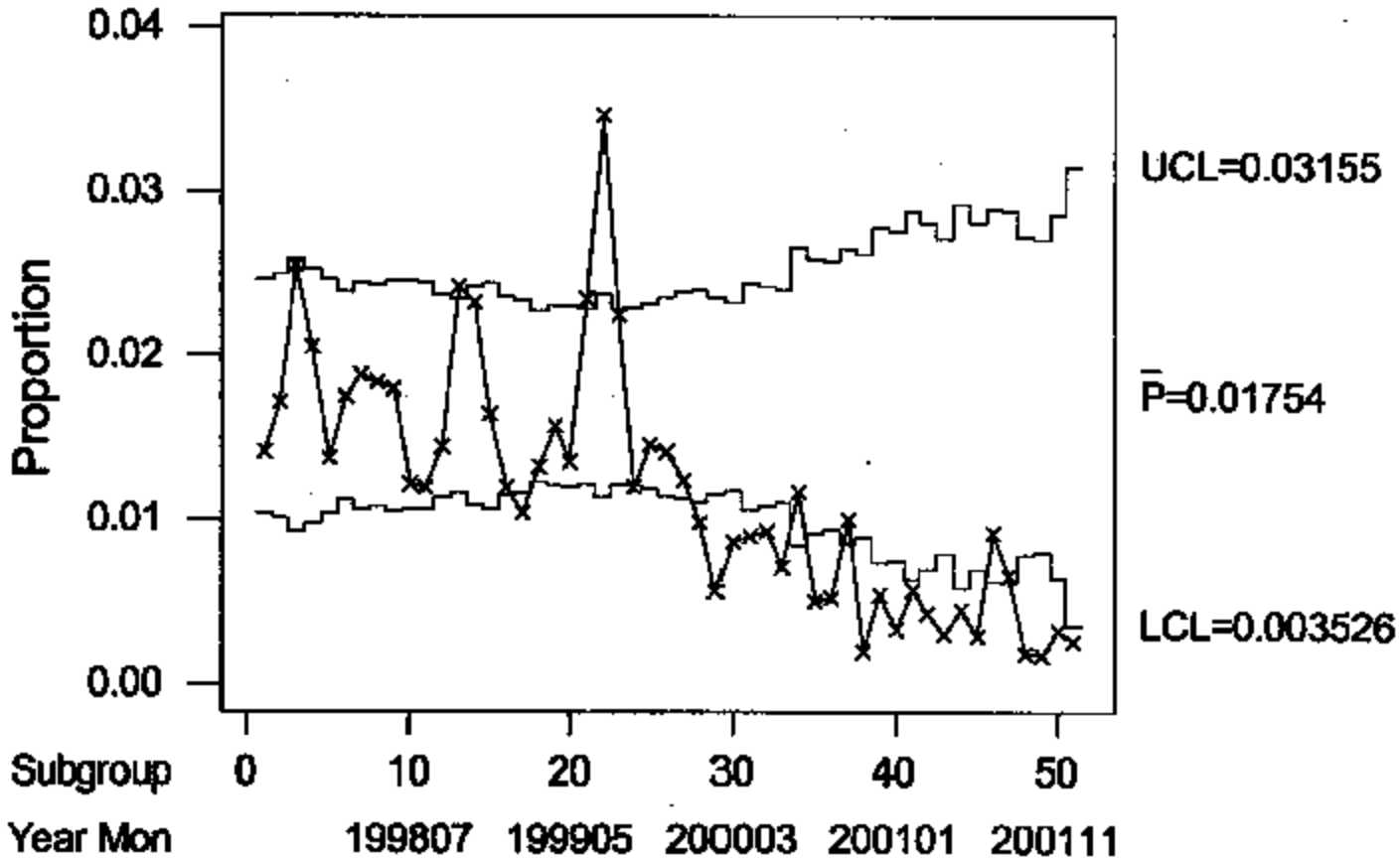
- Mike Lewis requested analysis of Chuck Smith's suggestions that "Aiken" had several periods of high failure. In addition, Chuck and Mike have requested help in determining hubs to retrieve from high warranty production periods. These answers are possible if someone can identify hubs within vehicle.
- Duane Gipe months ago identified several time periods that had a higher proportion of claims
- This study supports both analysts using the hub production date from the SKF analyzed returns database of only those claims when production date is listed. Therefore, there may be a selection bias. The Null hypothesis Ho1 is rejected.
- One or more parties (ARM, Aiken and Luechow) experienced abnormal variation during several weeks.
- I added the comments, root cause from SKF work and whether the claim was validated to support decisions on true root cause.
- Other hypotheses were tested and included. Sunday has a higher proportion of claims, for instance.
- Axial clearance hypothesis requires data on gage maintenance.
- Six Sigma analysis includes SPC and hypothesis testing. Further analysis is possible when data is available.
- FMEA is again recommended to direct root cause analysis

- Data Concerns/Notes
  - Selection bias may be present because claims missing build dates were excluded.
  - I have received no process measurement data to assist in identifying variation in Aiken.
  - Several claims were posted against hub build dates that showed zero production. Several analyses were run and this error was insignificant.
  - Immature data for periods after these studied due to Mean Time to Failure
  - Luechow hubs are included in one high proportion time period
  - Databases used were Aiken production quantities by day, the SKF analyzed returns database and the ARM database of 2,200 claims.
  - Claims were also shown for hub build dates that were identified as producing only trailer hubs.
  - No data is available from suppliers that may be tested for variation and correlation with claims.

Duane Gipe's original chart

Claims Vs Produced

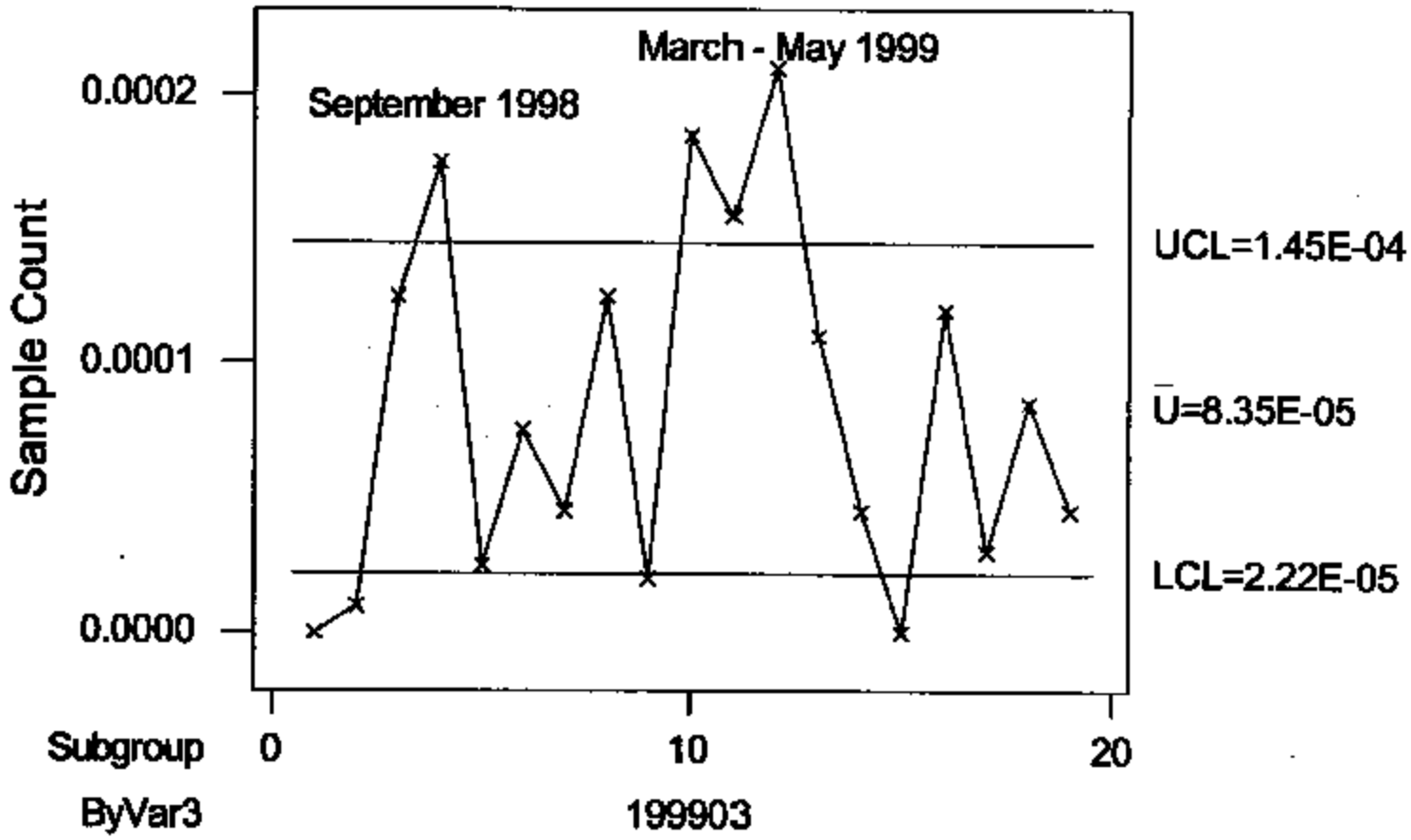
Limits Based on Dates Up To 19910



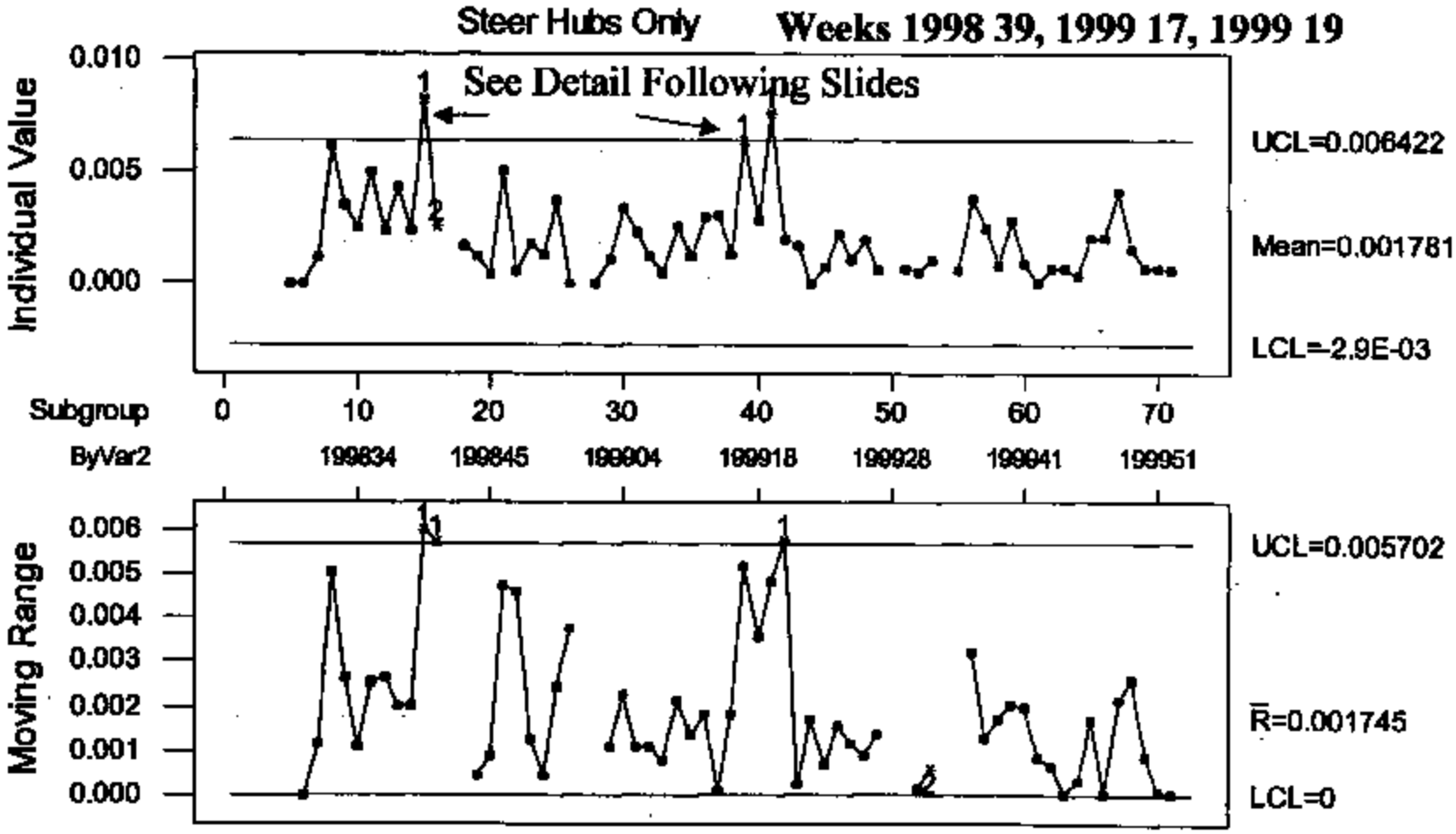
SKF 002076

Analysis Begins 6/27/02

u Chart Count of Claims Vs Monthly Production
Steer Claims Only

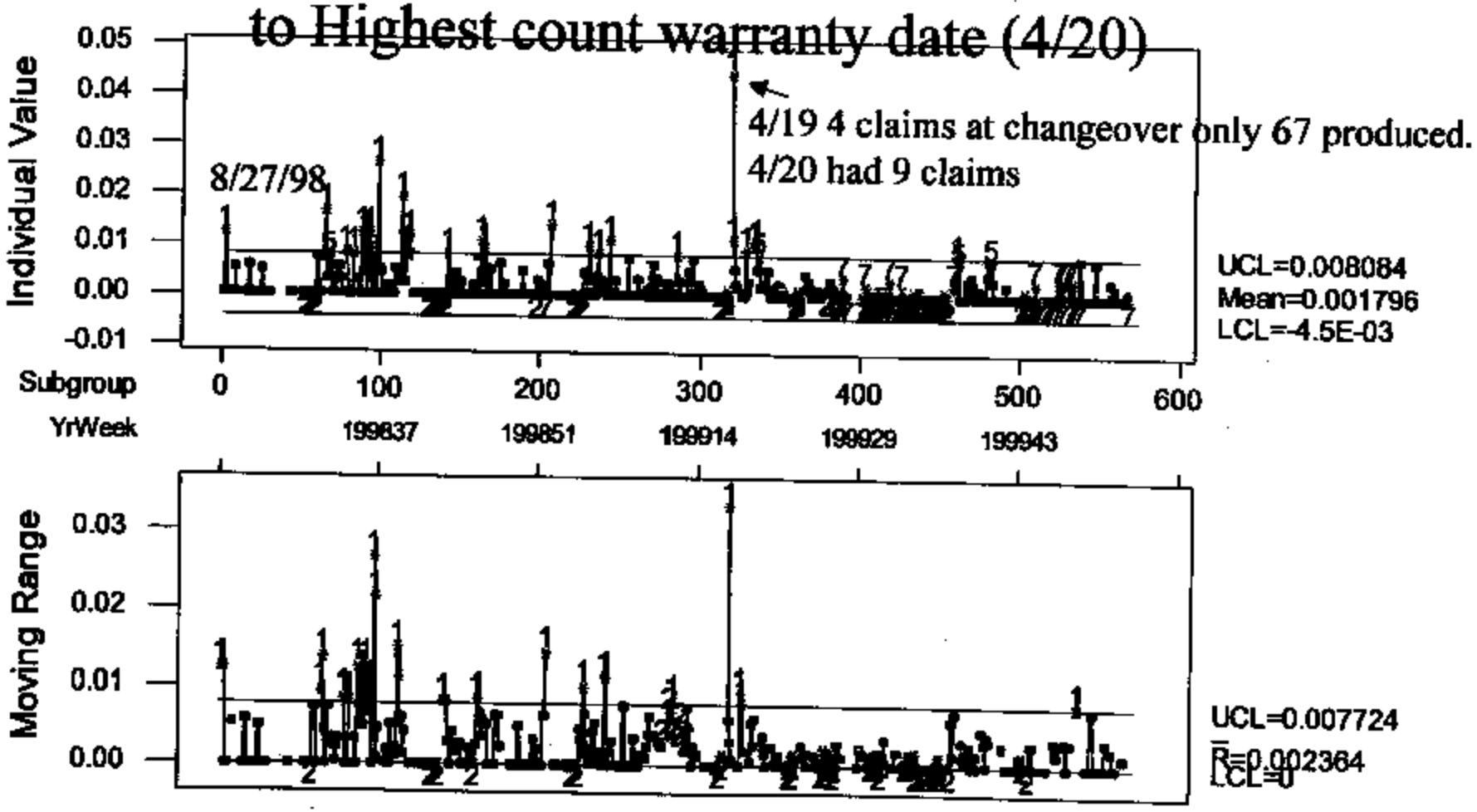


Warranty Claim Proportion by Year/Week



SKF 002078

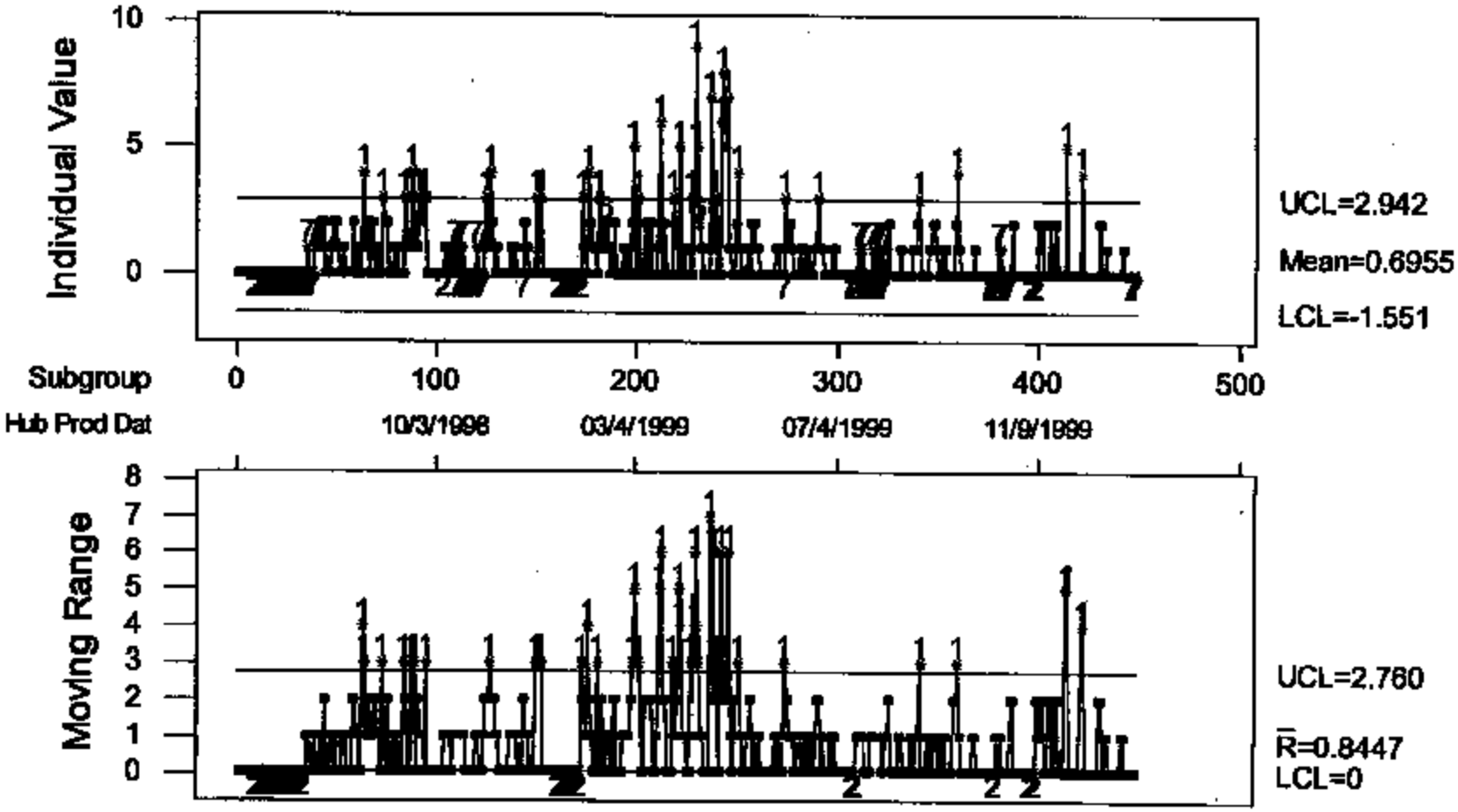
Warranty Claim Proportion by Day Steer Only - Note some warranty on dates showing zero steer produced. Changeover to Steer Mentioned and Next to Highest count warranty date (4/20)



SKF 002079

Steer Production Dates Only

Warranty Claims by Day



SKF 002080

Day 8/27/98

BTF-0052	0016245	08/27/98	3	1998	Alken	Frtlnr	Ryder	CWA00159
BTF-0052	016439	08/27/98	3	1998	Alken	Frtlnr	Ryder	CWA00154
BTF-0049	0015726	08/27/98	3	1998	Luechow	Frtlnr	Ryder	318273
BTF-0049	0015966	08/27/98	3	1998	Luechow	Frtlnr	Ryder	318277

Noise in bearing	NOISE/VIBRATION	1FUYDDYB0XLA70915	498210	500000	IB SEAL LEAK - INGRESS
Wheel bearings were failed	BEARING FAILURE	1FUYDDYB3XLA70906	351267	400000	IMPACT DAMAGE
	NO INFO	1FUYDDYB4XLA70917	369097	400000	IMPACT DAMAGE
	NO INFO	1FUYDDYB6XLA70921	418370	450000	WATER INTRUSION ALON

IB brg row water content 0.49%, brg ctr 0.12%	Valid
Line spalling of IB IR at loaded zone	Invalid
Rec'd disasm, OB row G, IB row line spalls at roller spacing	Invalid
Endplay 0.000", jerky rotation, OB row met debris, IB row VG, IB seal fun	Invalid

Week 39 1998

Day of Week	Hub Production Date		Claims				3rd	1st	2nd	Total Daily	Proportion of Claims
Sunday	9/20/1998		1	No	Steer	*	*	63	160	223	0.4484%
Monday	9/21/1998		4	No	Steer	*	36	91	80	207	1.9324%
Tuesday	9/22/1998	Honer down	1	No	Steer	*	0	0	120	120	0.8333%
Wednesday	9/23/1998		1	No	Steer	*	136	174	76	386	0.2591%
Thursday	9/24/1998		3	No	Steer	*	129	94	122	345	0.8696%
Friday	9/25/1998	Drill Operation down 2nd shift	2	No	Steer	*	176	7	84	267	0.7491%
Saturday	9/26/1998		3	No	Steer	*	86	72	99	257	1.1673%
Sunday	9/27/1998	Grinder & Honer down	3	No	Steer	*	*	*	0	0	*

BTF-0052	0022910	09/20/98	3	1998	Aiken	Frtlnr	Ryder - Ashland City	0031499
BTF-0052	0022921	09/21/98	3	1998	Aiken		Ryder	Unit 329665
BTF-0052	0022922	09/21/98	3	1998	Aiken		Ryder	Unit 329668
BTF-0049		09/21/98	3	1998	Luechow	Frtlnr	Mox Trkg	CHE08413 1/2
BTF-0049	001097	09/21/98	3	1998	Luechow	Frtlnr	Mox Trkg	CHE08457
BTF-0049	0023434	09/22/98	3	1998	Luechow	Frtlnr	Mox Trkg	CHE08413 2/2
BTF-0052	0024551	09/23/98	3	1998	Aiken	Navistar	Andrews Trucking	0088188A
BTF-0052	0027234	09/24/98	3	1998	Aiken	Frtlnr	Mike Newsome	HLFD0001E450T
BTF-0052	0024343	09/24/98	3	1998	Aiken	Navistar	Vision Transp.	069156A
BTF-0049	M222432	09/24/98	3	1998	Luechow	Navistar	G&P Trucking	0041874D
BTF-0052	0024014	09/25/98	3	1998	Aiken	Frtlnr	Interstate	DWFD0001F334T
BTF-0052	0023916	09/25/98	3	1998	Aiken		Ryder	Unit 329654
BTF-0052	0024707	09/26/98	3	1998	Aiken	Frtlnr		E1703119 1/2
BTF-0052	0024841	09/26/98	3	1998	Aiken	Frtlnr		E1703119 2/2
BTF-0052	0024231	09/26/98	3	1998	Aiken		Ryder	Unit 329670 2/2
BTF-0052	0024453	09/27/98	3	1998	Aiken		Ryder	Unit 329664
BTF-0052	0024430	09/27/98	3	1998	Aiken		Ryder	Unit 329666
BTF-0052	0024434	09/27/98	3	1998	Aiken		Ryder	Unit 329670 1/2

9/20 – 9/27/98 Week 199839 continued

Seized	SEIZED	1FUYSDYB6ML808901	275378	300000	IB SEAL LEAK - INGRESS
Inspect wheel speed senso	TONE RING BROKEN/LO	B08807	470504	500000	IB SEAL LEAK - INGRESS
Inspect inner bearing, front	NON-SPECIFIC	B08900	490158	500000	IB SEAL LEAK - INGRESS
Bearing Failure	BEARING FAILURE	IFUYSCBX0L973976	597114	600000	NO PROBLEM FOUND
	NO INFO				NO PROBLEM FOUND
Bearing Failure	BEARING FAILURE	IFUYSCBX0L973976	597114	600000	OUTER RING SPALL
Lube leaking from RF hub	LEAK	2HSFMAMR5XC025337	225063	250000	OIL SEPARATION
Noisy, Rattles	NOISE/VIBRATION	1FUYSDYBX0PA67067	348506	350000	NO PROBLEM FOUND
Loose	LOOSE	2HSFMAER1XC030744	213878	250000	NO PROBLEM FOUND
Wheel seal leaking	LEAK	2HSFMAHR3XC025573	180681	200000	IB SEAL LEAK - EGRESS
Binds & sticks	BINDYSTICK	1FUYSDYB6MP966379	396906	400000	UNKNOWN
	NO INFO	B08886	298782	300000	IB SEAL LEAK - INGRESS
Leaks	LEAK	1FUPCSZB5XLA12820	353143	400000	NO PROBLEM FOUND
Leaks	LEAK	1FUPCSZB5XLA12820	353143	400000	NO PROBLEM FOUND
	NO INFO	B08902	508895	550000	IB SEAL LEAK - INGRESS
	NO INFO	B08896	402790	450000	IB SEAL LEAK - INGRESS
	NO INFO	B08896	318601	350000	IB SEAL LEAK - INGRESS
	NO INFO	B08902	508895	550000	IB SEAL LEAK - INGRESS

Endplay 0.000", noisy, little spalls IB OR RW, IB seal dust lip worn out	Valid
Endplay 0.020", Noisy, OB seepage ~2.0 g, oil seperation, IB cage melted	Valid
Endplay 0.000", smooth rotation, very clean seals, appears to be corrosion	Valid
Endplay 0.000", smooth quiet rotation, IB & OB brg rows VG, IB seal func	Invalid
Endplay 0.000", smooth quiet rotation, IB & OB brg rows VG, IB seal func	Invalid
Endplay 0.000", smooth quiet rotation, OB row VG, IB OR RW single line	Valid
EP 0.000", smooth rotation, no internal distress, very little extra grease in	Valid
OB seepage ~1.5g, IB dry, endplay 0.000", smooth quiet rotation	Invalid
Endplay 0.000", smooth quiet rotation, OB seepage <2.0 g, IB <1.0 g	Invalid
Hub OD covered in grease and dirt,	Valid
IB row seized, OB heat damaged - melted cage & blued, IB rollers ends p	Inconclusive
Endplay 0.000", rotation stiff, no noise, OB IR spall multi loc. around ring,	Valid
Endplay 0.000", smooth rotation, no internal distress(Troy Lab determinati	Invalid
Endplay 0.000", smooth rotation, no internal distress(Troy Lab determinati	Invalid
Endplay 0.000", smooth rotation, IB OR spall multi loc., appears to be cor	Valid
Rec'd diseas., OB IR spall, IB seepage ~2.0 g, IB OR RW spall line 360	Valid
Endplay 0.000", smooth rotation, corrosion in OB row, OB seepage ~2.0g,	Valid
Rec'd diseas., IB IR missing, IB OR RW spall multi loc., appears to be co	Valid

High Occurrences 9/17/98 also

4/18/99 – 4/24/99 Cont

Week 17 1999

		Changeov										
Monday	4/19/1999	er to Steer	3	No	Steer	*	0	0	67	67	4.4776%
Tuesday	4/20/1999		9	No	Steer	*	239	295	262	796	1.1307%
Wednesday	4/21/1999		5	No	Steer	*	340	275	294	909	0.5501%
Thursday	4/22/1999		2	No	Steer	*	320	296	180	796	0.2513%
Friday	4/23/1999		1	No	Steer	*	200	134	210	544	0.1838%
Saturday	4/24/1999		0	No	Steer	*	*	*	*	0 *	

BTF-0052	0126613	04/19/99	2	1999	Alken	Navistar	Trucks inc. of Janesvl	CWA08206
BTF-0052	0121704	04/19/99	2	1999	Alken	Navistar	WalMart	Unit 91069
BTF-0052	0121945	04/19/99	2	1999	Alken	Navistar	WalMart	Unit 9711
BTF-0052	0122948	04/20/99	2	1999	Aiken	Frtlnr	Ryder	E17248206
BTF-0052	0127740	04/20/99	2	1999	Alken	Frtlnr	KLLM	E1744815
BTF-0052	0121708	04/20/99	2	1999	Aiken	Navistar	WalMart	Unit 91058
BTF-0032	0122092	04/20/99	2	1999	Alken	Volvo	Fil-Mor Express	CWA01737
BTF-0052	0121402	04/20/99	2	1999	Alken		Ryder	Ryder Unit # 337287
BTF-0052	M121626	04/20/99	2	1999	Luechow	Frtlnr		BPFD0001A182T
BTF-0052	0122112	04/20/99	2	1999	Alken	Navistar	WalMart	WMT91492 2/2
BTF-0052	0122110	04/20/99	2	1999	Aiken	Navistar	WalMart	WMT91492 1/2
BTF-0052	0122124	04/20/99	2	1999	Aiken	Navistar	WalMart	WMT91509
BTF-0052	122933	04/21/99	2	1999	Aiken	Frtlnr	Heartland Express	E1692195
BTF-0052	0122545	04/21/99	2	1999	Alken	Frtlnr	Heartland Express	E1720710
BTF-0052	0122935	04/21/99	2	1999	Aiken	Frtlnr	Ryder	348606
BTF-0052	012302?	04/21/99	2	1999	Alken		Ryder	33623
BTF-0052	0122896	04/21/99	2	1999	Alken	Frtlnr		CWA09666
BTF-0052	0123651	04/22/99	2	1999	Aiken	Navistar	WalMart	Unit 91287
BTF-0052	0123372	04/22/99	2	1999	Alken	Navistar	Fleet Pride	Unit 3038
BTF-0052	0124025	04/23/99	2	1999	Alken		Ryder Unit 334749	33614

4/18/99 – 4/24/99 Cont

NOISE/VIBRATION	2HSCHASR1YC068276	277648	300000	IB SEAL LEAK - INGRESS	Valid
NOISE/VIBRATION	2HSFMAMR4YC029364	280260	300000	IB SEAL LEAK - INGRESS	Valid
ENDPLAY/LOOSE	2HSFMAMR5YC029700	346249	350000	LOW CLAMP LOAD	Invalid
BIND/STICK	1FUYSDYBXYLF38978	588523	600000	UNKNOWN	Inconclusive
LEAK	1FUYSZYBXYL787534	304850	350000	NO PROBLEM FOUND	Invalid
NOISE/VIBRATION	2HSFMAMRXYC029353	289151	300000	IB SEAL LEAK - INGRESS	Valid
NOISE/VIBRATION	4V4ND2UF8YN768360	356930	400000	IMPACT DAMAGE	Invalid
NO INFO				IB SEAL LEAK - INGRESS	Valid
NO INFO				NO PROBLEM FOUND	Invalid
BEARING FAILURE		146540	150000	IB SEAL LEAK - INGRESS	Valid
BEARING FAILURE		146540	150000	IMPACT DAMAGE	Invalid
BEARING FAILURE		195398	200000	IB SEAL LEAK - INGRESS	Valid
NOISE/VIBRATION	1FUYSDYB5YCA93260	249423	250000	WATER INTRUSION ALON	Invalid
LEAK	1FUYSDYBYLB91576	311918	350000	IB SEAL LEAK - INGRESS	Valid
NO INFO	1FUYSDYE3YLF38977	591544	600000	IB SEAL LEAK - INGRESS	Valid
NO INFO	4V4ND1JF1YN793198	615339	650000	IB SEAL LEAK - INGRESS	Valid
NOISE/VIBRATION	4V4ND1UF9YN768433	351894	400000	IB SEAL LEAK - INGRESS	Valid
NOISE/VIBRATION	2HSFMAMR5YC030216	260100	300000	IMPACT DAMAGE	Invalid
BROKEN/SEPARATED E	XC023080DOM			UNKNOWN	Inconclusive
NO INFO	1FUYDDYBOYP886713	526469	550000	IB SEAL LEAK - INGRESS	Valid

Week 19 5/2/99 – 5/7/99

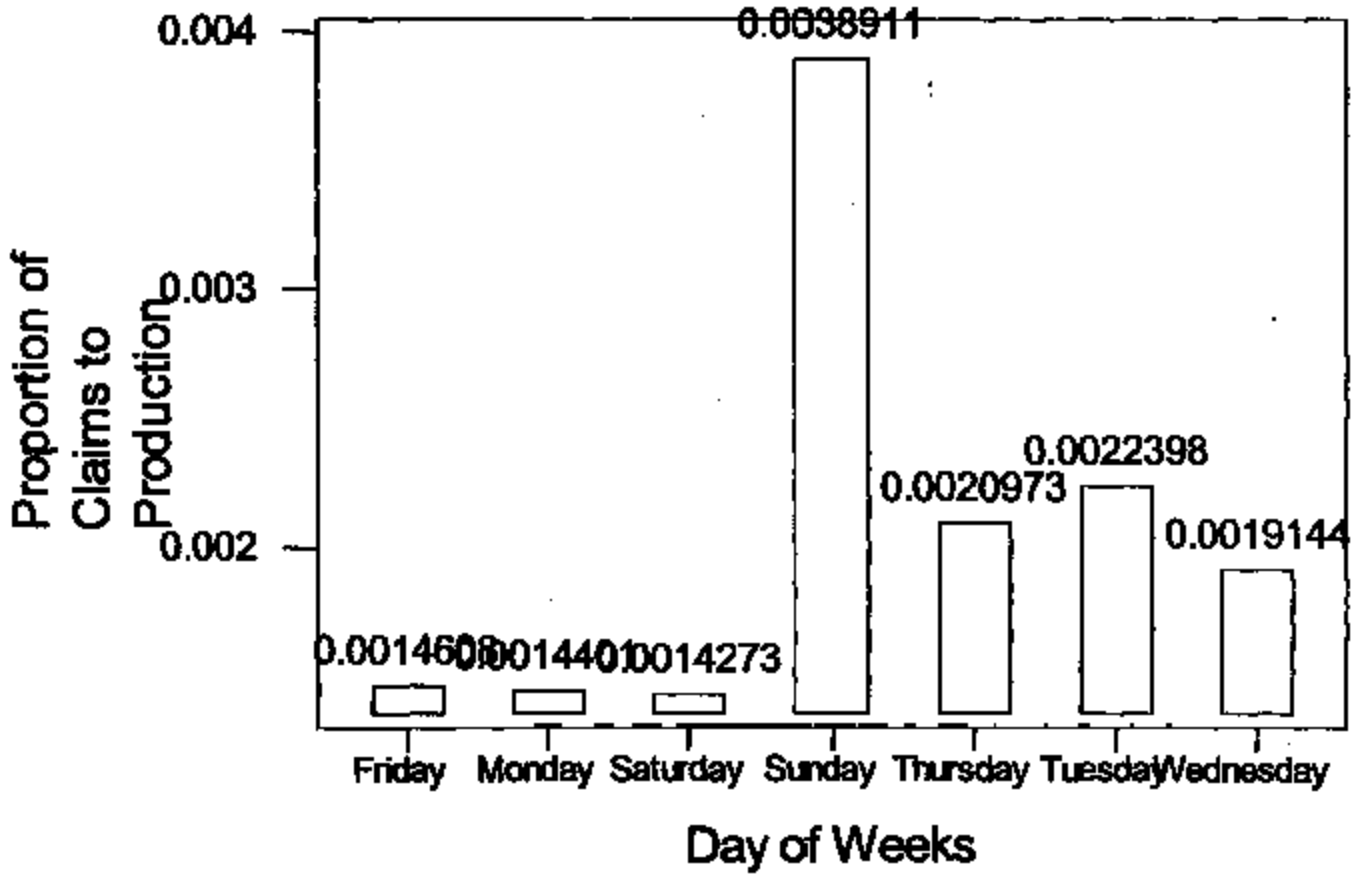
Week 19 1999

Sunday	5/2/1999	1	No	Steer	*	*	*	*	0	*	
Monday	5/3/1999	6	No	Steer	*	57	350	176	583		1.0292%
Tuesday	5/4/1999	8	No	Steer	*	259	264	217	740		1.0811%
Wednesday	5/5/1999	5	No	Steer	*	300	265	358	923		0.5417%
Thursday	5/6/1999	7	No	Steer	*	302	280	289	871		0.8037%
Friday	5/7/1999	1	No	Steer	*	0	251	274	525		0.1905%

BTF-0052	0128993	05/02/99	2	1999	Aiken	Frtlnr		E1748129	Valid
BTF-0052	0128110	05/03/99	2	1999	Aiken	Frtlnr		66762	Invalid
BTF-0052	128126	05/03/99	2	1999	Aiken	Frtlnr	Empire Truck Sales	CWA06549	Valid
BTF-0052	128021	05/03/99	2	1999	Aiken	Frtlnr		E1741081	Invalid
BTF-0052	0128019	05/03/99	2	1999	Aiken	Frtlnr		E1692210	Valid
BTF-0052	0128460	05/03/99	2	1999	Aiken		Mckenzie Tank Lines	R.O. 49442	Valid
BTF-0052	128098	05/03/99	2	1999	Aiken	Frtlnr		C WA07488	Invalid
BTF-0052	129302	05/04/99	2	1999	Aiken	Frtlnr		E1674449	Invalid
BTF-0052	0129348	05/04/99	2	1999	Aiken	Frtlnr	Tim Mallard/CR Engla	E1525550	Valid
BTF-0052	128649	05/04/99	2	1999	Aiken	Frtlnr	Zuran Petrie	E1752443	Invalid
BTF-0052	129277	05/04/99	2	1999	Aiken		Martin Lipe	86102	OPEN
BTF-0052	0170218	05/04/99	2	1999	Aiken	Mack	Tom Bailey Motors	CWA04353	OTHER
BTF-0052	128683	05/04/99	2	1999	Aiken	Frtlnr	Roehl Transport	CWA07839	Valid
BTF-0052	128691	05/04/99	2	1999	Aiken	Frtlnr	Roehl Transport	CWA07839	Invalid
BTF-0052	0129180	05/04/99	2	1999	Aiken		KLLM		Inconclusive
BTF-0049	0130080	05/05/99	2	1999	Aiken	Frtlnr		E1689451	Invalid
BTF-0032	004339	05/05/99	2	1999	Luechow	Frtlnr		NSFD0001BT43T 1/2	Invalid
BTF-0052	129813	05/05/99	2	1999	Aiken	Frtlnr	Bar None	E1689062	Valid
BTF-0052	0129943	05/05/99	2	1999	Aiken	Frtlnr	New Prime	E1750047	Valid
BTF-0052	0129837	05/05/99	2	1999	Aiken	Navistar	James Lifkin	0013495A	Invalid
BTF-0052	0130816	05/06/99	2	1999	Aiken	Frtlnr		E1692211	Invalid
BTF-0052	0130092	05/06/99	2	1999	Aiken	Ptrbilt		CWA05961	Inconclusive
BTF-0052	0130507	05/06/99	2	1999	Aiken	Navistar	Hazmat Environments	CCU00571	Valid
BTF-0052	0131322	05/06/99	2	1999	Aiken	Navistar		0042205B	Valid
BTF-0049	130922	05/06/99	2	1999	Aiken	Frtlnr		E1689133	Valid
BTF-0052	130662	05/06/99	2	1999	Aiken	Frtlnr	Harjit Singh	E1755522	Valid
BTF-0052	0131015	05/06/99	2	1999	Aiken	Frtlnr	CSS Transp	BNFD0001ME67T	Invalid
BTF-0052	131259	05/07/99	2	1999	Aiken	Frtlnr		E1752364	Valid

Week 19 5/2/99 – 5/7/99

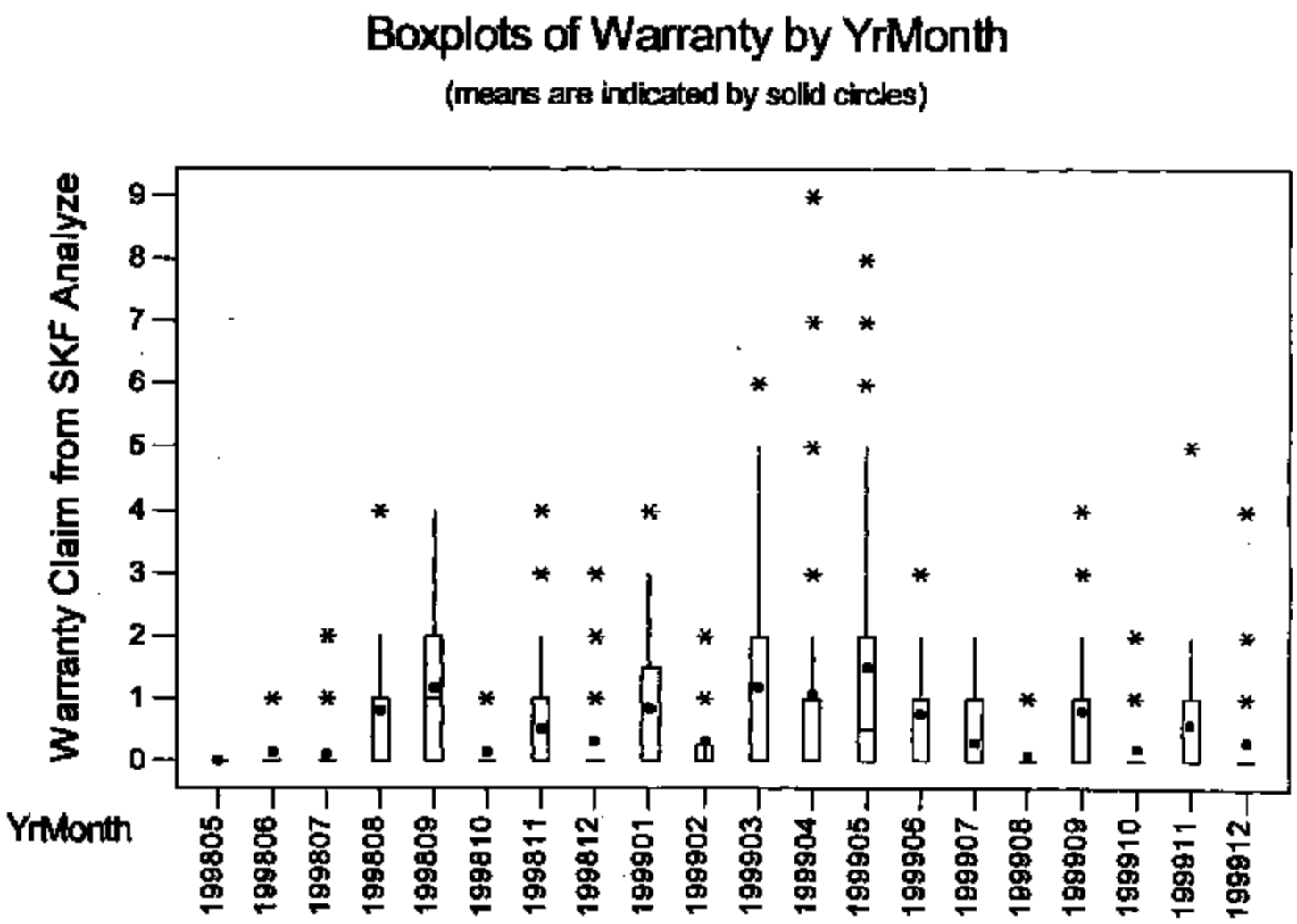
	NO INFO					Valid
	NO INFO	1FUPCSZBYLA66762	273985	300000	IMPACT DAMAGE	Invalid
Bearing failure	BEARING FAILURE	1FUYDSZB3YLF06032	385007	400000	IB SEAL LEAK - INGRESS	Valid
Chater , noisy, vibration	NOISE/VIBRATION	1FUYSXYB0YLB40034	391382	400000	TAMPERING	Invalid
Corroded & rust	CORROSION/RUST	1FUYSXYB7YLB40032	278902	300000	IB SEAL LEAK - INGRESS	Valid
Noise and vibration in front	NOISE/VIBRATION	M1AA12Y5YW123599	209797	250000	IB SEAL LEAK - INGRESS	Valid
	NO INFO				UNKNOWN	Invalid
Hub bearing binds & stick	BIND/STICK	1FUYDDYB6YLB05748	191161	200000	WATER INTRUSION ALON	Invalid
Too much play/leaking	ENDPLAY/LOOSE	1FUYSDYB6WP917799	304315	350000	UNHARDENED RW	Valid
Hub bearing broken	BROKEN/SEPARATED B	1FUYSSZB5YLA92032	346050	350000	UNKNOWN	Invalid
Hub bearing noisy & rattl	NOISE/VIBRATION	1FUYSSZBXYLB86102	460061	500000	OPEN	OPEN
Seal leaking	LEAK	1M1AA18YXYW121483	251046	300000	IB SEAL DAMAGED	OTHER
Hub bearing rough	NOISE/VIBRATION	2HSFMAHR5YC032039	284297	300000	IB SEAL LEAK - INGRESS	Valid
Hub bearing rough	NOISE/VIBRATION	2HSFMAHR5YC032039	284297	300000	WATER INTRUSION ALON	Invalid
	NO INFO				UNKNOWN	Inconclusive
Broken	BROKEN	1FUPCSZB5YPB62016	308355	350000	LOW CLAMP LOAD	Invalid
Binds & Sticks - Leaking	LEAK	1FUYSDYB4XPA31291	331718	350000	NO PROBLEM FOUND	Invalid
Hub bearing broken	BROKEN/SEPARATED B	1FUYSSEB4YPF80354	233800	250000	IB SEAL LEAK - INGRESS	Valid
Front axle hub loose	LOOSE HUB	1FUYSSZB1YLB54929	386207	400000	IB SEAL LEAK - INGRESS	Valid
Noise/tire wear	NOISE/VIBRATION	2HSCNAER9YC053562	145715	150000	NO PROBLEM FOUND	Invalid
Binds & sticks	BIND/STICK	1FUYSDYBXYLA55443	258767	300000	LOW CLAMP LOAD	Invalid
Bearing failure	BEARING FAILURE	1XP5D69X44YD509427	304476	350000	UNKNOWN	Inconclusive
Seal Leak	LEAK	2HSFHAMR5YC024047	11821	50000	IB SEAL LEAK - EGRESS	Valid
Worn	WORN BEARING/HUB	2HSFTAER0YC043108	166851	200000	IB SEAL LEAK - INGRESS	Valid
	NO INFO				IB SEAL LEAK - INGRESS	Valid
Front axle bearing worn	WORN BEARING/HUB		403200	450000	IB SEAL LEAK - INGRESS	Valid
LS hub faulty	BEARING FAILURE		346177	350000	WATER INTRUSION ALON	Invalid
Front axle, hub bearing nois	NOISE/VIBRATION	1FUYSSEB3YLA80791	308528	350000	IB SEAL LEAK - INGRESS	Valid



Steer Hubs Only

SKF 002088

Includes all weeks even when trailer hubs made



SKF 002089

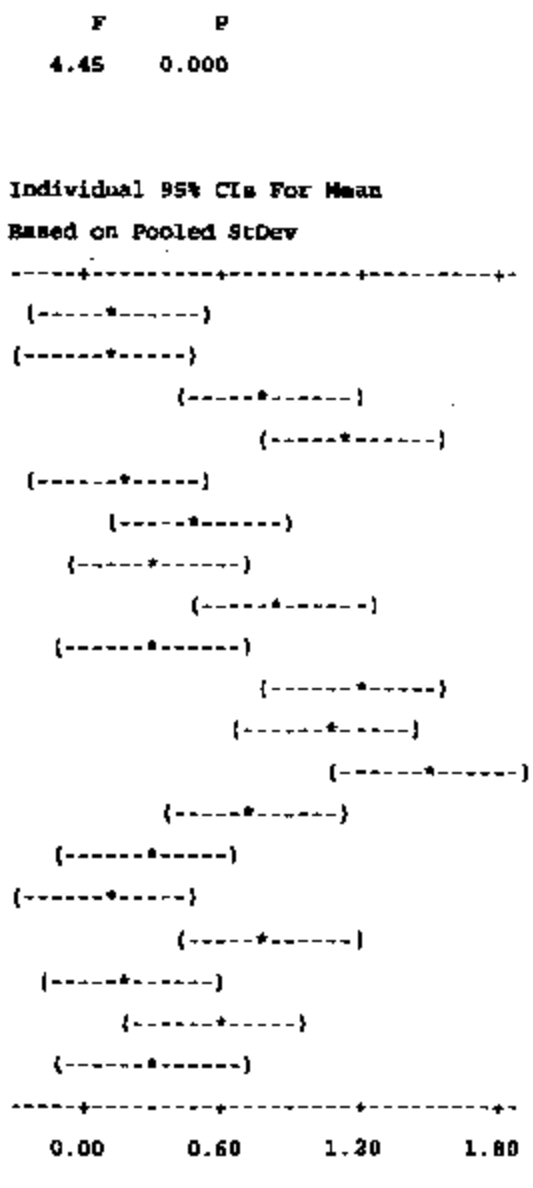
One-way ANOVA: Warranty [redacted] Includes all weeks even when trailer hubs made

Analysis of Variance for Warranty

Source	DF	SS	MS	F	P
YrMonth	18	98.91	5.50	4.45	0.000
Error	555	684.74	1.23		
Total	573	783.65			

Level	N	Mean	StDev
199806	30	0.133	0.346
199807	31	0.097	0.396
199808	31	0.806	0.980
199809	30	1.167	1.234
199810	32	0.156	0.369
199811	30	0.500	0.974
199812	31	0.323	0.832
199901	29	0.862	1.187
199902	26	0.308	0.618
199903	31	1.194	1.682
199904	30	1.067	2.243
199905	28	1.500	2.317
199906	31	0.742	0.815
199907	31	0.290	0.529
199908	32	0.094	0.296
199909	31	0.806	1.014
199910	31	0.194	0.477
199911	31	0.581	1.119
199912	28	0.321	0.863

Pooled StDev = 1.111

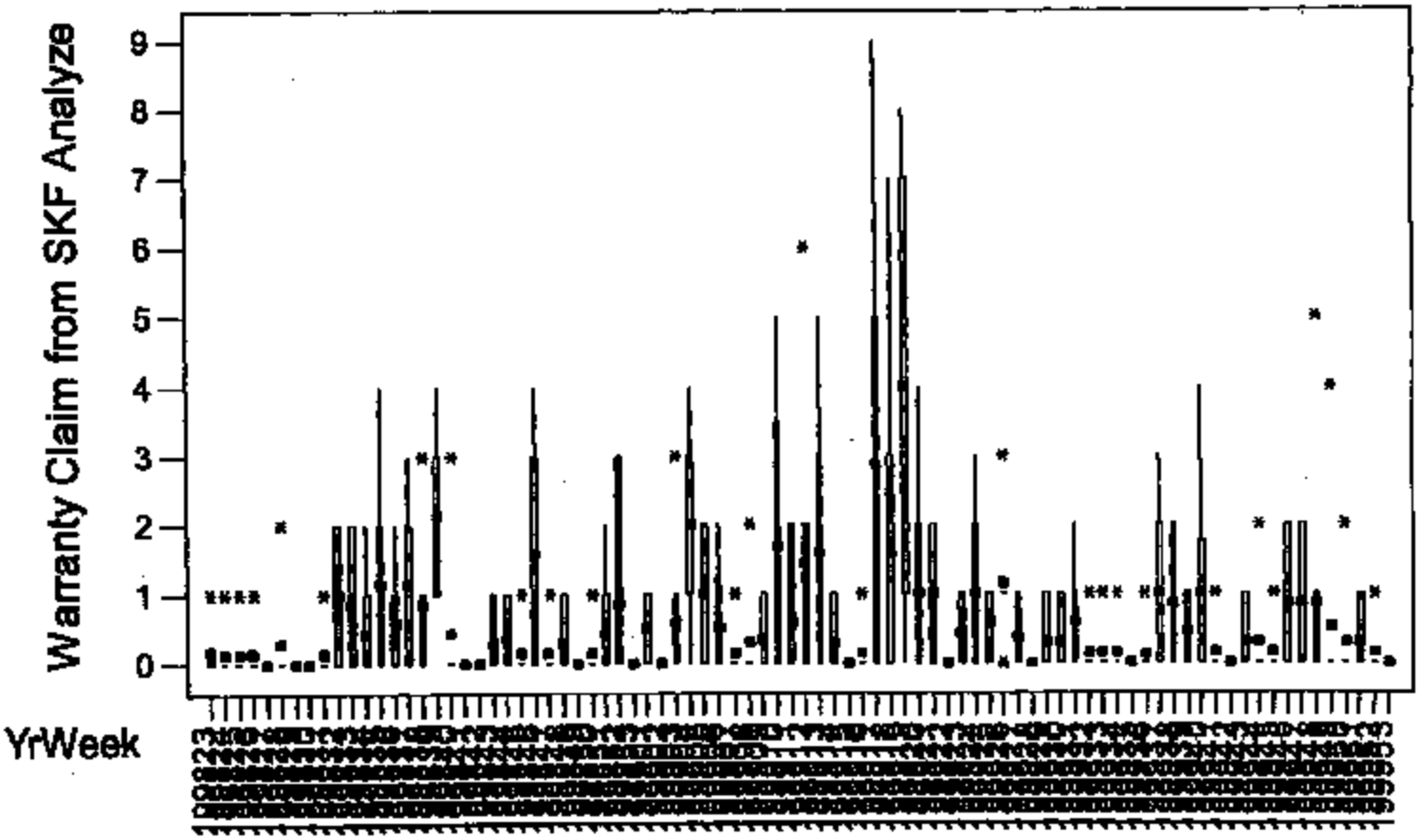


SKF 002090

Includes all weeks even when trailer hubs made

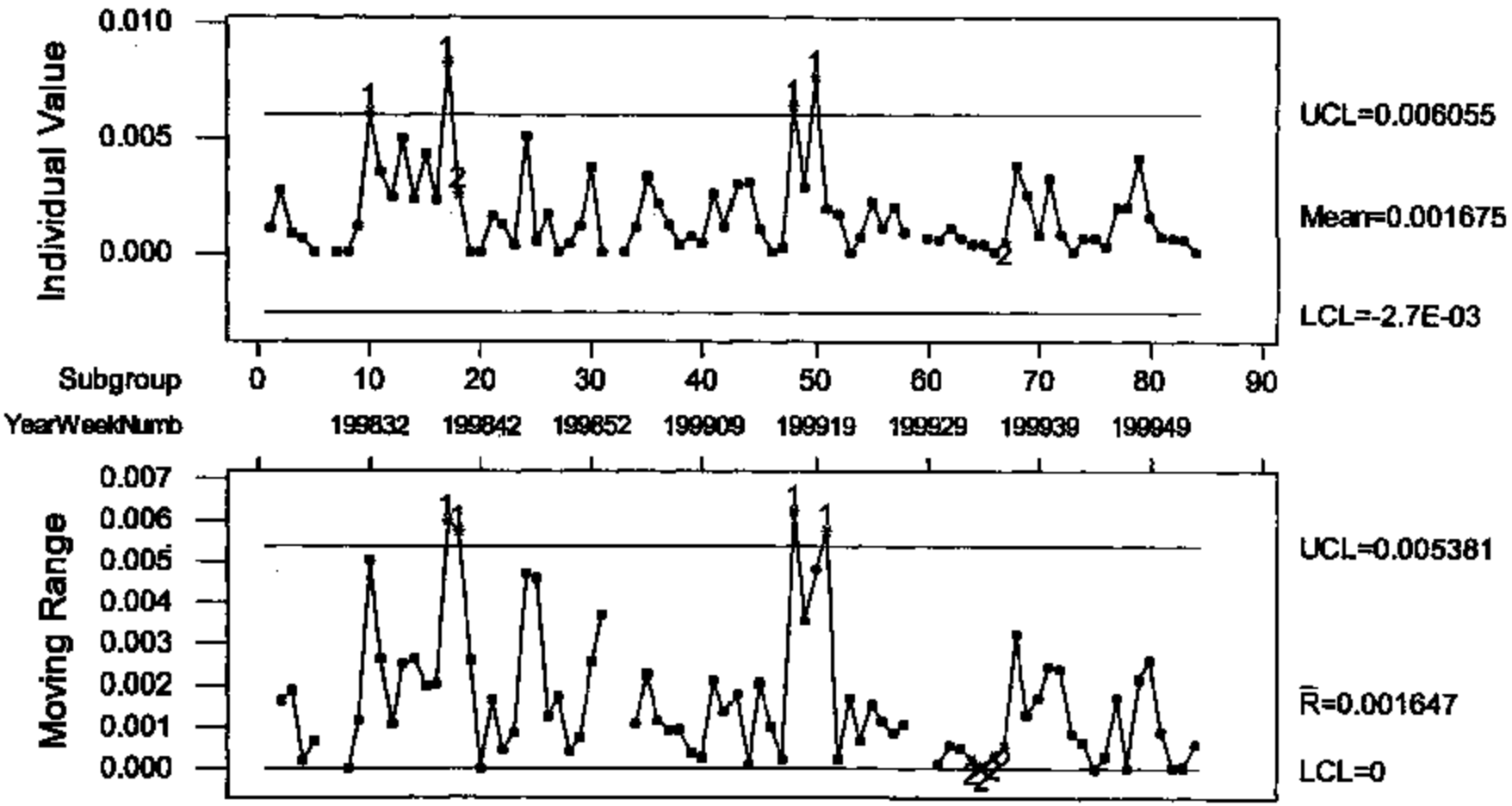
Boxplots of Warranty by YrWeek

(means are indicated by solid circles)



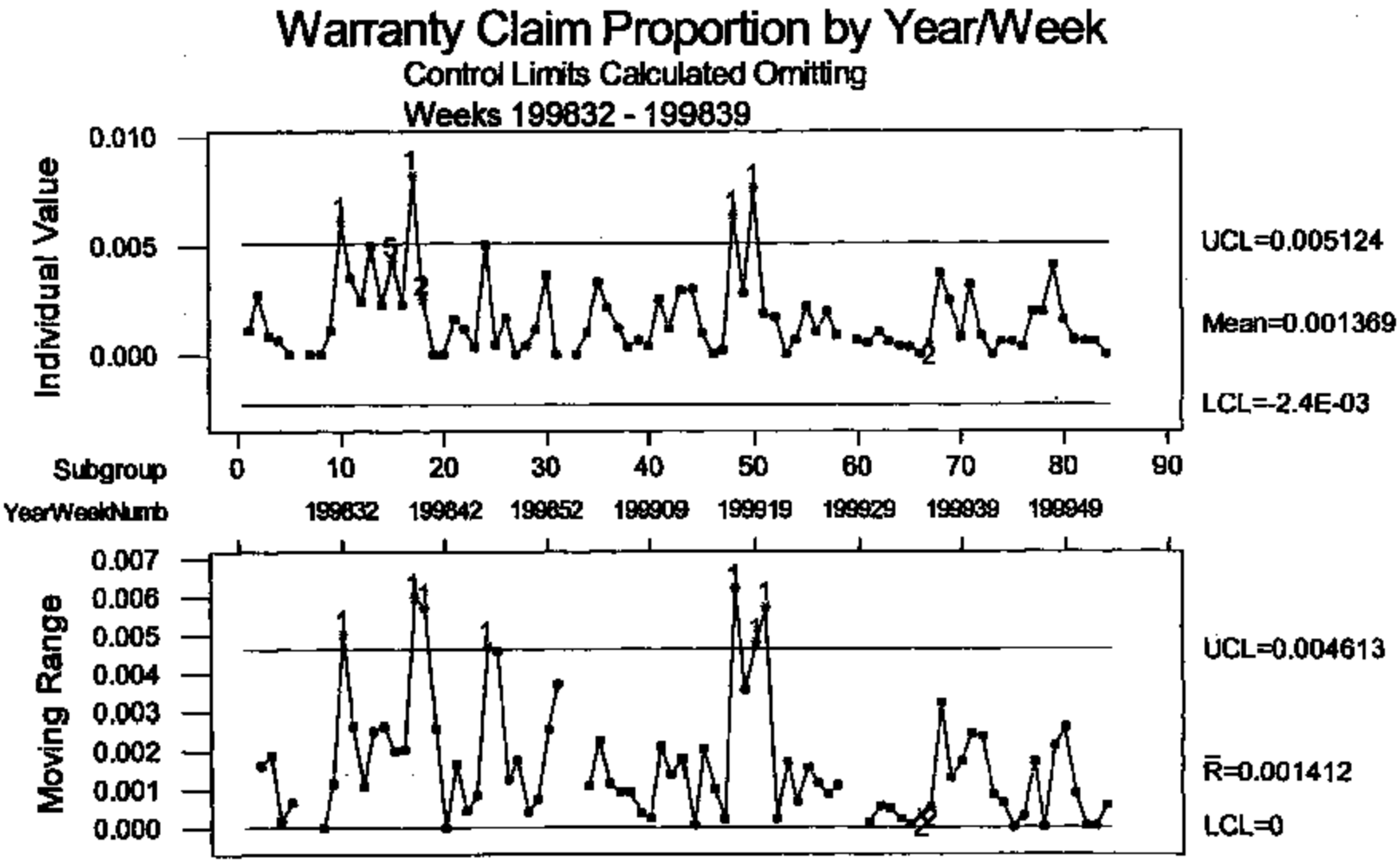
Includes all weeks even when trailer hubs made

Warranty Claim Proportion by Year/Week



SKF 002092

Includes all weeks even when trailer hubs made



SKF 002093

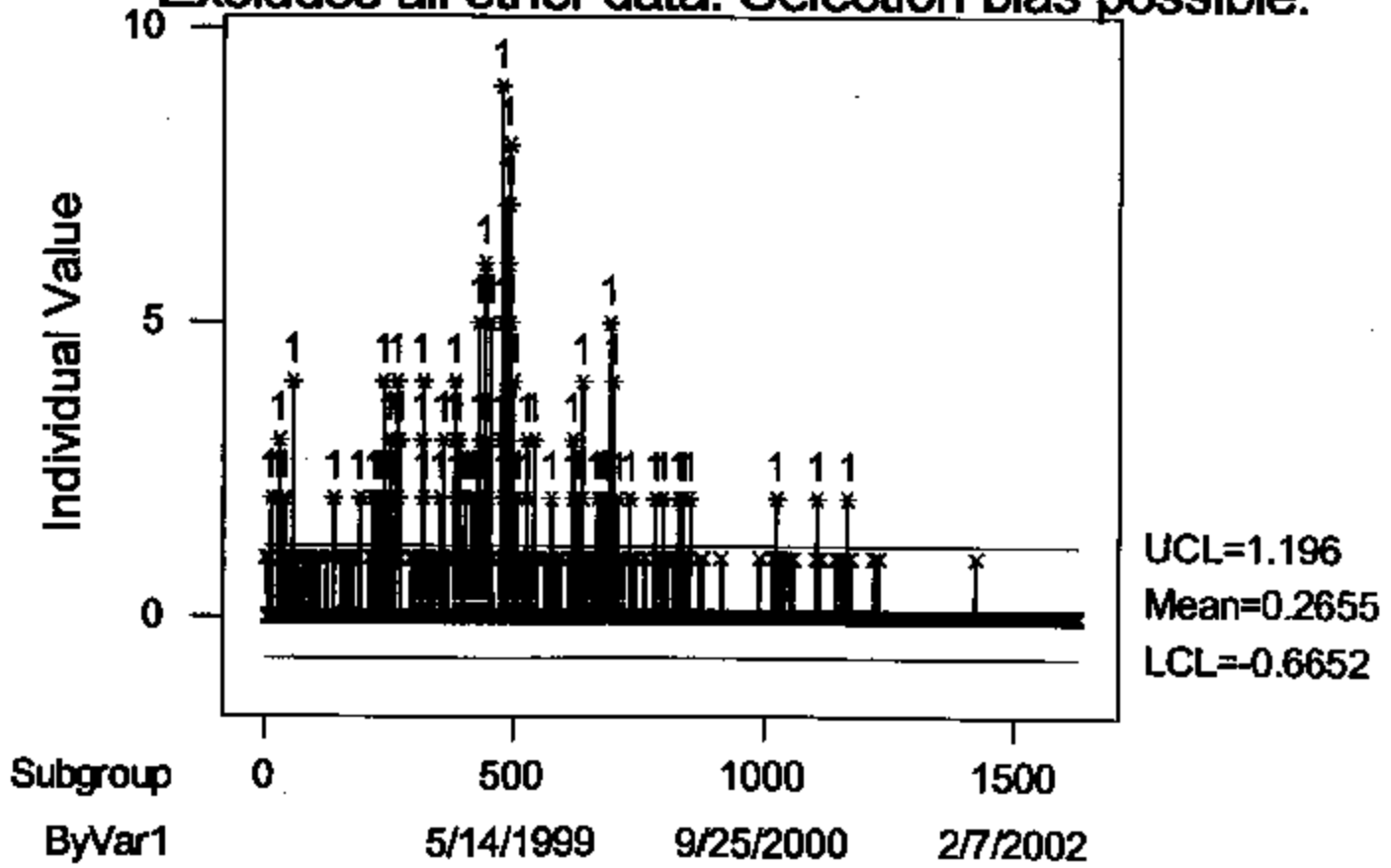
Includes all weeks even when trailer hubs made

Analysis of Warranty by Hub Production Date 6/26/02

Claims By Calendar Date

Warning - Data includes SKF analyzed with hub production date

Excludes all other data. Selection bias possible.



SKF 002094

Response to Main Document	Subject:	R-Safe Seal yield from Bethlehem
Rick P Morrow/AMER/SKF 07/19 11:31 AM	Response to:	Statistical Evaluations
	Category:	Statistics

Rick P Morrow
07/16/2002 11:06 AM

To: Robert J Bondy/DET/SKF@SKF
cc: Juergen Schultheis/SCH/SKF@SKF, Christopher Jones/AMER/SKF@SKF, Bernd Stephan/SCH/SKF@SKF, William J Farrell/ELG/SKF@SKF, Aurelio Nervo/VLN/SKF@SKF, Richard W Frett/ELG/SKF@SKF, Edward F Cotter/AMER/SKF@SKF, Bruce Weeks/AMER/SKF@SKF, Michael D Lewis/DET/SKF@SKF

Subject: Re: notification to the customer of R-safe defect rate.

The potential failure rate of hubs in the future is what you are asking, I believe for Chuck. Given that water ingress is a factor and exposure to water is required for the majority of the hub failures, 2% may be reasonable. If the probability of failure of the R-Safe Bethlehem hub is no worse in the earlier lots than the lots we sampled, the failure rate is no greater than the total warranty return rate.

However, we should clarify that the yield on the R-Safe seal is different than the 2% according to Elgin's study of the Bethlehem seal.

Here is why. However, the seals themselves show a higher failure rate than the 2% mentioned. The defective seals from Bethlehem and sufficient water prior to self-healing I could not reproduce the 2% number. I believe Bob's mention of a 50 piece sample below was Hans Kirch's small sample of 50 seals of unknown origin having 1 defect.

Don Nowak, Engineering Manager at Elgin, and I estimate 12% for potential functional defects with water exposure early in the life of the seal (Bob's comment on self-healing is a very factual and important addition to any statement on potential failure rate.) I also recommend that we mention other factors must be present to result in failure. The number one factor is probably sufficient water exposure prior to self-healing.

Again - no one has been able to provide samples form earlier Bethlehem lots to project probability of failure from all Bethlehem production. Self-healing of the defects we have seen, luckily, have probably occurred by now on those seals.

Our study is below. Please call me for any clarification or support.

Rick P Morrow
07/09/2002 08:59 AM

To: Michael D Lewis/DET/SKF@SKF, William J Farrell/ELG/SKF@SKF, David M Simms/ELG/SKF@SKF
cc: Richard W Frett/ELG/SKF@SKF

Subject: Probability of R-Safe failures in the field. Follow-up to the "2%" finding.

As you can read below, I would like to assist us in answering Chuck Smith's questions on the R-Safe Bethlehem seals in a timely manner. He specifically asked me to ensure SKF is telling him the number of R-Safe seals from Bethlehem that may cause problems. The best estimate Don Nowak and I have is 12% from the sample from Bethlehem that Elgin received. This is a higher number than what Hans and Juergen have suggested. I state that this may not represent the population of seals because we have not received samples across all production lots.

The other question you all know is when will SKF validate the root causes of the hub units? I sent my suggestions earlier.

What can I do to support us with Chuck? I will be available to discuss how Chuck may react to this info on the R-Safe and what we can do to mitigate issues.

---------- Forwarded by Rick P Morrow/AMER/SKF on 07/09/2002 08:45 AM ----------

Rick P Morrow
07/05/2002 11:03 AM

To: Juergen Schultheis/SCH/SKF@SKF
cc:

Subject: Probability of R-Safe failures in the field. Follow-up to the "2%" finding.

Juergen, I am afraid that Claes is out and you need this latest info now. I have not sent this to Aurelio or to Hans.

Please contact me so we can discuss.

Thanks.

---------- Forwarded by Rick P Morrow/AMER/SKF on 07/05/2002 10:58 AM ----------

Rick P Morrow
07/03/2002 09:37 AM

To: Claes Rehnberg/GHQ/GOT/SKF@SKF
cc: Richard W Frett/ELG/SKF@SKF

Subject: Probability of R-Safe failures in the field. Follow-up to the "2%" finding.

The 5 sample that Aurelio has was from the 100 piece random from the known bad 429 sample of the 529 population sample from the 4,000 Bethlehem inventory. 3 of the 100 samples were later eliminated from the survey because they may have been damaged during the sampling.

Therefore, these seals were considered defective and Aurelio was to reproduce that finding or reject.

The greater percentage of failures evidenced from the leaktest are from the cut primary lip cause. If the leaktest best reproduces the impact on the truck performance, then cut lip alone is sufficient to cause ingress of air and presumably water.

25 of 97 seals from the Bethlehem sample noted above failed leak test.

8 of these had both axial and primary lip functional defects.

4 seals had only axial lip defects.

21 of the 25 had the cut lip defect (Note that these may also be included in the 8 with both lip defects).

If the water ingress failure mode is of major concern, then this mode is only expected for the 4 + 8 seals with the axial lip failure. Having only a primary lip failure would not be expected to result in the water ingress failure in the field when the axial lip is not defective. This suggests the more probable root cause of water ingress is an axial and/or axial and primary lip defect. The probability is 12/97 = 12.4%.

We still can not be confident of this probability across all Bethlehem production because we only sample one lot produced by Bethlehem and the axial lip defects could be set-up dependent, operator dependent and other non-random dependent.

The leaktest fills the cavity between the axial and primary lip area. This is the best known method to reproduce a sealing failure. The MSA has proven leaktest is capable knowing that severely defective seals result in discrimination issues within n MSA of this type. It is not known if all leaktest failures would 100% result in field failures. Again, it is the best reproduction known and is used by seal manufacturers and customer in a variety of applications.

Robert J Bondy

Robert J Bondy
07/18/2002 10:29 AM

To: Juergen Schulthels/SCH/SKF@SKF, Christopher Jones/AMER/SKF@SKF, Rick P Morrow/AMER/SKF@SKF, Bernd Stephan/SCH/SKF@SKF, William J Farrell/ELG/SKF, Aurelio Narvo/VLN/SKF@SKF, Richard W Frett/ELG/SKF@SKF, Edward F Cotter/AMER/SKF@SKF
cc: Bruce Weeks/AMER/SKF@SKF, Michael D Lewis/DET/SKF@SKF

Subject: notification to the customer of R-safe defect rate.

Gentlemen

Chuck Smith wants an answer to the R-safe spill rate from Bethlehem.

Unless otherwise instructed this is what I'm going to tell Mr. Smith

Our estimate of the exposure rate is 2% maximum that leaked into the field. We conducted two independent evaluations on samples of 50 and found 1 piece in each sample with a two lip defect. Because of the self healing properties of the seal we expect the number of failures related to the seal to be less than 2%. The total population is 99093 seals which means we expect a maximum of 2000 hubs to fail early.

We propose that we increase inspections on these items to every 50,000 miles per TP0251. Southwest research is indicating that we will be able to detect these failures.

Bob

---------- Forwarded by Robert J Bondy/DET/SKF on 07/18/2002 11:04 AM ----------

Charles.Smith@ArvinMeritor.com on 07/17/2002 10:42:56 AM

To: Robert.J.Bondy@skf.com
cc: Thomas.Sanko@ArvinMeritor.com, Dale.Bell@ArvinMeritor.com
Subject: Data

FF981 Database Analysis, cls.

Bob

Attached are the most recent charts for Aiken Failures. Worksheet one (charts in this sheet) and two are up to date through yesterday, the rest have not been updated.

The charts show a serious increase in R-Safe seal failures. Based on implementation date for this seal and Aiken production dates, it appears that the failures begin with the implementation date of the seal. This indicates that the degradation of the seal molding tool had little to do with the failure mode, as the failures began with the first production run. Note on the rate chart that the worst R-safe rate is approaching the worst period in May 1999 for axial clearance failures, and the data indicates that these failures are all low mileage.

I must impress on you that ArvinMeritor needs to know the exposure that this defect will give us based on the acceptance criteria used at CR Bethlehem. We need to know the estimated spill rate. We need it now, more delays can not be tolerated.

Chuck

<<FF981 Database Analysis, cls.xls>>

Response
to Main Document

Rick P Morrow/AMER/SKF
07/22 12:04 PM

Subject:	R Safe Leaktest MSA
Response to:	Statistical Evaluations
Category:	Statistics

THU R Safe MSA.ppt

Gage R&R for Leak Test R-Safe Elgin

Results for: Worksheet 6

Attribute Gage R&R Study

Attribute Gage R&R Study for Data

Date of study: 7/16/02

Reported by: D. Nowak

Name of product: R Safe

Misc:

Within Appraiser

Assessment Agreement

Appraiser	# Inspected	# Matched	Percent (%)	95.0% CI
Don	8	8	100.0	(68.8, 100.0)
Karen	8	8	100.0	(68.8, 100.0)

Matched: Appraiser agrees with him/herself across trials.

Between Appraisers

Assessment Agreement

# Inspected	# Matched	Percent (%)	95.0% CI
8	8	100.0	(68.8, 100.0)

Matched: All appraisers' assessments agree with each other.

Response

to Main Document

Rick P Morrow/AMER/BKF
10/09 02:06 AM

Subject: THU Proportion of claims Vs Alken Production Data

Response to: Statistical Evaluations

Category: Statistics

Steer THU RM Oct 2002 and 6 27.p

THU Steer Analysis
10/8/02
Includes June 2002 analysis

Warranty Problems from 6/1/98 – 12/31/99

Data Sources

Aiken production quantities by type of hub by month

Warranty info refreshed 10/02 by Bob Bondy, Mike Lewis and others against

Aiken Hub Production Date

Hypotheses

1. Null H_o:There are no significantly higher proportions of warranty problems by Aiken Hub production date. Specifically highlighting July – Sept. 1998 and April, May 1999

H_a: There are significantly higher proportions

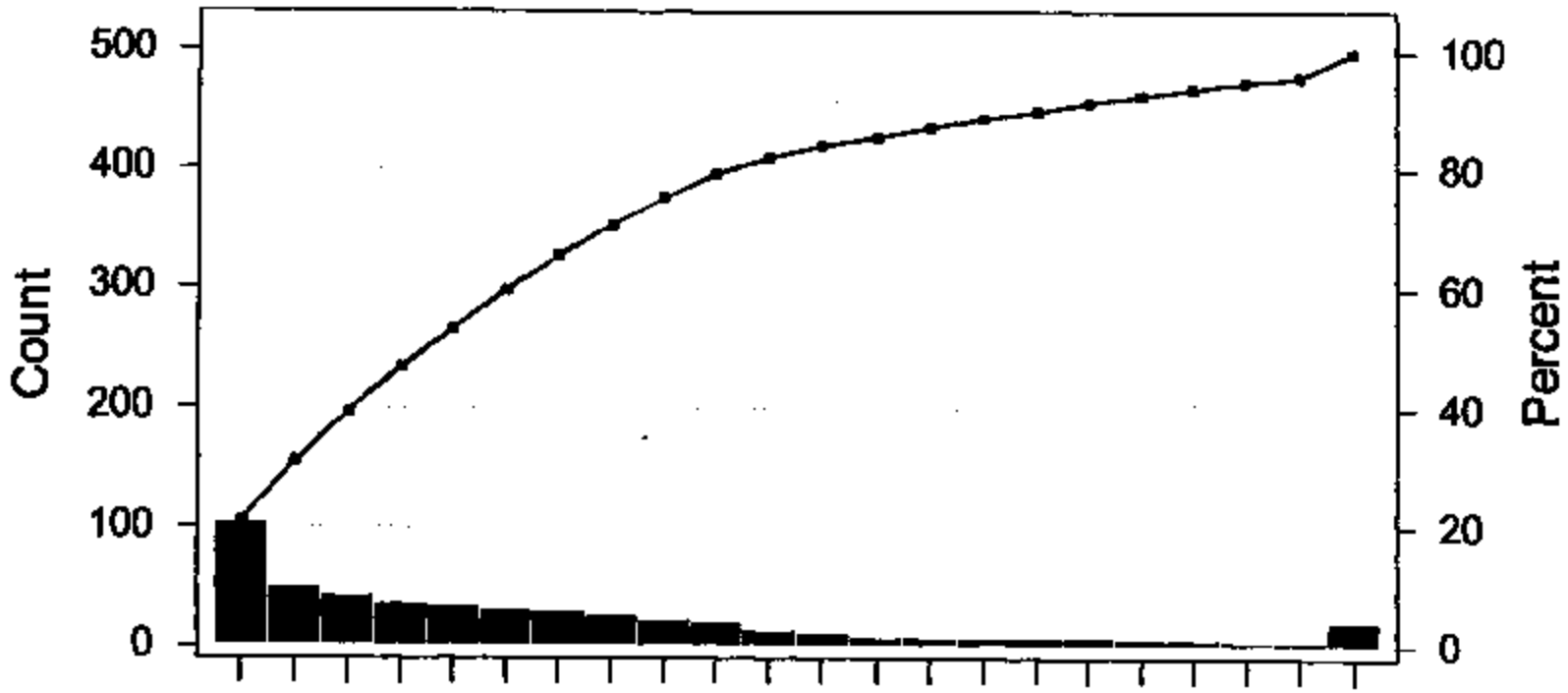
This study again confirmed reason to reject the null. These dates correlate with higher proportions of claims than other dates before and after.

1. Null H_o: The mean miles to failure is independent of date of hub production

H_a:The mean miles to failure is not independent of date of hub production

This study again confirmed reason to reject the null. The mean miles to failure correlate with these suspect dates Vs dates before. Control Group included only dates before the Suspect Group due to probability immaturity would eventually show lower Mean miles to failure.

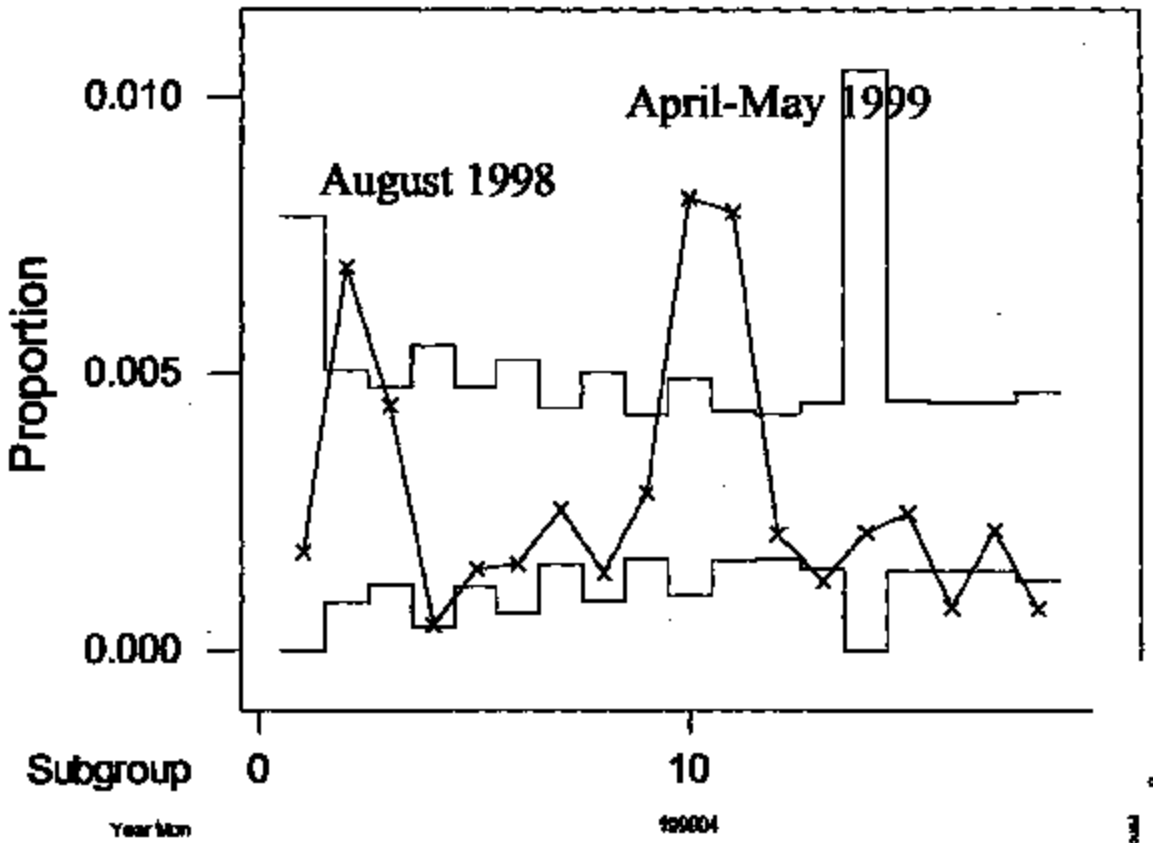
Count of Claims by Year and Month



Defect	199905	199904	199808	199903	199809	199905	199901	199909	200102	199911	199907	199811	199910	200005	199812	199912	200003	199902	200010	200001	200011	Others
Count	104	50	42	37	33	31	29	26	22	21	13	10	8	8	7	7	7	6	6	5	5	20
Percent	21	10	8	7	7	6	6	5	4	4	3	2	2	2	1	1	1	1	1	1	1	4
Cum %	21	31	39	47	54	60	66	71	75	79	82	84	86	87	89	90	92	93	94	95	96	100

SKF 002105

P Chart Proportion Claims Against Hub Production Qty for Aiken Production Year Month

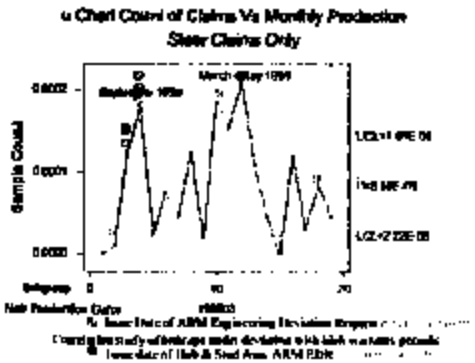


Conclusion:
Reject null and accept alternative that there are weeks of significantly higher proportions of claims evidenced by proportions beyond upper control limits.

UCL=0.004649

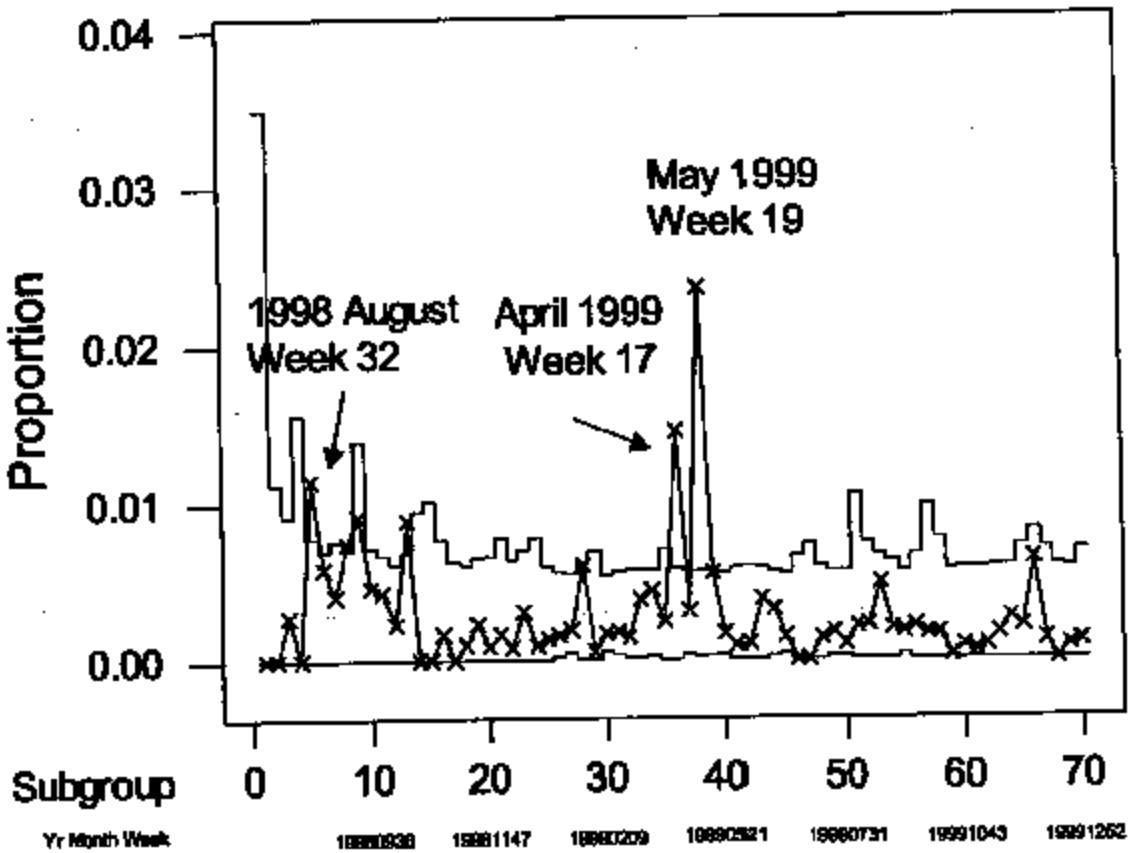
$\bar{P}$=0.002971

LCL=0.001292



SKF 002106

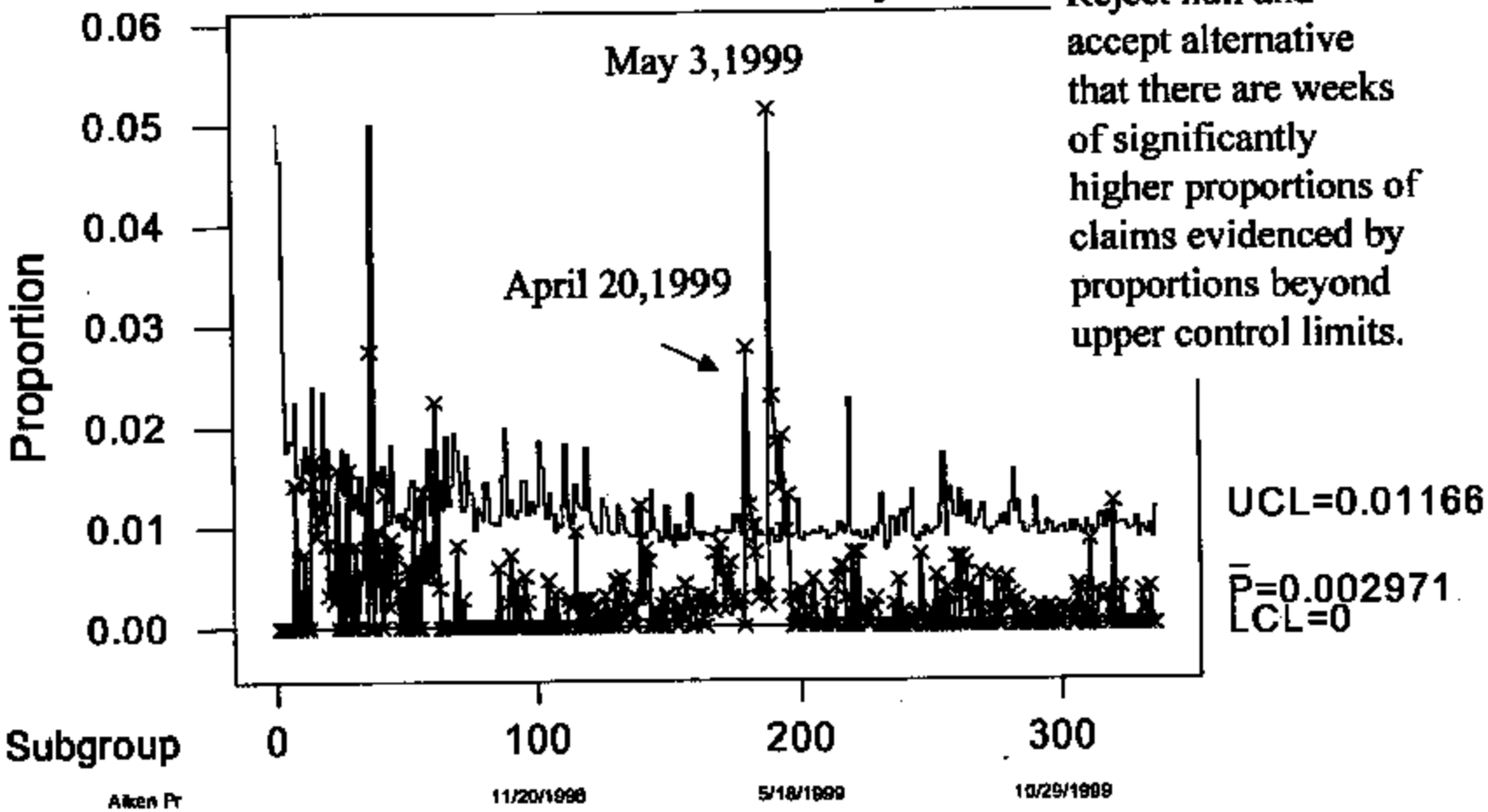
P Chart Proportion of Claims Against Hub Production Qty for Aiken Production Year Month Week



Conclusion:
Reject null and accept alternative that there are weeks of significantly higher proportions of claims evidenced by proportions beyond upper control limits.

UCL=0.006941
$\bar{P}$=0.002971
LCL=0

P Chart Proportion Claims Against Hub Production Qty for Aiken Production Day

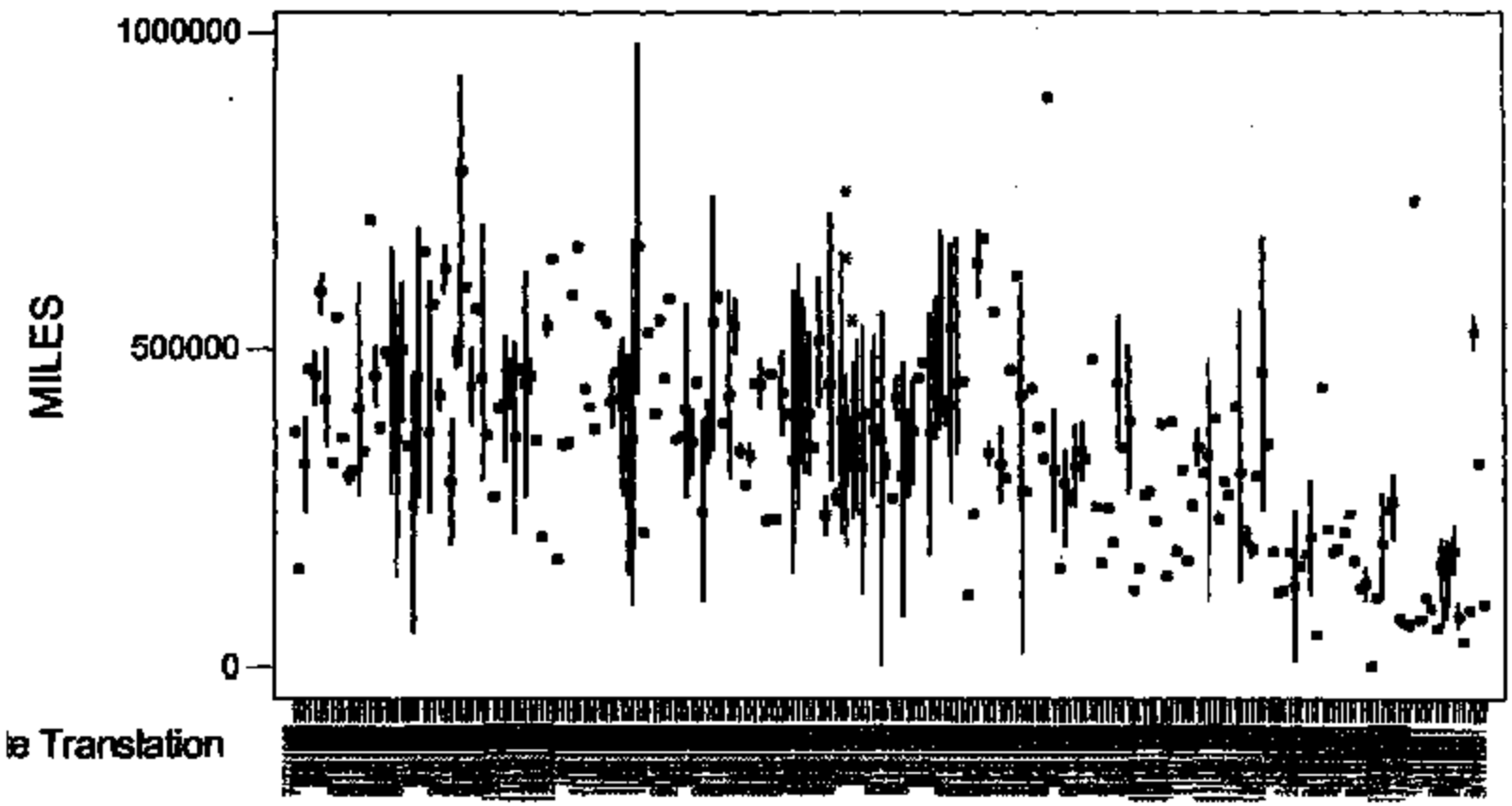


Conclusion:
Reject null and accept alternative that there are weeks of significantly higher proportions of claims evidenced by proportions beyond upper control limits.

SKF 002108

Mean Time To Failure

Significantly



SKF 002109

Null Hypothesis: Mean Miles to Failure independent of Days of April 20-22 and May3-7 of 1999 than all other Dates Prior to April,1999

One-way ANOVA: MILES versus Group

P<.05, therefore reject Null. Mean Miles to Failure are not independent of periods. April and May of 1999 has lower mean miles to failure than dates prior.

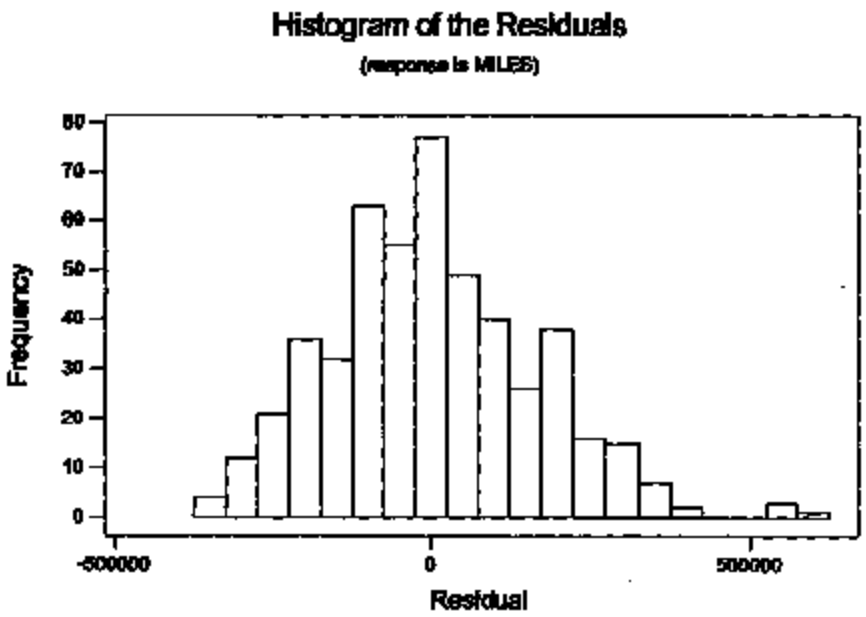
Analysis of Variance for MILES

Source	DF	SS	MS	F	P
Group	1	2.735E+11	2.735E+11	13.69	0.000
Error	301	6.014E+12	1.998E+10		
Total	302	6.288E+12			

```
                                    Individual 95% CIs For Mean
                                    Based on Pooled StDev
Level       N      Mean     StDev  -------+---------+---------+---------
Control   188    428466    150486                          (------*------)
Suspect   115    366553    124929   (-------*--------)
                                    -------+---------+---------+---------
Pooled StDev =   141351               360000    390000    420000
```

Suspect = April 20-22 – May 3- 7, 1999

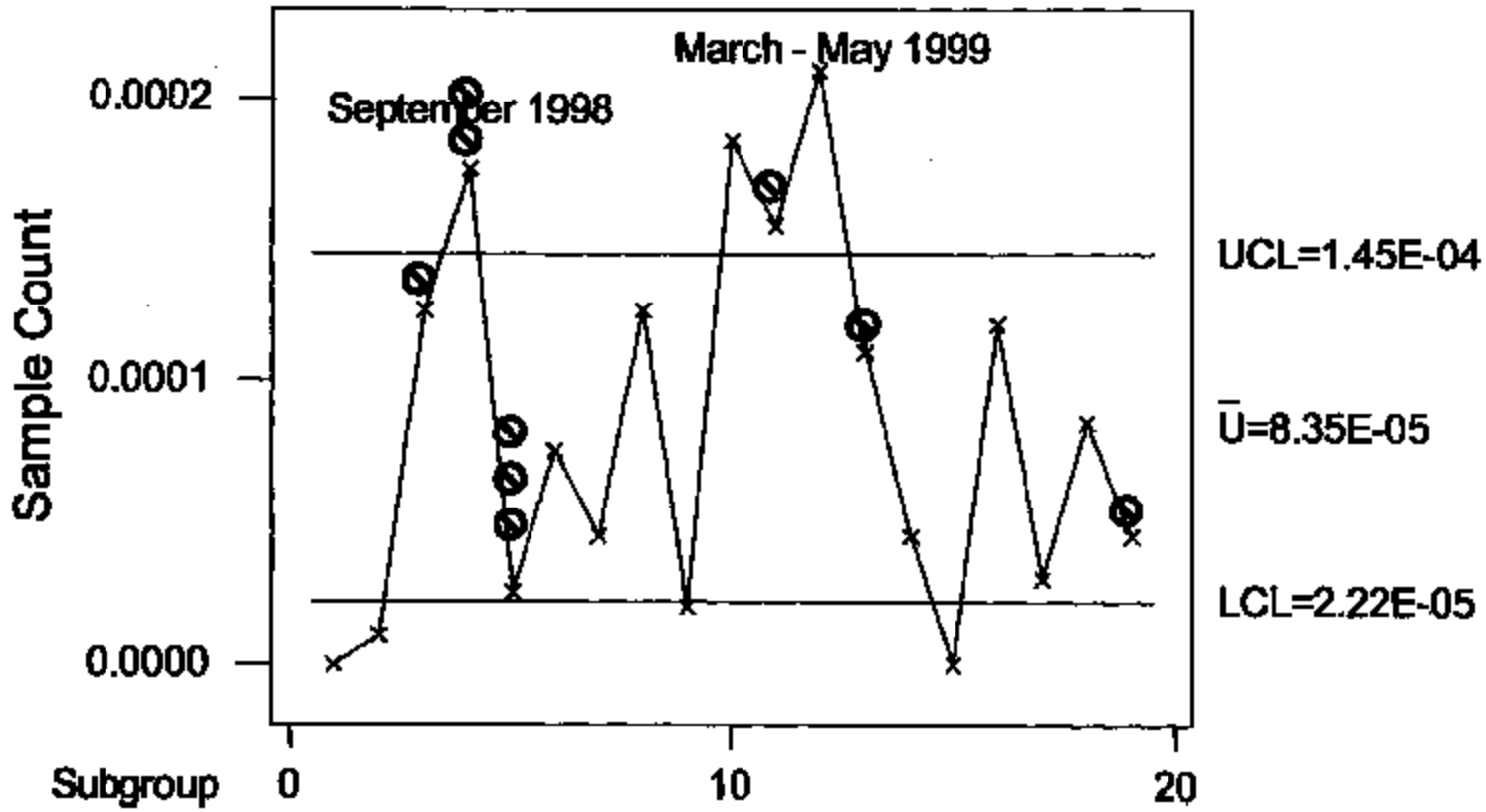
SKF 002110


Histogram of the Residuals
(response is MILES)
Frequency
0
10
20
30
40
50
60
70
80
-500000
0
500000
Residual

Analysis 10/8/02

- Reject the Null Hypotheses and Accept Alternatives. Therefore, proportion of claims is not independent of Aiken production date.
- Confirms April 20,1999, May 3,1999 and other dates within these weeks had significantly higher proportions in claims than other periods.
- This is a correlation only with this data – does not mean causation

u Chart Count of Claims Vs Monthly Production
Steer Claims Only



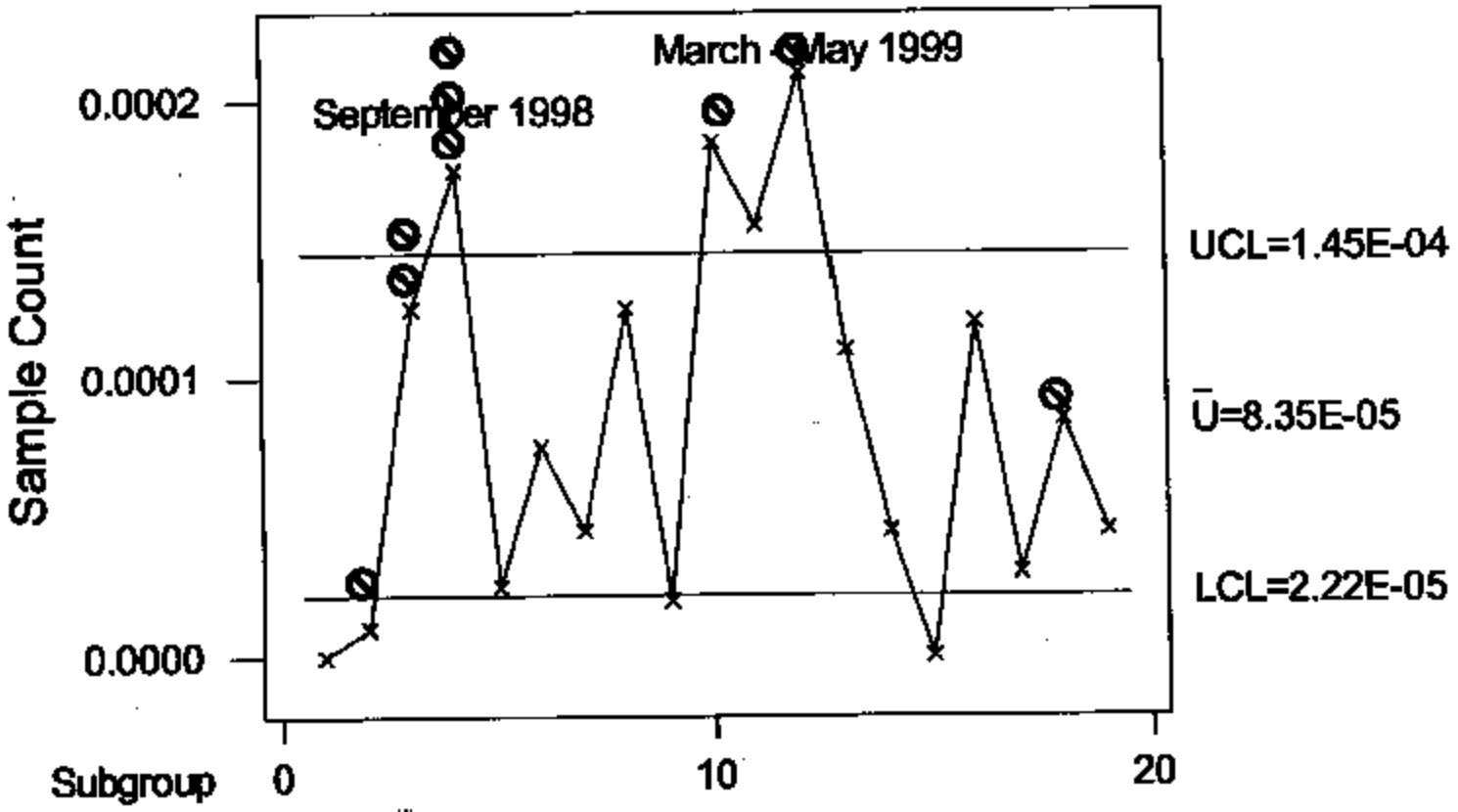
Hub Production Dates

Issue Date of ARM Engineering Deviation Request
Correlation study of hubcaps under deviation with high warranty periods

Issue date of Hub & Stud Assy ARM EDR

SKF 002113

u Chart Count of Claims Vs Monthly Production
Steer Claims Only



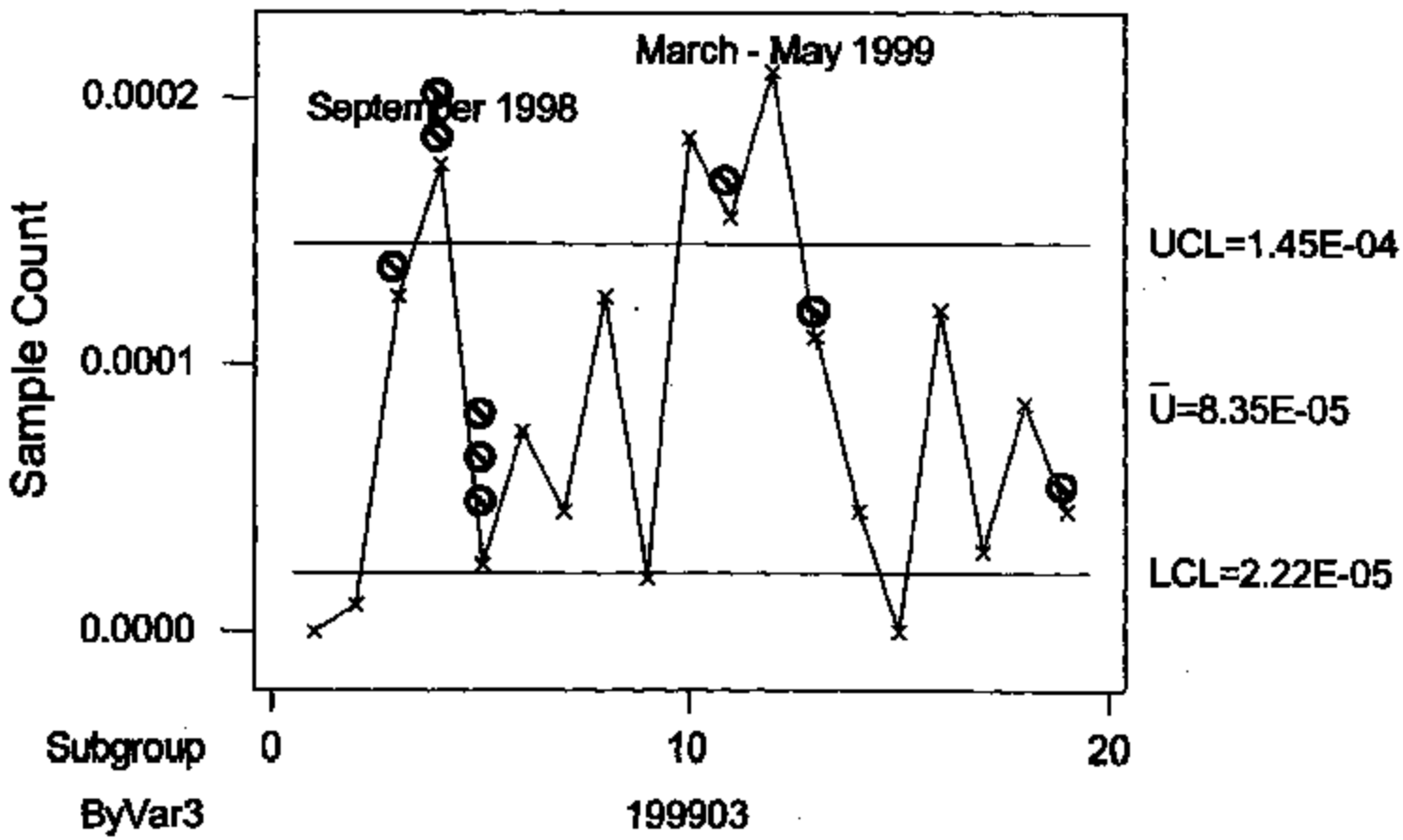
Hub Production Dates

⊘ Issue Date of ARM Engineering Deviation Request minus one month.

Correlation study of hubcaps under deviation with high warranty periods

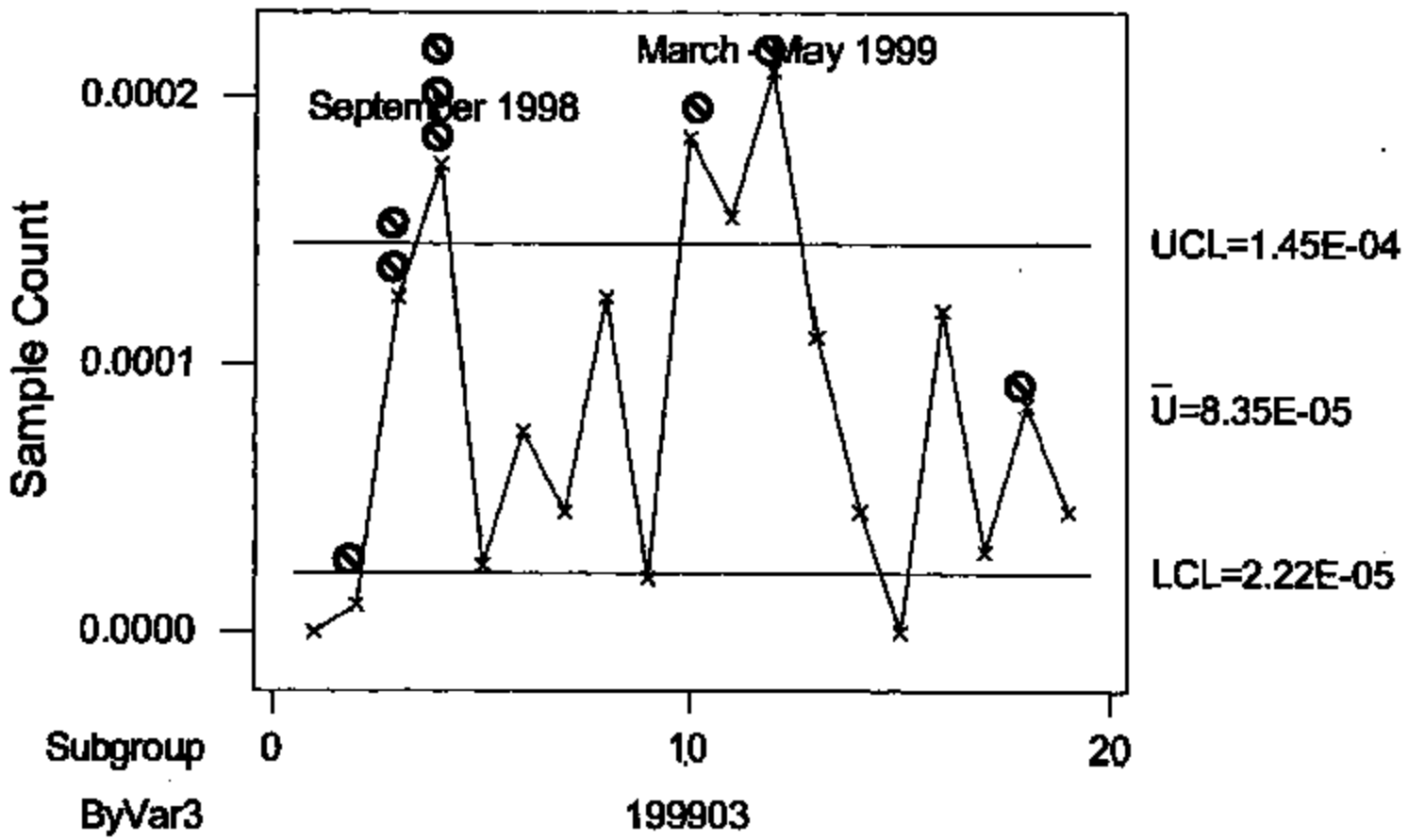
⊘ Issue date of Hub & Stud Assy ARM EDR minus one month

u Chart Count of Claims Vs Monthly Production



SKF 002115

u Chart Count of Claims Vs Monthly Production



SKF 002116

Analysis 6/27/02

- Mike Lewis requested analysis of Chuck Smith's suggestions that "Aiken" had several periods of high failure. In addition, Chuck and Mike have requested help in determining hubs to retrieve from high warranty production periods. These answers are possible if someone can identify hubs within vehicle.
- Duane Gipe months ago identified several time periods that had a higher proportion of claims
- This study supports both analysts using the hub production date from the SKF analyzed returns database of only those claims when production date is listed. Therefore, there may be a selection bias. The Null hypothesis Ho1 is rejected.
- One or more parties (ARM, Aiken and Luechow) experienced abnormal variation during several weeks.
- I added the comments, root cause from SKF work and whether the claim was validated to support decisions on true root cause.
- Other hypotheses were tested and included. Sunday has a higher proportion of claims, for instance.
- Axial clearance hypothesis requires data on gage maintenance.
- Six Sigma analysis includes SPC and hypothesis testing. Further analysis is possible when data is available.
- FMEA is again recommended to direct root cause analysis

Chuck believes Aiken produced hubs went through two and maybe three periods of higher than normal failure rates. Julian dates 12098 -27398, 11099 - 14099 and possibly Aug and Sep 1999.

His hypothesis is an axial clearance gage cycled into a wear pattern after recalibrating. This gage was eventually permanently corrected and the higher than normal failure rates ceased. He believes this permanent correction occurred in November.

He described a peak and valley cycle in the axial clearance.

Null Hypotheses

Ho1: No time periods correlate with significantly higher warranty claims Vs Production Quantities

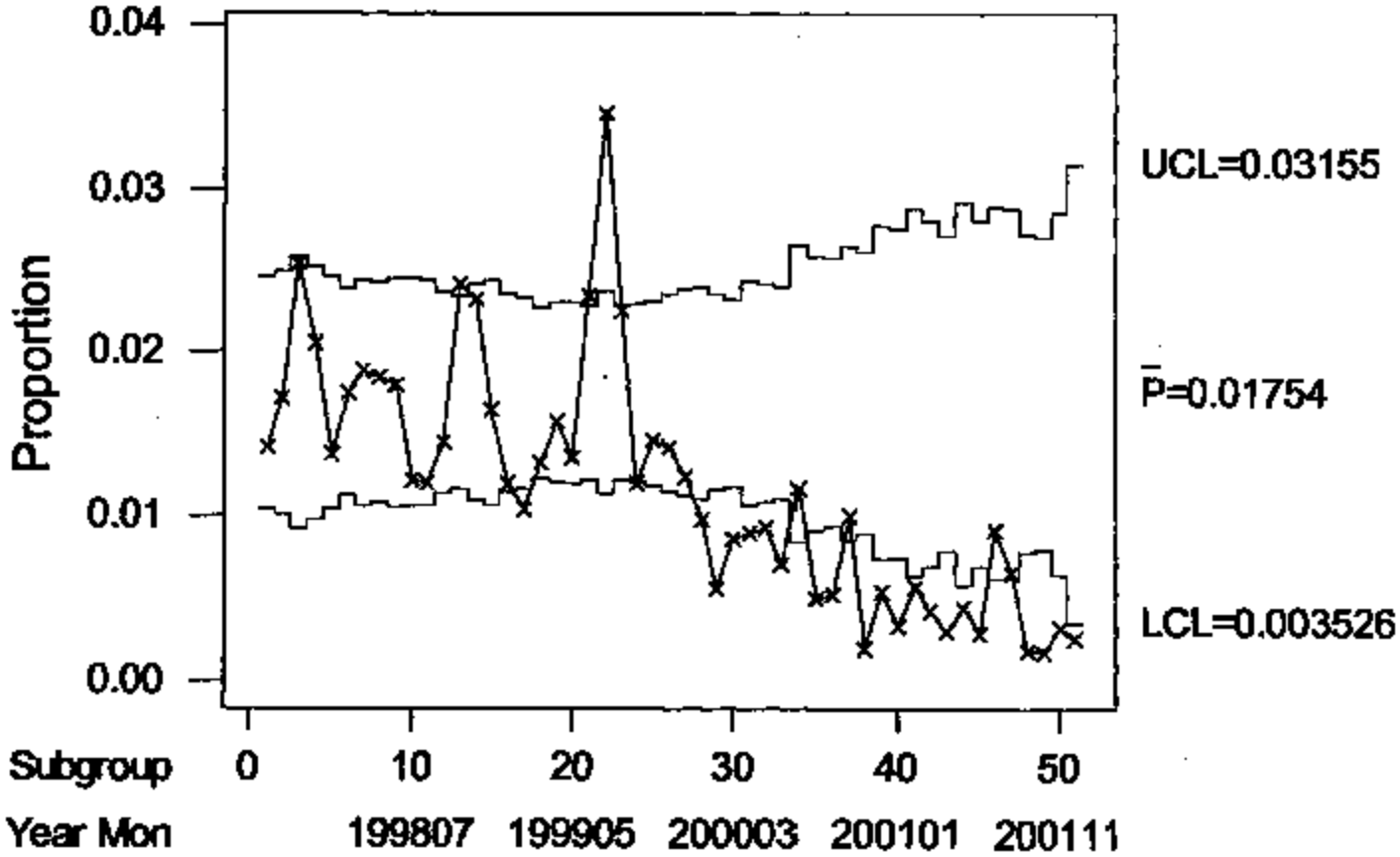
Ho2: Axial clearance gage performance does not affect proportion of claims

- Data Concerns/Notes
  - Selection bias may be present because claims missing build dates were excluded.
  - I have received no process measurement data to assist in identifying variation in Aiken.
  - Several claims were posted against hub build dates that showed zero production. Several analyses were run and this error was insignificant.
  - Immature data for periods after these studied due to Mean Time to Failure
  - Luechow hubs are included in one high proportion time period
  - Databases used were Aiken production quantities by day, the SKF analyzed returns database and the ARM database of 2,200 claims.
  - Claims were also shown for hub build dates that were identified as producing only trailer hubs.
  - No data is available from suppliers that may be tested for variation and correlation with claims.

Duane Gipe's original chart

Claims Vs Produced

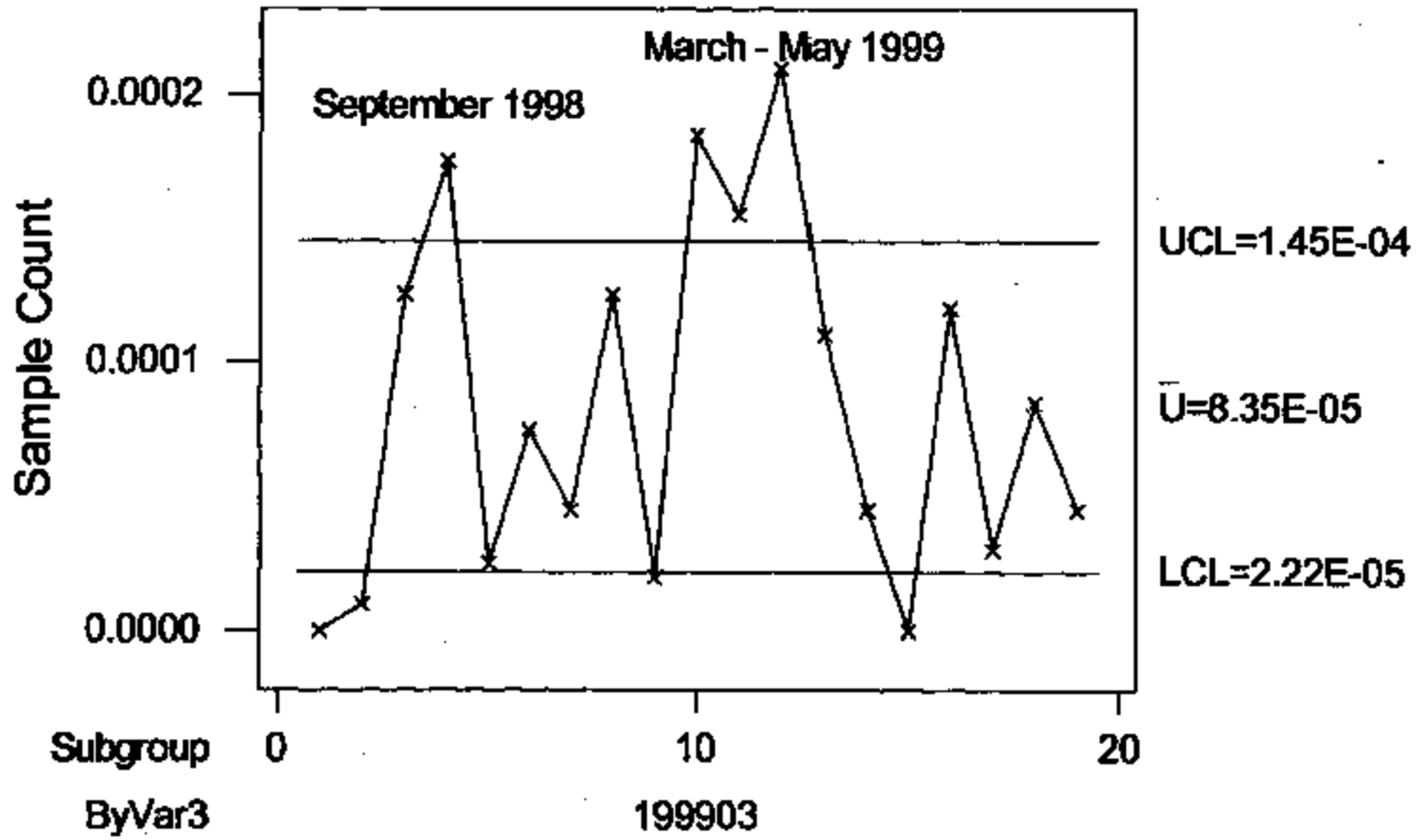
Limits Based on Dates Up To 19910



SKF 002120

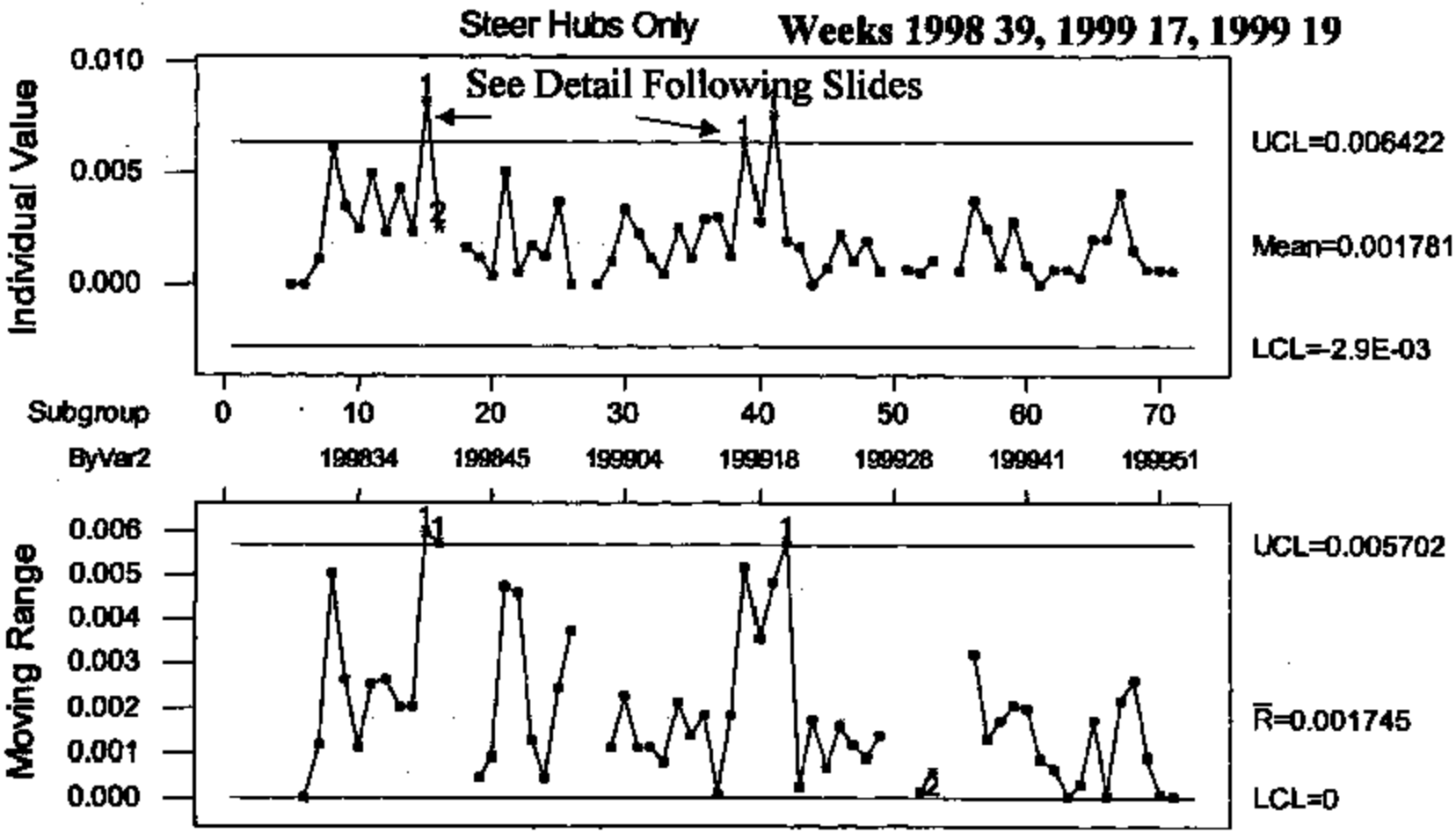
Analysis Begins 6/27/02

u Chart Count of Claims Vs Monthly Production
Steer Claims Only



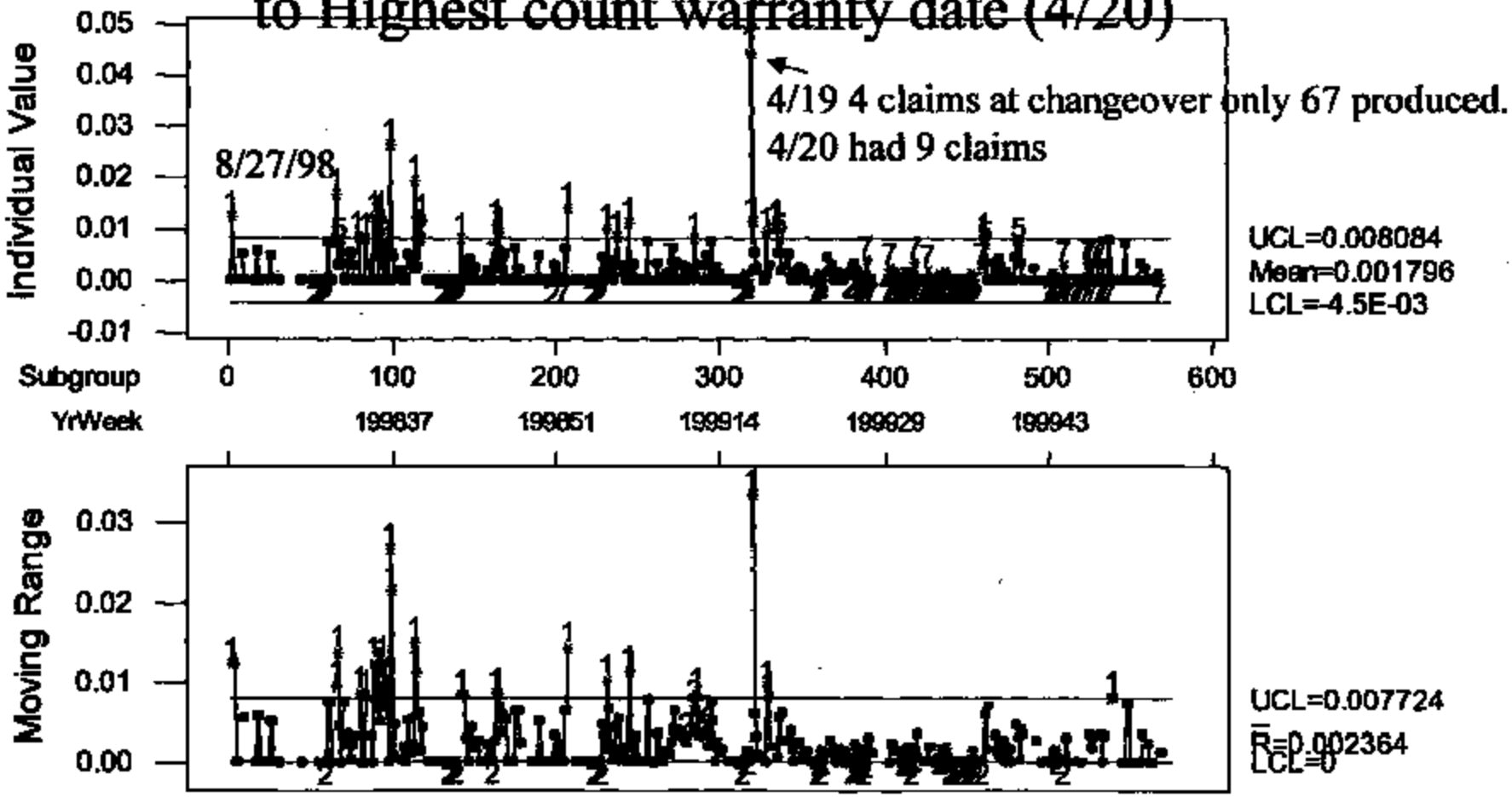
SKF 002121

Warranty Claim Proportion by Year/Week



SKF 002122

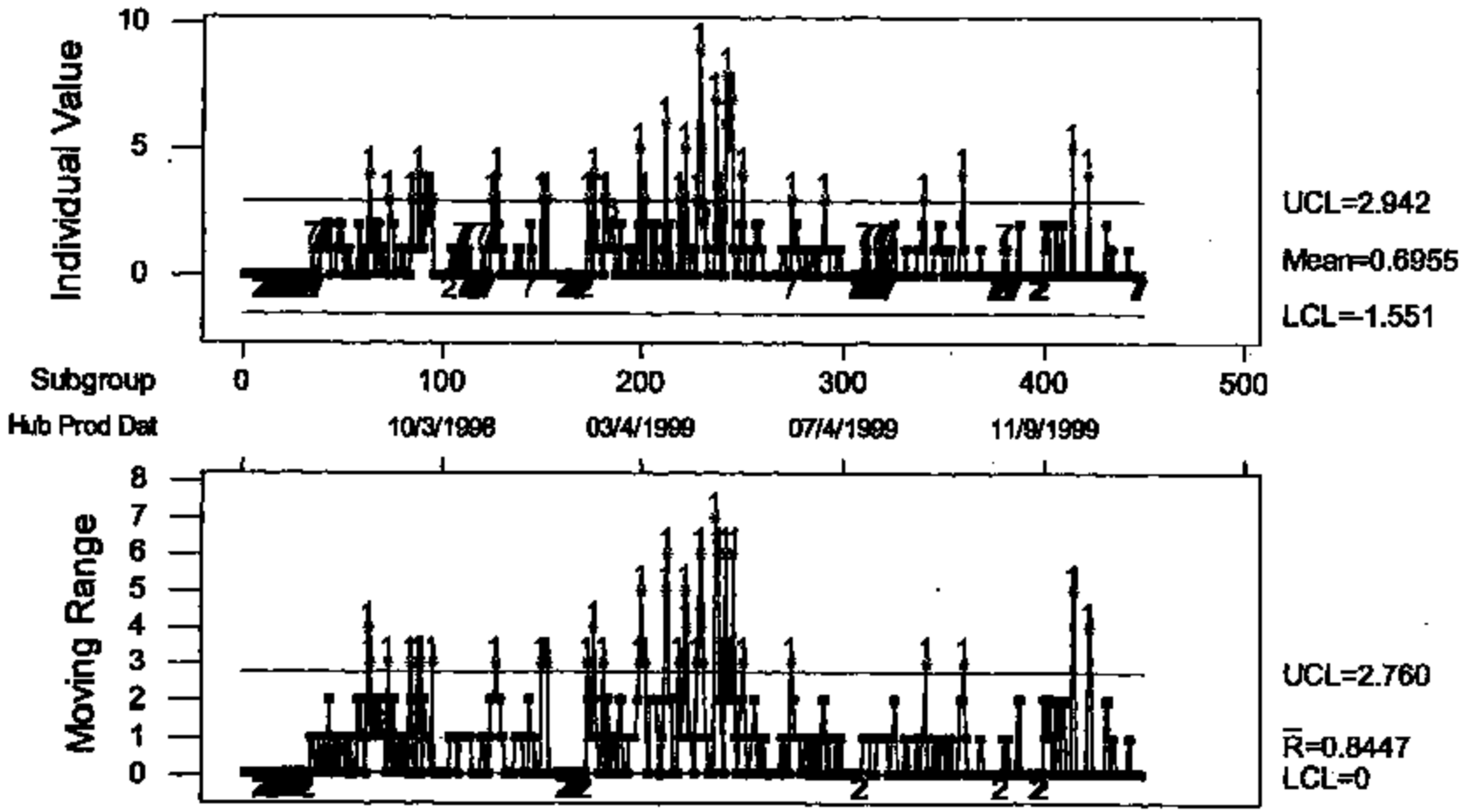
Warranty Claim Proportion by Day Steer Only - Note some warranty on dates showing zero steer produced. Changeover to Steer Mentioned and Next to Highest count warranty date (4/20)



SKF 002123

Steer Production Dates Only

Warranty Claims by Day



SKF 002124

Day 8/27/98

BTF-0052	0016245	08/27/98	3	1998	Aiken	Frtlnr	Ryder	CWA00159
BTF-0052	016439	08/27/98	3	1998	Aiken	Frtlnr	Ryder	CWA00154
BTF-0049	0015726	08/27/98	3	1998	Luechow	Frtlnr	Ryder	318273
BTF-0049	0015968	08/27/98	3	1998	Luechow	Frtlnr	Ryder	318277

Noise in bearing	NOISE/VIBRATION	1FUYDDYB0XLA70915	498210	500000	IB SEAL LEAK - INGRESS
Wheel bearings were failed	BEARING FAILURE	1FUYDDYB3XLA70908	351267	400000	IMPACT DAMAGE
	NO INFO	1FUYDDYB4XLA70917	369097	400000	IMPACT DAMAGE
	NO INFO	1FUYDDYB6XLA70921	418370	450000	WATER INTRUSION ALON

IB brg row water content 0.49%, brg ctr 0.12%	Valid
Line spalling of IB IR at loaded zone	Invalid
Rec'd disasm, OB row G, IB row line spalls at roller spacing	Invalid
Endplay 0.000", jerky rotation, OB row met debris, IB row VG, IB seal fun	Invalid

Week 39 1998

Day of Week	Hub Production Date		Claims				3rd	1st	2nd	Total Daily	Proportion of Claims
Sunday	9/20/1998		1	No	Steer	*	*	63	160	223	0.4484%
Monday	9/21/1998		4	No	Steer	*	36	91	80	207	1.9324%
Tuesday	9/22/1998	Honer down	1	No	Steer	*	0	0	120	120	0.8333%
Wednesday	9/23/1998		1	No	Steer	*	136	174	76	386	0.2591%
Thursday	9/24/1998		3	No	Steer	*	129	94	122	345	0.8696%
Friday	9/25/1998	Drill Operation down 2nd shift	2	No	Steer	*	176	7	84	267	0.7491%
Saturday	9/26/1998		3	No	Steer	*	86	72	99	257	1.1673%
Sunday	9/27/1998	Grinder & Honer down	3	No	Steer	*	*	*	0	0	*

BTF-0052	0022910	09/20/98	3	1998	Aiken	Frtlnr	Ryder - Ashland City	0031499
BTF-0052	0022921	09/21/98	3	1998	Aiken		Ryder	Unit 329665
BTF-0052	0022922	09/21/98	3	1998	Aiken		Ryder	Unit 329668
BTF-0049		09/21/98	3	1998	Luechow	Frtlnr	Mox Trkg	CHE08413 1/2
BTF-0049	001097	09/21/98	3	1998	Luechow	Frtlnr	Mox Trkg	CHE08457
BTF-0049	0023434	09/22/98	3	1998	Luechow	Frtlnr	Mox Trkg	CHE08413 2/2
BTF-0052	0024551	09/23/98	3	1998	Aiken	Navistar	Andrews Trucking	0089188A
BTF-0052	0027234	09/24/98	3	1998	Aiken	Frtlnr	Mike Newsome	HLFD0001E450T
BTF-0052	0024343	09/24/98	3	1998	Aiken	Navistar	Vision Transp.	089158A
BTF-0049	M222432	09/24/98	3	1998	Luechow	Navistar	G&P Trucking	0041874D
BTF-0052	0024014	09/25/98	3	1998	Aiken	Frtlnr	Interstate	DWFD0001F334T
BTF-0052	0023918	09/25/98	3	1998	Aiken		Ryder	Unit 329654
BTF-0052	0024707	09/26/98	3	1998	Aiken	Frtlnr		E1703119 1/2
BTF-0052	0024841	09/26/98	3	1998	Aiken	Frtlnr		E1703119 2/2
BTF-0052	0024231	09/26/98	3	1998	Aiken		Ryder	Unit 329670 2/2
BTF-0052	0024453	09/27/98	3	1998	Aiken		Ryder	Unit 329664
BTF-0052	0024430	09/27/98	3	1998	Aiken		Ryder	Unit 329666
BTF-0052	0024434	09/27/98	3	1998	Aiken		Ryder	Unit 329670 1/2

9/20 – 9/27/98 Week 199839 continued

Seized	SEIZED	1FUYSDYB80LB06901	275376	300000	IB SEAL LEAK - INGRESS
Inspect wheel speed senso	TONE RING BROKEN/LO	B06897	470504	500000	IB SEAL LEAK - INGRESS
Inspect inner bearing, front	NON-SPECIFIC	B06900	490155	500000	IB SEAL LEAK - INGRESS
Bearing Failure	BEARING FAILURE	1FUYSCBX0L973976	597114	600000	NO PROBLEM FOUND
	NO INFO				NO PROBLEM FOUND
Bearing Failure	BEARING FAILURE	1FUYSCBX0L973976	597114	600000	OUTER RING SPALL
Lube leaking from RF hub	LEAK	2HSFMAMR5XC025337	226063	250000	OIL SEPARATION
Noisy, Rattles	NOISE/VIBRATION	1FUYSDYBX0PA87067	345506	350000	NO PROBLEM FOUND
Loose	LOOSE	2HSFMAER1XC030744	213676	250000	NO PROBLEM FOUND
Wheel seal leaking	LEAK	2HSFMAHR3XC025573	180661	200000	IB SEAL LEAK - EGRESS
Binds & sticks	BIND/STICK	1FUYSDYB8XP586379	396806	400000	UNKNOWN
	NO INFO	B06898	298792	300000	IB SEAL LEAK - INGRESS
Leaks	LEAK	1FUPCSZB5XLA12820	353143	400000	NO PROBLEM FOUND
Leaks	LEAK	1FUPCSZB5XLA12820	353143	400000	NO PROBLEM FOUND
	NO INFO	B06902	506895	550000	IB SEAL LEAK - INGRESS
	NO INFO	B06898	402780	450000	IB SEAL LEAK - INGRESS
	NO INFO	B06898	318801	350000	IB SEAL LEAK - INGRESS
	NO INFO	B06902	506895	550000	IB SEAL LEAK - INGRESS

Endplay 0.000", noisy, line spalls IB OR RW, IB seal dust lip worn out	Valid
Endplay 0.020", Noisy, OB seepage ~2.0 g, oil separation, IB cage melted	Valid
Endplay 0.000", smooth rotation, very clean seals, appears to be corrosion	Valid
Endplay 0.000", smooth quiet rotation, IB & OB brg rows VG, IB seal func	Invalid
Endplay 0.000", smooth quiet rotation, IB & OB brg rows VG, IB seal func	Invalid
Endplay 0.000", smooth quiet rotation, OB row VG, IB OR RW single line	Valid
EP 0.000", smooth rotation, no internal distress, very little extra grease in	Valid
OB seepage ~1.5g, IB dry, endplay 0.000", smooth quiet rotation	Invalid
Endplay 0.000", smooth quiet rotation, OB seepage <2.0 g, IB <1.0 g	Invalid
Hub OD covered in grease and dirt,	Valid
IB row seized, OB heat damaged - melted cage & blued, IB rollers ends p	Inconclusive
Endplay 0.000", rotation stiff, no noise, OB IR spall multi loc. around ring,	Valid
Endplay 0.000", smooth rotation, no internal distress(Troy Lab determinati	Invalid
Endplay 0.000", smooth rotation, no internal distress(Troy Lab determinati	Invalid
Endplay 0.000", smooth rotation, IB OR spall multi loc., appears to be cor	Valid
Rec'd disass., OB IR spall, IB seepage ~2.0 g, IB OR RW spall line 360	Valid
Endplay 0.000", smooth rotation, corrosion in OB row, OB seepage ~2.0g,	Valid
Rec'd disass., IB IR missing, IB OR RW spall multi loc., appears to be co	Valid

High Occurrences 9/17/98 also

4/18/99 – 4/24/99 Cont

Week 17 1999

		Changeov										
Monday	4/19/1999	er to Steer	3	No	Steer	*	0	0	67	67	4.4776%
Tuesday	4/20/1999		9	No	Steer	*	239	295	262	796	1.1307%
Wednesday	4/21/1999		5	No	Steer	*	340	275	294	909	0.5501%
Thursday	4/22/1999		2	No	Steer	*	320	296	180	796	0.2513%
Friday	4/23/1999		1	No	Steer	*	200	134	210	544	0.1838%
Saturday	4/24/1999		0	No	Steer	*	*	*	*	0	*

BTF-0052	0126613	04/19/99	2	1999	Aiken	Navistar	Trucks Inc. of Janesvi	CWA08206
BTF-0052	0121704	04/19/99	2	1999	Aiken	Navistar	WalMart	Unit 91069
BTF-0052	0121945	04/19/99	2	1999	Aiken	Navistar	WalMart	Unit 9711
BTF-0052	0122949	04/20/99	2	1999	Aiken	Frtlnr	Ryder	E17246208
BTF-0052	0127740	04/20/99	2	1999	Aiken	Frtlnr	KLLM	E1744815
BTF-0052	0121708	04/20/99	2	1999	Aiken	Navistar	WalMart	Unit 91058
BTF-0032	0122092	04/20/99	2	1999	Aiken	Volvo	Fil-Mor Express	CWA01737
BTF-0052	0121402	04/20/99	2	1999	Aiken		Ryder	Ryder Unit # 337287
BTF-0052	M121626	04/20/99	2	1999	Luechow	Frtlnr		BPFD0001A182T
BTF-0052	0122112	04/20/99	2	1999	Aiken	Navistar	WalMart	WMT91492 2/2
BTF-0052	0122110	04/20/99	2	1999	Aiken	Navistar	WalMart	WMT91492 1/2
BTF-0052	0122124	04/20/99	2	1999	Aiken	Navistar	WalMart	WMT91509
BTF-0052	122933	04/21/99	2	1999	Aiken	Frtlnr	Heartland Express	E1692195
BTF-0052	0122545	04/21/99	2	1999	Aiken	Frtlnr	Heartland Express	E1720710
BTF-0052	0122935	04/21/99	2	1999	Aiken	Frtlnr	Ryder	348806
BTF-0052	0123027	04/21/99	2	1999	Aiken		Ryder	33623
BTF-0052	0122896	04/21/99	2	1999	Aiken	Frtlnr		CWA09666
BTF-0052	0123651	04/22/99	2	1999	Aiken	Navistar	WalMart	Unit 91287
BTF-0052	0123372	04/22/99	2	1999	Aiken	Navistar	Fleet Pride	Unit 3038
BTF-0052	0124025	04/23/99	2	1999	Aiken		Ryder Unit 334749	33614

4/18/99 – 4/24/99 Cont

NOISE/VIBRATION	2HSCHASR1YC066276	277648	300000	IB SEAL LEAK - INGRESS	Valid
NOISE/VIBRATION	2HSFMAMR4YC029364	280250	300000	IB SEAL LEAK - INGRESS	Valid
ENDPLAY/LOOSE	2HSFMAMR5YC029700	346249	350000	LOW CLAMP LOAD	Invalid
BIND/STICK	1FUYSDYBXYLF38978	588523	600000	UNKNOWN	Inconclusive
LEAK	1FUYSZYBXYL787534	304850	350000	NO PROBLEM FOUND	Invalid
NOISE/VIBRATION	2HSFMAMRXYC029353	289151	300000	IB SEAL LEAK - INGRESS	Valid
NOISE/VIBRATION	4V4ND2UF6YN786380	356930	400000	IMPACT DAMAGE	Invalid
NO INFO				IB SEAL LEAK - INGRESS	Valid
NO INFO				NO PROBLEM FOUND	Invalid
BEARING FAILURE		146540	150000	IB SEAL LEAK - INGRESS	Valid
BEARING FAILURE		146540	150000	IMPACT DAMAGE	Invalid
BEARING FAILURE		195398	200000	IB SEAL LEAK - INGRESS	Valid
NOISE/VIBRATION	1FUYSDYB5YCA93260	249423	250000	WATER INTRUSION ALON	Invalid
LEAK	1FUYSDYBYLB91576	311918	350000	IB SEAL LEAK - INGRESS	Valid
NO INFO	1FUYSDYE3YLF38977	591544	600000	IB SEAL LEAK - INGRESS	Valid
NO INFO	4V4ND1JF1YN793196	615339	650000	IB SEAL LEAK - INGRESS	Valid
NOISE/VIBRATION	4V4ND1UF9YN786433	351894	400000	IB SEAL LEAK - INGRESS	Valid
NOISE/VIBRATION	2HSFMAMR5YC030216	260100	300000	IMPACT DAMAGE	Invalid
BROKEN/SEPARATED E	XC023060DOM			UNKNOWN	Inconclusive
NO INFO	1FUYDDYBOYP885713	526489	550000	IB SEAL LEAK - INGRESS	Valid

Week 19 5/2/99 – 5/7/99

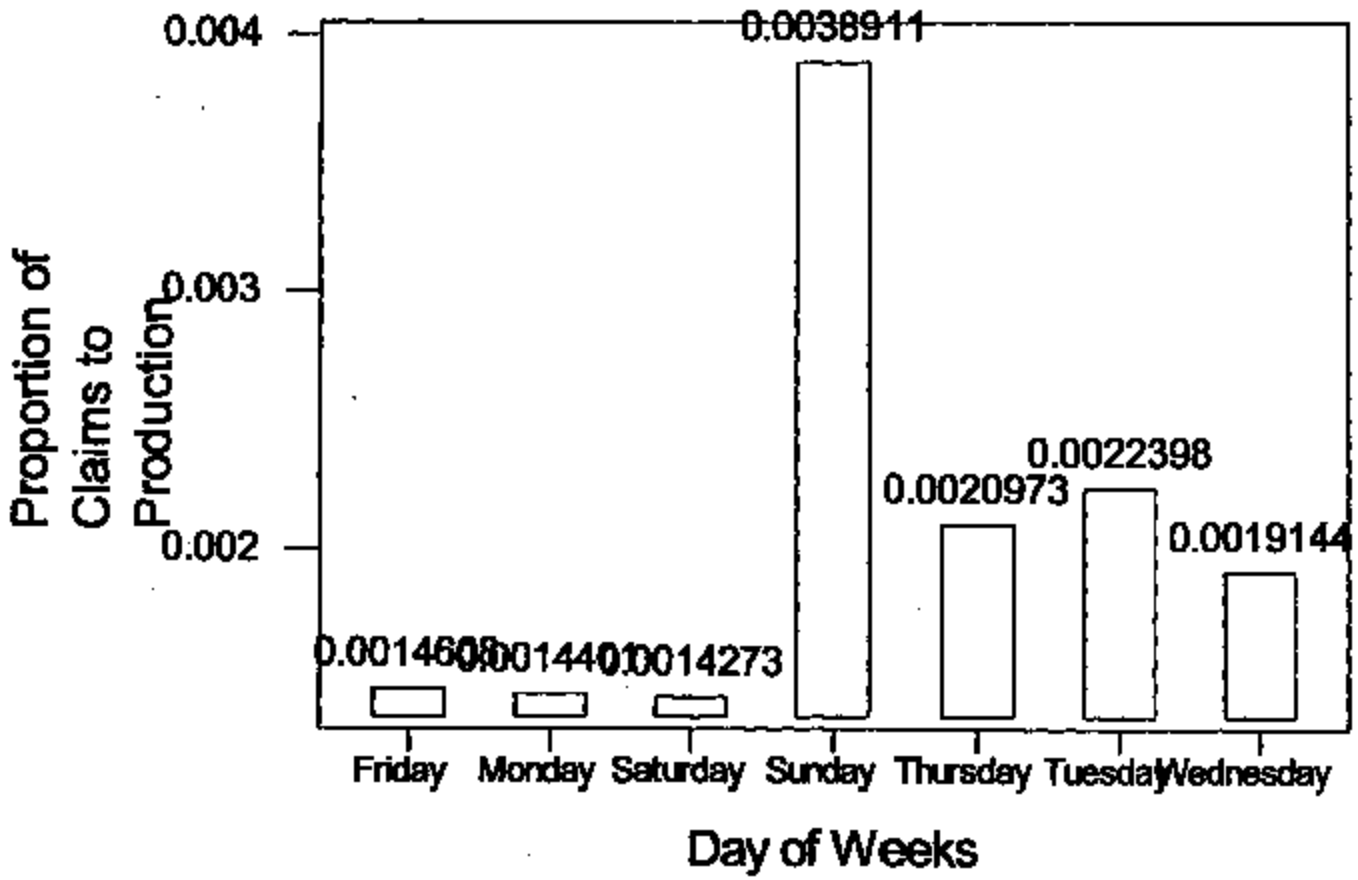
Week 19 1999

Sunday	5/2/1999	1	No	Steer	*	*	*	*	0	*
Monday	5/3/1999	6	No	Steer	*	57	350	176	583	1.0292%
Tuesday	5/4/1999	8	No	Steer	*	259	264	217	740	1.0811%
Wednesday	5/5/1999	5	No	Steer	*	300	265	358	923	0.5417%
Thursday	5/6/1999	7	No	Steer	*	302	280	289	871	0.8037%
Friday	5/7/1999	1	No	Steer	*	0	251	274	525	0.1905%

BTF-0052	0128993	05/02/99	2	1999	Aiken	Frtlnr		E1748129	Valid
BTF-0052	0128110	05/03/99	2	1999	Aiken	Frtlnr		86762	Invalid
BTF-0052	128126	05/03/99	2	1999	Aiken	Frtlnr	Empire Truck Sales	CWA06549	Valid
BTF-0052	128021	05/03/99	2	1999	Aiken	Frtlnr		E1741061	Invalid
BTF-0052	0128019	05/03/99	2	1999	Aiken	Frtlnr		E1692210	Valid
BTF-0052	0128460	05/03/99	2	1999	Aiken		Mckenzie Tank Lines	R.O. 49442	Valid
BTF-0052	128098	05/03/99	2	1999	Aiken	Frtlnr		C WA07488	Invalid
BTF-0052	129302	05/04/99	2	1999	Aiken	Frtlnr		E1674449	Invalid
BTF-0052	0129348	05/04/99	2	1999	Aiken	Frtlnr	Tim Mellard/CR Engls	E1525550	Valid
BTF-0052	128849	05/04/99	2	1999	Aiken	Frtlnr	Zuran Petrie	E1752443	Invalid
BTF-0052	129277	05/04/99	2	1999	Aiken		Martin Lipe	88102	OPEN
BTF-0052	0170218	05/04/99	2	1999	Aiken	Mack	Tom Bailey Motors	CWA04353	OTHER
BTF-0052	128683	05/04/99	2	1999	Aiken	Frtlnr	Roehl Transport	CWA07839	Valid
BTF-0052	128691	05/04/99	2	1999	Aiken	Frtlnr	Roehl Transport	CWA07839	Invalid
BTF-0052	0129180	05/04/99	2	1999	Aiken		KLLM		Inconclusive
BTF-0049	0130080	05/05/99	2	1999	Aiken	Frtlnr		E1689451	Invalid
BTF-0032	004339	05/05/99	2	1999	Luechow	Frtlnr		NSFD0001GT43T 1/2	Invalid
BTF-0052	129813	05/05/99	2	1999	Aiken	Frtlnr	Bar None	E1689062	Valid
BTF-0052	0129943	05/05/99	2	1999	Aiken	Frtlnr	New Prime	E1750047	Valid
BTF-0052	0129637	05/05/99	2	1999	Aiken	Navistar	James Lifkin	0013495A	Invalid
BTF-0052	0130616	05/06/99	2	1999	Aiken	Frtlnr		E1692211	Invalid
BTF-0052	0130092	05/06/99	2	1999	Aiken	Ptrblt		CWA05961	Inconclusive
BTF-0052	0130507	05/06/99	2	1999	Aiken	Navistar	Hazmat Environmentz	CCU00571	Valid
BTF-0052	0131322	05/06/99	2	1999	Aiken	Navistar		0042205B	Valid
BTF-0049	130922	05/06/99	2	1999	Aiken	Frtlnr		E1689133	Valid
BTF-0052	130862	05/06/99	2	1999	Aiken	Frtlnr	Harjit Singh	E1755522	Valid
BTF-0052	0131015	05/06/99	2	1999	Aiken	Frtlnr	CSS Transp	BNFD0001ME67T	Invalid
BTF-0052	131259	05/07/99	2	1999	Aiken	Frtlnr		E1752364	Valid

Week 19 5/2/99 – 5/7/99

	NO INFO					Valid
	NO INFO	1FUPCSZBYLA88762	273985	300000	IMPACT DAMAGE	Invalid
Bearing failure	BEARING FAILURE	1FUYDSZB3YLF06032	385007	400000	IB SEAL LEAK - INGRESS	Valid
Chatter , noisy, vibration	NOISE/VIBRATION	1FUYSXYB0YLB40034	391362	400000	TAMPERING	Invalid
Corroded & rust	CORROSION/RUST	1FUYSXYB7YLB40032	278902	300000	IB SEAL LEAK - INGRESS	Valid
Noise and vibration in front	NOISE/VIBRATION	M1AA12Y5YW123599	209797	250000	IB SEAL LEAK - INGRESS	Valid
	NO INFO				UNKNOWN	Invalid
Hub bearing binds & stick	BIND/STICK	1FUYDDYBGYLB05748	191161	200000	WATER INTRUSION ALON	Invalid
Too much play/leaking	ENDPLAY/LOOSE	1FUYSDYB6WP917798	304315	350000	UNHARDENED RW	Valid
Hub bearing broken	BROKEN/SEPARATED B	1FUYSSZB5YLA92032	346050	350000	UNKNOWN	Invalid
Hub bearing noisy & rattl	NOISE/VIBRATION	1FUYSSZBXYLB86102	460061	500000	OPEN	OPEN
Seal leaking	LEAK	1M1AA16YXYW121483	251046	300000	IB SEAL DAMAGED	OTHER
Hub bearing rough	NOISE/VIBRATION	2HSFMAHR5YC032039	284297	300000	IB SEAL LEAK - INGRESS	Valid
Hub bearing rough	NOISE/VIBRATION	2HSFMAHR5YC032039	284297	300000	WATER INTRUSION ALON	Invalid
	NO INFO				UNKNOWN	Inconclusive
Broken	BROKEN	1FUPCSZB5YPB62016	308355	350000	LOW CLAMP LOAD	Invalid
Binds & Sticks - Leaking	LEAK	1FUYSDYB4XPA31291	331718	350000	NO PROBLEM FOUND	Invalid
Hub bearing broken	BROKEN/SEPARATED B	1FUYSSEB4YPF80354	233800	250000	IB SEAL LEAK - INGRESS	Valid
Front axle hub loose	LOOSE HUB	1FUYSSZB1YLB54929	386207	400000	IB SEAL LEAK - INGRESS	Valid
Noise/tire wear	NOISE/VIBRATION	2HSCNAER9YC053582	145715	150000	NO PROBLEM FOUND	Invalid
Binds & sticks	BIND/STICK	1FUYSDYBXYLA55443	258767	300000	LOW CLAMP LOAD	Invalid
Bearing failure	BEARING FAILURE	1XP5D69X44YD509427	304478	350000	UNKNOWN	Inconclusive
Seal Leak	LEAK	2HSFHAMR5YC024047	11621	50000	IB SEAL LEAK - EGRESS	Valid
Worn	WORN BEARING/HUB	2HSFTAERXYC043108	166851	200000	IB SEAL LEAK - INGRESS	Valid
	NO INFO				IB SEAL LEAK - INGRESS	Valid
Front axle bearing worn	WORN BEARING/HUB		403200	450000	IB SEAL LEAK - INGRESS	Valid
LS hub faulty	BEARING FAILURE		346177	350000	WATER INTRUSION ALON	Invalid
Front axle, hub bearing nois	NOISE/VIBRATION	1FUYSSEB3YLA80791	308528	350000	IB SEAL LEAK - INGRESS	Valid



Steer Hubs Only

SKF 002132

Response
to Main Document

Rick P Morrow/AMER/SKF
10/11 12:50 AM

Subject: Proportion Claims Against Aiken Prod Qty. 6/98 - 2001

Response to: Statistical Evaluations

Category: Statistics

This is the additional 2000 and 2001 production and claim numbers to add to the earlier analysis. This data reproduces to most days the analysis from Arvin-Meritor. Peak days include May 3-7 and February dates in 2001/ The proportions may increase as vehicles age, especially the February dates.

Add this analysis to the earlier analysis.

THU Steer Analysis Oct 10 2002 Add to Earlie

THU Steer Analysis
10/10/02
See file dated Oct 9 for earlier analysis

Includes 10/8/02 and June 2002 analyses
Arvin Meritor Charts Included

Warranty Problems from 6/1/98 – 2001

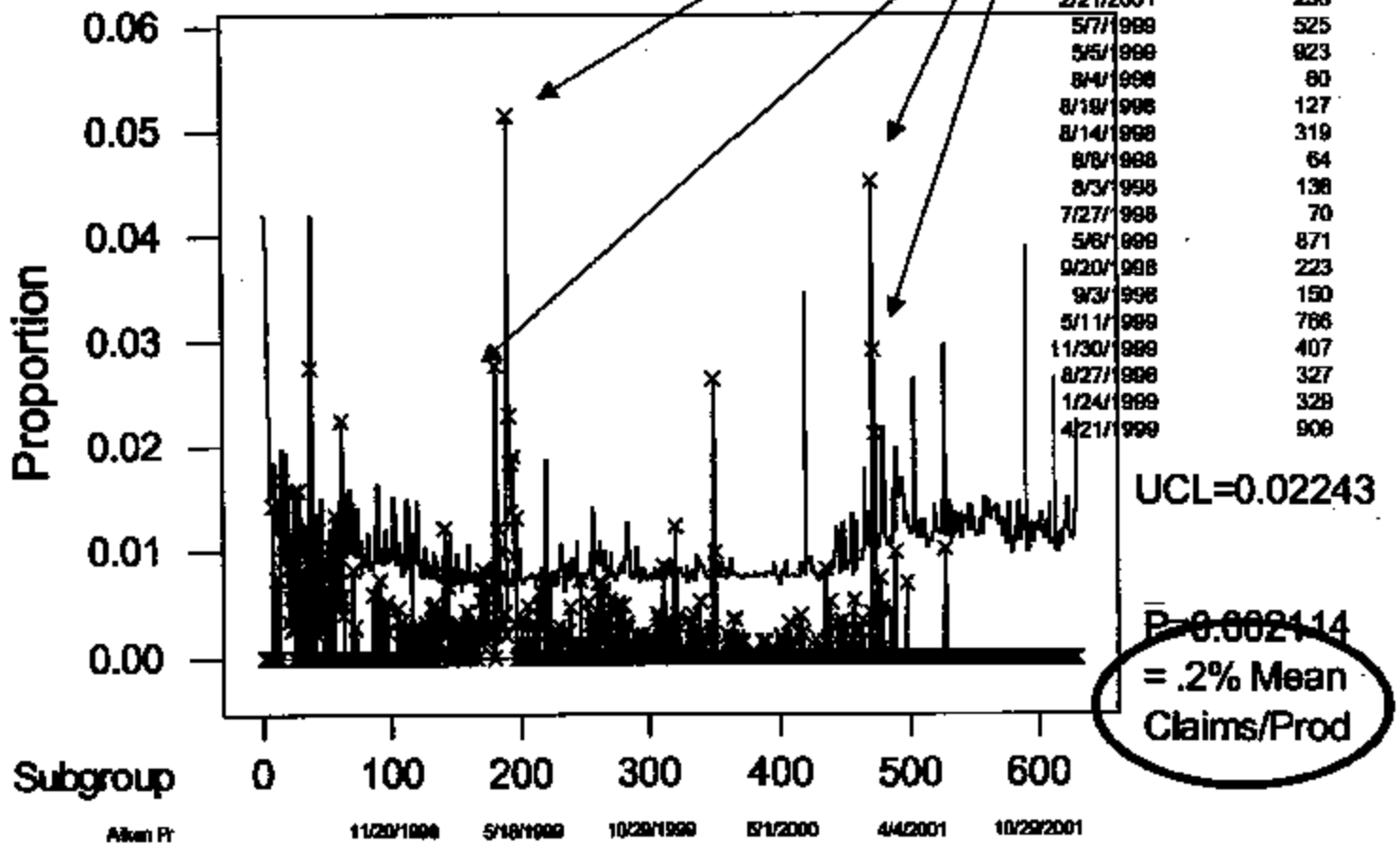
Data Sources

Aiken production quantities by type of hub by month

Warranty info refreshed 10/02 by Bob Bondy, Mike Lewis and others against Aiken Hub Production Date

DAILY

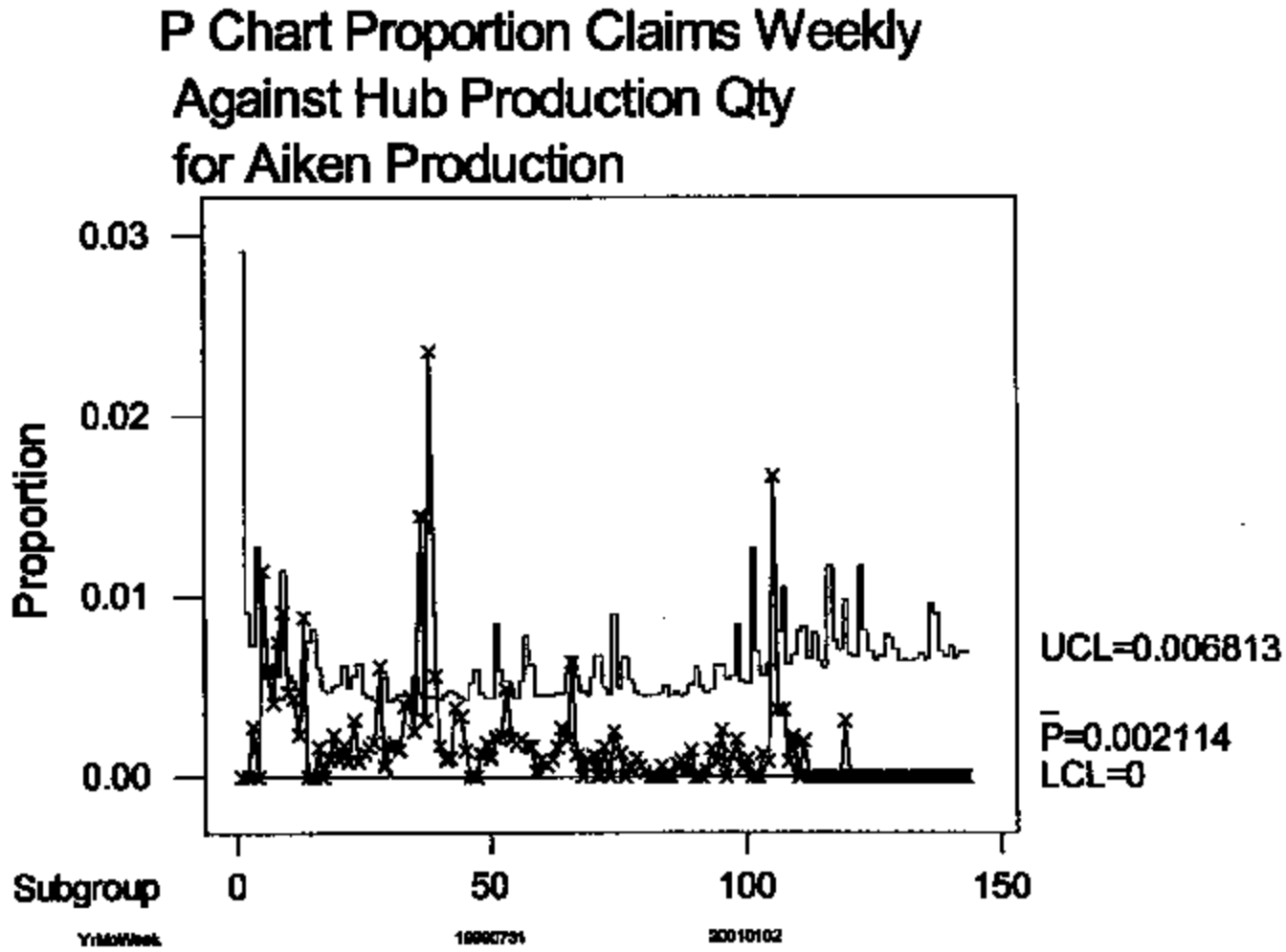
P Chart Proportion Claims Daily Against Hub Production Qty



Aiken Production Date	Aiken Production Qty	Warranty Claims	Proportion
5/3/1999	583	30	5.1%
2/19/2001	177	8	4.5%
2/20/2001	206	6	2.9%
4/20/1999	786	22	2.8%
8/29/1998	182	5	2.7%
2/21/2000	38	1	2.6%
5/4/1999	740	17	2.3%
9/25/1998	267	6	2.2%
2/21/2001	238	5	2.1%
5/7/1999	525	10	1.9%
5/5/1999	923	17	1.8%
8/4/1998	60	1	1.7%
8/18/1998	127	2	1.6%
8/14/1998	319	5	1.6%
8/8/1998	64	1	1.6%
8/3/1998	138	2	1.4%
7/27/1998	70	1	1.4%
5/6/1999	871	12	1.4%
9/20/1998	223	3	1.3%
9/3/1998	150	2	1.3%
5/11/1999	766	10	1.3%
11/30/1999	407	5	1.2%
8/27/1998	327	4	1.2%
1/24/1999	329	4	1.2%
4/21/1999	908	11	1.2%

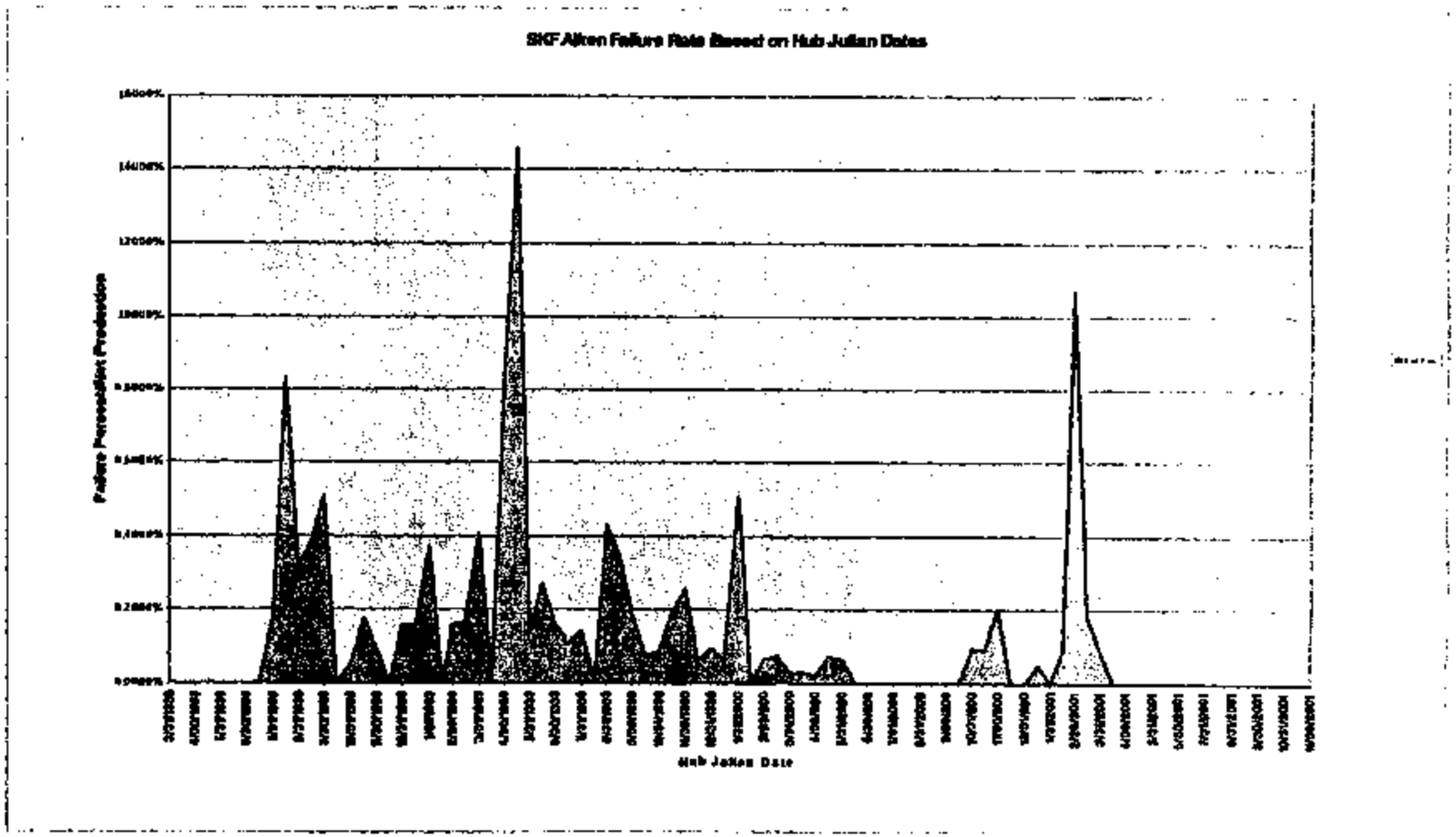
Claim values are the x's. x's above the red line are statistically higher than expected.
Immature data likely excludes future claims against year 2000 and other dates

WEEKLY 1998 - 2001



SKF 002136

Proportion claims to net production. Source – Arvin Meritor



This chart combines data into half months. The peak periods agree with the analysis SKF did. The peak days are noted in the SKF daily chart.

Response
to Main Document

Michael D Lewis/DET/SKF
10/15 05:26 PM

Subject: Failure rate by hub julian date (Chuck Smith data)

Response to: Statistical Evaluations

Category: Statistics

FF981 Database Analysis, cls.

ID	A/L?	HIGHLY PROGRESSIVE INCIDENTS	SKF / FS LAB COMMENTS	MILES
1 ?	YES		Seal leak; in board brg row overheated	252622
2 L	YES		Rec hub, spindle IB and OB cones are seized to spindle; hub still on spindle due to nut spacer (lock ring) and outer nuts still on; spindle rec. drum, with shoes, rim and tire	524473
3 L	YES		Hub "fell off" when vehicle was jacked up, hub was received in Troy disassembled for circular scratches on inner race and faces (indicates no relative motion between the	460547
4 L	YES		Hub off	337133
5 L	YES		Hub separation from vehicle, failed hub assembly, spindle worn under inner races, groove worn in clip ring (indication of relative motion between inner races); Hub off	488550
6 L	YES		No paperwork received with claim, complaint unknown, not a separation, hub was received in Troy disassembled, rust in outer bearing row, high water content in both IB	
7 L	YES		Rec hub, tire, rim, drum, spindle, customer used wheel saver; sent to SKF 4/2/02	660503
8 L	YES		Rec hub; IB and OB cones; clip ring and several burned up rollers; scrap 4/8/02	658624
9 L	YES		Hub bearing seized to knuckle spindle due to excessive heat	605417
10 L	YES		Clip ring grooved; rec hub burned up; IB & OB cone show signs of spinning rollers have heavy wear on small end; inconclusive	
11 L	YES		Rec hub only; no bearings; bearing races are all rusty; burn up - R side	433307
12 L	YES		Received disassembled, badly damaged, IB or bell-mouthed, no rollers, cages, seals or grease, very rusty, cannot determine origin of failure due to lack of parts and damage	762914
13 L	YES		Received disassembled, IB IR out & split, spun on spindle, badly damaged, root cause not determinable	461480
14 L	YES		Rec spindle with IB and OB cones seized to spindle; no hub was received; scrap 4/8/02	600202
15 L	YES		Near wheel off	507446
16 L	YES		Burnt up; wheel bearing came apart; toasted. Bearing failure damaging drum and brakes, truck pulled to the right, had to replace left side brakes also bearing failure	284605
17 L	YES		1996 FTL Century; Hub off right side	646630
18 L	YES		15 rollers from OB; 18 flat rollers from IB returned; both inner cones torched off spindle; not all pieces of IB inner cone ring returned; cannot determine if inner cones were cracked causing loss of clamp load; ob inner cone did not crack; burn up	491184
19 L	YES		Drvr too much play; 2 gears locked; _____ leaks; complete toast - unhardened roadway? Driver steer wheel bearing has too much play; both F hubs leaking; had to press hubs off w/puller	304315
20 L	YES		Front wheel loose; truck towed to shop	391184
21 L	YES		Only hub was returned; HPI no inner cones or rollers; tone ring missing also	455622
22 ?	YES		Fire	258153
23 ?	YES		Received disassembled, OR or IR grease seals rollers cages missing, OB spindle and heat damage, suspect OB row failure, IB row G considering damage, cannot determine origin of failure due to lack of components	482701
24 L	YES		Hub, knuckle, drum, shoes, 5-com returned; inner cones still on spindle; scrap	609095
25 A	YES		Rec, hub and a few rollers and a badly damaged cone; IB and OB hub races are burned	499157
26 A	YES		Fire; rec spindle (IB and OB cones seized on spindle) hub (burnt up); drum, shoes, rim and tire (burn up) inconclusive 4/5/02	586279
27 A	YES		Sent to SKF 4/1/02	350583
28 L	YES		Smooth rotation, some water ingress after removal/not mixed in w/grease; Hub off; lost in pond (AVF98161314)	687140
29 A	YES		Rec Hub and knuckle; hub till on spindle because of inner and outer nuts and lock ring still of spindle; near off; WARRANTY PAYMENT APPROVED; Burn up; near wheel off	441085
30 A	YES		Rec hub, knucle & drum; hub bearings burnt up; knuckle bearing cones seized to spindle	514966
31 A	YES		Reb hub only; burn up	555498
32 A	YES		Rec hub and knuckle cones seized to spindle; hub burn up ; inner and outer nuts and locking ring stop hub from coming off of spindle; near wheel off	320491
33 A	YES		Rec hub burned up; inconclusive	415198
34 A	YES		IB inner cone spalled on bottom 180°; sent to SKF	155379
35 ?	YES		Received disassembled, IB row frosted-cage melted, seal lips burned away, OB row debris denied	447863
36 A	YES		Rec hub only; no bearing; bearing races burned up; burn up - L side	501725
37 A	YES		Hub returned; still on knuckle; a few rollers were returned; both inner cones fractured	294608
38 ?	YES		Hub burn up	298602
39 A	YES		King pin R&R 100K miles previous; cannot accurately assess root cause; maybe loose; IRs fractured	520185
40 ?	YES		Near wheel off	
41 A	YES		Near wheel off	143063
42 ?	YES		Rec'd disassembled, OR only, appears IB row failed first, cannot assign root cause	423258

43 ?	YES	IB row seized. OB heat damaged-melted cage & blued, IB roller ends pegged. IB IR RW spall in line	396908
44 ?	YES	Rec hub burned up; inconclusive; L side front wheel smoking (towed in); bearing failure on L front wheel damaging spindle & s-cam	
45 ?	YES	R front steer axle wheel bearing failure; progressive damage to hub, brake, steering knuckle, tie rod cross tube; ABS sensor & hub cap wheel bearing failed causing R hub to wobble violently damaging additional parts	
46 ?	YES	IB & OB CONE BURNED; NO OTHER BRG PART WERE RECEIVED; INCONCLUSIVE	
47 A	YES	Bearing burn up; hub, knuckle, drum returned; scrap	
48 A	YES	Hub burn up	482228
49 A	YES	Hub off	583429
50 A	YES	Rec disassembled; could not find cause of failure; rec knuckle/hub seized on it; clip has groves from rotation of cups; cone faces have circular rotation witness marks; brg rollers have end wear, low clamp load	429615
51 A	YES	Rec hub & half bearing burned up; inconclusive	
52 A	YES	Knuckle, drum, shoes, hub, kingpin, brake chamber, ASA	
53 A	YES	Knuckle returned with hub still on. Both inner cones fractured; put in box	733619
54 A	YES	Near wheel off / or rec drum & knuckle, inner & outer brg cones are burnt up and seized to spindle; no hub returned	287309
55 A	YES	Rec hub burned up; rec one bearing cone; do not know if it is IB or OB; inconclusive	
56 A	YES	Scrap 4/9/02	270436
57 ?	YES	Shipped to SKF for further inspection / Received disassembled, no internal components. OB row badly eroded, unhardened	262756
58 A	YES	Rec hub & knuckle; hub still on knuckle because of inner & outer nuts & lock washer still threaded to spindle	481916
59 A	YES	Near wheel off	552843
60 ?	YES	Hub off	593498
61 A	YES	Knuckle, hub returned; sent to SKF	303850
62 ?	YES	Rec disassembled, OB IR only missing, some rust in hubcap threads	266462
63 A	YES	Loose; unhardened raceway; bearing burn up. Hubs, front bearing misadjusted; L front hub smoking; removed L front tire hub & drum; wheel bearing dry on grease & fell apart	98600
64 A	YES	Rec hub and knuckle, only thing stopping hub rom coming off are the locking ring and inner and outer nuts (near off)	692708
65 A	YES	Rec spindle with both IB and OB cones seized to spindle; hub and a few rollers; inconclusive	280365
66 A	YES	Hub returned still caged on knuckle; scrap	344208
67 A	YES	Sent to SKF	346060
68 A	YES	Hub, drum and shoes, knuckle returned; scrap	346211
69 A	YES	Knuckle returned with IB inner cone still attached; hub was returned; scrap	
70 A	YES	Near wheel off	366145
71 ?	YES	Near wheel off	327460
72 A	YES	Right side knuckle with hub still on, drums, shoes; scrap	398398
73 A	YES	Fire; rec spindle; IB and OB cone seized to spindle; hub stayed on only because of inner and outer locking nuts; rec drum and shoes, rim and tires near off; inconclusive 4/5/02	398172
74 ?	YES	Fire	
75 ?	YES	Hub off	638239
76 A	YES	Knuckle, drum, hub, shoes returned; inner cones still on spindle; right side	554589
77 A	YES	BOTH INNER CONES RETURNED UNCRACKED & HUB, KNUCKLE, TONE RING; SENT TO SKF	585523
78 A	YES	Left side knuckle, shoes, drums, hubs; scrap	579119
79 A	YES	Rec hub & knuckle; both burnt up	579730
80 ?	YES	Unhardened raceway; could remove hub, or hub, spindle, brakes, drum	90960
81 A	YES	Rec hub, spindle, bearings rollers & cones burnt up; cone spinning on spindle; OB cone saw more heat than IB cone; rollers are distorted & burnt up; OB cone has signs of high heat; clip ring grooved; lack of lube	367059
82 A	YES	Rec spindle (IB and OB cones spinning on spindle, cone cut off with cutting torch; burn up); rec tire, rim, brake, drum and shoes and hub; inconclusive 4/5/02	
83 A	YES	Knuckle and hub returned; wheel off; inner cones still on spindle	
84 L	YES	Sent to SKF 4/1/02	333982
85 ?	YES	Rec hub burned up; inconclusive	331928
86 A	YES	Rec; rusty burned up hub, (1) Bearing was cut in half by cutting torch and was spinning on spindle; other bearing cone also cut off with torch but to rusty to tell if it was spinning on spindle.	385798
87 A	YES	Hub returned disassembled; only 13 rollers & both inner cones returned; clip ring is fractured; IB inner cones spalled on bottom half; guiding flange on both inner cones show excessive wear; both outer races have line spalling	330850
88 A	YES	Rec hub, drum & tire; hub burnt up; near wheel off	280086
89 A	YES	Rec hub & knuckle; hub still attached to knuckle because inner & outer nut & lock washer still threaded on knuckle; near wheel off	363634

90 A	YES	Cannot accurately determine failure origin; IB IR cracked; OB; Hub burn up	341848
91 A	YES	Rec hub, bearing cones & rollers; IB & OB cone broke apart; rollers show lack of lub; burn up	378222
92 ?	YES	Rec burnt up; had to cut inner cones off knuckle; inner cones were not cracked at time of return; inner cones cracked during removal; clip ring grooved from rotation; circular marks on inner cone faces	668312
93 A	YES	Rec burnt up; inner cones cracked; clip ring grooved; inner & outer brg have equal damage & heat indicators	668312
94 A	YES	Sent to SKF	410001
95 ?	YES	Hub burnt up; 39 rollers returned; IB inner cone fractured into 5 pieces; D washer deformed; tone ring fractured into several pieces; OB inner cone not fractured - shows very little damage from rotation	
96 A	YES	Near wheel off	363669
97 A	YES	Rec burnt up; cones cracked; clip ring grooved; rotation witness marks on cone faces; cannot determine if low clamp load caused failure due to cones being cracked; both brgs burned in color from heat	267031
98 A	YES	Rec hub, spindle, shoes, drum, hub did not come off spindle because of inner and outer nut and locking spacer still on spindle; near off; hub and spindle are in Bob Rosenthal box	552941
99 ?	YES	Received disassembled, IB OR RW badly deformed, metallurgy confirms was heat treated on	223486
100 A	YES	Rec. disassembled; IB & OB races heavy pitting; OB cone heavy; inconclusive	359264
101 A	YES	Returned hub, drum, shoes, knuckle, ABS sensor, king pin	559678
102 A	YES	REC ONLY BOTH BRG CONE SEIZED TOGETHER; ONE CONE PIECE MISSING, ONE CONE CRACKED IN TWO PLACES; INCONCLUSIVE; Rec hub and spindle; IB and OB cones seized to spindle; scrap 4/9/02	509563
103 ?	YES	Hub off	374840
104 ?	YES	Rec. hub burned up; rec. IB and OB cones; clip ring - both cones were cut with cutting torch; inconclusive	206535
105 A	YES	Rec hub & both bearing cones; cones and races are burned up; near wheel off	320406
106 A	YES	Rec hub, drum; no bearings, hub burnt up; inconclusive; burn up; near off	463126
107 A	YES	Rec hub and spindle, IB and OB cone, seized to spindle; burn up; scrap 4/7/02	
108 A	YES	Passenger wheel bearing seized up; wheel bearing seized up; tire blew; took out underbrace for the sleeper & fender; took out AC/heater; sleeper lineshock ripped up; tire & tube was damaged; brake drum & brakes were half melted; r/r side spring shackle wa	424577
109 A	YES	Rec hub brg cone burn up; low clamp load	255688
110 ?	YES	Shipped to SKF for further inspection / received disassembled, rollers, cages, seals & grease gone, OR RWs badly damaged, root cause not determinable; Hub burn up; Fire	230849
111 A	YES	Hub was returned with OB brg cone in place & IB seal in place; IB brg cone & clip ring missing; tone ring broken off; OB cage starting to mat; all grease dry & stiff; can only imagine what IB brg looks like	179052
112 A	YES	Near wheel off	279729
113 L	YES	Rec hub IB & OB cones, clip ring & some rollers; all items were burned up; lack of lubricant	328433
114 A	YES	Rec hub only; hub burn up	214024
115 A	YES	Rec hub, spindle, drum, shoes, tire and rim; hub burned up; inconclusive 4/6/02	170225
116 A	YES	Rec hub and knuckle, hub still on spindle because inner and outer nut and lock ring are still on spindle; nut and lock, ring are still on spindle; near wheel off	423452
117 A	YES	Wheel off; inner & outer nuts burned up; drum & hub still mounted to wheel	397604
118 A	YES	Sent to SKF	124982
119 A	YES	Hub off	182369
120 A	YES	INNER CONES MISSING, TONE RING GONE, HUB CAP STILL INSTALLED BUT BROKEN OUT; SENT TO SKF	166217
121 ?	YES	REC HUB AND SPINDLE; I/B AND O/B CONES SEIZED TO SPINDLE; INNER AND OUTER NUTS OR STILL THREADED ON TO SPINDLE (NEAR OFF); INCONCLUSIVE	305141
122 A	YES	Rec hub only no IB; OB brg clip ring; IB race has heavy damage due to brg failure; what caused the failure is unknown at this time because of lack of information; unknown	305952
123 ?	YES		394873
124 ?	YES	109388; Rec disassembled; brgs destroyed; only 10 rollers from OB & from IB inner cones cracked; ?; Right wheel caught fire from wheel bearing failure; also inspected left front wheel – ok; parts shipped to Troy via Yellow Freight to Rosenthal; misc is fo	421494
125 A	YES	Rec. hub, drum and side with knuckle spindle with burned up IB and OB cones; inner and outer FF961 Lx58 nuts still on sindle; hub burn up; S10-12641-000, AVF-99253149 99340	317625
126 A	YES	Rec hub only; no brgs; hub races are burned up	334132
127 A	YES	IB & OB cones & races are spalled	176412
128 ?	YES	Fire; Hub burn up	43671
129 A	YES	Ryder Truck - Albuquerque; rec hub and spindle; hub seized to spindle; scrap 4/7/02	449766
130 ?	YES	Received disassembled, IB row badly damaged, poss unhardened row	173242

131 ?	YES	IR OR RW eroded badly	41412
132 ?	YES	OB row rusty w/black corrosion in OR RW; IB row same; chips in IRs @ clip ring noses, brinnell lines across both IR RW; spindle head sheared off & pulled out of knuckle; corrosion in bearing appears to be post-failure (no churning); impact load	120710
133 A	YES	Near wheel off	125288
134 A	YES	Wheel departed; inner brg row cage fractured; clip ring 2 notes mokey w/light central scratches; OB IR circular scratches IB side; small amount oil small face; brake shoe fastened one place (wheel fell off?); IB seal was F-NOK; grease was GARZ; one is wr	833
135 A	YES	HUB & ROLLERS RETURNED; NO INNER CONES; SENT TO SKF	53489
136 A	YES	No rollers returned, all mounting hardware & inner cones returned; sent to SKF	962591
137 L	YES	Complete failure; worn spindle under IR; groove worn in clip ring; low clamp load	
138 A	YES	Fell apart; unhardened raceway; inboard outer ring raceway heavily eroded	
139 A	YES	Unhardened raceway; inboard outer ring raceway heavily eroded	79378
140 ?	YES	R front wheel bearing fell apart; unhardened raceway	31609
141 ?	YES	Seal leak; lube failure	21309
142 A	YES	Wearsalze; unhardened raceway; IR RW belled; entire hub opened; melted shoes; knuckle @ AP end	50024
143 A	YES	Brakes burnt; bearings were hot; unhardened raceway	8702
144 A	YES	Smoking hub; hub cap ok	21309
146 ?	YES		654858
148 A	YES	Rec hub burned up; inconclusive	360736
147 L	YES		
148 ?	YES	Rec disassembled; IB inner cone cracked; no signs of rotation brg & clip ring; IB inner cone spalled; not at roller spacing; seal journal on IB race corroded; IB seal bad; rust lip groove completely worn out; bearings have signs of water ingress; IB seal	
149 ?	YES	Rec hub burnt up; had to cut inner cones off; inner cones not cracked when returned; outer cone cracked during removal; outer cone spun on spindle; excessive galling on spindle; clip ring grooved	258982
150 A	YES	Inner cones not returned; only 20 rollers returned; half were flat; O washer shows deformity from heat; both nuts & lock washer returned; not on unhardened raceway - fire extinguisher used on hub; hub cap threads show no sign of rust; suspect hubcap was o	
151 L	YES		
152 ?	YES	Rec'd disassembled, no rollers or cages, IB row listed first	
153 ?	YES	Locked up; unhardened raceway IB	66097
154 A	YES		
155 A	YES	Bearing locked up; IRs fractured; IB IR spalled	
156 ?	YES	Unhardened raceway; wheel off?	35188
157 ?	YES	Fire	
158 ?	YES	Received disassembled, badly damaged, no rollers-cages-grease or seals, cannot determine origin of failure due to lack of components	
159 A	YES	Near wheel off	
160 L	YES	RETURNED KNUCKLE RIGHT SIDE; BOTH CONES & CLIP RING, NO ROLLERS RETURNED; CIRCULAR WITNESS MARKS ON CONE FACES; GROOVES ON SPINDLE FROM CONES ROTATING; LOW CLAMP LOAD	
161 A	YES		
162 ?	YES	Wheel off	
163 A	YES		
164 A	YES		
165 A	YES	Rec, hub, cone and pieces of other cone; hub burn up; no other information was provided.	
166 L	YES	Rec, hub, inner and outer bearing cones; both cones were cut with a cutting torch in order to remove from spindle; hub burn up.	
167 A	YES	Rec hub & knuckle: both burnt up	
168 A	YES	No rollers, seals or gears; smeared IRs; same look as BPBS; broken tone ring w/circular notch; IRs fractured; low clamp load; grooves in clip ring	
169 ?	YES	Unhardened raceway; no parts, pic only	
170 ?	YES	Fire / Bruce Ketchum	
171 A	YES	Near wheel off	360273
172 ?	YES	Hub burn up	
173 ?	YES	Hub off; unit towed in for losing R steer axle wheel assy	335132
174 ?	YES	Fire	
175 A	YES	No claim; sent to SKF	
176 A	YES	Inner cone still attached to knuckle; both fractured; scrap	234548
968 A	YES	Only hub returned, no inner cones missing, both BRG rings damaged by failure; sent to SKF	
969 A	YES	Hub returned with no inner cones; mounting hardware returned with hub; O washer in functional shape; both outer rings have heavy damage; hub cap still on hub; customer cut hub cap open to remove hub	
970 A	YES	Only the hub was returned; HPI both brgs ring severely damaged; sent to SKF	

971 A	YES	Rec hub & knuckle; hub races are burned up; knuckle bearing cones seized to spindle	186543
972 ?	YES	Rec hub & knuckle; hub races burned up; knuckle burn up	154995
974 ?	YES	Sent to SKF-5/23/02	455497
975 ?	YES	REC HUB, KNUCKLE AND DRUM; KNUCKLE INNER AND OUTER CONES SEIZED TO SPINDLE; HUB RACES BURNT UP-5/23/02	586652
976 L	YES	Sent to SKF-5/23/02	
977 L	YES	REC, HUB, KNUCKLE, DRUM SHOES; INNER AND OUTER CONES SEIZED TO SPINDLE; HUB RACES BURNT UP-5/23/02; ; warranty payment approved	535852
978 A	YES	REC. HUB, KNUCKLE, 2 BURNED UP AND BROKEN; HUB RACES AND HUB CONES ARE BURNED UP; KNUCKLE BEARINGS SPINNING ON BEARING JOURNALS; BURN UP-5/28/02	338501
979 A	YES	REC. DRUM, HUB, KNUCKLE AND CD BRAKE SHOE KNUCKLE INNER AND OUTER CONES SEIZED TO SPINDLE; HUB RACES BURN UP	458000
960 ?	YES	REC HUB AND KNUCKLE ASSEMBLED; KNUCKLE INNER AND OUTER CONES SEIZED TO SPINDLE HUB RACES BURN UP; INNER AND OUTER NUT AND WASHER STOPPED HUB FROM COMING OFF; BURN UP; NEAR OFF-5/23/02	274602
961 A	YES	Sent to SKF-5/28/02	622284
962 ?	YES	REC, DRUM AND KNUCKLE INNER AND OUTER BRG CONES ARE BURN UP AND SEIZED TO SPINDLE; NO HUB RETURNED; BURN UP-5/8/02	287309
963 A	YES	REC, HUB AND INNER AND OUTER CONES; HUB AND BEARING BURNT UP; ; warranty payment approved	408632
984 A	YES	REC HUB AND KNUCKLE, HUB STILL ON SPINDLE BECAUSE INNER AND OUTER NUTS ARE STILL THREADED ON SPINDLE; BURNT UP - NEAR WHEEL OFF- 5/22/02; ; warranty payment approved	407277
985 A	YES	Sent to SKF-5/23/02	306968
986 ?	YES	Sent to SKF-5/22/02	296145
987 A	YES	REC AXLE WITH BURNED UP BEARING SEIZED TO SPINDLE; REC HUB; WHEEL OFF-5/17/02	687193
988 A	YES	IB RACE HEAVY SPALLING AND DISCOLORATION ON LOAD ZONE; SPALLING AND PITTING AND HEAVY DISCOLORATION ON LOAD ZONE; IB ROLLERS HEAVY DEBRIS DENTING AND DISCOLORATION ON LOAD ZONE; O/B CONE AND RACE PITTING WHERE ROLLERS MEET RACE; INBOARD OIL SEAL LEAKAGE W	687193
989 A	YES	IN BOARD SEAL ALLOWED WATER INGRESS WHICH IN TURN CORRODED THE IN-BOARD BEARING AND CREATD CONTAMINATES; THESE CONTAMINANTS HELPED BREAK APART THE OUTBOARD BEARING; THE O/B RACE IS DAMAGED FROM THE ROLLERS TURNING SIDEWAYS AND BLOCKING; THIS IS INCONCLUSI	167925
990 A	YES	REC HUB ONLY; HUB RACES BURN UP-5/28/02	412700
991 A	YES	REC. HUB, KNUCKLE, NUTS AND 1 CONE INNER AND OUTER NUT WHERE CUT OFF IN ORDER TO REMOVE HUB; 1 CONE WAS CUT WITH A TORCH TO REMOVE FROM SPINDLE; HUB BURN UP-5/20/02; ; warranty payment approved	491999
992 ?	YES	Sent to SKF-5/23/02	312303
993 A	YES	HPI RETURNED; HUB CAP STILL ON HUB, BUT CENTER IS BLOWN OUT; ONLY 11 FLAT LOSE ROLLERS RETURNED; NO INNER CONES	
1179 L	YES	REC HUB, KNUCKLE AND SPINDLE ASSEMBLY WITH I/B AND O/B CONES STILL ATTACHED; CONES AND RACES ARE BURNED UP	287591
1180 L	YES	REC HUB, KNUCKLE/SPINDLE ASSEMBLY; I/B AND O/B CONES AND ROLLERS; CONES, ROLLERS AND RACES ALL BURNED UP; ALSO RECEIVED KINGPIN	434826
1181 L	YES	REC., HUB WITH I/B AND O/B RACES, REC KNUCLE AND SPINDLE WITH I/B AND O/B CONES. I/B AND O/B CONES AND RACES WERE ALL BURNED UP	520116
1182 A	YES	REC HUB ATTACHED TO SPINDLE/KNUCKLE ASSEMBLY WITH I/B AND O/B CONES AND RACES; CONES AND RACES ARE BURNED UP; ROLLERS FALL OUT AND NOT RECEIVED.	493109
1183 A	YES	REC HUB, SPINDLE/KNUCKLE ASSEMBLY, BRAKE SHOES, AND BRAKE DRUM; RACES ARE BURNED UP	392974
1184 ?	YES	REC KNUCKLE/SPINDLE ASSEMBLY WITH I/B AND O/B CONES SEIZED TO SPINDLE; CONES ARE BURNED UP; HUB NOT REC	501627
1185 A	YES	REC HUB, BRAKE DRUM, BRAKE SHOES, KNUCKLE/SPINDLE ASSEMBLY WITH I/B AND O/B CONES AS SPINDLE ASSEMBLY	143063
1186 A	YES	REC HUB AND KNUCKLE: HUB I/B AND O/B RACES BURNED UP;KUCKLE I/B AND O/B CONES ARE BURNED AND SEIZED TO SPINDLE; BURN-UP; WARRANTY PAYMENT APPROVED	549459
1187 L	YES	REC HUB, KNUCKLE, SPINDLE AND DRUM/ DRUM WAS STILL ATTACHED TO HUB; A CONE WAS CUT WITH TORCH AND INCLUDED IN BOX; HUB RACES WERE BURNED UP.	541172

1188 ?	YES	REC KNUCKLE ATTACHED TO A PARTIAL AXLE THAT HAD BEEN CUT OFF. AS SPINDLE IS ATTACHED TO KNUCKLE WITH BEARING CONES ATTACHED TO IT; WHEEL IS OFF; TALK TO SERVICE MANAGER AND WAS INFORMED THAT THEY LOOKED FOR TWO HOURS FOR HUB AND WHEEL ASSEMBLY; BURN-UP; W	663187
1189 A	YES	REC HUB AND KNUCKLE, HUB RACES BURNED UP. KNUCKLE I/B CONE BURNED UP AND SEIZED TO SPINDLE. WARRANTY PAYMENT APPROVED	
1190 A	YES	REC HUB, ROLLERS, RACES, AND CONES. CONES, RACES AND ROLLERS ARE ALL BURNED UP	414924
1191 A	YES	REC HUB: HUB RACES BURNED UP	673600
1192 A	YES	REC HUB AND I/B AND O/B CONES; CONES AND RACES BURNED UP	570162
1193 A	YES	REC HUB AND CONE. HUB I/B AND O/B SEAL RACES BURNED UP; BURN-UP; WARRANTY PAYMENT APPROVED	
1194 A	YES	REC HUB ONLY; I/B AND O/B RACES BURNED UP; BURN-UP; WARRANTY PAYMENT APPROVED	
1195 A	YES	REC HUB AND I/B AND O/B RACES; RACES ARE BURNED UP.	544159
1196 A	YES	REC HUB, KNUCKLE/SPINDLE ASSEMBLY, BRAKE DRUM, BRAKE SHOES, KINGPIN, AND I/B AND O/B CONES; I/B AND O/B CONES AND RACES ARE BURNED UP	442364
1197 A	YES	REC HUB ATTACHED TO KNUCKLE SPINDLE ASSEMBLY; CONES, RACES AND ROLLERS ARE ALL BURNED UP	368288
1198 A	YES	REC HUB, KNUCKLE/SPINDLE ASSEMBLY, I/B AND O/B CONES; RACES AND CONES BURNED UP	327469
1199 A	YES	REC HUB AND KNUCKLE/SPINDLE ASSEMBLE; I/B AND O/B CONES STILL ON SPINDLE IN A BURNED UP CONDITION; RACES (I/B AND O/B) BOTH BURNED UP.	332123
1200 ?	YES	REC KNUCKEL/SPINDLE ASSEMBLY WITH I/B AND O/B CONES SEIZED UP; CONES ARE BURNED UP	349581
1201 A	YES	REC HUB, ROLLERS, AND BRAKE SHOES; RACES AND ROLLERS BURNED UP	349651
1202 A	YES	REC HUB WITH O/B CONE, ROLLERS, AND STILL ATTACHED; I/B RACE BURNED UP	477024
1203 A	YES	REC HUB, ROLLERS, RACES, AND CONES; CONES AND RACES BURNED UP; ROLLERS ALSO BURNED UP	471882
1204 A	YES	REC HUB ONLY; HUB RACES BURNED UP	646809
1205 A	YES	REC HUB WITH O/B CONES, ROLLERS STILL TOGETHER; I/B RACE BURNED UP	298248
1206 A	YES	REC HUB, BRAKE DRUM, KNUCKLE AND SPINDLE ASSEMBLY AND CONES; CONES ARE BURNED UP AND STUCK TO SPINDLE; RACES IN HUB ARE BOTH BURNED UP.	349353
1207 A	YES	REC HUB, ROLLERS, RACES, AND CONES. RACES, ROLLERS, AND CONES ARE ALL BURNED UP	292498
1208 A	YES	REC HUB, I/B AND O/B CONES, BRAKE DRUM, AND BRAKE SHOES; I/B AND O/B CONES AND RACES BURNED UP	408672
1209 A	YES	REC HUB ATTACHED TO SPINDLE/KNUCKLE ASSEMBLY; CONES (I/B AND O/B) AND RACES BURNED UP; ROLLERS BURNED UP AND BOUND UP INSIDE HUB	312541
1210 A	YES	REC HUB STILL ATTACHED TO KNUCKLE/SPINDLE ASSEMBLY; ROLLERS MISSING WITH CONES SEIZED TO SPINDLE; BOTH CONES AND RACES BURNED UP! NEAR WHEEL OFF	570893
1211 A	YES	REC HUB RACES OF HUB BURNED UP	260359
1212 A	YES	REC HUB AND I/B AND O/B RACE; I/B AND O/B RACES ARE BOTH BURNED UP!	378487
1213 A	YES		114675
1214 A	YES	REC HUB, I/B AND O/B CONES, AND ROLLERS; I/B AND O/B CONES AND RACES ARE BURNED UP	268281
1215 A	YES	REC HUB AND KNUCKLE, HUB AND KNUCKLE BURNED UP THE ONLY THING STOPPING HUB FROM COMING OF WAS THE INNER AND OUTER NUTS AND WASHER; BURN-UP; WARRANTY PAYMENT APPROVED	377144
1216 A	YES	REC HUB, I/B AND O/B CONES AND ROLLERS; CONES, ROLLERS, AND RACES ARE ALL BURNED UP	380211
1217 A	YES	O/B SEAL AND BEARING IN TALT; SEVERAL MM OF GREASE LEAKAGE FROM SEAL; O/B CONE AND ROLLERS SHOW HIGH HEAT; I/B CONE, RACE, AND ROLLERS BURNED UP; CLIP RING SHOWS HIGH HEAT; SEAL LEAKAGE; WARRANTY PAYMENT APPROVED	288080
1218 A	YES	REC HUB, I/B AND O/B CONES, ROLLERS; ROLLERS, CONES AND RACES ARE BURNED UP	213730
1219 A	YES	REC HUB, I/B AND O/B CONES, AND ROLLERS; CONES, RACES AND ROLLERS ARE BURNED UP	341900
1220 ?	YES	REC HUB ONLY; RACES OF HUB BURNED UP	253388
1221 A	YES	REC HUB WITH I/B AND O/B CONES; CONES AND RACES ARE ALL BURNED UP	298363
1222 A	YES	REC HUB AND I/B CONE; CONE AND RACES WERE BURNED UP	410068

1223 A	YES	REC HUB STILL ON KNUCLE/SPINDLE ASSEMBLY WITH ROLLERS, AND BRAKE SHOES; I/B AND O/B CONES SEIZED TO SPINDLE ASSEMBLY; CONES AND RACES BURNED UP; NEAR-OFF	292291
1224 A	YES	REC., HUB, SPINDLE AND KNUCKLE ASSEMBLY, AND I/B AND O/B CONES STILL ATTACHED TO SPINDLE, CONES AND RACES BURNED UP. MISSING ROLLERS AND CAGES; NEAR WHEEL OFF	223866
1225 A	YES	REC HUB AND I/B CONE; CONE AND RACES WERE BURNED UP	246275
1226 A	YES	REC HUB, BRAKE SHOES, BRAKE DRUM, ROLLERS AND I/B AND O/B CONES; HUB STILL HELD ON SPINDLE; I/B AND O/B CONES SEIZED TO SPINDLE/KNUCKLE ASSEMBLY; CONES AND RACES BURNED UP; NEAR-OFF	438123
1227 A	YES	REC., HUB, KNUCKLE/ SPINDLE WITH I/B AND O/B CONES STILL ON SPINDLE, BRAKE SHOES, CONE AND RACES BURNED UP.	212000
1228 A	YES	REC HUB, KNUCKLE, I/B AND O/B CONES AND A FEW ROLLERS. HUB RACES BURNED UP. I/B AND O/B CONES AND ROLLERS BURNED UP.	
1229 A	YES	REC HUB AND I/B AND O/B CONES; CONES AND RACES ALL BURNED UP; NO CLAIM TAG WAS AVAILABLE	
1370 A	YES	REC HUB, DRUM, AXLE AND TIE ROD; HUB AND DRUM BURN-UP; AXLE SPINDLE BURN-UP; I/B AND O/B NUTS AND LOCK WASHED STILL ON SPINDLE; BURN-UP WHEEL OFF; WARRANTY PAYMENT APPROVED	551077
1371 A	YES	REC HUB ONLY; HUB I/B AND O/B HUB RACES BURNED UP; BURN-UP	
1372 L	YES	REC HUB ONLY; RACES OF HUB BURNED UP	736221
1373 L	YES	REC HUB, KNUCKLE/SPINDLE ASSEMBLY; I/B AND O/B CONES AND ROLLERS; RACES, CONES, AND ROLLERS ARE ALL BURNED UP; WARRANTY PAYMENT APPROVED	468603
1374 A	YES	REC HUB COMPLETE; I/B SEAL BURNED UP; I/B ROLLERS TURNED AND BURNED; BEARING FAILURE FROM CONTAMINATION ON THE I/B SIDE OF HUB; WARRANTY PAYMENT APPROVED	376161
1431 A	YES	Rec hub, spindle assembly w/cones seized to spindle (IB & OB), brake drum & shoes; cones & races burned up; 7/24/02	544282
1432 A	YES	Rec hub, knuckle, spindle assembly with IB & OB cones still attached; brake drum & brake shoes; cones & races burned up; 7/24/ 02	207120
1434 ?	YES	Rec spindle/knuckle assembly w/IB & OB cones still attached; cones burned up; 7/23/02	467601
1436 A	YES	Rec hub, rollers, IB & OB cones all components burned up; 7/24/02	437629
1437 A	YES	Rec hub IB and OB rollers and cones and brake shoes; cones, rollers and races are all burned up; 7/23/02	572022
1438 A	YES	Rec hub with IB and OB cones and rollers seized in hub; both IB and OB seals burned out; rollers on OB side turned sideways and burned up; 7/23/02	576629
1441 A	YES	Rec hub only; races in hub all burned up; 7/23/02	334111
1445 A	YES	Rec hub with brake shoes and brake drum; races in hub burned up; also rec knuckle/spindle assembly with IB and OB cones seized on spindle; cones are burned up; 7/16/02	669729
1446 A	YES	Rec hub with IB and OB cones and rollers; cones, rollers and races are all burned up; 7/16/02	288374
1449 A	YES	Rec hub with IB and OB cones cut free from spindle with Torch; rollers also included; cone, races, and rollers are all burned up; 7/16/02	268374
1451 A	YES	Rec hub and brake shoes; races in hub burned up; 7/15/02	326306
1452 A	YES	Rec hub with missing rollers; cones, races, and rollers burned up; 7/15/02	185990
1456 A	YES	Rec hub & knuckle/spindle assembly with IB & OB cones still attached; all components burned up; 7/15/02	
1459 ?	YES	Rec knuckle/spindle assembly only; IB & OB cones seized on spindle; everything burned up; 7/15/02	138799
1463 A	YES	Rec hub, drum, shoes & king pin; races in hub burned up; 7/5/02	446227
1464 A	YES	Rec hub, brake drum; spindle/knuckle assembly & IB & OB cones; IB & OB cones seized to spindle; cones & races burned up; near off; 7/5/2	715592
1466 A	YES	Rec hub; races in hub burned up; 7/5/02	246321
1468 A	YES	Rec hub, knuckle/spindle assembly, rollers & IB & OB cones; cones, races & rollers burned up; 7/3/02	353926
1469 ?	YES	Rec knuckle/spindle assembly, brake shoes; king pin; s-cam & IB & OB cones; hub was not rec; IB & OB cone is seized to spindle & burned up; 7/3/02	446227
1470 A	YES	Rec hub w/burned up cones, races & rollers (IB & OB)/ 7/2/03	525115
1473 A	YES	Rec hub only; races inside hub are burned up; 7/2/02	572351
1478 A	YES	Rec hub, rim, knuckle/spindle assembly & brake drum; hub races burned up; 6/25/02	541720
1479 A	YES	Rec hub, brake drum, knuckle/spindle assembly & IB & OB cones; cones & races burned up; 6/25/02	342884
1486 L	YES	Rec hub and IB and OB bearing cones both cones are broken; hub races are burned up; Warranty payment approved; 7/17/02	722964
1489 ?	YES	Rec Knuckle and part of bearing cone; knuckle IB and OB race seized to spindle no hub was returned; Burn-up; Warranty Payment Approved 7/17/02	757591
1502 A	YES	Rec hub & knuckle; hub races burnt up; knuckle IB & OB cones seized to spindle; warranty payment approved; 7/9/02	248295
1509 L	YES	Rec hub only; races in hub burned up; warranty payment approved; 7/10/02	645436

1517 A	YES	Rec hub only; hub races burn up; 7/19/02	439489
1619 A	YES	Rec hub and IB bearing cone; hub IB and OB races burned up; IB cone shows extreme heat; burn up; 7/19/02	587487
1620 A	YES	Rec hub only; hub races burned up; 7/19/02	439489
1629 ?	YES	Rec knuckle brake and brake parts; knuckle IB and OB cones seized to spindle old not recive hub; burn up; approved; 7/9/02	645438
1530 A	YES	Rec hub, knuckle and drum; hub and knuckle burn up; the only thing stoping hub from coming off was the inner and outer nut and washer; 7/18/02	575430

ID	Hub Problem Y/N	VIN	CLAIM #	IN SERVICE DATE	MILES	Date	Quantity
1099 Y			12345				
828 Y		1FUYDXYB3XLA77259	77259				
848 Y		1FUYDDYB8XLA70918	318274		417040		
1097 Y			E1749214				
849 Y		1FUYDDYB6XLA70921	318277		418370		
850 Y		1FUYDDYB8XLA70931	318287		260582		
851 Y		1FUYDDYB6XLA70931	318287		260582		
1089 Y			E1686919				
1088 Y			E1605895				
852 Y		1FUYDDYB4XLA70934	318290		298067		
858 Y		G63870	362039		484508		
1078 Y		840034	E1660645				
1101 Y			E1773776				
1070 Y			701-				
847 Y		1FUYDDYB6XLA70915	318274		450374		
1082 Y			0331597				
1081 Y			628785				
1080 Y			R0229627				
332 Y		1M1AA08Y1WW01238	Unit 808		743004		
327 Y			Unit				
326 Y			Unit				
325 Y			Unit				
323 Y			Unit 2084		236900		
320 Y			Test hub		160000		
316 Y		1FUYD5EB01PH36272	E38R204		116192		
311 Y			189121		422836		
309 Y			939395		103326		
858 Y		1FUYDSEB2YLF44872	396565		523036		
1146 Y		2HSFMAMR5YC029723	WMT9123		293366		
839 Y		A63965	317570		587711		
840 Y		A63966	317570		587711		
845 Y		1FUYDDYB8XLA70914	318270		310151		
846 Y		1FUYDDYB4XLA70917	318273		369097		
1164 Y		2HSFMAMR6YL065325					
1158 Y		2HSFTAER6XC023136	WO				
925 Y			STCD				
1163 Y		2HSFMAMR7XC030638	WMT9194		361726		
1162 Y			WMT9163		244969		
1161 Y			WMT9160		195396		
1160 Y			WMT9149		146540		
1100 Y		1FUY3SE57XPA16635	E1758668		346374		
1148 Y		3HSFMAMDYN052039	WMT9143		282456		
306 Y		1FUYDXYB2XLA77263	77263				
1145 Y		2HSFMAMR0XC029628	WMT9071		318360		
1144 Y		2HSCEAMR7Y8071068	WMT0027		199689		
1143 Y		2HSCEAMR8YC061878	WMT0001		215022		
1142 Y		F14723	VSFD02A				
1141 Y			VHMD000				
1134 Y			STCD000				
1133 Y			STCD				
1119 Y			R6AR00J		225500		
1113 Y		A73648	JJWD01F				
1112 Y			E1749214				
1106 Y		AD1448	E1678709				
1107 Y		1FUJACAS61LJ92596	D1104490		109316		
1149 Y			WMT9149		146540		
947 Y		2HSFTAER6XC023136	WO				
897 Y			CWA0604				
900 Y		1FUJACAS61LJ92596	D1104490		109316		
903 Y		A73648	JJWD01F				
911 Y			R6AR00J		225500		
334 Y			Unit		366472		
151 Y			N3FD				
152 Y			No info				
970 Y		855091	E1760012				
969 Y			0213279				
966 Y		660573	0084436				
958 Y		2HSFHAER2XG071467			339185		
305 Y		1FUY8DYBXYPA69367	189122		404902		
950 Y		1FUYDSEB1YP940512	ZVAR01C				
150 Y			GKFD01A				
948 Y			WMT9970		265738		
942 Y		2HSFMAMR7XC030638	WMT9194		361726		

941 Y		WMT9153	244950
940 Y		WMT9150	195396
939 Y		WMT9149	146540
938 Y		WMT9149	146540
937 Y	3HSFMAM0YN082039	WMT9143	262455
935 Y	2HSFMAMR6YC029723	WMT9123	293366
934 Y	2HSFMAMR0XC029626	WMT9071	318360
933 Y	2HSCEAMR7Y6071088	WMT0027	196569
932 Y	2HSCEAMR6YC061678	WMT0001	218022
931 Y		VHMD000	
963 Y	2HSFMAMR5YL065525		
966 Y	2HSFHAMR1XC076576	0128543A	194627
1161 Y	1FUYDSEB1YP940512	ZVAR01C	
137 Y		51298	
302 Y	1FUYSDZBXXLA14579	14579	129446
862 Y	G13974	918275	556934
866 Y	G13979	918280	466773
867 Y		918281	605219
868 Y		918281	605219
869 Y	G13981	918282	472256
872 Y	G13982	918283	615973
138 Y		0041467A	
139 Y		0056844A	79378
874 Y		918284	666044
895 Y		7 of 9	
141 Y		0062958A	21309
894 Y	1FUYDDYB7XLA70927	318283 (1	652695
142 Y		1186555A	50024
996 Y	1XKDD69X1XR953605	02093-	
143 Y		65601	8702
893 Y	2HSFMAXR4XC049219	1610097A	145031
993 Y	1FUY1WEBZ1LH51156	UNIT	
144 Y		82956A	21309
145 Y		A64347	554656
146 Y	1FUY5DYB4XPA65968	AW33844	350736
147 Y		CDCD	
148 Y	2HSFBAER7WC06715	CWA0267	
149 Y	1FUYDCYB4YDF46176	E1562173	256962
307 Y		97780	439660
140 Y		0067480A	61600
1228 Y			
360 Y			126536
827 Y	1FUYDXYB2XLA77254	77254	
174 Y	1XPBD69X9XD460364		
172 Y	1FUYSSEB6YPB66699		
171 Y	1FUYSZYB7YL787491		380273
170 Y			
163 Y			
1229 Y			
175 Y	no paperwork		
169 Y			
166 Y			
167 Y			
168 Y			
165 Y			
164 Y			
1234 Y	2HSFMAMR0YC029359	WMT9106	357036
1330 Y		352131	
335 Y	1FUYNMDB3YP662774	WBAR000	195728
339 Y			464166
1337 Y		322679	
1336 Y		349618	
1335 Y		365358	
1334 Y		357609	
1157 Y		WMT9970	285738
1332 Y		349886	
351 Y			484044
1326 Y		341294	
1327 Y		350606	
1328 Y		R0-	670906
1324 Y	2HSCEMAR3YC040100	WMT9168	343358
1323 Y		RO	388072
176 Y	1FUYSDYBXYLF72791		234548
361 Y			234416

1333 Y		349619				
160 Y	WD445455	WD44845				
161 Y						
162 Y						
820 Y	M266510	33654				
821 Y	1FUPCSZBYLA66762	66762		237985		
365 Y				506652		
159 Y		Unit 379				
158 Y		Unit 3038				
157 Y		Unit 1631				
156 Y		Unit #		35186		
153 Y		RO		66087		
155 Y		TNFD000				
154 Y		T622				
1 Y	1XKDD29XXVR736713	CBL02203	01-Jul-96	262622	01/01/97	0
2 Y	1FUYNMDB5VP795206	CWA0666	27-Jan-97	624473	01/27/97	2
363 Y	1FUYNMDB5VP795206	CWA0666	27-Jan-97	642473	03/10/97	1
178 Y	1FUYNMCB6VP629243	CHE0443	10-Mar-97	460400	03/17/97	2
3 Y	2HSFMAXR1VC034769	034769 /	17-Mar-97	460547	03/20/97	1
4 Y	2HSFMAXR4VC034779	CAI03740	17-Mar-97	337133	04/23/97	1
5 Y	2HSFMAXR5VC034774	CBE2409	20-Mar-97	466650	04/25/97	2
6 Y	2HSFMAXR1VC034756	034756	23-Apr-97		04/30/97	1
367 Y	2HSFNAMRNC053316	CWA0917	25-Apr-97		05/08/97	1
368 Y	1FUYDXYB7VP604700	E1599424	25-Apr-97	675671	05/11/97	1
974 Y	2FUYDDYB6WA93366	E1741260	30-Apr-97	456497	05/15/97	1
370 Y	1FUYSSEBXVL865687	CWA0964	06-May-97	351125	06/17/97	1
1179 Y	1FUYSSZB6WP447339	E1776932	11-May-97	257561	06/22/97	1
7 Y	1FUYSZYB4WL803501	E1660090	15-May-97	660503	06/30/97	1
375 Y	1FUYSSEB1WB606847	E1663613	17-Jun-97	460937	07/07/97	1
1242 Y	1FUYNMDB6WL74146	CWA1205	22-Jun-97	576417	07/15/97	1
179 Y	1FUYSSEB2WP780465	E1572206	30-Jun-97	413368	07/17/97	1
8 Y	1FUYSSEB5WL696076	E1700593	07-Jul-97	668524	07/21/97	1
9 Y	1FUYSSZB9WL447407	E1776417	15-Jul-97	605417	07/23/97	1
10 Y	1FUYSKYB8WL694423	CWA0872	17-Jul-97		07/27/97	1
11 Y	1XPGDU9X0WD44693	CWA0705	21-Jul-97	453507	07/29/97	2
383 Y	1FUYNWEBXWL69660	E1650654	23-Jul-97	917742	08/06/97	1
384 Y	2FUYDDYB5WA90457	E1703129	27-Jul-97	495673	08/08/97	1
180 Y	1FUYSMDB3WL69969	E1672165	29-Jul-97	727018	08/13/97	1
12 Y	1FUYSMDB5WL69969	E1672166	29-Jul-97	762914	08/21/97	1
181 Y	2FUPFBDB4XA948883	CWA0371	06-Aug-97	322860	08/26/97	1
13 Y	1FUYDZYB2WL787003	E1651664	06-Aug-97	481450	09/02/97	2
14 Y	1FUYSBZB3WB935948	CWA0370	13-Aug-97	600202	09/09/97	1
1372 Y	1FUYSXYB7WL624066	E1506260	21-Aug-97	736221	09/15/97	2
15 Y	1FUYSSEB4WL695222	CWA0660	26-Aug-97	607446	10/03/97	1
999 Y	1FUYNWDB9WL90887	E1717541	02-Sep-97		10/16/97	1
1008 Y	1FUYNWDB9WL90887	E1717542	02-Sep-97		10/20/97	1
1239 Y	1FUYDDYB8WL907661	0034562	09-Sep-97	714570	10/28/97	1
16 Y	2HSFRAHR6WC06018	CBY0008	15-Sep-97	284606	11/07/97	1
17 Y	1FUYSBZB6WL888461	Invoice	15-Sep-97	646650	12/10/97	1
183 Y	2FUPDSEB4WA90139	E1672375	03-Oct-97	716653	12/31/97	0
400 Y	1FUPDSEB3WA94470	E1694337	16-Oct-97			
401 Y	4JG7DBJH4WN751205	CWA0764	20-Oct-97	482329		
978 Y	2FUYDSEB9WA942373	E1755102	28-Oct-97	566652		
166 Y	1FUY3MCB3WL806377	D1099970	07-Nov-97	422725		
18 Y	1FUYDDYB4WL922966	Unit	10-Dec-97	491164		
19 Y	1FUYSDYB6WP917799	E1525560	29-Jan-98	304316		
427 Y	1FUPCBEB6WA95605	E1574441	02-Feb-98			
1343 Y	2FUPCDYB4WA97785	E1795404	12-Feb-98	661216		
1008 Y	1FUYNMDB9WL927554	E175668	16-Feb-98			
994 Y	1FUYSSEB4WL971649	E1755677	01-Mar-98	386606		
976 Y	2FUYDSZB6WA962028	E1712579	20-Mar-98			
437 Y	1FUSNWEBXWP95625	E1599193	01-Apr-98	622316	01/01/99	0
977 Y	1FUYSDYB1WLA17838	CWA1331	01-Apr-98	636662	01/29/99	1
438 Y	1FUYNMDB1WLA2281	CWA0398	06-Apr-98		02/02/99	1
20 Y	1FUPDSZB4WP28654	E1662280	21-Apr-98	381184	02/12/99	1
1014 Y	1FUYSWCB8WLA0620	E1755674	24-Apr-98		02/16/99	1
1077 Y	1FUYDSYB0WL375488	E1574422	28-Apr-98	337468	03/01/99	1
189 Y	1FUYSSEB8XP928387	E1651612	28-Apr-98	442225	03/20/99	1
1180 Y	1M1AA15Y9WW06964	CWA0671	29-Apr-98	434825	04/01/99	2
448 Y	1XPGDU9X1WN47141	CWA0697	30-Apr-98	462662	04/06/99	1
997 Y	1FUYSDYB9XLA29088	33638	01-May-98	461834	04/21/99	1
1015 Y	1FUYSDYB9XLA29088	33638	01-May-98	461834	04/24/99	1
190 Y	1FUYDDYB3XPA09169	32872	15-May-98	250087	04/26/99	2
451 Y	1FUW3MCA2XP987112	E1699409	19-May-98	332009	04/29/99	1

21 Y	1FUYDWDB$XL96440	33770	23-May-98	465822	04/30/98	1
1151 Y	1FUPDSEB1X1973360	E1791912	29-May-98	520116	05/01/98	2
456 Y	1FUPCSSB0XLA10466	E1755927	04-Jun-98	573902	05/15/98	1
457 Y	1FUYSWEB1XLA22961	E1730746	11-Jun-98		05/19/98	1
458 Y	1FUYSWEB3XLA22962	E1730747	11-Jun-98		05/23/98	1
191 Y	1FUYSWEB3XLA22962	E1730747	11-Jun-98		05/29/98	1
22 Y	1FUYDSEB7XLA33756	C8Y0015	16-Jun-98	253163	06/04/98	1
462 Y	1FUYDSEB1XL995553	E1667466	22-Jun-98	419279	06/11/98	3
464 Y	1FUYDSEB1XPA69404	CWA0232	26-Jun-98	504205	06/18/98	1
978 Y	1FUYSDYB1YLA62888	E1785664	30-Jun-98	338501	06/22/98	1
469 Y	4VGJDEJF5X N865091	33696	17-Jul-98	194124	06/26/98	1
470 Y	1FUYCDYB7XLA67567	317981	17-Jul-98	556605	06/30/98	1
471 Y	1FUY3MDB4XPA77111	33894	20-Jul-98	264153	07/16/98	2
23 Y	1FUYSDYB1XP956272	E1686498	31-Jul-98	462701	07/31/98	1
472 Y	1FUYDSEB7XPA41431	CWA0300	04-Aug-98	598034	08/04/98	1
473 Y	1FUYSSZB1XLA05404	CWA1426	06-Aug-98	747624	08/06/98	2
194 Y	1FUYSSZB1XLA06404	CWA1426	06-Aug-98	747624	08/26/98	2
479 Y	1FUYSKYBXXLA75539	8.55244e+	26-Aug-98	599062	09/01/98	2
24 Y	1FUYSDZB1XP918088	E1704740	26-Aug-98	509095	09/15/98	2
481 Y	XLA95581	CWA1033	01-Sep-98	523549	09/17/98	1
196 Y	1FUYDSEB5XPA07049	CWA1426	01-Sep-98	411300	09/21/98	2
483 Y	1XPCD69X1XN465638	CAW0602	15-Sep-98	468759	09/22/98	1
482 Y	1XPCD69X1XN465638	CAW0602	15-Sep-98	468759	09/24/98	2
1019 Y	1FUYSSZB3XLA01258	E1717654	17-Sep-98	488779	09/25/98	1
1084 Y	1FUYDSYB3XL978597	E1662202	21-Sep-98	350813	09/30/98	3
1083 Y	1FUYDSYB3XL978597	E1662202	21-Sep-98	350813	10/01/98	1
25 Y	1FUYSSEB7XPA67438	E1661998	22-Sep-98	496167	10/02/98	1
1182 Y	1FUYSDYB7XPA28767	E1778014	24-Sep-98	493109	10/05/98	4
26 Y	1FUYSDYB4XP968348	CWA0940	24-Sep-98	588279	10/06/98	1
27 Y	1FUYDSYB4XL979606	E1692440	25-Sep-98	390563	10/08/98	2
468 Y	1FUYSSEB7XL921614	E1702613	30-Sep-98	348980	10/13/98	1
486 Y	1FUYDDYB7XPA39198	CWA0608	30-Sep-98	388348	10/14/98	5
28 Y	1M1AA12YXXW099251	CWA0707	30-Sep-98	587140	10/19/98	1
199 Y	1XXADB9X6XJ799392	CWA1255	01-Oct-98	377145	10/20/98	2
29 Y	1FUYSSEB4XLA44932	CWA1426	02-Oct-98	441085	10/22/98	1
1020 Y	1FUYSDZR5XP915099	E1776461	05-Oct-98	617764	10/23/98	2
30 Y	1FUYSDZB5XP916099	E1776717	05-Oct-98	614986	10/26/98	1
1183 Y	1FUYSSEB1XP923097	E1741076	05-Oct-98	392974	10/31/98	2
31 Y	1FUYSSZB1XLA01308	E1781278	05-Oct-98	555498	11/04/98	1
480 Y		YHCD000	06-Oct-98	509283	11/07/98	1
32 Y	2HSFHAMR1XC076492	CWA1177	06-Oct-98	320491	11/08/98	2
39 Y	1FUSSDZB7XP953753	E1704752	06-Oct-98	415186	11/11/98	1
200 Y	1FUYSSZB8XLA01619	E1687204	13-Oct-98	384172	11/13/98	2
497 Y	1FUYSDYB7XPA87046	CWA0936	14-Oct-98	417825	11/15/98	1
494 Y	1FUYDDYB0XLA70929	0368717	14-Oct-98	274741	11/16/98	1
1269 Y	1FUYDDYB6XLA70935	0034998	14-Oct-98	432283	11/17/98	1
201 Y	1FUYDSEB1XPA26553	E1672379	14-Oct-98	405549	11/18/98	1
34 Y	2HSFRAHR4XC070296	CWA0466	14-Oct-98	166379	11/19/98	3
501 Y	1FUYDDYB3XLA70940	0034011	15-Oct-98	604692	11/21/98	3
202 Y	4VG7DBUFGXN788406	CWA0638	20-Oct-98	391658	11/23/98	2
504 Y	1FUYDSYB7XL975618	E1692468	20-Oct-98	314612	11/24/98	2
505 Y	1FUYSSEB3XLA04807	E1700878	22-Oct-98	490060	11/25/98	2
507 Y	1FUYSXYB0XPA29810	VEH NO.	23-Oct-98		11/27/98	1
506 Y	1FUYNMDB0XL927668	E1669113	23-Oct-98		12/01/98	2
509 Y	1FUYNMDB0XPA23400	E1700143	28-Oct-98	341022	12/03/98	1
206 Y	2HSFBAMR6XC67962	CWA0273	31-Oct-98		12/04/98	1
208 Y		Unit	31-Oct-98	298752	12/08/98	1
1373 Y	1FUYSSEB0XPA07375	E1803068	04-Nov-98	466803	12/15/98	1
1001 Y	1FUYSDYB2XL906912	0034234	07-Nov-98	469308	12/17/98	2
1184 Y	1FUYSSZB2XLA01524	E1776991	08-Nov-98	501527	12/18/98	2
36 Y	1FUYSSZB2XLA01524	E1744763	08-Nov-98	501725	12/31/98	0
37 Y	1FUYSCYB1XLA46574	E1744771	11-Nov-98	284808		
38 Y	1FUYSSEB4XPA67443	E1674256	13-Nov-98	295802		
515 Y		Unit	13-Nov-98	283513		
39 Y	1FUYSSZB6XLA01333	CWA0609	15-Nov-98	520186		
516 Y	1FUPCSZB1XPA67312	E1701164	16-Nov-98	409060		
209 Y		Unit	17-Nov-98	470804		
210 Y		Unit	18-Nov-98	490155		
211 Y	1FUYSZYB3XPA45988	E1684654	19-Nov-98	323243		
517 Y	1FUWNWDA7XLB3254	E1682062	19-Nov-98	411858		
518 Y		Unit	19-Nov-98	402790		
1185 Y	1FUWTECA3XHB3049	E1682106	21-Nov-98	143063		
40 Y	1FUWTECA3XHB3049	E1682106	21-Nov-98			
41 Y	1FUWTCCA3XHB3049	E1682106	21-Nov-98	143063		

214 Y		Unit	23-Nov-98	608696		
213 Y		Unit	23-Nov-98	508695		
42 Y	1FUYSDYB4XP986377	CWA0112	24-Nov-98	423268		
43 Y	1FUYSDYB6XP986379	E1645207	24-Nov-98	399606		
1168 Y	1FUY5BZB3XLA01533	CWA1575	25-Nov-98	649469		
217 Y	1FUYSSZB5XLA20441	E1690685	25-Nov-98	245584		
522 Y	1FUYS5ZB7XLA16133	E1778432	27-Nov-98	356014		
523 Y	1FUYBXYB3XLA77282	33887	01-Dec-98	698650		
1266 Y	1XP6DB8X4VN439850	CWA1312	01-Dec-98	632241		
1167 Y	1FUWNWDA6XLB3358	E1785694	03-Dec-98	541172		
524 Y	2HSFHAER1XC024205	CWA0485	04-Dec-98			
1344 Y	1FUYTECB60XHB30019	E1803062	06-Dec-98	211209		
529 Y	1FUYDDYB6XDA39020	CWA0806	15-Dec-98	327694		
1267 Y	1FUYSDYB3XLB06699	0034580	17-Dec-98	380012		
979 Y	1FUYSDYB2XLB25645	0034387	17-Dec-98	458000		
216 Y		N94800Y0	18-Dec-98	173		
960 Y	1FUYTECBXHB30080	E1741117	18-Dec-98	274602		
44 Y	1FUPD6ZB7XLA94174	CWA0278	01-Jan-99			
45 Y	1FUPD6ZB7XLA94174	CWA0278	01-Jan-99			
221 Y	1FUYDCYB0XLB30108	E1555176	06-Jan-99	389616		
46 Y	1FUPDXYB0XLA14617	E1676127	08-Jan-99			
532 Y	1FUPDYX60XLA14617	E1699450	08-Jan-99	466456		
1022 Y	1FUYJECB3XHB30012	E1787981	08-Jan-99	195480		
47 Y	1FUY3WE90XLA61760	CFA02893	10-Jan-99			
222 Y	1FUYNMDB9XLB72625	E1672074	14-Jan-99	399766		
223 Y	1FUYSBZB9XLA01441	E1687158	15-Jan-99	193292		
1188 Y	1FUY5SZB8XLA29675	E1797445	16-Jan-99	883167		
981 Y	1FUYSSZB2XLA06870	E1778449	18-Jan-99	622254		
1189 Y	2HSFBAER1XC037344	CFY00032	29-Jan-99			
48 Y	1FUYSSZB7XLA01440	CWA0273	29-Jan-99	462226		
49 Y	1FUYDSZB1XL973977	CWA0874	01-Feb-99	583429		
540 Y	1FUYDSCB0XL973978	CHEC841	01-Feb-99	597114		
50 Y	1FUPD8ZB2XB06121	E1683667	01-Feb-99	429615		
225 Y	1FUPDSEB0XPB50115	E1660674	04-Feb-99	572000		
544 Y	2HSFMAER9XC028294	CWA0356	10-Feb-99			
226 Y	1FUYDXYB5XLA77253	0034116	11-Feb-99	506244		
545 Y	1FUYDXYB5XLA77253	0034116	11-Feb-99	606244		
996 Y	1FUYBXYB8XLA66444	E1765616	19-Feb-99			
61 Y	1FUYDWEB8X1A22942	E1710565	23-Feb-99			
1073 Y	1FUYSXYB0XLA72106	CWA1030	26-Feb-99	431266		
1268 Y	2HSFMAER3XC029046	WMT9275	26-Feb-99	313586	01/01/99	2
228 Y	1FUYDSYB2XLB66484	E1670048	01-Mar-99	284715	01/06/99	3
1104 Y		Unit	01-Mar-99		01/06/99	1
1190 Y	1FUYSXYB0XPA10374	E1787977	06-Mar-99	414924	01/10/99	1
62 Y	1FUYSBEB1X1B67544	E1755659	09-Mar-99		01/14/99	1
1095 Y	1FUPDSZB8XLA14512	E1745391	20-Mar-99		01/16/99	2
53 Y	1FUYSSZB0XLA42647	E1750134	22-Mar-99	733519	01/18/99	1
1272 Y	1FUYDXYB0XLF38014	0034959	23-Mar-99	641971	01/29/99	2
54 Y	1FUYSXYB3XPA06251	E1715199	24-Mar-99	287309	02/01/99	3
982 Y	1FUYSXYB3XPA06251	E1715199	24-Mar-99	257309	02/04/99	1
1366 Y	2HSFHAMR2XC03526	CWA1558	25-Mar-99	534269	02/10/99	1
1369 Y	2HSFHAMR2XC03526	CWA1558	25-Mar-99	534269	02/11/99	2
55 Y	1FUPD9ZB3XPA65373	E1696261	26-Mar-99		02/19/99	1
654 Y	1FUPD8ZB3XPA65373	E1696261	26-Mar-99		02/23/99	1
555 Y	1FUYDDYB6XDB67276	0359661	27-Mar-99	442040	02/26/99	1
556 Y	1FUYDXYB8XLF98021	0359646	29-Mar-99	561581	02/28/99	1
56 Y	1FUPD8ZB0XLA14636	E1699401	31-Mar-99	270435	03/01/99	2
559 Y	1FUPD8ZB0XLA14636	E1703110	31-Mar-99	258164	03/05/99	1
561 Y	2HSFMAER3XC067100	CWA0309	01-Apr-99		03/08/99	1
1026 Y	1FUYDSEBXXPB70049	E1765941	01-Apr-99	543529	03/20/99	1
57 Y	1FUYSDYB8XLA61790	E1674309	01-Apr-99	252758	03/22/99	1
58 Y	1FUYS8ZB0XLA42942	E1775451	03-Apr-99	491916	03/23/99	1
565 Y	2HSFTAER0XC023133	CWA0930	05-Apr-99		03/24/99	2
566 Y	1FUYDDYB5XDB67286	0358743	05-Apr-99	403575	03/25/99	2
1191 Y	1FUYD5ZB1XPA64746	E1763585	12-Apr-99	573500	03/26/99	2
59 Y	1FUPD5ZB1XPA64743	E1717868	15-Apr-99	582883	03/27/99	1
60 Y	1FUYD5ZB3XPA64747		16-Apr-99	593468	03/29/99	1
572 Y	1FUYSSZB2XLA01672	CWA0468	18-Apr-99	406310	03/31/99	2
61 Y	1FUYSDYB9YPA66031	E1752963	20-Apr-99	303650	04/01/99	3
1027 Y	2HSFTAER2XC043087	CWA1358	21-Apr-99	481421	04/03/99	1
1290 Y	2HSFTAER5XC090969	CWA1518	23-Apr-99		04/06/99	1
62 Y	1FUYD5ZB9XPA64333	E1633999	23-Apr-99	285462	04/08/99	1
1192 Y	1FUYS5ZB8XLA42904	E1775452	29-Apr-99	570162	04/12/99	1
1193 Y	2HSFHAER0XC041693	CWA1519	03-May-99		04/15/99	1

230 Y	2HSFTASR0XC042538	E1667234	03-May-99	177990	04/16/99	1
1273 Y	2HSFHAER0XC041893	CWA1619	03-May-99		04/16/99	1
83 Y	1FUYSDYB3YPA46789	E1517030	14-May-99	92600	04/20/99	1
582 Y	1FUYDDYB1YPF37320	33954	17-May-99	268703	04/21/99	1
231 Y	2HSFTASR0XC033983	E1646525	18-May-99	191756	04/23/99	2
583 Y	2HSPMAER1XC029266	WMT9547	19-May-99	320974	04/29/99	1
1255 Y	XC040585	CWA1355	20-May-99		05/03/99	3
1194 Y	XC040585	CWA1355	20-May-99		05/14/99	1
1195 Y	1FUYDSZB2XPA84336	E1785930	20-May-99	544158	05/17/99	1
1277 Y	2HSFTAMR7XC041574	CWA1237	21-May-99		05/18/99	1
586 Y	1M1AE07Y1XW001201	CWA0496	26-May-99	508937	05/19/99	1
585 Y	1FUYDDYB8YLB84025	33892	26-May-99	443272	05/20/99	3
587 Y	2HSFHASR7YC037897	0523320A	28-May-99	389903	05/21/99	1
588 Y	1FUPCSZB9YLA86762	66762	01-Jun-99	273966	05/26/99	2
232 Y	1FUYSDYE3YLF38977	348806	01-Jun-99	591544	05/28/99	1
1261 Y	1FUYSBZB4YLB54620	CWA1386	04-Jun-99	504862	06/01/99	2
1260 Y	2HSFMAMR2YC037026	CWA1616	04-Jun-99		06/04/99	4
1029 Y	1FUYDDYB7YLF60659	34096	04-Jun-99	443137	06/06/99	1
233 Y	1FUYSXYB8YLB67836	E1707294	04-Jun-99	438310	06/07/99	2
64 Y	1FUYSSZB2YLB54886	CWA1184	06-Jun-99	592706	06/10/99	2
593 Y	1FUYDDYB1YLF20942	33965	07-Jun-99	359724	06/11/99	3
594 Y	1FUYSXYB4YLA84213	E1695955	07-Jun-99	250000	06/12/99	1
56 Y	1FUYSDYB1YLA55415	E1749994	10-Jun-99	250555	06/14/99	2
1196 Y	1FUYSSZB9YLB54525	E1753245	10-Jun-99	442384	06/15/99	3
597 Y	4V4ND1UF0YN765434	CWA0505	11-Jun-99	293140	06/17/99	1
596 Y	1M1AA12Y6YW117912	CWA0498	11-Jun-99	152259	06/18/99	3
58 Y	4V4ND1UF0YN765434	CWA0546	11-Jun-99	344309	06/19/99	4
985 Y	1FUYSSZB9YLF02584	CWA1458	12-Jun-99	409632	06/22/99	3
1197 Y	1FUYSWDB6YLA89692	E1751282	14-Jun-99	386288	06/23/99	4
954 Y	1FUYSWEB[illegible]YLA86108	CWA1400	14-Jun-99	407277	06/24/99	1
67 Y	1FUYSBZB5YLA92032	E1752443	16-Jun-99	346060	06/25/99	2
1284 Y	2HSFTAER3XC092861	CWA1452	16-Jun-99	343073	06/28/99	3
601 Y	4V4ND2UF8YN765380	CWA0173	16-Jun-99	356930	06/29/99	2
68 Y	1FUYDSYB0YLB05720	E1691102	17-Jun-99	346211	06/30/99	2
603 Y	4V4ND1JE8YN703196	0034097	18-Jun-99	593443	07/01/99	5
69 Y	1M1AE08Y0XW001143	CWA0597	18-Jun-99		07/02/99	2
173 Y	1FUYDDYB0YLB97858	CWA0348	18-Jun-99	336132	07/06/99	3
1198 Y	1FUYSDYB5YPF68984	E1735901	19-Jun-99	327489	07/09/99	1
71 Y	1FUYSDYB6YPF68984	E1735901	19-Jun-99	327489	07/10/99	2
1004 Y	1FUYDDYB9YLF29330	0380860	19-Jun-99	325951	07/12/99	3
70 Y	1FUYSDYB4YPF68972	E1730866	19-Jun-99	355145	07/13/99	1
612 Y	1FUPCSZB7YLB91162	E1707483	22-Jun-99	371288	07/14/99	1
613 Y	1FUPCSZB7YLB91162	E1707483	22-Jun-99	371288	07/15/99	2
236 Y	2HSFTAER8XC041975	40961A	22-Jun-99	156256	07/16/99	4
1031 Y	1FUYDCYB5YL1F3818	33837	23-Jun-99	387484	07/19/99	2
72 Y	1FUYSSZB3YPA86034	E1755829	23-Jun-99	396358	07/20/99	5
666 Y	1FUYSSZB0YLB97951	E1717834	25-Jun-99	306695	07/21/99	1
614 Y	1HSHCANRLYH212428	CWA1197	25-Jun-99	361553	07/22/99	2
1288 Y	1FUW3MCA8YLB5441	CWA1299	24-Jun-99	440920	07/23/99	1
1199 Y	1FUYDSEB5YPF29133	E1785945	25-Jun-99	332123	07/24/99	1
1032 Y	1FUPCSEB6YPB96602	E1772999	25-Jun-99	348409	07/26/99	2
1287 Y	1FUYSDYB3YPA88077	E1786113	28-Jun-99	239000	07/27/99	2
617 Y	1XKWDR9X6YJ838190	CWA1207	28-Jun-99	254734	07/28/99	3
73 Y	1FUYSDYB9YPA86063	E1780046	28-Jun-99	396172	07/29/99	5
74 Y	1FUYSDYB7YPA86347	Unit 3169	29-Jun-99		07/30/99	1
237 Y	1FUYSDYB5YPA86353	RO86464	29-Jun-99	302048	08/01/99	1
75 Y	1FUYDWDB1YLB1792	E1641505	30-Jun-99	638229	08/05/99	1
238 Y		N94600Y0	30-Jun-99	209	08/09/99	2
76 Y	1FUYDSEB2YLF44965	8.83747e+	01-Jul-99	564569	08/10/99	2
624 Y	1FUYSSZB0YLB54890	E1750074	01-Jul-99	462883	08/11/99	2
1201 Y	1FUYDDZB8YPB71245	E1752349	01-Jul-99	349661	08/12/99	1
79 Y	1FUYSDYB[illegible]YLF38982	E1775958	01-Jul-99	579730	08/13/99	1
77 Y	1FUY[illegible]DYB[illegible]XYLF38978	E1746208	01-Jul-99	588523	08/14/99	2
621 Y	1FUYDSEB8YLF44960	033885	01-Jul-99	567295	08/15/99	3
78 Y	1FUYSDYB9YLF38425	E1773649	01-Jul-99	579189	08/16/99	2
1200 Y	1FUYSDZB8YPB71245	E1752349	01-Jul-99	349661	08/17/99	2
627 Y	1FUYDDYB2YDF37814	Unit	02-Jul-99	197412	08/18/99	1
628 Y	1FUYDDYB2YDF37814	32882	02-Jul-99	197412	08/19/99	2
1203 Y	1FUPDWEB4YDF5482	E1795214	06-Jul-99	471862	08/20/99	3
1202 Y	1FUYSBZB6YLB54920	E1772794	06-Jul-99	477024	08/23/99	2
1033 Y	1FUYDSZB3YLB56100	E1783577	09-Jul-99	367277	08/24/99	1
80 Y	1FUYSDYB3YPA46789	E1527206	09-Jul-99	90980	08/25/99	1
630 Y	1FUPCSZB1YPB87246	E1862266	10-Jul-99	281746	08/26/99	1
631 Y	1FUYSSZB6XP057711	E1752468	10-Jul-99	466608	08/27/99	1

632 Y	1FUYSS7B7YLB54916	E1662020	12-Jul-99	345217	06/28/99	2
633 Y	1FUY5S7B7YLB54919	E1662020	12-Jul-99	345217	06/30/99	4
240 Y	1FUPD5ZB9YPA66055	E1705151	12-Jul-99	391921	08/31/99	3
1204 Y	1FUYS5ZB7YLB54644	E1793025	13-Jul-99	545809	09/01/99	3
51 Y	2HSFHMR0YC052886	CWA1014	14-Jul-99	367059	09/06/99	1
241 Y	1FUYSSER0YL065342	E1708935	15-Jul-99		09/07/99	1
1290 Y	1FUWSMCA7YLB5440	CWA1357	15-Jul-99	398353	09/08/99	1
52 Y	1FUYSSEB6XLA90486	E1744739	16-Jul-99		09/09/99	3
242 Y	1FUPLS7B5YPB62016	E1669451	16-Jul-99	306356	09/11/99	1
1034 Y	1FUY5XYB8YLB61651	E1755665	16-Jul-99	422048	09/14/99	1
1205 Y	1FUPCSEB8YLB48501	E1756152	16-Jul-99	298246	09/15/99	1
636 Y	1FUYSSEB2YPF20489	E1682277	19-Jul-99	272436	09/16/99	3
635 Y	2HSFTAERXYC043106	0042206B	19-Jul-99	186651	09/17/99	1
83 Y	2HSFTAMR7Y6031728	CFW0109	20-Jul-99		09/20/99	2
84 Y	1FUYDDYB7YLB05743	E1663527	20-Jul-99	333982	09/24/99	1
85 Y	1FUYSSZB8YLB54922	E1708917	20-Jul-99	331928	09/25/99	1
1208 Y	1FUY5DYB9YLA65434	E1792903	20-Jul-99	546363	09/27/99	1
1067 Y	1FUYDDYB7Y1B05743	E1663527	20-Jul-99	333982	09/28/99	1
636 Y	1FUPDDYB9YLB64725	CWA0528	21-Jul-99		09/30/99	1
1292 Y	2HSFTASR3YC024131	CWA1402	22-Jul-99	332284	10/04/99	1
1293 Y	2HSFTASR3YC024131	CWA1402	22-Jul-99	332284	10/06/99	2
1207 Y	1FUY3XYB3YLA54951	E1795227	23-Jul-99	292496	10/08/99	1
86 Y	1FUYDDYB4YDF45696	033570	24-Jul-99	396799	10/08/99	1
1342 Y	1FUY8DYB1YLF11663	E1756651	26-Jul-99	273782	10/14/99	1
642 Y	1FUYDDYB3YLB06755	CWA0435	26-Jul-99	201208	10/15/99	3
243 Y	YC034837	CWA0566	27-Jul-99	369239	10/18/99	1
87 Y	1FUYDLYB4YMF46064	33626	27-Jul-99	330550	10/19/99	1
244 Y	1FUYSDYBXYLA65443	E1692211	28-Jul-99	256757	10/20/99	3
1206 Y	1FUPCZYB4YD787518	E1755890	28-Jul-99	408672	10/21/99	1
643 Y	1FUYD5ZBXYLA60075	E1689399	28-Jul-99	474311	10/25/99	1
644 Y	1M1AA15YXYW121463	CWA0435	29-Jul-99	251046	10/27/99	1
245 Y	1FUYSDYB3YPA50464	E1680019	29-Jul-99	222801	10/28/99	1
88 Y	1FUYSDYB0YPA50468	E1773685	29-Jul-99	280096	10/29/99	3
1003 Y	1FUYSSZB6YLB54960	E1783264	30-Jul-99	392469	11/01/99	1
1294 Y	1M1AA13Y5YW118997	0034679	01-Aug-99	373875	11/03/99	1
1005 Y	1FUY5DYB0XYLB61563	E1710514	05-Aug-99	296109	11/08/99	1
1209 Y	1FUPCXYB2YLB70886	E1775223	06-Aug-99	312541	11/09/99	1
1036 Y	1FUYDCYB3YLP60433	0034228	06-Aug-99		11/11/99	1
89 Y	1FUWNWDA5YLF9271	E1748140	10-Aug-99	383534	11/12/99	1
652 Y	1FUYBSZB8YPA63318	E1693175	10-Aug-99	225500	11/13/99	1
653 Y	1FUY5WEB8YLB16300	E1752504	11-Aug-99	351104	11/15/99	1
1295 Y	1FUY5WEB6YLB16254	E1785997	11-Aug-99	315200	11/16/99	2
1094 Y	1FUPD5EB8YLF26318	E1741296	12-Aug-99	432484	11/19/99	1
1210 Y	1FUYSSEB6YLF80188	E1796201	13-Aug-99	570693	11/25/99	1
1000 Y	1FUYSSZB0YPA75877	E1717463	14-Aug-99	302367	11/29/99	1
90 Y	1FUPCZYB0XYD787519	787519	14-Aug-99	341648	12/01/99	2
655 Y	1FUYDCZB8YDF60214	32871	15-Aug-99	466620	12/03/99	1
1037 Y	1FUYDCYB4YDF45506	00003355	15-Aug-99		12/10/99	1
246 Y	1FUYDCYB2YDF60220	360911	15-Aug-99	443780	12/15/99	1
1038 Y	1FUYSSEB2YLA80785	E1775930	16-Aug-99	250145	12/16/99	1
986 Y	1FUYSSEB2YLA80785	E1775930	16-Aug-99	250145	12/17/99	1
91 Y	1FUY8SZB3YLB54964	E1744753	17-Aug-99	375222	12/20/99	4
1039 Y	1FUY8SZB3YLB34194	E1781300	17-Aug-99	537485	12/21/99	2
657 Y	1FUY8DZB4YPA89948	E1720617	18-Aug-99	374923	12/22/99	1
661 Y	2HSFMAXR8YC025503	CWA0349	19-Aug-99		12/24/99	1
660 Y	2HSFMAXR8YC025503	CWA0349	19-Aug-99		12/29/99	2
251 Y	1FUYSSEB0XLA60461	E1669202	20-Aug-99	794620	12/29/99	1
92 Y	1FUYDWDB2YLB1793	E1672355	20-Aug-99	655312	12/30/99	2
93 Y	1FUYDWDB2YLB1793	E1672355	20-Aug-99	655312	12/31/99	0
665 Y	1FUY3XYB7YLB40032	E1662210	23-Aug-99	278902		
664 Y	2HSFTAER9YC034985	034984	23-Aug-99	615906		
1041 Y	1FUYSDYB5YLA8294	E1753353	24-Aug-99	342046		
94 Y	1FUWNWDA9YLF9275	E1750128	25-Aug-99	410001		
1042 Y	1M1AA12Y3YW12497	CWA1458	26-Aug-99	375200		
1238 Y	2HSFTAMR0YC034152	CWA1562	27-Aug-99	476999		
1043 Y		34229	28-Aug-99			
1298 Y	1FUYDSE35YPB73104	0034629	28-Aug-99	662361		
670 Y	2HSFMAMR1YC030259	0347602A	30-Aug-99	259603		
671 Y	2HSFMAMR1YC030259	0347602A	30-Aug-99	259603		
95 Y	2HSFTAMR8YC035948	0028561A	30-Aug-99			
96 Y	1FUYSDYB7YPB35730	E1717616	30-Aug-99	383689		
97 Y	1FUPD9ZB1YLF69730	E1696343	31-Aug-99	267031		
673 Y	4V4ND1UFXYN787864	CWA0639	31-Aug-99	334810		
252 Y	2HSFHAHR8YC046441	0111731A	31-Aug-99	250759		

987 Y	1FUYDDYB7YPF26768	E1793325	01-Sep-99	687193
988 Y	1FUYDDYB7YPF26768	E1793325	01-Sep-99	687193
1211 Y	1FUYSDYB3YLF46579	E1766606	01-Sep-99	260565
98 Y	1FUYDDYBXYFA53374	53374	08-Sep-99	552941
99 Y	1FUYS7DB0YPA59991	E1654132	07-Sep-99	223466
100 Y	1FUYSSEB0YLA56308	E1700664	08-Sep-99	359284
1212 Y	1FUPCSZB6YP962838	E1753578	09-Sep-99	376467
101 Y	1FUYSSZB5YPB94461	CWA0745	09-Sep-99	559678
102 Y	1FUYSSZB6YPB94461	E1696000	09-Sep-99	506563
103 Y	1FUWNWDAZYLF9263		11-Sep-99	374640
877 Y	1FUPDCZB0YPG19084	E1678135	14-Sep-99	
104 Y	1FUY3MDB4YLB03456	E1691022	15-Sep-99	206535
879 Y	1M1AA12YXYW121976	CWA0637	15-Sep-99	307087
105 Y	1FUY55ZB3YPF23753	E1730671	16-Sep-99	320405
253 Y	1M1AA12YXYW121976	CWA0637	18-Sep-99	307087
106 Y	1FUPC5ZB1DF69750	E1745020	17-Sep-99	463126
1213 Y	1FUYSDYB5YPA50529	E1753351	20-Sep-99	114875
1044 Y	1FUYSDYB0YLF07235	E1765607	20-Sep-99	333741
107 Y	1HSCNAER3YCD5740	CWA1254	24-Sep-99	
1214 Y	1FUPCDZB6XPA16580	E1741252	25-Sep-99	266261
108 Y	1FUYSSZB4YPF23789	E1748139	27-Sep-99	424577
883 Y	4V4ND2JF1YN242517	33835	28-Sep-99	277232
884 Y	1M1AA12YZYW123222	CWA0434	30-Sep-99	450000
109 Y	1HSCAAHN9YJ066665	66665	04-Oct-99	256858
885 Y	2HSCNAMR0YL06141	CWA0853	05-Oct-99	245039
1045 Y	1FUPCXYB9YLB67966	E1785637	05-Oct-99	552164
886 Y	2HSFTASR6XC042539	E1687954	06-Oct-99	184958
1215 Y	1FUYSSZ8YLB55058	CWA1491	06-Oct-99	377144
1046 Y	1FUYSDZB24P918241	E1775408	14-Oct-99	318111
887 Y	2HSCNAMR0YC06293	CWA0399	15-Oct-99	
1216 Y	1FUY6MDR1YLB03499	E1797039	16-Oct-99	380211
110 Y	1FUYD6E86YP940540	E1670070	15-Oct-99	230649
111 Y	2HSCNAER7YL048117	1018034A	18-Oct-99	179082
112 Y	1M1AA09Y7YW019793		19-Oct-99	279729
255 Y	1FUYSSZB0YLB66084	E1650594	20-Oct-99	224108
1217 Y	YC038706	CWA1329	20-Oct-99	266060
1236 Y	YC036706	CWA1329	20-Oct-99	268060
113 Y	1FUYDXYB1YPB45999	E1699425	21-Oct-99	326433
1303 Y	1FUPDXZB1YLB60577	CWA1588	26-Oct-99	
1304 Y	1FUYDDYB8YLB06533	440971	27-Oct-99	358116
114 Y	1FUYSDZB5YP919251	CWA1015	28-Oct-99	214024
1218 Y	1FUPDSZB1YLB97483	E1781608	29-Oct-99	213730
696 Y	2HSCNAER6YL056445	0074439	29-Oct-99	295338
698 Y	1FUYDDYB1YLF55154	E1658301	30-Oct-99	174379
697 Y	1FUYSDYB6YF00206	E1703698	01-Nov-99	165362
256 Y	1M1AA3Y1YW121948	CWA0321	02-Nov-99	128457
115 Y	1FUYSXYB7YLA66313	E1744786	06-Nov-99	170225
700 Y	1HSCEAHR7YJ105690	0239169D	09-Nov-99	241798
257 Y	2HSCEAMR9C040240	9383718A	11-Nov-99	265720
1002 Y	1FUY5CYR0YLF75970	E1766605	12-Nov-99	
969 Y	1FUYDDYB6YLB66685	E1717878	13-Nov-99	157925
1306 Y	1XPCDR9X6XN465363	CWA1698	15-Nov-99	365645
259 Y	2HSFTAER6YC049933	1062181A	18-Nov-99	298300
116 Y	1FUYSSZB8YLB66404	E1773870	18-Nov-99	423453
1307 Y	1FUPDSZB3YLB5L154	CWA1491	18-Nov-99	407216
708 Y	1FUY5DYB1YLB91860	E1696060	26-Nov-99	249830
709 Y	1FUYDBEB4YLA66323	E1707462	29-Nov-99	284719
710 Y	1FUYDXYB7XLA77284	33639	01-Dec-99	740386
261 Y	2HSCEAMR6YC040442	9559415A	01-Dec-99	297175
1219 Y	1FUYSSZB4YLF11881	E1766544	03-Dec-99	341900
262 Y	2HSCNAMR6YC06238	E1649518	10-Dec-99	41159
718 Y	2HSCHAER7YC066663	0093084A	15-Dec-99	178143
264 Y	2HSCEAMR1YC071122	9388248A	16-Dec-99	270280
265 Y	1FUPDSZB7YCA14618	E1701163	17-Dec-99	
266 Y	2HSCNAER0YC049402	0103570A	20-Dec-99	161766
1371 Y	2HSCEAXR1YC070434	00103	20-Dec-99	
267 Y	2HSCEAMRXYC04012	9347364A	20-Dec-99	246077
268 Y	1FUYSDYB3YPA66764	E1660603	20-Dec-99	348177
720 Y	1FUYSDZB6YLG16379	0034124	21-Dec-99	383661
721 Y	1M1AA13Y0YW127770	CBE2246	21-Dec-99	156967
269 Y	4V4NC4RH6YN250656	E1646208	22-Dec-99	163186
723 Y	1FUYSZYB7YLA66630	E1652247	24-Dec-99	105415
726 Y	1FUYDSBB4YLE90917	E1712674	26-Dec-99	
724 Y	1FUDDYB1YPG13691	018292	26-Dec-99	486160

117 Y	1FUYSDYB3YLF48193	33897	28-Dec-99	397504		
1220 Y	1FUYSSEB1YPG06381	E1762391	30-Dec-99	253565		
1370 Y	2HSCHAMR5YC05555	CWA1469	30-Dec-99	551077		
118 Y	1FUYSSEBXYPF80439	E1755635	03-Jan-00	124962		
119 Y	1FUYNEDB2YP569452	E1674330	04-Jan-00	182359	01/01/00	0
270 Y	2HSCEAMR0YC030723	9378613A	05-Jan-00	253809	01/03/00	1
729 Y	2HSCEAM0YC030723	9378613A	05-Jan-00	253809	01/04/00	1
730 Y	2HSCEAHR3YC064596	CWA0434	11-Jan-00	348235	01/05/00	2
731 Y	2HSCBAHR3YC064596	CWA0434	11-Jan-00	348236	01/11/00	2
272 Y	3HSFMAXR4Y039872	102921B	14-Jan-00	66837	01/14/00	1
990 Y	1FUYSSEB9YLA68497	E1785593	15-Jan-00	412700	01/15/00	1
120 Y	1FUYS6EBXYLB56513	E1751474	23-Jan-00	188217	01/23/00	1
735 Y	2HSCKASR3YC071357	0026574A	24-Jan-00	234258	01/24/00	1
737 Y	1FUPD6ZB9YLB56178	E1694304	25-Jan-00	388506	01/25/00	1
273 Y	1FUYS7EBXYPG60320	E1867193	30-Jan-00	178571	01/30/00	1
1050 Y	1FUYS5EB1YLF66500	E1710642	31-Jan-00	261363	01/31/00	2
274 Y	2HSCEAXR2YC066517	E1649483	31-Jan-00	184963	02/01/00	1
275 Y	1XKWD49X6YR969383	CWA0631	01-Feb-00		02/03/00	1
121 Y	1FUPDSZB2YPB06605	E1598253	03-Feb-00	306141	02/05/00	1
122 Y	1FUPC5ZB7YPB62034	E1705158	05-Feb-00	306962	02/10/00	1
123 Y	1FUYSSZB7YLB66177	E1724321	10-Feb-00	384673	02/15/00	1
740 Y	1M1AE07YBYW003707	CWA0571	16-Feb-00	171846	02/17/00	1
276 Y	2HSCHAER4YC066639	0044146A	17-Feb-00	144147	02/21/00	2
1221 Y	1FUYSZYB6YPF45366	E1776031	21-Feb-00	296363	02/24/00	1
741 Y	2HSCNAMR9YC05973	0238693A	21-Feb-00	167728	02/25/00	1
124 Y	1FUYSSZB2YLB66253	CBY0046	24-Feb-00	421494	02/28/00	1
277 Y	1FUPD7EB6YPA66125	E1672341	25-Feb-00	172104	03/08/00	1
278 Y	1FUYDSZB3YLG48617	E1703150	25-Feb-00		03/13/00	2
748 Y	2HSCHAFR6YC70338	140757A	08-Mar-00	244822	03/15/00	1
748 Y	1FUPD5ZB0YLF02678	E1682218	13-Mar-00	188797	03/22/00	1
747 Y	1FUPDSZB0YLF02678	E1682218	13-Mar-00	188797	03/23/00	1
751 Y	1FUYSSE60YLB63446	E1710548	15-Mar-00		03/26/00	1
279 Y	2HSCKAER4YC071766	E1667979	22-Mar-00	82134	03/29/00	1
1222 Y	1FUYS7EB2YPG26910	E1787993	23-Mar-00	410068	04/03/00	2
1228 Y	1FUYSSEB9YP641154	E1795174	25-Mar-00	292291	04/10/00	2
125 Y	1FUYS7EB0YPA69423	E1776957	29-Mar-00	317826	04/12/00	1
1374 Y	1FUYD5ZB1YLG69530	E1803286	03-Apr-00	375151	04/16/00	1
991 Y	1XPCDU8X3XN511397	CWA1240	03-Apr-00	491999	04/18/00	1
1224 Y	1FUYDSZB3YLH40364	E1766116	10-Apr-00	223858	04/20/00	1
1093 Y	1FUYDSZB0YLH40368	E1741246	10-Apr-00	191226	04/27/00	1
1315 Y	1HSHCAHR1YH272676	CBY0071	12-Apr-00	254936	05/08/00	1
758 Y	1FUYS6EB6YP641212	E1707267	18-Apr-00	172807	05/12/00	1
760 Y	1FUYDSZB3YLG67593	E1779229	18-Apr-00	189591	05/25/00	1
1225 Y	1FUYSSEB0YPG07436	E1796163	20-Apr-00	246276	05/28/00	1
1099 Y	1FUYSXYB8YLF66772	E1750104	27-Apr-00		06/01/00	1
285 Y	2HSCNAMR61C076742	0124574A	05-May-00	84929	06/05/00	2
992 Y	1FUYSSZB31LG44326	E1717656	12-May-00	312305	06/08/00	2
770 Y	2HSCKAFR0YC084722	114548A	25-May-00	153075	06/15/00	1
286 Y	1FUJA3BD61LG61590	E1656652	25-May-00	149520	06/21/00	1
126 Y	1FUYSSZB21LG62171	E1730774	01-Jun-00	334132	06/22/00	1
287 Y	2HSCNAMR71C079466	83375A	06-Jun-00	160588	06/23/00	1
127 Y	1FUYSSEB31P641379	E1679953	08-Jun-00	178412	06/27/00	1
773 Y	2HSCNAMR51C059537	0089943A	09-Jun-00	115160	07/10/00	1
1375 Y	1FUYSDYBX1LH37468	E1792848	09-Jun-00	192466	07/13/00	2
1226 Y	1FUJA3CG61LG62177	E1795173	15-Jun-00	438125	07/14/00	1
128 Y	4V4N99RH11N239267	CCV0034	21-Jun-00	49671	08/01/00	1
129 Y	1FUJAHBD51LG71191	33690	22-Jun-00	449798	08/07/00	1
288 Y	1FUPDDYB8YLG16463	CWA0707	23-Jun-00		08/14/00	1
130 Y	1FUYSSZB31LG44345	E1674311	27-Jun-00	173242	08/28/00	1
290 Y	1FUYDWDB3YLB1793	E1672362	10-Jul-00	355412	10/02/00	1
1007 Y	1FUJCLCG11PG06403	E1741269	13-Jul-00	167667	10/04/00	1
777 Y	1FUYDWDBXYLB1793	E1741271	13-Jul-00	590162	10/13/00	1
291 Y	1FUYDWDB7YLB1794	E1672361	14-Jul-00	381374	11/02/00	1
293 Y		1706456A	01-Sep-00	118082	12/14/00	1
131 Y	1FUJA3CG41LG84585	E1667416	07-Sep-00	41412	12/15/00	1
132 Y	2HSCAAMN21C010388	KFA03341	14-Sep-00	120710	12/18/00	1
133 Y	1FUNA3B641PG98471	E1738627	28-Sep-00	125258	12/31/00	0
134 Y		CBX00473	02-Oct-00	833		
784 Y	4V4ND4JHBYN247516	CWA0834	04-Oct-00	230961		
1364 Y	1FUJBBBD91LH99806	E1765549	13-Oct-00	347031		
792 Y	2HSCHAER3YC063984	01452658	22-Nov-00	136013		
1347 Y	1FUJAHCGX1LJ20437	20437	14-Dec-00	261304		
295 Y	2HSCNAMR61C067439	64832A	15-Dec-00	157161		
1227 Y	1FUJA6CG81PH99825		18-Dec-00	212000		

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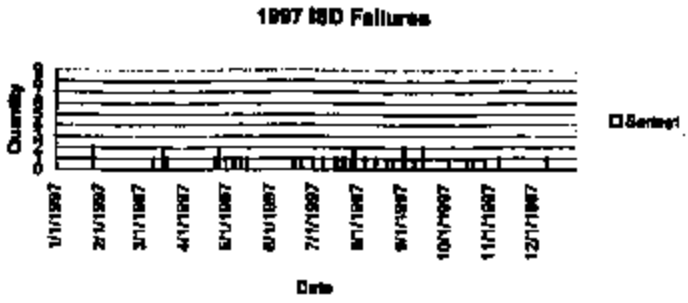
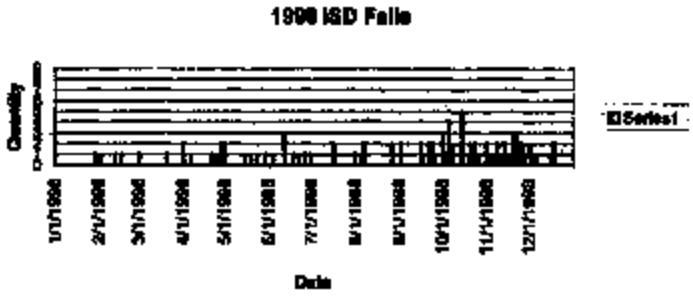
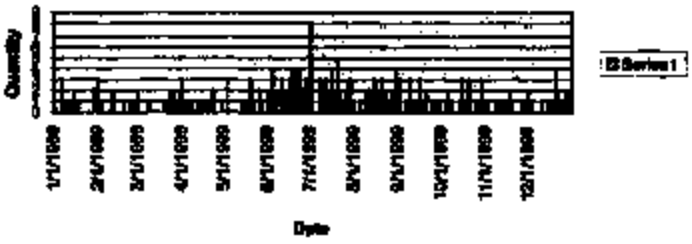
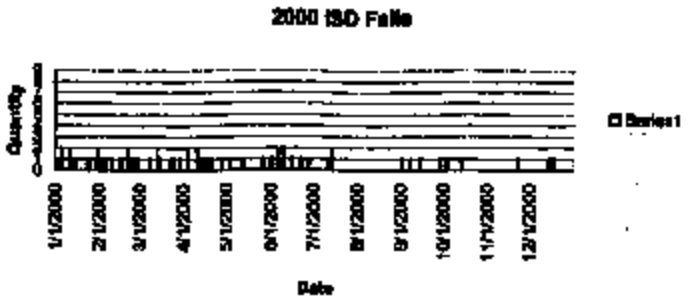
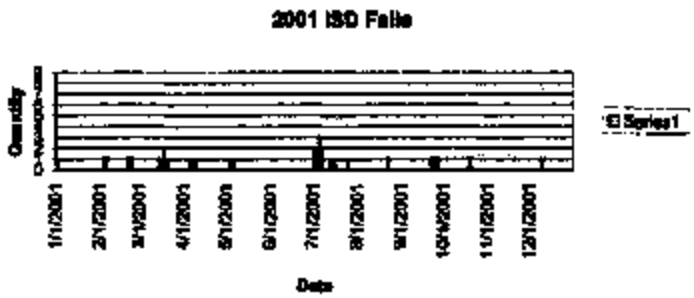
795 Y	1XPCDR9X1YD614352	CWA0671	01-Jan-01	312719	01/01/01	1
996 Y	1FUJBBCG71PB38710	E1671990	04-Feb-01	67367	02/04/01	1
1058 Y	1XKWDR9X81R679257	CWA1106	05-Feb-01	239253	02/05/01	1
600 Y	117991	F160	21-Feb-01	426	02/21/01	1
801 Y	2HSCEAHR31C021238	44366A	23-Feb-01	89353	02/23/01	1
971 Y	1FUJBBAV61LF25366	E1761270	15-Mar-01	166843	03/15/01	1
297 Y	1FUJBBCG31LJ15204	E1674302	18-Mar-01	34958	03/18/01	2
1348 Y	1FUJBBCGX1LJ15202	1799459	18-Mar-01	201419	03/21/01	1
1367 Y	4V4MC9RF91N328053	E1763842	21-Mar-01	74800	04/06/01	1
135 Y	1FUJBBCG71PB36536	E1744724	06-Apr-01	63469	04/09/01	1
298 Y	1FUPUDZB01LF85345	E1662365	09-Apr-01	17819	05/03/01	1
804 Y	1FUJBBCA31PB39019	E1693693	03-May-01	76300	05/06/01	1
1363 Y	1FUJAHBG32PJ64114	E1781379	06-May-01	120568	07/01/01	2
1368 Y	1FUJABLG22LK06605	E1786737	01-Jul-01	133471	07/02/01	2
1350 Y	1FUJA6CG62LK06608	E1779615	01-Jul-01	157671	07/03/01	2
806 Y	1FUJA6CG12LK06614	E1773846	02-Jul-01	182279	07/06/01	3
1351 Y	1FUJA6CG52LK06610	E1798054	02-Jul-01	225167	07/06/01	2
807 Y	2HSCEAMR72C023368	9379713A	03-Jul-01	61264	07/07/01	2
808 Y	2HSCEAMR72C023368	9379713A	03-Jul-01	61264	07/13/01	1
1385 Y	1FUJA6CG72LK06617	E1779619	05-Jul-01	181991	07/15/01	1
1380 Y	1FUJA6CGX2LK06627	E1779616	05-Jul-01	186966	07/16/01	1
1345 Y	1FUJA6CGX2LK06630	E1778620	06-Jul-01	158692	07/25/01	1
1353 Y	1FUJA6CG02LK06638	E1755738	06-Jul-01	147371	08/22/01	1
1367 Y	1FUJA6CG42LK06636	E1796257	06-Jul-01	185053	09/22/01	1
972 Y	1FUJA6CG62LK06639	E1778618	07-Jul-01	154995	09/26/01	1
1349 Y	1FUJA6CG62LK06639	E1778616	07-Jul-01	154996	09/26/01	1
1355 Y	1FUJBBBD52PJ15196	E1755601	13-Jul-01	107874	10/19/01	1
1361 Y	1FUJA6CG82LF24507	E1800662	15-Jul-01	92723	12/09/01	1
1359 Y	1FUJAHBG22PJ71412	E1773651	16-Jul-01	99560	12/31/01	0
809 Y	1FUJBRLD82LJ73947	E1750131	25-Jul-01	60934		
811 Y	1FUJA6C612LJ74356	E1752389	22-Aug-01	91572		
815 Y	1FUJAPCG016H09469	E1683135	22-Sep-01	102647		
816 Y	1XP5D60XX2N674466	CBC0409	25-Sep-01	39686		
817 Y		3120441A	26-Sep-01			
818 Y	2HSCHAPR4YC045194		19-Oct-01			
138 Y	1FUPCDYB0XLA94169	E1727993	09-Dec-01	982591		


1997 ISD Failures
Quantity
Series1
Date

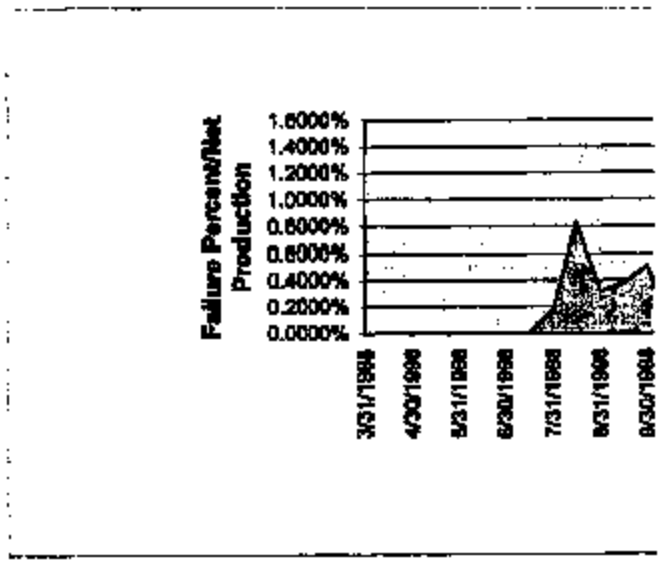

1998 ISD Fails
Quantity
Series1
Date


1999 ISD Fails
Quantity
Series1
Date


2000 ISD Falls
Quantity
Series1
1/1/2000
2/1/2000
3/1/2000
4/1/2000
5/1/2000
6/1/2000
7/1/2000
8/1/2000
9/1/2000
10/1/2000
11/1/2000
12/1/2000
Date


2001 ISD Falls
Quantity
Series1
1/1/2001
2/1/2001
3/1/2001
4/1/2001
5/1/2001
6/1/2001
7/1/2001
8/1/2001
9/1/2001
10/1/2001
11/1/2001
12/1/2001
Date

Period End	Fail Quantity	Net Produced Quantity	Period End	Fail Rate
03/31/98	0	0	03/31/98	#DIV/0!
04/15/98	0	0	04/15/98	#DIV/0!
04/30/98	0	0	04/30/98	#DIV/0!
05/15/98	0	0	05/15/98	#DIV/0!
05/31/98	0	0	05/31/98	#DIV/0!
06/15/98	2	0	06/15/98	#DIV/0!
06/30/98	0	0	06/30/98	#DIV/0!
07/15/98	0	0	07/15/98	#DIV/0!
07/31/98	2	1124	07/31/98	0.1779%
08/15/98	23	2771	08/15/98	0.8300%
08/31/98	19	6032	08/31/98	0.3150%
09/15/98	17	4437	09/15/98	0.3831%
09/30/98	20	3923	09/30/98	0.5095%
10/15/98	0	824	10/15/98	0.0000%
10/31/98	2	3644	10/31/98	0.0549%
11/15/98	8	5181	11/15/98	0.1737%
11/30/98	3	3255	11/30/98	0.0922%
12/15/98	0	0	12/15/98	#DIV/0!
12/31/98	8	5098	12/31/98	0.1570%
01/15/99	10	5341	01/15/99	0.1577%
01/31/99	26	7030	01/31/99	0.3698%
02/15/99	2	0	02/15/99	#DIV/0!
02/28/99	9	5617	02/28/99	0.1647%
03/15/99	14	8484	03/15/99	0.1650%
03/31/99	31	7671	03/31/99	0.4041%
04/15/99	1	0	04/15/99	#DIV/0!
04/30/99	56	6724	04/30/99	0.8328%
05/15/99	106	7269	05/15/99	1.4603%
05/31/99	10	7278	05/31/99	0.1374%
06/15/99	20	7437	06/15/99	0.2690%
06/30/99	13	6111	06/30/99	0.1003%
07/15/99	4	3599	07/15/99	0.1111%
07/31/99	12	8551	07/31/99	0.1403%
08/15/99	2	0	08/15/99	#DIV/0!
08/31/99	2	468	08/31/99	0.4274%
09/15/99	14	4032	09/15/99	0.3472%
09/30/99	13	7145	09/30/99	0.1819%
10/15/99	4	5127	10/15/99	0.0780%
10/31/99	8	5732	10/31/99	0.0691%
11/15/99	13	6765	11/15/99	0.1922%
11/30/99	12	4660	11/30/99	0.2576%
12/15/99	4	6583	12/15/99	0.0608%
12/31/99	3	3037	12/31/99	0.0988%
01/15/00	4	6330	01/15/00	0.0632%
01/31/00	2	394	01/31/00	0.5076%
02/15/00	0	0	02/15/00	#DIV/0!
02/29/00	2	3024	02/29/00	0.0661%
03/15/00	5	6617	03/15/00	0.0733%
03/31/00	2	7972	03/31/00	0.0251%
04/15/00	2	6630	04/15/00	0.0306%
04/30/00	1	5684	04/30/00	0.0176%
05/15/00	5	6636	05/15/00	0.0753%
05/31/00	3	4498	05/31/00	0.0667%
06/15/00	0	0	06/15/00	#DIV/0!
06/30/00	0	0	06/30/00	#DIV/0!
07/15/00	0	0	07/15/00	#DIV/0!
07/31/00	0	0	07/31/00	#DIV/0!
08/15/00	0	0	08/15/00	#DIV/0!
08/31/00	0	0	08/31/00	#DIV/0!
09/15/00	0	0	09/15/00	#DIV/0!
09/30/00	0	0	09/30/00	#DIV/0!
10/15/00	0	3388	10/15/00	0.0000%



55
55002
0.00065

10/31/00	6	6266	10/31/00	0.0959%	
11/15/00	4	4251	11/15/00	0.0934%	
11/30/00	2	986	11/30/00	0.2028%	212000
12/15/00	1	0	12/15/00	#DIV/0!	239253
12/31/00	0	0	12/31/00	#DIV/0!	247031
01/15/01	2	3942	01/15/01	0.0507%	167587
01/31/01	0	0	01/31/01	#DIV/0!	125288
02/15/01	3	3151	02/15/01	0.0949%	102647
02/28/01	21	1965	02/28/01	1.0687%	157181
03/15/01	4	2179	03/15/01	0.1836%	833
03/31/01	1	1080	03/31/01	0.0926%	109318
04/15/01	0	1505	04/15/01	0.0000%	120588
04/30/01	0	2435	04/30/01	0.0000%	109318
05/15/01	0	1417	05/15/01	0.0000%	201419
05/31/01	1	0	05/31/01	#DIV/0!	281304
06/15/01	1	0	06/15/01	#DIV/0!	78300
06/30/01	0	318	06/30/01	0.0000%	
07/15/01	0	0	07/15/01	#DIV/0!	69353
07/31/01	0	1993	07/31/01	0.0000%	67367
08/15/01	0	1875	08/15/01	0.0000%	733519
08/31/01	0	1908	08/31/01	0.0000%	74600
09/15/01	0	1394	09/15/01	0.0000%	107974
09/30/01	0	2002	09/30/01	0.0000%	92723
10/15/01	0	1990	10/15/01	0.0000%	61264
10/31/01	0	2180	10/31/01	0.0000%	159682
11/15/01	0	2082	11/15/01	0.0000%	133471
11/30/01	0	1691	11/30/01	0.0000%	156996
12/15/01	0	1712	12/15/01	0.0000%	196053
12/31/01	0	0	12/31/01	#DIV/0!	154995
01/15/02	0	0	01/15/02	#DIV/0!	61264
01/31/02	0	0	01/31/02	#DIV/0!	157871
02/15/02	0	2385	02/15/02	0.0000%	182279
02/28/02	0	1410	02/28/02	0.0000%	225167
03/15/02	0	2082	03/15/02	0.0000%	147371
03/31/02	0	449	03/31/02	0.0000%	181991
04/15/02	0	0	04/15/02	#DIV/0!	60934
04/30/02	0	0	04/30/02	#DIV/0!	39865
05/15/02	0	2784	05/15/02	0.0000%	91872
05/31/02	0	2260	05/31/02	0.0000%	99850
06/15/02	0	2239	06/15/02	0.0000%	
06/30/02	0	2874	06/30/02	0.0000%	5460600
07/15/02	0		07/15/02		48
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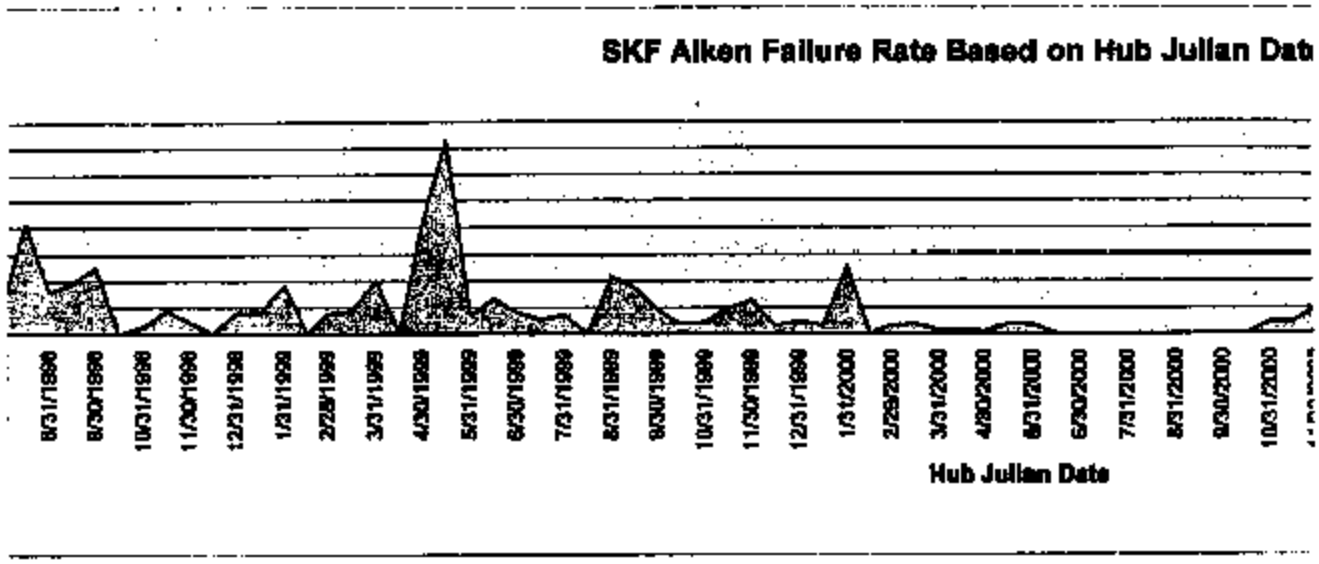
564


SKF Aiken Failure Rate Based on Hub Julian Dat
Hub Julian Date

ates
11/30/2000
12/31/2000
1/31/2001
2/28/2001
3/31/2001
4/30/2001
5/31/2001
6/30/2001
7/31/2001
8/31/2001
9/30/2001
10/31/2001
11/30/2001
12/31/2001
1/31/2002
2/28/2002
3/31/2002
4/30/2002
5/31/2002
6/30/2002
Fail Rate

ID	A/L?	Julian Date Translation	Hub Problem Y/N	SKF SERIAL #	VIN#	IN SERVICE DATE	FAILURE DATE	MILES
54	A	01-Jun-98	Y	15298 0142729	1FUYSXYB3XPA05251	24-Mar-99	02-Nov-01	287309
55	A	05-Jun-98	Y	015898 0087125	1FUPDSZB3XPA46373	26-Mar-99	27-Aug-01	
846	A	27-Jul-98	Y	23998-0015736	1FUYDDYB4XLA70917			389097
34	A	30-Jul-98	Y	21198 0010100	2HSFRAHR4XC070206	14-Oct-98	18-Sep-01	155379
712	A	02-Aug-98	Y	21598 0010546	1FUPDSZB3YM86262	02-Dec-98	18-Jun-01	244682
1163	A	03-Aug-98	Y	21598-0010684	1FUYSSEB1XP923097	05-Oct-98	23-Dec-01	392974
483	A	04-Aug-98	Y	21698-0011278	1XPCD69X1XN465538	15-Sep-98	26-Oct-01	468759
1162	A	05-Aug-98	Y	21798-0010799	1FUYSDYB7XPA26797	24-Sep-98	20-Feb-02	403109
195	A	05-Aug-98	Y	21798-001081	1FUYDSEB5XPA07040	01-Sep-98	12-Mar-02	411300
482	A	05-Aug-98	Y	21798-0011003	1XPCD69X1XN465538	15-Sep-98	26-Oct-01	468759
31	A	06-Aug-98	Y	21898-0011263	1FUYSSZB1XLA01306	05-Oct-98	11-Mar-08	566496
539	A	06-Aug-98	Y	21898 0011335	1FUYDSZB0XL937999	01-Feb-99	24-Jan-02	595016
1020	A	06-Aug-98	Y	21898-001270	1FUYSDZR5XP918099	05-Oct-98	04-Mar-02	617754
763	A	07-Aug-98	Y	21998 0011546	1FUYSTEB4YP626939	23-Mar-00	07-Mar-02	347915
33	A	07-Aug-98	Y	21998 0011535	1FUSSDZB7XP963753	06-Oct-98	19-Sep-01	415198
26	A	07-Aug-98	Y	21998-0011552	1FUYSSEB7XPA67436	22-Sep-98	05-Jul-01	499187
32	A	08-Aug-98	Y	22098-0011512	2HSFHAMR1XC075492	06-Oct-98	04-Mar-02	320491
1188	A	10-Aug-98	Y	22298-0026193	1FUYSSZB3XLA01639	25-Nov-98	15-May-02	549489
27	A	11-Aug-98	Y	22398 0011999	1FUYDSYB4XL979606	25-Sep-98	27-Aug-01	360653
669	A	12-Aug-98	Y	22498	1FUPDSZB3XXLA14835	31-Mar-99	10-Sep-01	288154
604	A	12-Aug-98	Y	22498-0012262	1FUYDSYB7XL979615	20-Oct-98	27-Aug-01	314612
645	A	13-Aug-98	Y	22598-0020963	1FUYDDYB9XLA70914			310151
58	A	14-Aug-98	Y	22698	1FUPDSZB3XXLA14836	31-Mar-99	23-Jul-01	270436
1698	A	14-Aug-98	Y	22698-0130720	1FUYSSEB3YLA65417	26-Jul-99	09-Apr-02	344482
497	A	14-Aug-98	Y	22698-0012906	1FUYSDYB7XPA87046	14-Oct-98	16-Jan-02	417625
488	A	14-Aug-98	Y	22798-0013327	1FUYDDYB7XPA39188	30-Sep-98	24-Aug-01	386348
867	A	14-Aug-98	Y	22698-0013062				406219
809	A	17-Aug-98	Y	22998 0013578	1FUYNMDB9XPA23409	28-Oct-98	16-Sep-01	341022
1523	A	19-Aug-98	Y	23198-0014058	2HSFHAERXXC28284	23-Jan-99	21-May-02	703014
1522	A	19-Aug-98	Y	23198-0014062	2HSFHAERXXC28284	23-Jan-99	21-May-02	703014
586	A	22-Aug-98	Y	23498-0014798	1M1A507Y1XW001201	26-May-99	02-Oct-01	506937
516	A	22-Aug-98	Y	23498-0014598	1FUPCSZB1XPA57312	16-Nov-98	17-Sep-01	409850
199	A	25-Aug-98	Y	23798-0013262	1XXADB9X8XJ799392	01-Oct-98	21-Mar-02	377146
1832	A	26-Aug-98	Y	23898-00167	1FUYSDYB3XPA34621	09-Oct-98	29-May-02	490699
493	A	26-Aug-98	Y	23898 0015413	1FUYSSZB9XLA37965	14-Oct-98	18-Feb-02	499129
494	A	27-Aug-98	Y	23998	1FUYDDYB0XLA70929	14-Oct-98	21-Mar-02	274741
849	A	27-Aug-98	Y	23998-0016968	1FUYDDYB8XLA70921			416370
894	A	27-Aug-98	Y	23998-0016942	1FUYDDYB7XLA70927			682595
840	A	27-Aug-98	Y	23998-0016764	A63965			567711
41	A	29-Aug-98	Y	24198 0015700	1FUWTCCA3XHB30495	21-Nov-98	27-Jul-01	143063
823	A	29-Aug-98	Y	24198-0016428	1FUYDDYB8XLA70914			397109
848	A	29-Aug-98	Y	24198-0016419	1FUYDDYB6XLA70918			417040
1674	A	29-Aug-98	Y	24198-0016421	1FUYDDYB2HA70916			575800
861	A	29-Aug-98	Y	24198 041777	1FUYDDYB0XLA70931			280962
226	A	31-Aug-98	Y	024398-0018160	1FUYDXYB0XLA77263	11-Feb-99		608244
958	A	31-Aug-98	Y	24398 0016621	1FUYSDYB9XP985667		07-Dec-01	384859
488	A	01-Sep-98	Y	24498	1FUYSSEB7XL921514	30-Sep-98	21-Sep-01	348960
979	A	03-Sep-98	Y	24698-0017258	1FUYSDYB2XLB25646	17-Dec-98		458000
136	A	03-Sep-98	Y	24698 0017289	1FUJBBCG71PB38839	06-Apr-01	11-Aug-01	53459
517	A	04-Sep-98	Y	24798-0016119	1FUWNWDA7XLB32548	19-Nov-98	31-Jul-01	411858
1699	A	04-Sep-98	Y	24798-0017731	1FUYDXYB7XLB08979	09-Nov-98		680941
1214	A	04-Sep-98	Y	24798-0026870	1FUPCDZB8XPA16360	26-Sep-99	03-Nov-01	286261
801	A	05-Sep-98	Y	24898-0016287	1FUYDDYB0XLA70940	19-Oct-98		484882
161	A	08-Sep-98	Y	25098 0016801				
850	A	07-Sep-98	Y	25198-0046919	1FUYDDYB6XLA70931			280962
546	A	07-Sep-98	Y	25098-0016803	1FUYDXYB5XLA77263	11-Feb-99		608244
498	A	07-Sep-98	Y	25098 0016454	4V8T0BUFXXN786361	14-Oct-98	29-Jan-02	244370
839	A	08-Sep-98	Y	25198-0018216	A63965			567711
1337	A	08-Sep-98	Y	25198-0018678				
586	A	12-Sep-98	Y	25598-0020687	1FUYDDYB6XDB57266	08-Apr-99		403875
847	A	12-Sep-98	Y	25598-0020470	1FUYDDYB8XLA70915			460374
28	A	14-Sep-98	Y	25798-0021187	1FUYSDYB4XP966349	24-Sep-98	24-Jan-02	588279
1369	A	14-Sep-98	Y	25798-0021196	1FUPCSEB5XP973362	09-Nov-98	02-May-02	688203
888	A	15-Sep-98	Y	25898-0027834	2HSFHAMR1XC078576		21-Jun-01	194627
202	A	15-Sep-98	Y	25998 0016762	4VG7DBUFGXN786408	20-Oct-98	02-Nov-01	391858
1001	A	15-Sep-98	Y	26198-0022388	1FUYSDYB2XLB06912	07-Nov-98		489306
39	A	16-Sep-98	Y	26198-0022611	1FUYSSZB6XLA01333	18-Nov-98	30-Oct-01	520166
1705	A	20-Sep-98	Y	26398 0023166	1FUYSSEB5XLA64322	29-Jan-99	10-May-02	932369
1709	A	20-Sep-98	Y	26398 0023106	1FUYSSEB5XLA64322	29-Jan-99	10-May-02	932369

1584 A	20-Sep-96 Y	26408-0023341	1XKDD99X8XJ818143	21-Apr-02	29-Jul-02	475286
184 A	21-Sep-96 Y	26408 0023397				
540 A	22-Sep-96 Y	26598-0023434	1FUYDSC8XXL973978	01-Feb-99	22-Jan-02	597114
1267 A	23-Sep-96 Y	26798-0024236	1FUYSDYB3XL505899	17-Dec-96		380012
36 A	23-Sep-96 Y	26698 0023974	1FUYSSZB2XLA01524	06-Nov-96	17-Jan-02	501725
159 A	24-Sep-96 Y	26798 0024014				
1526 A	24-Sep-96 Y	26798-0024043	2HSFMAER8XC020832	08-Oct-98	21-Jan-02	562107
1100 A	25-Sep-96 Y	26898 0034542	1FUYSSEB7XPA16633			346374
523 A	25-Sep-96 Y	26898-0024432	1FUYSXYB3XLA77282	01-Dec-98		698950
49 A	25-Sep-96 Y	26898 0023431	1FUYDSZB1XL973977	01-Feb-99	15-Jan-02	583429
622 A	25-Sep-96 Y	26898-0024502	1FUYSSZB7XLA16133	27-Nov-98	04-Mar-02	356014
1560 A	25-Sep-96 Y	26898-0024504	1FUYSCYB4XLA46567	11-Nov-96	08-May-02	450979
37 A	25-Sep-96 Y	26898 0024537	1FUYSCYB1XLA46574	11-Nov-96	29-Dec-01	294808
96 A	26-Sep-96 Y	26995 0024902	1FUYSDYB7YP633730	30-Aug-99	02-Nov-01	383869
1446 A	20-Oct-96 Y	29395-0029976	1FUPDSEB2XP973388	10-Dec-98	17-Apr-02	288374
531 A	22-Oct-96 Y	29695 0030283	1FUPCDZB8XPA16485	01-Jan-99	19-Feb-02	407036
1585 A	06-Nov-96 Y	30496-0035506	1FUYSSZB5XPA39431	10-Jan-99	30-May-02	619867
1586 A	06-Nov-96 Y	30696-0035512	1FUPCDZB6YPG73052	03-Mar-00	30-Apr-02	324128
824 A	08-Nov-96 Y	30995 0035802	1FUYDSZB3YLB95063			393580
507 A	09-Nov-96 Y	31395 0036822	1FUYSXYB6XPA39510	23-Oct-98	19-Aug-01	
533 A	10-Nov-96 Y	31496 0037090	1FUYSSEB9XPB28443	06-Jan-99	12-Jan-02	406965
48 A	10-Nov-96 Y	31496 0037109	1FUYSSZB7XLA01440	29-Jan-99	03-May-01	462228
1344 A	12-Nov-96 Y	31696-0033163	1FUYTEC8XHB30019	05-Dec-98	10-May-02	211259
1700 A	12-Nov-96 Y	31696-0036124	1FUYDSEB0XPA28576	28-Dec-99	08-Mar-02	509123
632 A	15-Nov-96 Y	31995-0036471	1FUPDYX88XLA14517	06-Jan-99	08-Aug-01	466456
1109 A	16-Nov-96 Y	32095 005136	A01446			
981 A	24-Nov-96 Y	32696 0061997	1FUYSSZB2XLA06870	18-Jan-99	10-Mar-02	622284
460 A	24-Nov-96 Y	32696 0061970	1FUYDCYB6XLA42757	13-Jun-96	27-Nov-01	289710
542 A	16-Dec-96 Y	35095-0067614	1FUPDSZB2XPB06121	01-Feb-99	28-Sep-01	462498
50 A	16-Dec-96 Y	35095-0067297	1FUPDSZB2XB06121	01-Feb-99	13-Jun-01	429615
193 A	21-Dec-96 Y	35696 0029234				
1513 A	22-Dec-96 Y	35696-0069505	1M1AA13Y3XW110363	05-Mar-99		356863
1410 A	23-Dec-96 Y	35798-0070044	2HSFMAHR4XC038090	18-Feb-00	17-Jan-02	204711
59 A	24-Dec-96 Y	35896 0070436	1FUPDSZB1XPA64743	16-Apr-99	11-Oct-01	552863
1461 A	24-Dec-96 Y	35896-0076454	1FUPDSEB0XPB60118	04-Feb-99	01-Apr-02	520116
1026 A	30-Dec-96 Y	36496-0071317	1FUYDSEBXXPB70649	01-Apr-99	22-Mar-02	543629
116 A	02-Jan-99 Y	00299-0194704	1FUYSXYB7YLA68813	08-Nov-99	23-Dec-01	170225
146 A	04-Jan-99 Y	00499-0071656	1FUYSDYB4XPA68686		12-Oct-01	360730
595 A	05-Jan-99 Y	00699	2HSFTAER0XC023133	06-Apr-99	30-Jan-02	
1468 A	05-Jan-99 Y	00699-0073049	1FUYDEB1XPA12751	29-Apr-99	18-Mar-02	363926
1647 A	06-Jan-99 Y	00699-0074171	2HSFTAFR8XC027979	19-Feb-99	06-Jun-02	584473
1552 A	10-Jan-99 Y	01099-0074912	1FUYSSZB5XLA42858	18-Mar-99	13-Jan-02	662858
996 A	12-Jan-99 Y	01299-0036270	1FUYSXYB8XLA68444	19-Feb-99	08-Mar-02	
1230 A	14-Jan-99 Y	01499-0077206	2HSFTAER8XC090989	23-Apr-99	16-May-02	
665 A	14-Jan-99 Y	01499-0077359	1FUYDDYB6XDB67276	27-Mar-99		442040
1259 A	14-Jan-99 Y	01499-0077379	1FUYDDYB6XLA70935	14-Oct-98		432283
573 A	16-Jan-99 Y	01699 0096787	1FUYDS297YPB39094	30-Apr-99	14-Jan-02	409781
608 A	17-Jan-99 Y	01799	1FUYNMDB6XLB27658	23-Oct-98	20-Jul-01	
51 A	17-Jan-99 Y	01799 0058494	1FUYZWEB8X1A22043	23-Feb-99	15-Oct-01	
1294 A	18-Jan-99 Y	01899-0126879	1M1AA13Y5YW116997	01-Aug-99		373875
666 A	19-Jan-99 Y	01999-0079551	1FUYDXYB6XLF36021	29-Mar-99		551581
1272 A	20-Jan-99 Y	02099-0080680	1FUYDXYB0XLF36014	23-Mar-99		641971
1487 A	22-Jan-99 Y	02299-0081917			07-May-02	457289
1212 A	22-Jan-99 Y	02299-0082083	1FUPCSZB6YPB62036	09-Sep-99	21-Mar-02	376467
1027 A	23-Jan-99 Y	02399-0082499	2HSFTAER2XC043087	21-Apr-99	02-Apr-02	461421
1703 A	24-Jan-99 Y	02499-002986	2HSCBAER2YC083880	20-Sep-99	16-Jun-02	617414
88 A	24-Jan-99 Y	02499-0082897	1FUYSSZB5XLA42942	03-Apr-99	03-Mar-02	491918
672 A	24-Jan-99 Y	02499-0082892	1FUYSSZB2XLA01572	16-Apr-99	30-Sep-01	408310
681 A	24-Jan-99 Y	02499 0106928	1FUYSWEB0YLF13019	15-May-99	17-Jan-02	299914
893 A	25-Jan-99 Y	02599-0083692	2HSFMAXR4XC049219		02-Jul-01	145031
1588 A	25-Jan-99 Y	02599-0083612	1FUYSXYB3XLA72097	26-Feb-99	25-Jun-02	490918
63 A	25-Jan-99 Y	02599 0107771	1FUYSDYB3YPA66799	14-May-99	07-Mar-00	98600
1190 A	26-Jan-99 Y	02699-0083657	1FUYSXYB0XPA10374	06-Mar-99	22-Apr-02	414924
1508 A	26-Jan-99 Y	02699-0084194	1FUYSSER2XPA06382	16-Mar-99	06-May-02	273169
1441 A	26-Jan-99 Y	02699-0084277	1FUYDSEB2XP641038	24-Mar-99	03-Jan-02	334111
968 A	26-Jan-99 Y	02699 0084436	560573			
1191 A	26-Jan-99 Y	02699-0084021	1FUYDSZB1XPA84746	12-Apr-99	08-Mar-02	573500
136 A	27-Jan-99 Y	02799	1FUPCDYB0XLA84189	09-Dec-01	09-Dec-01	962591
52 A	27-Jan-99 Y	02799-0084646	1FUYSSEB1X1987544	08-Mar-99	13-Feb-02	
1182 A	27-Jan-99 Y	02799-0085066	1FUYSSZB8XLA42904	29-Apr-99	10-Mar-02	570162

1073 A	27-Jan-99 Y	02799-0084630	1FUYSXYB0XLA72106	26-Feb-99	20-Dec-01	431365
1218 A	30-Jan-99 Y	03099-0191652	1FUPCSZB1YLB87463	29-Oct-99	16-Apr-01	213730
1470 A	01-Feb-99 Y	03299-0328498	1FUYCSZB3YPB56121	22-Jun-99	01-May-02	525115
1493 A	07-Feb-99 Y	03899-	1MUAA13YGYW124100	19-Aug-99	31-May-02	397464
1195 A	16-Feb-99 Y	05099-0092580	1FUYDSZB2XPA64335	20-May-99	04-Jan-02	544159
1198 A	21-Feb-99 Y	05299	2HSFHAER0XC041593	03-May-99	10-May-02	
1273 A	21-Feb-99 Y	05299	2HSFHAER0XC041593	03-May-99	10-May-02	
326 A	23-Feb-99 Y	05499 0096702				
82 A	24-Feb-99 Y	05599	1FUYSSEB6XLA90486	16-Jul-99	16-Jan-02	
1559 A	24-Feb-99 Y	05599-0095645	1FUYSSEBXXLA86482	02-Apr-99	01-Apr-02	453726
1438 A	25-Feb-99 Y	05699-0097122	1FUY3HEB6XPB43062	05-Apr-99	16-Jan-02	576529
155 A	26-Feb-99 Y	05799 0097986				
587 A	27-Feb-99 Y	05899-0113190	2HSFHASR7YC037967	28-May-99	09-Nov-01	359903
577 A	02-Mar-99 Y	06199 0098764	1FUYSSEB5YLB61759	10-May-99	05-Feb-02	360348
1580 A	03-Mar-99 Y	06299-0099523				
1215 A	04-Mar-99 Y	06399-0100570	1FUYSSZBYLB55058	08-Oct-99	09-Apr-02	377144
552 A	04-Mar-99 Y	06399	1FUYDDYB1YPF37520	17-May-99	25-Mar-02	266705
1519 A	04-Mar-99 Y	06399-0100937	1FUYSSZBXLB54647	17-Jun-99	23-May-02	567487
61 A	05-Mar-99 Y	06499-0101518	1FUYSDYB8YPA86031	20-Apr-99	21-Jan-02	303850
1595 A	05-Mar-99 Y	06499-0101719	1FUYSSEB6YPF65368	14-Oct-99	22-May-02	403032
1463 A	09-Mar-99 Y	06699-0113156	1FUYSSZBX4LB54664	04-Jun-99	08-Apr-02	446227
309 A	10-Mar-99 Y	06999 0103637			27-Sep-01	103326
1323 A	10-Mar-99 Y	07099-0104907				386072
663 A	11-Mar-99 Y	07099 0104993	2HSFMAER1XC020258	19-May-99	07-Dec-01	320074
1663 A	11-Mar-99 Y	07099-0104908			16-Apr-02	419837
1594 A	15-Mar-99 Y	07499-0105820	1FUYDCYB6YLB10331	01-Jun-98	24-May-02	343440
710 A	15-Mar-99 Y	07499-0106326	1FUYDXYB7XLA77284	01-Dec-99		740356
777 A	16-Mar-99 Y	07599-0106976	1FUYDWDBXYLB17936	13-Jul-00	14-Jan-02	590162
1487 A	16-Mar-99 Y	07599-0106979	1FUYDWDB1YLB17940	14-Jul-00	14-Jan-02	572022
614 A	17-Mar-99 Y	07699-0107840	1HSHCANRLYH212428	25-Jun-99	12-Mar-02	381553
1196 A	18-Mar-99 Y	07799-0107912	1FUYSSZB6YLB54626	10-Jun-99	15-Dec-01	442364
1407 A	18-Mar-99 Y	07799-0108161	1FUYNEDB3YLB26176	01-Feb-00	05-Apr-02	362250
623 A	18-Mar-99 Y	07799 0108097	1FUYSSEB8YPF15665	01-Jul-99	30-Oct-01	297661
64 A	18-Mar-99 Y	07799-0108458	1FUYSSZB2YLB54588	06-Jun-99	07-Mar-02	392708
1640 A	18-Mar-99 Y	07799-0107615	1FUYSDYB5YPA86646	01-Jun-99	21-May-02	408006
991 A	19-Mar-99 Y	07899-0108056	1XPCDU9X3XN511397	03-Apr-00	06-Mar-02	491999
69 A	19-Mar-99 Y	07899-0108938	1M1AE05Y0XW001149	18-Jun-99	30-Nov-01	
79 A	19-Mar-99 Y	07899-0108959	1FUYSDYBLYLF38982	01-Jul-99	13-Feb-02	579730
165 A	22-Mar-99 Y	08299 0110148				
67 A	22-Mar-99 Y	11199-0122648	1FUYDLYB4YMF48064	27-Jul-99	28-Jan-02	330850
1101 A	22-Mar-99 Y	08199 0159092				
1284 A	22-Mar-99 Y	06199-0109506	2HSFTAER3XC092681	18-Jun-99	02-May-02	343973
1201 A	22-Mar-99 Y	06199-0109430	1FUYSCZB6YPB71245	01-Jul-99	20-Dec-01	349561
733 A	23-Mar-99 Y	06299 0110102	1FUYSSZBXYLB94300	13-Jan-00	04-Sep-01	288104
653 A	24-Mar-99 Y	06399-0110036	1FUYSWEB8YLB16300	11-Aug-99	06-Feb-02	351104
1295 A	24-Mar-99 Y	06399-0110585	1FUYSWEB6YLB16264	11-Aug-99		316200
678 A	24-Mar-99 Y	06399 0109332	2HSFTAMR3XC090254	14-May-99	11-Feb-02	
903 A	25-Mar-99 Y	06499 0111482	A73546		26-Nov-01	
1113 A	25-Mar-99 Y	06499 0111482	A73546		26-Nov-01	
1665 A	25-Mar-99 Y	06599-0112223	1M1AA12Y8YW123225	31-Oct-99	29-May-01	446209
1037 A	25-Mar-99 Y	06499	1FUYDCYB4YDF45505	16-Aug-99	17-Mar-02	
826 A	25-Mar-99 Y	06599 0111901	1FUYLDDYB8YLF12050			482615
964 A	26-Mar-99 Y	06399-0110857	1FUYSWEB8YLA86108	14-Jun-99	10-Apr-02	407277
579 A	27-Mar-99 Y	06699 0112373	1FUYDCYB9YDF18130	15-May-99	08-Feb-02	231190
1649 A	29-Mar-99 Y	06699-0112842	1FUW3MCA2YLB54990	18-May-99	09-Jul-02	458435
175 A	30-Mar-99 Y	09099	1FUYSDYBXYLF72791			234548
1653 A	31-Mar-99 Y	09099-0114086	1FUYSDYB7YPB36730	30-Aug-99	02-Nov-01	363659
626 A	31-Mar-99 Y	09099-0114223	1FUYSWEB6WL942211	01-Jul-99	17-Jan-02	499975
68 A	01-Apr-99 Y	09199-0114274	1FUYDCYB4YDF45995	24-Jul-99		395709
1234 A	20-Apr-99 Y	11099-0121668	2HSFMAMR0YC029359		09-May-02	387036
1606 A	20-Apr-99 Y	11099-0121841	2HSFMAMR9YC029405	13-Jul-99	08-Apr-02	253574
1650 A	20-Apr-99 Y	11099-0122133			18-Apr-02	375826
938 A	20-Apr-99 Y	11099-0122110				146540
1150 A	20-Apr-99 Y	11099-0122112				146540
896 A	20-Apr-99 Y	11099-0122128				
1149 A	20-Apr-99 Y	11099-0122110				146540
68 A	20-Apr-99 Y	11099	4V4ND1JF0YN766434	11-Jun-99	31-Dec-01	344209
1539 A	20-Apr-99 Y	11099-0121809	2HSFMAMR7YC029357	12-Jun-99	25-Jul-02	363455
1151 A	20-Apr-99 Y	11099-0122124				196208
1658 A	20-Apr-99 Y	11099-0122123				375525

938 A	20-Apr-99 Y	11099-0122112				148540
940 A	20-Apr-99 Y	11099-0122124				195396
1029 A	20-Apr-99 Y	11099-0125467	1FUYDDYB7YLF50569	04-Jun-99		443137
1683 A	20-Apr-99 Y	11099-0121601	1FUYDSEB1YLB08542	09-Jan-00	30-Apr-02	491606
1482 A	20-Apr-99 Y	11099-0122108			03-Jul-02	448507
820 A	20-Apr-99 Y	11099-0121936	M288510			
615 A	20-Apr-99 Y	11099 0121402		24-Jun-99	19-Jan-02	
1657 A	20-Apr-99 Y	11099-0122113			16-Apr-02	396290
1541 A	20-Apr-99 Y	11099-0121616	2HSFMAMR7YC029357	12-Jun-99	25-Jul-02	353458
232 A	20-Apr-99 Y	11199-0122936	1FUYSDYE3YLF38977	01-Jun-99		591544
600 A	21-Apr-99 Y	11199 0122545	1FUYSDYB7YLB91576	15-Jun-99	14-Nov-01	311918
77 A	21-Apr-99 Y	11199 0122948	1FUYSDYBXYLF38978	01-Jul-99	10-Jan-02	588523
78 A	21-Apr-99 Y	11199-0122901	1FUYDSEB2YLF44855	01-Jul-99	27-Jan-02	554589
589 A	21-Apr-99 Y	11199 0122143	4V4MD2RF4YN798016	01-Jun-99	31-Jan-02	388911
1148 A	21-Apr-99 Y	11199-0122186	3HSFMAMDYN052039		25-Sep-01	282455
937 A	21-Apr-99 Y	11199-0122186	3HSFMAMDYN052039		25-Sep-01	282455
629 A	21-Apr-99 Y	11199 0123027	4V4ND1JF1YN793198	10-Jul-99		616339
1521 A	21-Apr-99 Y	11199-0126770	2HSFTAMR7YC056906	15-Jul-99	15-Apr-02	532065
604 A	21-Apr-99 Y	11199 0122596	4U4ND1UF9YN768433	18-Jun-99	03-Jan-02	351894
690 A	21-Apr-99 Y	11199 0122933	1FUYSDYB5YLA93260	02-Jun-99	27-Jul-01	249423
603 A	21-Apr-99 Y	1119-0122883	4V4ND1JF5YN703196	18-Jun-99		593443
1336 A	22-Apr-99 Y	11299-0123303			26-Dec-01	
78 A	22-Apr-99 Y	11299-0123377	1FUYSDYB9YLF38423	01-Jul-99	13-Feb-02	579169
593 A	22-Apr-99 Y	11299-0123059	1FUYDDYB1YLF20942	07-Jun-99		359724
1568 A	22-Apr-99 Y	11299-0123553	1FUYSDYB4YPA46794	09-Jul-99	29-Oct-01	304354
1630 A	22-Apr-99 Y	11299-0123190	1FUYSDYBZYLF35455	22-Nov-99		575430
167 A	22-Apr-99 Y	11299 0123236				
1451 A	22-Apr-99 Y	11299-0494721	1FUYSDZB3YLF11944	09-Nov-99	12-Apr-02	328386
1290 A	22-Apr-99 Y	11299-0123453	1FUWSMCA7YLB54403	15-Jul-99	09-Apr-02	398303
597 A	23-Apr-99 Y	11399 0124269				
243 A	23-Apr-99 Y	11399- 0124347	YC034637	27-Jul-99	18-Oct-01	369299
807 A	23-Apr-99 Y	11399 0124025	1FUYDDYB0YP886713	22-Jun-99	27-Feb-02	528469
1654 A	23-Apr-99 Y	11399-0123993	2HSCEAMR3YC029097	01-Dec-99	01-Mar-02	302478
68 A	25-Apr-99 Y	11599-0124400	1FUYDSYB0YLB05720	17-Jun-99	13-Mar-02	346211
241 A	26-Apr-99 Y	11699-0124091	1FUYSSER0YL986342	16-Jul-99	17-Oct-01	
983 A	27-Apr-99 Y	11799-0125187	1FUYSSZB9YLF02394	12-Jun-99	26-Mar-02	409632
30 A	27-Apr-99 Y	11799-0126614	1FUYSDZB8XP918099	05-Oct-98	28-Feb-02	814958
1432 A	28-Apr-99 Y	11899-0125356	1FUYSSEB0YP835187	22-Jul-99	21-May-02	207120
961 A	28-Apr-99 Y	11899- 0125808	n0 paperwOrk			
902 A	28-Apr-99 Y	11899-0126060	1FUYSXYB8YLF06767			266745
1484 A	28-Apr-99 Y	11999-026068	1FUYSDZBX4LF26627	09-Jul-99	16-Apr-02	715692
1207 A	29-Apr-99 Y	11999-0126979	1FUYSXYB3YLA54861	23-Jul-99	26-Mar-02	292490
105 A	29-Apr-99 Y	11999-0126944	1FUYSSZB3YPF23783	16-Sep-99	11-Nov-01	320405
617 A	30-Apr-99 Y	12099-0127604	1XKWDR9X8YJ836190	26-Jun-99	12-Mar-02	254734
1622 A	30-Apr-99 Y	12099-0127586	1FUYSSZB3YLB81452	15-Jul-99	20-Oct-01	278248
97 A	02-May-99 Y	12299-0131009	1FUPDSZB1YLF59730	31-Aug-99	02-Jun-01	267031
817 A	02-May-99 Y	72299-0011785		26-Sep-01	19-Oct-01	
65 A	03-May-99 Y	12399	1FUYSDYB1YLA55413	10-Jun-99	22-Dec-01	230385
171 A	03-May-99 Y	12499 0126926	1FUYSZYB7YL787491		16-Jan-02	380273
912 A	03-May-99 Y	12399 0126400	1M1AA12Y5YW123599		06-Dec-01	209797
160 A	03-May-99 Y	12399 0126126				
102 A	03-May-99 Y	12399 0126093	1FUYSSZB9YPB94451	09-Sep-99	14-Aug-01	539563
73 A	03-May-99 Y	12399-0126144	1FUYSDYB9YPA55953	26-Jun-99	24-Oct-01	396172
61 A	03-May-99 Y	12399-0126396	2HSFHMR0YC062899	14-Jul-99	14-Jan-02	367058
72 A	03-May-99 Y	12399-0126217	1FUYSSZB3YPA56034	23-Jun-99	09-Feb-02	398398
688 A	03-May-99 Y	12399 0126110	1FUPCSZBYLA86792	01-Jun-99	20-Sep-01	273985
63 A	03-May-99 Y	12399-0127878	2HSFTAMR7Y0031728	20-Jul-99	30-Jan-02	
612 A	03-May-99 Y	12399-0126303	1FUPCSZB7YLB91162	22-Jun-99	19-Nov-01	371288
821 A	03-May-99 Y	12399 0126110	1FUPCSZBYLA86792		20-Sep-01	237985
685 A	03-May-99 Y	12399-0126019	1FUYSXYB7YLB40032	23-Aug-99	01-Oct-01	275902
101 A	03-May-99 Y	12399- 0126098	1FUYSSZB6YPB94461	09-Sep-99	03-Dec-01	559675
1460 A	03-May-99 Y	12399-0126014	1FUYSSEB1YLA52944	11-Aug-99	05-Mar-02	330953
1206 A	03-May-99 Y	12399-0126399	1FUPCSEB9YLB40601	16-Jul-99	08-Apr-02	296248
1203 A	03-May-99 Y	12399-0126950	1FUPCWEB4YDF54525	06-Jul-99	12-Apr-02	471662
1039 A	03-May-99 Y	12399-0126909	1FUYDSZB3YLB86100	08-Jul-99	11-Mar-02	367277
1199 A	03-May-99 Y	12399-0126314	1FUYDSEB5YPF29133	25-Jun-99	04-Mar-02	332123
1296 A	03-May-99 Y	12399-0126114	1FUYDSEB6YPB73104	28-Aug-99		652381
1196 A	03-May-99 Y	12399-0126063	1FUYSDYB6YPF88984	19-Jun-99	24-Nov-01	327489
1075 A	03-May-99 Y	12399 0126024	840034			
1494 A	03-May-99 Y	12399-0126373	1FUYDDYB6YLB99823	02-Jul-99		423225
1585 A	03-May-99 Y	12399-0127979	2HSFTAMR7YC031728	20-Jul-99	30-Jan-02	556756
1597 A	03-May-99 Y	12399-0126297	1FUPDDYB1WL960934	29-Dec-97	30-Apr-02	496126
1555 A	03-May-99 Y	12399-0126212	1FUYSDYB2YPF82465	05-Jul-99	24-May-02	303774

985 A	03-May-99 Y	12399-0128011	1FUYSSZB0YLB97951	23-Jun-99	02-Nov-01	306995
1590 A	03-May-99 Y	12399-0128364	B50122			509221
1531 A	03-May-99 Y	12399-0128116	1FUYDSEB6YP85104	26-Jun-99		562049
1579 A	03-May-99 Y	12399-0128316	1FUYDSEB1YPF29125	23-Jun-99	25-May-02	312457
813 A	04-May-99 Y	12499-0129294	1FUPCSZB7YLB91162	22-Jun-99	19-Nov-01	371258
761 A	04-May-99 Y	12499 0151780	1FUYSSZB3YLB49604	20-Apr-00	27-Nov-01	259307
1068 A	04-May-99 Y	12499-029318				
830 A	04-May-99 Y	12499- 0128626	1FUPCSZB1YPB67245	10-Jul-99	12-Jul-01	251745
839 A	04-May-99 Y	12499-0128302	1FUYDDYB0YLB05748	21-Jul-99	02-Jul-01	191181
810 A	04-May-99 Y	12499 0128691	2HSFMAHR5YC032039	22-Jun-99	05-Nov-01	284297
608 A	04-May-99 Y	12499 0128277	1FUYSSZBXYLB86102	22-Jun-99	15-Jan-02	480061
1142 A	04-May-99 Y	12499 0129156	F14793			
1087 A	04-May-99 Y	12499-0129319	1FUYDDYB7Y1B05743	20-Jul-99	02-Aug-01	333962
1187 A	04-May-99 Y	12499-0128830	1FUYSWDB8YLA89892	14-Jun-99	19-Feb-02	356266
609 A	04-May-99 Y	12499 0128683	2HSFMAHR6YC032039	22-Jun-99	05-Nov-02	284297
87 A	04-May-99 Y	12499-0128849	1FUYSSZB6YLA82032	18-Jun-99	26-Dec-01	346050
1206 A	04-May-99 Y	12499-0129191	1FUPCZYB4YD787516	28-Jul-99	09-Feb-02	406872
1650 A	04-May-99 Y	12499-0129237	2HSFMAXR4YC037024	09-Sep-99	07-Jun-02	643458
90 A	04-May-99 Y	12499-0129180	1FUPCZYBXYD787519	14-Aug-99		341648
473 A	04-May-99 Y	12499-0128779	1FUYSSZB1XLA05404	06-Aug-98	13-Apr-02	747824
1433 A	04-May-99 Y	12499-0128243	1FUYSSEB1YLA87957	22-Jul-99	13-May-02	340184
652 A	05-May-99 Y	12599 0129432	1FUYSS7B7YLB54915	12-Jul-99	23-Jun-01	348217
879 A	05-May-99 Y	12599 0129649	1M1AA12YXYW121976	16-Sep-99	17-May-01	307067
1438 A	05-May-99 Y	12599-0129416	1FUYSSZB9YLB54922	20-Jul-99	23-May-02	437629
645 A	05-May-99 Y	12599 0129643	1FUYSSZB1YLB54929	29-Jul-99	22-Jan-02	386207
844 A	05-May-99 Y	12599-0170218	1M1AA15YXYW121483	29-Jul-99	20-Sep-01	251049
840 A	05-May-99 Y	12599 0129613	1FUYSSEB4YPF60354	21-Jul-99	18-Jul-01	233800
1208 A	05-May-99 Y	12599-0129411	1FUYSDYB9YLA55434	20-Jul-99	27-Mar-02	349353
633 A	05-May-99 Y	12599 0129401	1FUYSS7B7YLB54918	12-Jul-99	23-Jun-01	346217
795 A	05-May-99 Y	12599 0129834	1XPCDR9X1YD514352	01-Jan-01	12-Nov-01	312719
1398 A	05-May-99 Y	12599-0129682	1FUYSSEBXYPF60357	21-Jul-99	11-Jun-02	380996
253 A	05-May-99 Y	12599 0129651	1M1AA12YXYW121976	16-Sep-99	17-May-01	307067
1298 A	05-May-99 Y	12599-0129488	2HSFTASR3YC024131	22-Jul-99	04-Jan-02	332284
1202 A	05-May-99 Y	12599-0129421	1FUYSSZB6YLB84920	05-Jul-99	18-Jan-02	477024
1209 A	05-May-99 Y	12599-0180160	1FUPCXYB2YLB70686	09-Aug-99	13-Feb-02	312641
1204 A	05-May-99 Y	12599	1FUYSSZB7YLB54944	13-Jul-99	22-Mar-02	548609
1292 A	05-May-99 Y	12599-0129470	2HSFTASR3YC024131	22-Jul-99	04-Jan-02	332284
342 A	05-May-99 Y	12599-0130060	1FUPLS765YPB62016	18-Jul-99	17-Aug-01	508356
1003 A	05-May-99 Y	12599-0120924	1FUYSSZB8YLB54960	30-Jul-99	06-Mar-02	392489
1478 A	06-May-99 Y	12699-0130609	1FYSSEB6YLA80690	20-Jul-99	02-May-02	341720
1000 A	06-May-99 Y	12699 0130031	1FUYSSZB0YPA75877	14-Aug-99	19-Nov-01	302357
663 A	06-May-99 Y	12699-0130922	1FUYSSZB8YLB54968	20-Aug-99	04-Jun-01	372781
244 A	06-May-99 Y	12699-0130616	1FUYSDYBXYLA55443	28-Jul-99	15-Aug-01	258767
88 A	06-May-99 Y	12699-0130302	1FUYSDYB0YPA50468	29-Jul-99	18-Dec-01	280096
1287 A	06-May-99 Y	12699-0130450	1FUYSDYBXYPA56077	28-Jun-99	11-Apr-02	339000
1623 A	06-May-99 Y	12699-0130412	1FUPCZBXYDF58265	13-Sep-99	01-Dec-01	448789
1554 A	06-May-99 Y	12699-0130413	1FUPCSZB1YDF58268	13-Sep-99	25-Apr-02	616314
1428 A	07-May-99 Y	12799-0131327	1FUYSDYBXYPA69969	12-Aug-99	03-May-02	376879
1039 A	07-May-99 Y	12799-	1FUYSSZB3YLB34194	17-Aug-99	18-Mar-02	637468
116 A	07-May-99 Y	12799-0131138	1FUYSSZB6YLB96404	18-Nov-99	16-Feb-02	423462
635 A	07-May-99 Y	12799 0131322	2HSFTAERXYC043106	19-Jul-99	11-Jul-01	156851
869 A	07-May-99 Y	12799-0131269	1FUYSSEB3YLA80791	24-Aug-99	26-Jan-02	306525
911 A	07-May-99 Y	12799-0131147				225500
1462 A	07-May-99 Y	12799-0131262	1FUYSSEB1YLA80790	24-Aug-99	19-Mar-02	113240
70 A	07-May-99 Y	12799 0128062	1FUYSDYB4YPF68972	19-Jun-99	11-Dec-01	358145
592 A	07-May-99 Y	12799 0131259	1FUYSDZB9YLF41935	27-Oct-99	11-Feb-02	403200
1119 A	07-May-99 Y	12799-0131147				225500
1490 A	08-May-99 Y	12899-0130731	1M1AA13Y8YW124100	13-Aug-99	31-May-02	397464
724 A	10-May-99 Y	13099-0131601	1FUDDYB1YPG13991	28-Dec-99		486150
1032 A	10-May-99 Y	13099	1FUPCSEB6YPB99602	25-Jun-99	25-Feb-02	348409
670 A	10-May-99 Y	13099 0131971	2HSFMAMR1YC030259	30-Aug-99	18-Sep-01	289603
671 A	10-May-99 Y	13099 0131952	2HSFMAMR1YC030259	30-Aug-99	18-Sep-01	289603
858 A	10-May-99 Y	13099-0132106	1FUYDSEB2YLF44972			522038
908 A	10-May-99 Y	13099 0132553				
1607 A	10-May-99 Y	13099-0131972	2HSFMAMR8YC030257	30-Aug-99	17-Apr-02	329379
800 A	11-May-99 Y	13199-0132078	117991	31-Feb-01	22-Oct-01	428
			1FUYDSBXYLF44962 or			
863 A	11-May-99 Y	13199 0132982	1FUYDSBXYLF44967			
621 A	11-May-99 Y	13199-0132677	1FUYDSEB6YLF44960	01-Jul-98	21-Mar-02	667298
1342 A	11-May-99 Y	13199-0132751	1FUYSDYB1YLF11663	26-Jul-99	25-Mar-02	273762
1533 A	11-May-99 Y	13199-0132645	4V4ND10P4YN703220	10-Jul-99		655628
1327 A	11-May-99 Y	13199-0133044				
1330 A	11-May-99 Y	13199-0132912			27-Aug-01	
1334 A	11-May-99 Y	13199-0132630				

1662 A	11-May-99 Y	13199-0132747	1FUYSDYB3YLF38434	01-Nov-99		307800
1288 A	11-May-99 Y	13199	1FUW3MCA6YLB54412	24-Jun-99	21-Dec-01	440920
1005 A	12-May-99 Y	13299 0131117	1FUYSDYRXYLB51383	05-Aug-99	17-Oct-01	298108
1044 A	12-May-99 Y	13299-0133864	1FUYSDYB9YLF07235	20-Sep-99	11-Mar-02	333741
257 A	14-May-99 Y	25799 0165236	2HSCEAMR9C040240	11-Nov-99	18-Jan-02	266720
1034 A	18-May-99 Y	13899-0136441	1FUYSXYB9YL661651	16-Jul-99	22-Mar-02	422046
1031 A	18-May-99 Y	13899-0136839	1FUYDCYB6YL1F36150	23-Jun-99		387494
616 A	18-May-99 Y	13899 0135833	1FUYDDYB4YLF47364	26-Jun-99		457612
139 A	19-May-99 Y	14099 0137951				79378
1235 A	19-May-99 Y	13999	2HSFTAMR0YC034162	27-Aug-99	27-May-02	478998
1041 A	19-May-99 Y	13999-0138680	1FUYSDYB6YLA6294	24-Aug-99	08-Mar-02	342048
1104 A	22-May-99 Y	14299 0139968		01-Mar-99	23-Mar-01	
1449 A	24-May-99 Y	14499-0140140	1FUPDDYB6YPF70312	05-Aug-99	17-Apr-02	268374
1596 A	24-May-99 Y	14499-013649	1FUYSSEB6YPF66368	14-Oct-99	22-May-02	403032
1405 A	24-May-99 Y	14499-0140132	1FUPDDYB6YPF70312	05-Aug-99	17-Apr-02	270355
1558 A	01-Jun-99 Y	15299-1042779	1FUYSDYBZYPB35730	01-Aug-99	06-Sep-02	450008
106 A	02-Jun-99 Y	15399-0143664	1FUPC6ZB1OF69786	17-Sep-99	15-Dec-01	463126
1573 A	05-Jun-99 Y	15699-1441031	1FUWNWDA4YLF92624	14-Jul-99	14-May-02	477570
858 A	07-Jun-99 Y	15899 0146242	1FUYSSEB7YLF60204	17-Aug-99	19-Feb-02	554027
111 A	07-Jun-99 Y	15899-0146065	2HSCNAER7YL048117	18-Oct-99	05-Sep-01	179052
1089 A	07-Jun-99 Y	15899-0145897				
100 A	08-Jun-99 Y	15999 0144493	1FUYSSEB0YLA66306	06-Sep-99	22-Oct-01	359284
275 A	08-Jun-99 Y	16099	1XKWD69X6YR989383	01-Feb-00	06-Jan-02	
1210 A	08-Jun-99 Y	15999-0146491	1FUYSSEB6YLF60196	13-Aug-99	10-Apr-02	570663
93 A	09-Jun-99 Y	16099-0147221	1FUYDWD6ZYLB17932	20-Aug-99	22-Jun-01	688312
1445 A	09-Jun-99 Y	16099-0147016	1FUPCXYB1YLB57940	01-Sep-99	08-Jun-02	589726
98 A	09-Jun-99 Y	16099-0177260	1FUYDDYBXYFA63374	06-Sep-99		652941
857 A	09-Jun-99 Y	16099-0146968	1FUYSDZB4YPA89649	18-Aug-99	21-Nov-01	374923
108 A	10-Jun-99 Y	16199 0147882	1FUYSSZB4YPF23789	27-Sep-99	27-Dec-01	424577
1838 A	10-Jun-99 Y	16199-0148184	1FUYSDYB7YPA66117	27-Aug-99	16-May-02	380085
1431 A	14-Jun-99 Y	16599-0149329	1FUWNWDA1YLF92869	24-Jul-99	19-May-02	544292
987 A	14-Jun-99 Y	16599-0149069	1FUYDDYB7YPF25768	01-Sep-99	01-Feb-02	667193
988 A	14-Jun-99 Y	16599-0149087	1FUYDDYB7YPF25768	01-Sep-99	01-Feb-02	667193
1211 A	14-Jun-99 Y	16599-0149036	1FUYSDYB5YLF46579	01-Sep-99	26-Dec-01	260353
1036 A	14-Jun-99 Y	16599-0349244	1FUYDDYB3YLF50433	09-Aug-99		
1326 A	16-Jun-99 Y	16799-0151117			03-May-02	676906
662 A	16-Jun-99 Y	16899-0151437	1FUYSSEB3YLF60451	19-Aug-99	21-Sep-01	334666
94 A	16-Jun-99 Y	16799	1FUWNWDA9YLF92750	25-Aug-99	06-Jan-02	410001
89 A	16-Jun-99 Y	16799-0142609	1FUWNWDA6YLF92714	10-Aug-99	31-Dec-01	383634
129 A	16-Jun-99 Y	16799-0160663	1FUJAHBC61LG71191	22-Jun-00		446786
884 A	17-Jun-99 Y	16899 0151264	1M1AA12Y2YW123222	30-Sep-99	13-Sep-01	450000
1213 A	18-Jun-99 Y	16999-0152275	1FUYSDYB5YPA50529	20-Sep-99	13-Feb-02	114875
700 A	21-Jun-99 Y	17299 0153068	1HSCEAHR7YJ105600	09-Nov-99	07-Aug-01	241798
1045 A	23-Jun-99 Y	17499-0154886	1FUPCXYB9YLB57958	05-Oct-99	28-Mar-02	882194
619 A	23-Jun-99 Y	17499-0156704	1FUYDWD8XYLB17919	30-Jun-99	17-Jun-01	699347
388 A	24-Jun-99 Y	17599 0156423	1FUYDXYB7YP604700	25-Apr-97	30-Aug-01	678671
1046 A	25-Jun-99 Y	17699-0156100	1FUYSDZB24P918241	14-Oct-99	05-Feb-02	318111
736 A	28-Jun-99 Y	17999 0156166	1FUYD5ZB0YPB39095	24-Jan-00	19-Jan-02	356667
117 A	09-Jul-99 Y	19099-0122059	1FUYSDYB3YLF46193	20-Dec-99		397804
882 A	12-Jul-99 Y	19399-0160340	G13974			555984
91 A	14-Jul-99 Y	19599-0151297	1FUYSSZB3YLB64964	17-Aug-99	20-Jul-01	376222
1060 A	14-Jul-99 Y	19599 0151305	1FUYSSEB1YLF60600	31-Jan-00	22-Oct-01	281393
1221 A	18-Jul-99 Y	19799-0162074	1FUYSZYB9YPF45306	21-Feb-00	19-Jan-02	298363
856 A	21-Jul-99 Y	20299-0164562	G13979			468773
872 A	22-Jul-99 Y	20399-0166273	G13982			616973
1644 A	23-Jul-99 Y	20499-0166637	G13981			472258
144 A	23-Jul-99 Y	20499 0166678				21309
968 A	23-Jul-99 Y	20499-0166662				606219
874 A	23-Jul-99 Y	20499-0166631				566044
969 A	23-Jul-99 Y	20499-0166637	G13981			472258
563 A	27-Jul-99 Y	20899-0166635	4V4ND2JP1YN242517	26-Sep-99	15-Mar-02	277232
862 A	29-Jul-99 Y	21099 0169715	1FUYSSZB8YLB55043	27-Sep-99	23-Oct-01	438508
960 A	29-Jul-99 Y	21099 970032	1FUYD5EB1YP940512			
1161 A	29-Jul-99 Y	21099 970032	1FUYDSEB1YP940512			
491 A	12-Aug-99 Y	22599 0012762	1FUYNMDB7XLA29433	07-Oct-99	07-Dec-01	377606
606 A	14-Aug-99 Y	22699	2HSFMAHR1YC032037	21-Jun-99	13-Dec-01	330922
1428 A	19-Aug-99 Y	23199-0187013	1FUYSDYB8YLB91692	16-Dec-99	19-Apr-02	262119
1715 A	30-Aug-99 Y	24299 01136	1FUPDDYB3YLB60578	08-Oct-99	16-Jul-02	697455
114 A	01-Sep-99 Y	24499-0182452	1FUYSDZB5YP918251	26-Oct-99	24-Feb-02	214094
1507 A	01-Sep-99 Y	24499-0181799	1FUPD5ZB3YLB5L184	19-Nov-99	09-Apr-02	407215
1500 A	01-Sep-99 Y	24499-0182417	2HSCHAER4YC064464	14-Apr-00	09-May-02	310730
989 A	07-Sep-99 Y	25099 0183148	1FUYDDYB6YLB68665	13-Nov-99	10-Oct-01	157925
126 A	08-Sep-99 Y	25199-0183590	1FUYSSZB21LG62171	01-Jun-00	12-Nov-01	334132
1479 A	08-Sep-99 Y	25199-0183587	1FUYSSZB11LG44325			342884

1376 A	08-Sep-99 Y	25199-0183605	1FUYSDYBX1LH37485	09-Jun-00	14-Feb-02	192488
112 A	10-Sep-99 Y	25399 0184419	1M1AA05Y7YW019793	19-Oct-99	29-Oct-01	279729
109 A	10-Sep-99 Y	25399-0125412	1HSCAAHN0YJ068885	04-Oct-99		256588
270 A	10-Sep-99 Y	25499 0184508	2HSCEAMR0YC030723	05-Jan-00	13-Dec-01	253809
729 A	11-Sep-99 Y	25499 0184511	2HSCEAM0YC030723	05-Jan-00	13-Dec-00	253809
1216 A	11-Sep-99 Y	25499-0184584	1FUY6MDR1YLB03499	16-Oct-99	18-Apr-02	380211
1543 A	13-Sep-99 Y	25799-0184904	1FUYDZYB1YPF66524	08-Nov-99		353977
695 A	14-Sep-99 Y	25799-0185318	2HSCNAER9YL056445	28-Oct-99	16-Oct-01	295335
529 A	16-Sep-99 Y	25999-0021868	1FUYDDYB8XDA39020	15-Dec-98	11-Oct-01	327584
856 A	17-Sep-99 Y	26099-0186251	G63670			484508
138 A	17-Sep-99 Y	26099 0186711				
120 A	19-Sep-99 Y	26299 0187400	1FUY66EBXYLB48513	23-Jan-00	19-Jan-02	168217
706 A	23-Sep-99 Y	26699 0188904	1FUYSDYB1YLB91850	26-Nov-99	07-Sep-01	349830
396 A	24-Sep-99 Y	26799-0190464	1FUYNMDB3YP662774			195728
818 A	25-Sep-99 Y	26899-0190869	2HSCHAPR4YC046194	18-Oct-01	05-Nov-01	
1219 A	25-Sep-99 Y	26899-0191062	1FUYSSZB4YLF11861	03-Dec-99	20-Dec-01	341900
1666 A	26-Sep-99 Y	26999-0190928	1XKWD59XXYR969404	20-Oct-99	01-Mar-02	562737
731 A	29-Sep-99 Y	27299 0192595	2HSCEAHR3YC064585	11-Jan-00	26-Jul-01	348235
730 A	29-Sep-99 Y	27299 0191153	2HSCEAHR3YC064585	11-Jan-00	26-Jul-01	348235
783 A	30-Sep-99 Y	27399-0192266	1FUY95ZB1YPB09462	14-Sep-00	22-Jan-02	273721
1281 A	30-Sep-99 Y	27399-0193140	1FUYSSZB4YLB54620	04-Jun-99	09-Apr-02	504862
970 A	01-Oct-99 Y	27499 0193405	B58091			
1229 A	04-Oct-99 Y	27799-0193124				
715 A	08-Oct-99 Y	28199-0194362	1FUYSSEB4YLA66564	13-Dec-99	03-Jul-01	123401
741 A	12-Oct-99 Y	31699 0210559	2HSCNAMR9YCD59735	21-Feb-00	20-Jul-01	157726
785 A	18-Oct-99 Y	29100-0199975	1FUPGSZB4YPB95547	27-Oct-00	26-Jan-01	275959
784 A	20-Oct-99 Y	29399-0199852	4V4ND4JH6YN247516	04-Oct-00	26-Sep-01	250981
720 A	22-Oct-99 Y	29599-0201278	1FUYSDZB8YLG18379	21-Dec-98		383881
264 A	24-Oct-99 Y	29799 0197425	2HSCEAMR3YC071122	16-Oct-99	26-Jan-02	270280
1186 A	26-Oct-99 Y	29999-0202456	1FUWTECA3XHB30493	21-Nov-98	27-Jul-01	143083
669 A	27-Oct-99 Y	30099 0202971	1FUYDXYB2YPB49000	21-Oct-99	10-Jan-02	385017
119 A	01-Nov-99 Y	30699 0205007	1FUYNEDB2YP669432	04-Jan-00	16-Apr-01	162359
1665 A	02-Nov-99 Y	30699-0205692	2HSCNAMR6YC080915	10-Jan-00	22-Aug-00	310341
871 A	03-Nov-99 Y	30700-0319414	1FUJBAVB1LF26358	18-Mar-01	12-Mar-02	186543
993 A	08-Nov-99 Y	31299 0206072	1FUY1WEBZ1LH51158			
1315 A	08-Nov-99 Y	34299-0219166	1HSMCAHR1YH272578	12-Apr-00	19-Mar-02	254938
125 A	09-Nov-99 Y	31399-0206879	1FUY97EB0YPA89423	28-Mar-00	16-Dec-01	317625
1374 A	09-Nov-99 Y	31399-0206933	1FUYDSZB1YLG89630	03-Apr-00	09-May-02	378161
122 A	10-Nov-99 Y	31499-0208524	1FUPC6ZB7YPB62034	05-Feb-00	01-Oct-01	308962
890 A	14-Nov-99 Y	31999-0210991	1FUYSSEB9YLA68407	15-Jan-00	24-Mar-02	412700
1624 A	15-Nov-99 Y	31999-0211432	1M1AE08Y5YW003668	13-Jan-00	17-Nov-01	290724
1592 A	15-Nov-99 Y	31999-0210968	1FUYSSEB5YLA86216	22-Sep-00	12-Jun-02	467240
1635 A	15-Nov-99 Y	31999-0210910	1M1AE07YXYW004669	08-May-00	05-Jan-02	103388
1666 A	15-Nov-99 Y	31999-0210847	1FUYSSZB3YLB58161	16-Dec-99	19-May-02	408433
737 A	18-Nov-99 Y	32299-0213262	1FUPD6ZB4YLB58179	26-Jan-00	26-Jul-01	389506
969 A	18-Nov-99 Y	32299 0213279				
735 A	19-Nov-99 Y	32399 0243525	2HSCKASR9YC071357	24-Jan-00	24-Jan-02	234259
1466 A	20-Nov-99 Y	32499-0216098				
1223 A	22-Nov-99 Y	32699-0214123	1FUYSSEB9YP941154	25-Mar-00		292291
734 A	23-Nov-99 Y	32799 0214328	1FUY57EB7YLB74623	20-Jan-00	20-Jan-02	275235
758 A	23-Nov-99 Y	32799-0214430	1FUY95ZB4YLB85205	10-Apr-00	03-Jan-02	267203
1222 A	29-Nov-99 Y	33399-0125448	1FUY97EB2YPG26910	23-Mar-00	30-Mar-02	410088
1429 A	30-Nov-99 Y	33499-0012495	1FUYDSZB5XLA01494	11-Nov-95	03-Apr-02	580464
268 A	30-Nov-99 Y	33499-3225648	1FUPDDYB6YLG18453	23-Jun-00	28-Nov-01	
245 A	30-Nov-99 Y	33499-0216009	1FUY8DYB3YPA60464	29-Jul-99	26-Jun-01	222601
792 A	30-Nov-99 Y	33499-0218588	2HSCHAER8YC063964	22-Nov-00	10-Dec-01	136013
1224 A	03-Dec-99 Y	33799-0217692	1FUYDSZB3YLH40364	10-Apr-00	03-Apr-02	223658
1093 A	03-Dec-99 Y	33799 0217575	1FUYDSZB0YLH40366	10-Apr-00	10-Jan-02	191228
769 A	15-Dec-99 Y	34999 0222769	1FUYSSEB6YP941212	18-Apr-00	10-Oct-01	172507
1003 A	15-Dec-99 Y	34999 0222564	1FUYL7EB7YLH13266	17-Mar-00	22-Feb-02	197977
1668 A	16-Dec-99 Y	35099-0223035	1FUYS7EB8YPG28979	20-Apr-00	16-Aug-01	301517
1225 A	20-Dec-99 Y	35499-024097	1FUYSSEB0YPG07456	20-Apr-00	07-Mar-00	348275
1563 A	20-Dec-99 Y	35499-0224714	1FUPDSEB5WP973368	07-Apr-98	30-May-02	678433
1621 A	01-Jan-00 Y	00100-0771063	1FUJAHCG81LH92726	12-Dec-00	28-Apr-02	361201
764 A	03-Jan-00 Y	00300 0227103	1FUYSSEB0YPG60657	31-Mar-00	09-Jan-01	180038
178 A	04-Jan-00 Y	00400 0227602	no paperwork			
318 A	07-Jan-00 Y	00750-0228455	1FUYDSEB01PH36272			116192
1487 A	17-Jan-00 Y	01700-0232749	1FUW3MCAX1LB22129	08-Jun-00	20-Jun-02	119600
1408 A	28-Jan-00 Y	02600-0261189	2HSCBAMB41L009730	31-Aug-00	21-Mar-02	160432
143 A	22-Feb-00 Y	06300 0345606				8702
1488 A	22-Feb-00 Y	06300-0246500	1FUYDDYB6XPB22333	01-May-99	14-Dec-01	248321
320 A	03-Mar-00 Y	06300- 0250419				160000
127 A	06-Mar-00 Y	06600 0250924	1FUYSSEB31P941379	05-Jun-00	10-Jun-01	175412
773 A	10-Mar-00 Y	07000 0253001	2HSCNAMR51C069627	09-Jun-00	15-Aug-01	115160

1584 A	10-Mar-00 Y	07000-0253470	1FUYSDYBXPA87119	01-May-99	20-May-02	293017
142 A	13-Mar-00 Y	07300 0254205				50024
1226 A	16-Mar-00 Y	07500-0255865	1FUJA3CG51LG62177	15-Jun-00	08-Apr-02	438123
772 A	18-Mar-00 Y	07800- 0256280	1FUJA3BG51LB74638	08-Jun-00	25-Jan-02	218129
1618 A	09-Apr-00 Y	09900-0265977	1FUJA3AVB1LGB6728	10-Aug-00	16-Apr-02	181603
1452 A	12-Apr-00 Y	10300-0268140	2HSCHAMR21C012004	30-Mar-01	13-Mar-02	185980
1228 A	29-Apr-00 Y	12000-0276361				
1227 A	02-May-00 Y	12300-0276315	1FUJA6CG81PH99625	18-Dec-00	28-Dec-01	212000
1354 A	09-May-00 Y	13000-0279465	1FUJBBBD91LH99506	13-Oct-00	04-Feb-02	247031
1058 A	09-May-00 Y	13000-0279171	1XKWDR9X81R879257	05-Feb-01	26-Feb-02	239253
1007 A	12-May-00 Y	13300-0280662	1FUJCLCG11PG09403	13-Jul-00	14-Jan-02	167597
133 A	15-May-00 Y	13600 0282167	1FUNA3B641PG98471	28-Sep-00	15-Oct-01	125288
295 A	22-May-00 Y	14300 0284969	2HSCNAMR81C067439	15-Dec-00	04-Feb-02	167161
815 A	22-May-00 Y	14300 0284599	1FUJAPCG91HH09469	22-Sep-01	24-Jul-01	102647
134 A	24-May-00 Y	14400 0285228		02-Oct-00	19-Oct-00	833
1107 A	16-Oct-00 Y	29000-0312174	1FUJACAS61LJ92598			109318
1673 A	26-Oct-00 Y	29000-0312224	1FUJACAS21LJ92601	01-Jan-01		273301
1672 A	26-Oct-00 Y	29000-0312114	1FUJACAS21LJ92601	01-Jan-01		273301
900 A	26-Oct-00 Y	29000-0312174	1FUJACAS61LJ92598			109318
1383 A	26-Oct-00 Y	30000-0317037	1FUJAHBG32PJ84114	08-May-01	12-Mar-02	120668
1502 A	29-Oct-00 Y	30300-0229317	2HSCNAMR51C083297	25-Apr-00	05-Mar-02	246295
1348 A	02-Nov-00 Y	30700-0319284	1FUJBBCGX1LJ15202	18-Mar-01	12-Apr-02	201419
1347 A	02-Nov-00 Y	30700-0319121	1FUJAHCGX1LJ20437	14-Dec-00	18-Apr-02	261304
1570 A	02-Nov-00 Y	30700-0319275	1FUJVBCG51F883521	01-Feb-01	05-Sep-02	302250
804 A	14-Nov-00 Y	31000-0321505	1FUJBBCA21PB39019	03-May-01	17-Aug-01	78300
165 A	16-Nov-00 Y	32100-0320476				
501 A	20-Nov-00 Y	32500-0321457	2HSCEAHR31C021238	23-Feb-01	28-Dec-01	69383
996 A	07-Dec-00 Y	31200-0320060	1FUJBBCG71PB36710	04-Feb-01	25-Jun-01	87387
53 A	10-Jan-01 Y	01001 0326630	1FUYS8ZB0XLA42847	22-Mar-99	07-Jan-02	733519
1387 A	11-Jan-01 Y	01101-0327122	4V4MC9RP91N326003	21-Mar-01	14-Mar-02	74600
1365 A	03-Feb-01 Y	03401-0328939	1FUJBBBC52PJ13196	13-Jul-01	11-Feb-02	107974
1361 A	07-Feb-01 Y	03801-0329788	1FUJA6CG82LF24507	15-Jul-01	04-Apr-02	92723
807 A	15-Feb-01 Y	04601-0330847	2HSCEAMR72C023366	03-Jul-01	07-Jan-02	51284
808 A	19-Feb-01 Y	05001-0331211	2HSCEAMR72C023366	03-Jul-01	07-Jan-02	51284
1368 A	19-Feb-01 Y	05001-0331307	1FUJA6LG22LK06806	01-Jul-01	04-Feb-02	133471
1608 A	19-Feb-01 Y	05001-0331306	1FUJA6CG82LK06825	06-Jul-01	17-Apr-02	179926
1349 A	19-Feb-01 Y	05001-0331313	1FUJA6CG82LK06839	07-Jul-01	04-Mar-02	184966
1367 A	19-Feb-01 Y	05001-0331304	1FUJA6CG42LK06836	06-Jul-01	15-Apr-02	196053
1346 A	19-Feb-01 Y	05001-0331290	1FUJA6CG02LK06830	06-Jul-01	04-Mar-02	169592
1616 A	19-Feb-01 Y	05001-0331305	1FUJA6CG92LK06821	05-Jul-01	15-Apr-02	203552
1350 A	19-Feb-01 Y	05001-0331293	1FUJA6CG02LK06827	05-Jul-01	21-Feb-02	166966
1514 A	20-Feb-01 Y	05101-0331602	1FUJA6CG12LK06600	30-Jun-01	04-Mar-02	178236
1060 A	20-Feb-01 Y	05101-0331445			18-Feb-02	
1517 A	20-Feb-01 Y	05101-0331506	2HSCEAMR82C023369	06-Jun-01	17-Mar-02	74661
1350 A	20-Feb-01 Y	05101-0331486	1FUJA6CG82LK06806	01-Jul-01	18-Feb-02	157671
1061 A	20-Feb-01 Y	05101-0331598				
1609 A	20-Feb-01 Y	05101-0331511	1FUJA6CG62LK06805	01-Jul-01	08-May-02	201289
806 A	21-Feb-01 Y	05201-0331794	1FUJA6CG12LK06814	02-Jul-01	14-Feb-02	182279
1365 A	21-Feb-01 Y	05201-0331786	1FUJA6CG72LK06817	06-Jul-01	04-Mar-02	181991
1353 A	21-Feb-01 Y	05201-0331785	1FUJA6CG02LK06836	06-Jul-01	01-Feb-02	147371
1501 A	21-Feb-01 Y	05201-0331794	1FUJA6CG12LK06814	02-Jul-01	14-Feb-02	182279
1351 A	21-Feb-01 Y	05201-0331792	1FUJA6CG52LK06816	02-Jul-01	25-Apr-02	226167
1610 A	27-Feb-01 Y	05601-0332848	1FUJA9A72LJ47114	25-Sep-01	07-May-02	99774
809 A	27-Feb-01 Y	05601-0332852	1FUJBRLD82LJ73987	25-Jul-01	14-Jan-02	80934
810 A	01-Mar-01 Y	06001-0333346	1XP5D60X02N574466	25-Sep-01	27-Feb-02	39685
811 A	03-Mar-01 Y	06601-0334602	1FUJA6C612LJ74358	22-Aug-01	15-Jan-02	91672
1616 A	16-Mar-01 Y	07401 0335379	1FUY5BEB1XP780808	29-May-99	28-May-02	553097
1446 A	16-Mar-01 Y	07401-0335324	1FUWNWDABYLF92800	01-Sep-99	23-Apr-02	500011
1679 A	28-Mar-01 Y	08701-0336414	1FUJACAS61CH72212	01-Sep-00	22-Aug-02	321416
1359 A	17-May-01 Y	13701-0329469	1FUJAHBG22PJ71412	16-Jul-01	12-Feb-02	99680
1062 A	06-Jun-01 Y	15601-0331587				

ID	A/L?	Julian Date Translation	Hub Problem Y/N	SKF Serial number	In Service Date
1023 A		1/10/01	N	01001-0326365	12/08/98
				01300 0231669 or	
793 A		1/13/00	N	0272932?	11/20/00
947 A		1/20/99	N	02099-0080516	
948 A		1/22/99	N	02299-0081841	
946 A		1/22/99	N	02299-0081734	
690 A		1/25/99	N	02599-?	10/21/98
520 A		1/26/99	N	02699-0084213	08/29/99
560 A		1/27/99	N	02799 0031408	03/31/99
565 A		1/29/99	N	02999-0083970	04/01/99
788 A		1/4/00	N	00400-0227542	06/01/00
807 A		1/5/01	N	00501-0328003	06/22/01
801 A		10/12/00	N	25600-0311471	02/15/01
1066 A		10/12/00	N	25600-0311624	
804 A		10/16/00	N	29000-0312115	03/01/01
1061 A		10/16/00	N	29000-1312447	
1025 A		10/2/96	N	27598-0026198	01/25/99
527 A		10/22/98	N	29598-0030882	12/07/98
282 A		10/22/98	N	29599-0201636	11/30/99
298 A		10/25/00	N	30000 0317278	01/04/01
510 A		10/25/98	N	29698 0031016	10/23/98
843 A		10/26/00	N	300000-0317254	07/23/99
975 A		10/26/99	N	29999-0202760	03/04/00
529 A		10/27/98	N	30098-0001807	12/08/98
532 A		10/27/98	N	30098 0033813	12/19/98
705 A		10/9/99	N	28299 0194767	11/17/99
265 A		11/11/99	N	31599-0209916	04/22/00
800 A		11/2/00	N	30700-0319507	02/14/01
856 A		11/2/99	N	30699-0206531	
857 A		11/2/99	N	30699-0206533	
991 A		11/22/00	N	32700-0322922	
922 A		11/22/98	N	32598-0061110	
767 A		11/22/99	N	32799-0214312	04/22/00
967 A		11/26/99	N	33099-0184712	
1032 A		11/26/99	N	33099-0211572	06/04/99
773 A		11/29/99	N	33399-0215536	06/30/00
744 A		11/5/99	N	30999-0207401	02/29/00
806 A		11/9/00	N	31400-0321162	04/20/01
569 A		11/9/99	N	31399-0206879	03/29/99
751 A		12/1/99	N	33699-0216668	03/14/00
752 A		12/1/99	N	33699-0216667	03/14/00
785 A		12/1/99	N	33699-0216766	04/29/00
786 A		12/1/99	N	33699- 0216764	04/29/00
868 A		12/16/98	N	35098-0067476	
669 A		2/12/01	N	04301-0330229	06/23/99
522 A		2/13/01	N	04301-0330268	11/24/98
764 A		2/13/99	N	4499-0220385	03/17/00
307 A		2/20/99	N	05199-0093448	
306 A		2/25/99	N	05699-0097064	
528 A		2/26/01	N	05901-0333070	
915 A		3/11/99	N	07099-0104904	
831 A		3/12/01	N	07101-0334061	
320 A		3/16/00	N	07600-0266968	
713 A		3/16/99	N	07499-0106328	12/01/99
791 A		3/16/99	N	07599-0255796	10/30/00
597 A		3/23/99	N	08299-0109535	06/06/99
598 A		3/25/99	N	08499 0111242	07/19/99
596 A		3/26/99	N	08599 0111994	06/21/99
607 A		3/26/99	N	08599 0111756	06/21/99
932 A		3/26/99	N	08699-0111992	
787 A		3/29/00	N	08900-0261906	10/09/00
578 A		3/3/99	N	06299-0099568	05/06/99
422 A		3/31/99	N	09099 0114207	01/11/98
564 A		3/4/99	N	06399 0100778	04/01/99
437 A		3/5/98	N	06499-0101809	03/19/98
877 A		3/5/98	N	06499 0101320	05/06/99
776 A		3/9/00	N	06900 0251302	08/15/00
777 A		3/9/00	N	06900 0253844	08/15/00
373 A		3/9/01	N	06901-0334445	05/30/97
294 A		4/11/00	N	10200-0267939	06/19/00
792 A		4/12/00	N	10300-0268338	10/30/00
750 A		4/14/00	N	10500-0263779	07/21/00
622 A		4/22/99	N	11299-0123790	07/01/99

740 A	4/29/99	N	11999 0126513	02/07/00
682 A	5/10/99	N	16099-0146966	09/27/99
315 A	5/13/99	N	13399-0134207	
1056 A	5/16/00	N	13700-0282417	09/27/00
648 A	5/18/99	N	17099 0126513	07/30/99
938 A	5/18/99	N	13899-0135899	
614 A	5/2/00	N	12300 0278424	09/04/01
615 A	5/2/00	N	12300 0278648	09/04/01
616 A	5/2/00	N	12300 0278424	09/04/01
1037 A	5/2/99	N	12299-??70119	08/03/99
788 A	5/24/99	N	14499 0139659	10/12/00
315 A	5/28/99	N	14999-0160964	
504 A	5/3/99	N	12399-0128126	06/16/99
968 A	5/3/99	N	12399-0128021	08/23/99
593 A	5/5/99	N	12599-0129357	10/27/99
248 A	5/6/99	N	012699 0130890	06/01/99
249 A	5/6/99	N	12699 0130894	06/01/99
992 A	5/9/01	N	12901-0341718	10/22/99
358 A	6/1/99	N	15299-0143293	03/25/97
651 A	6/13/99	N	15599-0149091	06/07/99
652 A	6/13/99	N	15599-0149084	06/07/99
398 A	6/23/01	N	07401-0338228	06/11/97
660 A	6/23/99	N	17499 0154667	06/15/99
677 A	6/28/99	N	17999-0167386	09/01/99
918 A	6/3/99	N	18499-0164541	
661 A	6/30/99	N	18199-0158206	
662 A	6/30/99	N	18199-0160105	
252 A	6/8/99	N	16099-0147222	08/20/99
660 A	6/9/99	N	15999 0446617	09/19/99
661 A	6/9/99	N	15999-0146612	09/19/99
703 A	7/12/99	N	19399-0160357	11/14/99
704 A	7/12/99	N	19399-0160382	11/14/99
663 A	7/12/99	N	19399-0160341	
667 A	7/21/99	N	20299-0164294	
700 A	7/22/99	N	20399-0164730	11/04/99
665 A	7/22/99	N	20399-0164728	
666 A	7/22/99	N	20399-0164732	
672 A	7/22/99	N	20399-0167218	
673 A	7/22/99	N	20399-0166278	
675 A	7/23/99	N	20499-0166526	
677 A	7/23/99	N	20499-0166655	
678 A	7/23/99	N	20499-0166650	
679 A	7/23/99	N	20499-0165726	
680 A	7/23/99	N	20499-0165726	
681 A	7/24/99	N	20599-0166583	
682 A	7/24/99	N	20599-0166587	
969 A	7/26/99	N	20799-0165227	
887 A	8/11/98	N	22399-0012612	
639 A	8/15/98	N	22796 0013413	01/29/99
1027 A	8/17/01	N	22901-0351662	09/24/99
600 A	8/17/98	N	26099-0021894	10/14/98
968 A	8/22/99	N	23499-0184973	
582 A	8/26/98	N	23898 0017778	03/31/99
640 A	8/27/98	N	23998-0016020	
338 A	8/5/98	N	21598-0011238	
491 A	8/5/98	N	21798-0010812	10/06/98
685 A	9/15/99	N	25899-0166414	
689 A	9/17/99	N	26099-0166238	
730 A	9/18/99	N	26199-0166660	01/01/00
586 A	9/18/99	N	26299-0167046	
205 A	9/19/98	N	26299-0022562	10/28/98
443 A	9/22/99	N	26599 0168690	04/14/98
513 A	9/28/98	N	26898-0024707	10/28/98
514 A	9/28/98	N	26898-0024841	10/28/98
903 A	9/28/98	N	26898-0024914	
783 A	9/28/99	N	27199-0192051	09/08/00
784 A	9/28/99	N	27199-0192062	09/08/00
708 A	9/29/99	N	27299-0191943	11/28/99
709 A	9/29/99	N	27299-0192229	11/28/99
839 A	9/8/98	N	25196-0019215	
1028 A	9/8/98	N	25196-0019199	01/26/99

ID	A/L?	Julian	Date Translation	Hub Problem Y/N	SKF Serial number	In Service Date
31 A				Y	N/A Aiken	10/02/98
49 A				Y	Too rusty - Aiken	01/10/99
55 A				Y	01001 0326630	03/22/99
66 A				Y	N/A Aiken	03/31/99
67 A				Y	N/A Aiken	06/10/99
68 A				Y	Too rusty - Aiken	06/11/99
70 A				Y	?1999-0124400	06/17/99
84 A				Y	N/A Aiken	07/16/99
96 A				Y	Too rusty - Aiken	08/25/99
109 A				Y	N/A Aiken	09/24/99
110 A				Y	??199 0147852	09/27/99
120 A				Y	0209110 Aiken	01/03/00
136 A				Y	Too rusty - Aiken	12/09/01
156 A				Y	Too rusty - Aiken	
175 A				Y	Too rusty - Aiken	
253 A				Y	??199 01642301	12/01/99
495 A				Y	Too rusty - Aiken	10/14/98
587 A				Y	Too rusty; Aiken	04/06/99
684 A				Y	to rusty - Aiken	05/17/99
687 A				Y	N/A Aiken	05/26/99
826 A				Y	N/A AIKEN	07/01/99
866 A				Y	N/A Aiken	08/29/99
867 A				Y	Too rusty - Aiken	10/06/99
869 A				Y	Aiken	10/15/99
748 A				Y	0217497 ??199	03/06/00
852 A				Y	? 198-0048919	
854 A				Y	199-0016428	
935 A				Y	N/A Aiken	
944 A				Y	N/A Aiken	
955 A				Y	Too rusty - Aiken	
980 A				Y	Rusty - Aiken	06/30/99
1006 A				Y	RUSTY-AIKEN	08/19/99
1028 A				Y	37408-0071317	04/01/99
1039 A				Y	Too rusty - Aiken	06/15/99
1046 A				Y	?5799-0151140	06/28/99
1069 A				Y	Too rusty Aiken	

ID	A/L?	Julian Date Translation	Hub Problem Y/N	S	KF Serial number	In Service Date
521	A		N		N/A Aiken	11/21/98
613	A		N		99 0140255	08/22/99
696	A		N		Too rusty - Aiken	10/28/99
721	A		N		too rusty - Aiken	12/18/99
778	A		N		??/00 0288331	07/08/00
795	A		N		Too rusty - Aiken	12/18/00
812	A		N		N/A Aiken	07/26/01
817	A		N		??/99-0194600	
918	A		N		N/A Aiken	
920	A		N		??/98-0195061	
921	A		N		N/A Aiken	
923	A		N		N/A Aiken	
924	A		N		N/A Aiken	
926	A		N		??/98-007	
928	A		N		??/99-013145	
1068	A		N		??/00-0312161	

ID	A/L?	Julian Date Translation	Hub Problem Y/N	SKF Serial number	In Service Date
139 L			Y	1998 S M122978	
149 L			Y	009782 S N23214	
153 L			Y	000942 95175	
162 L			Y	004617 M043166	
168 L			Y	006265 S M422979	
334 L			Y	M397790	
949 L			Y	Too rusty: Luechow	
1000 L			Y	98036-081249-	
4 L			Y	000811-RM75943	01/27/97
365 L			Y	003544 M759439 R	01/27/97
21 L			Y	001938 M176870	01/29/98
5 L			Y	M317564	03/17/97
6 L			Y	000107 M617662	03/17/97
7 L			Y	00032 R M617534	03/20/97
978 L			Y	98040 1198303	03/20/98
439 L			Y	98026 M167132	04/01/98
979 L			Y	001437-M189112-	04/01/98
22 L			Y	38066-M195137	04/21/98
8 L			Y	000418 R M817584	04/23/97
369 L			Y	Luechow	04/25/97
1079 L			Y	00365-98052	04/28/98
450 L			Y	99038 M1195156	04/30/98
999 L			Y	98036-1798436-	05/01/98
1017 L			Y	00384-? Luechow	05/01/98
372 L			Y	000231 R M776332	05/08/97
9 L			Y	085443 R	05/15/97
453 L			Y	98044 M189111	05/19/98
23 L			Y	Too rusty - Luechow	05/23/98
161 L			Y	000307 M874570	06/30/97
10 L			Y	000177-S-M932414	07/07/97
633 L			Y	000257-M168234-	07/10/99
11 L			Y	009655-R-M	07/15/97
12 L			Y	096017-M776332	07/17/97
471 L			Y	001929-98078-	07/17/98
472 L			Y	98045-005700	07/17/98
473 L			Y	3349-19099-	07/20/98
86 L			Y	000207 98010	07/20/99
13 L			Y	009691 R M776332	07/21/97
14 L			Y		07/29/97
15 L			Y	002809 S M997790	08/08/97
198 L			Y	000442-98174-	08/08/98
16 L			Y	No hub received	08/13/97
17 L			Y		08/26/97
28 L			Y	Too rusty - Luechow	08/28/98
481 L			Y	99140 "S" M209649	08/28/98
483 L			Y	0033774-98189-	09/01/98
18 L			Y	001484 S	09/16/97
19 L			Y	009780 R M776332	09/16/97
402 L			Y	0348-M122978	10/16/97
403 L			Y	001882 M999016 S	10/20/97
118 L			Y	107704 M776332	10/21/99
157 L			Y	M776332	11/07/97
20 L			Y	001161 S M149785	12/10/97

ID	A/L?	Julian Date Translation	Hub Problem Y/N	SKF Serial number	In Service Date
314 L			N	M089016	
318 L			N	0225413-36699	
832 L			N	95495-M244530 S	
833 L			N	98190-M244530 R	
834 L			N	98170-M214560 S	
835 L			N	003518-98169-	
836 L			N	001730-98152-	
837 L			N	98152-M214550-	
838 L			N	003473-98168-	
843 L			N	96271-272-	
844 L			N	001153-96271-	
845 L			N	001048-96271-	
846 L			N	001062-96271-	
863 L			N	99032-M278237-	
864 L			N	00742-M278237-	
889 L			N	98138-M209679	
892 L			N	002812-M997790 S	
893 L			N	003352-M997790 S	
919 L			N	98454 ?	
929 L			N	M932414	
930 L			N	M776332	
931 L			N	M043168	
950 L			N	004829 M776532	
956 L			N	M122975 S 004636	
958 L			N	98050 M207100	
962 L			N	002330 98058-	
964 L			N	Too rusty - Luschow	
1104 L			N	Too rusty - Luschow	
419 L			N	002062 M122978	01/04/96
424 L			N	M149799	01/16/96
543 L			N	STF0049 95264	02/01/99
430 L			N	000459 M122978	02/06/96
431 L			N	97369 M137432	03/02/96
433 L			N	97583-33132	03/06/96
435 L			N	006199-M776397	03/09/96
440 L			N	95006 M187132	04/01/96
447 L			N	96037-M195439	04/21/96
371 L			N	000474Z-M709439	04/30/97
451 L			N	83095-1209096	05/01/96
452 L			N	96078-M203069	05/12/96
1018 L			N	N/A Luschow	05/15/96
302 L			N	M121828	05/18/01
454 L			N	99028 M185156	05/29/96
455 L			N	96055 M195137	05/29/96
374 L			N	006217-M776332 R	05/30/97
456 L			N	96056-M203069	05/30/96
375 L			N	000009-5-M997790	06/02/97
376 L			N	00600 M776332	06/13/97
379 L			N	000577 M997790	06/30/97
381 L			N	000620-M932414	07/07/97
382 L			N	001605-M932414	07/07/97
470 L			N	97351 M185117	07/15/96
476 L			N	004925-96172-	08/10/96
477 L			N	000213-96148-	08/13/96
478 L			N	004385-96171-	08/17/96
391 L			N	001103 M932414	08/18/97
392 L			N	00919 M932414	08/18/97
393 L			N	177633-0096 S	08/18/97
479 L			N	008148- M214549	08/20/96
480 L			N	008136-M214550	08/21/96
394 L			N	M997790 S 001647	08/26/97
396 L			N	003278-M043168	09/08/97
397 L			N	003674-M997080	09/05/97
398 L			N	303253-M997750	09/23/97
1083 L			N	002012-M089016 S	10/29/97
405 L			N	001484 M089016	11/06/97
406 L			N	003050-M089016	11/06/97
416 L			N	M122978	12/11/97

ID	AIL?	Julian Date Translation	Hub Problem Y/N	SKF Serial number	In Service Date
142 ?		Y			
143 ?		Y			
147 ?		Y			
150 ?		Y			
151 ?		Y			
154 ?		Y		No info	
155 ?		Y			
156 ?		Y			
159 ?		Y			
160 ?		Y		0123372	
164 ?		Y		023990 126102	
171 ?		Y			
172 ?		Y			
174 ?		Y			
178 ?		Y			
304 ?		Y			
308 ?		Y		0018799	
309 ?		Y			
310 ?		Y		0284177	
313 ?		Y		0128094	
325 ?		Y		0152652	
327 ?		Y		00739441	
329 ?		Y		0149652	
336 ?		Y		1730	
341 ?		Y			
353 ?		Y			
357 ?		Y			
362 ?		Y			
363 ?		Y			
829 ?		Y		0018042	
830 ?		Y		0018166	
927 ?		Y			
933 ?		Y		0196924	
934 ?		Y			
936 ?		Y			
937 ?		Y			
943 ?		Y			
946 ?		Y			
950 ?		Y		001057	
46 ?		Y			01/01/99
47 ?		Y			01/01/99
48 ?		Y			01/06/99
223 ?		Y			01/06/99
274 ?		Y			01/14/00
224 ?		Y			01/14/99
225 ?		Y			01/15/99
275 ?		Y			01/30/00
276 ?		Y			01/31/00
428 ?		Y			02/02/98
123 ?		Y			02/03/00
227 ?		Y			02/04/99
126 ?		Y			02/10/00
646 ?		Y			02/10/99
742 ?		Y		0246035	02/16/00
279 ?		Y			02/17/00
125 ?		Y			02/24/00
278 ?		Y			02/28/00
280 ?		Y			02/28/00
230 ?		Y			03/01/99
140 ?		Y			03/10/97
749 ?		Y			03/13/00
750 ?		Y			03/13/00
753 ?		Y			03/15/00
299 ?		Y			03/18/01
281 ?		Y			03/22/00
864 ?		Y			03/24/99
558 ?		Y			03/25/99
59 ?		Y			04/01/99
663 ?		Y			04/01/99
441 ?		Y			04/08/96
300 ?		Y			04/09/01
52 ?		Y			04/16/99
54 ?		Y			04/23/99

191 ?	Y		04/28/96
976 ?	Y	006522	04/30/97
267 ?	Y	0229814	05/03/00
232 ?	Y		05/03/99
994 ?	Y	0163406	05/12/00
102 ?	Y	05438	05/15/96
233 ?	Y		05/18/99
772 ?	Y		05/25/00
265 ?	Y		05/26/00
235 ?	Y	0128903	05/04/99
269 ?	Y		06/06/00
596 ?	Y		06/07/99
193 ?	Y		06/11/96
459 ?	Y		06/11/96
451 ?	Y		06/11/96
596 ?	Y		06/11/99
599 ?	Y		06/11/99
603 ?	Y		06/16/99
377 ?	Y		06/17/97
24 ?	Y		06/18/96
175 ?	Y		06/18/99
73 ?	Y		06/19/99
130 ?	Y		06/21/00
464 ?	Y		06/22/96
236 ?	Y	0076297	06/22/99
466 ?	Y		06/26/96
132 ?	Y		06/27/00
76 ?	Y		06/29/99
239 ?	Y	126048	06/29/99
77 ?	Y		06/30/99
240 ?	Y	0084640	06/30/99
3 ?	Y		07/01/96
628 ?	Y	722002	07/02/99
629 ?	Y		07/02/99
974 ?	Y	??60-012984	07/07/01
82 ?	Y		07/09/99
292 ?	Y		07/10/00
242 ?	Y		07/12/99
293 ?	Y		07/14/00
636 ?	Y		07/19/99
87 ?	Y		07/20/99
640 ?	Y		07/21/99
386 ?	Y		07/23/97
644 ?	Y		07/26/99
388 ?	Y		07/27/97
645 ?	Y		07/28/99
162 ?	Y		07/29/97
28 ?	Y		07/31/96
474 ?	Y		08/04/96
163 ?	Y		08/05/97
654 ?	Y		08/10/99
250 ?	Y		08/16/99
657 ?	Y	Unit #360810	08/18/99
966 ?	Y		08/18/99
662 ?	Y		08/19/99
663 ?	Y		08/19/99
94 ?	Y	Not legible	08/20/99
253 ?	Y		08/20/99
1044 ?	Y		08/26/99
97 ?	Y		08/30/99
254 ?	Y		08/31/99
675 ?	Y		08/31/99
295 ?	Y		09/01/00
133 ?	Y		09/07/00
101 ?	Y		09/07/99
105 ?	Y		09/11/99
134 ?	Y		09/14/00
679 ?	Y		09/14/99
106 ?	Y		09/16/99
185 ?	Y		10/03/97
492 ?	Y	0014749	10/08/96
688 ?	Y		10/08/99
202 ?	Y		10/13/96
203 ?	Y		10/14/96

112 ?	Y		10/16/99
257 ?	Y		10/20/99
507 ?	Y		10/22/98
977 ?	Y		10/28/97
698 ?	Y	000762	10/29/99
207 ?	Y		10/31/98
208 ?	Y	0023918	10/31/98
699 ?	Y		11/01/99
258 ?	Y		11/02/99
40 ?	Y		11/13/96
517 ?	Y		11/13/98
211 ?	Y	0022921	11/17/98
212 ?	Y	0022922	11/18/98
261 ?	Y		11/18/99
213 ?	Y		11/19/98
520 ?	Y	0024453	11/19/98
42 ?	Y		11/21/96
215 ?	Y	0024434	11/23/98
216 ?	Y	0024231	11/23/98
44 ?	Y		11/24/98
45 ?	Y		11/24/96
219 ?	Y		11/25/98
711 ?	Y		11/29/99
526 ?	Y		12/04/98
264 ?	Y		12/10/99
720 ?	Y		12/15/99
267 ?	Y		12/17/99
220 ?	Y	0037275	12/18/98
982 ?	Y		12/18/98
268 ?	Y	0144658	12/20/99
269 ?	Y		12/20/99
270 ?	Y		12/20/99
723 ?	Y		12/21/99
271 ?	Y		12/22/99
725 ?	Y		12/24/99
727 ?	Y		12/28/99

ID	A/L?	Julian Date Translation	Hub Problem Y/N	SKF Serial number	In Service Date
305 ?			N		
312 ?			N	0127632	
319 ?			N	002363	
321 ?			N		
323 ?			N		
324 ?			N		
328 ?			N	0127246	
330 ?			N	0270955	
331 ?			N	0267111	
332 ?			N	0867112	
333 ?			N	0314841	
335 ?			N	0136617	
339 ?			N		
340 ?			N		
342 ?			N		
343 ?			N		
344 ?			N		
345 ?			N		
346 ?			N		
347 ?			N		
348 ?			N		
349 ?			N		
350 ?			N		
351 ?			N		
352 ?			N		
354 ?			N		
355 ?			N		
356 ?			N		
358 ?			N		
359 ?			N		
360 ?			N		
361 ?			N		
364 ?			N		
555 ?			N	0011520	
604 ?			N	901608	
907 ?			N	0012510	
912 ?			N		
926 ?			N	004115	
953 ?			N	906878	
957 ?			N		
959 ?			N		
786 ?			N		01/03/01
420 ?			N		01/04/98
222 ?			N		01/04/99
273 ?			N		01/12/00
226 ?			N		01/15/99
425 ?			N		01/16/96
426 ?			N		01/16/96
427 ?			N		01/16/96
179 ?			N		01/21/97
799 ?			N	0022316	01/26/01
189 ?			N		02/04/96
741 ?			N		02/08/00
647 ?			N		02/10/99
368 ?			N		02/15/97
681 ?			N		02/23/99
552 ?			N		02/24/96
229 ?			N		02/26/98
190 ?			N		02/26/98
745 ?			N		02/29/00
746 ?			N		03/01/00
555 ?			N	02456-0062985	03/03/99
554 ?			N		03/03/99
434 ?			N		03/05/98
438 ?			N		03/25/98
231 ?			N		03/30/99
768 ?			N		04/03/00
282 ?			N		04/05/00
442 ?			N		04/07/98
283 ?			N		04/14/00
669 ?			N		04/14/99
670 ?			N		04/14/99
284 ?			N		04/16/00

446 ?	N		04/16/98
301 ?	N	No marking on	04/21/01
256 ?	N		04/26/00
789 ?	N	0188747	05/10/00
457 ?	N		06/01/96
236 ?	N		06/09/99
480 ?	N		06/11/96
237 ?	N		06/11/99
455 ?	N		06/23/98
281 ?	N		06/26/00
458 ?	N		06/29/98
350 ?	N	000434	06/30/97
821 ?	N		07/7/97
241 ?	N		07/01/99
194 ?	N		07/06/98
650 ?	N		07/09/99
489 ?	N		07/13/96
636 ?	N		07/17/99
383 ?	N		07/21/97
387 ?	N		07/29/97
195 ?	N		08/03/96
782 ?	N		08/09/00
388 ?	N		08/11/97
389 ?	N		08/11/97
390 ?	N		08/15/97
251 ?	N		08/18/99
197 ?	N		08/26/98
676 ?	N		08/31/99
184 ?	N		09/05/97
395 ?	N		09/05/97
199 ?	N	001983	09/07/98
200 ?	N		09/14/98
400 ?	N		09/26/97
401 ?	N		09/26/97
266 ?	N		09/30/99
489 ?	N		10/01/98
494 ?	N		10/13/98
501 ?	N		10/14/98
502 ?	N		10/15/98
186 ?	N	004692	10/16/97
298 ?	N	0276914	10/18/00
612 ?	N		10/27/98
208 ?	N		10/29/98
209 ?	N		11/03/98
210 ?	N	0024343	11/12/98
260 ?	N		11/12/99
407 ?	N		11/13/97
409 ?	N		11/15/97
411 ?	N		11/19/97
412 ?	N		11/19/97
214 ?	N		11/23/98
166 ?	N		11/24/97
217 ?	N	0024430	11/24/98
218 ?	N		11/25/98
715 ?	N		12/03/99
626 ?	N	7-0031666	12/06/99
630 ?	N		12/10/99
268 ?	N		12/10/99
418 ?	N		12/11/97
417 ?	N		12/17/97
724 ?	N		12/21/99
221 ?	N		12/29/98
729 ?	N		12/30/99
418 ?	N		12/31/97
309 ?	N		no paperwork

ID	A/L ? Julian Date Translation	Hub Problem Y/N	SKF Serial number	In Service Date
824 L		Q	0029316 M143785	
900 A		Q	Too rusty - Aiken	
901 L		Q	0018646 M122979	
906 A		Q	77799-0127701	
909 A		Q	Too rusty - Aiken	
910 A		Q	Too rusty - Aiken	
911 A		Q	Too rusty - Aiken	
954 L		Q	M779332 R 009873	
1068 L		Q	001252 S M122978	
1071 A		Q	N/A Aiken	
1072 ?		Q		
1076 L		Q	004518 98171	
1090 L		Q	001398 98149	
1105 L		Q	Too rusty -	
421 L		Q	00500 Luechow	01/08/98
536 ?		Q		01/08/98
1024 ?		Q	0072140	01/08/99
734 A		Q	AIKEN	01/13/00
423 L		Q	000152 S M148785	01/15/98
1014 L		Q	005481	01/16/98
1015 ?		Q		01/16/98
426 L		Q	004526 S M148785	01/29/98
541 L		Q	96284 M222431	02/01/99
545 A		Q	Aiken	02/05/99
1006 ?		Q		02/16/98
1073 L		Q	002384 R M017901	02/20/97
1053 ?		Q		02/21/00
1054 ?		Q		02/21/00
387 L		Q	N/A Luechow	02/21/97
747 A		Q	N/A AIKEN	03/01/00
898 L		Q	98006 01766	03/01/98
432 L		Q	98012 M156703	03/02/98
438 L		Q	000822-98046-	03/17/98
558 A		Q	TOO RUSTY-	03/18/99
1097 ?		Q		03/20/99
861 A		Q	Aiken	03/31/99
759 A		Q	77799 0224748	04/06/00
1056 A		Q	N/A AIKEN	04/12/00
444 L		Q	98001 M53747	04/10/98
445 L		Q	98002 M159111	04/15/98
762 A		Q	77299-0204811	04/18/00
448 L		Q	Too rusty -	04/21/98
1016 ?		Q		04/24/98
1100 A		Q	N/A Aiken	04/27/00
1101 A		Q	N/A Aiken	04/27/00
1080 L		Q	003763 98052	04/28/98
1030 ?		Q		04/30/99
576 A		Q	Too rusty - Aiken	05/03/99
770 A		Q	Too rusty - Aiken	05/11/00
771 A		Q	Too rusty - Aiken	05/11/00
582 A		Q	74699 0092486	05/18/99
1074 L		Q	001707 R	05/16/97
456 L		Q	Too rusty; Luechow	05/04/98
593 A		Q	Too rusty - Aiken	05/04/99
1019 L		Q	N/A Luechow	05/11/98
1020 L		Q	N/A Luechow	05/11/98
900 A		Q	TOO RUSTY-	05/11/99
463 L		Q	001318-98075-	05/16/98
378 L		Q	006817 R M778332	05/20/97
1082 ?		Q		05/24/99
467 L		Q	98124 002988	05/26/98
534 L		Q	M279237 98032	07/01/98
584 L		Q	001943-M932414 S	07/22/97
781 L		Q	0038238-M148739	07/23/98
849 A		Q	Too rusty - Aiken	08/01/99
680 L		Q	98010 M156703	08/04/98
683 A		Q	Too rusty - Aiken	08/08/99
1089 A		Q	N/A Aiken	08/12/98
1040 ?		Q		08/16/98
870 A		Q	Too rusty - Aiken	08/23/99
1077 A		Q	Too rusty Aiken -	08/27/99
1066 ?		Q		08/28/00
482 L		Q	M214580 98155	08/31/98
674 ?		Q	0136456 13199	08/31/98
1001 L		Q	M043165 670-	09/02/97
1010 L		Q	00857 -0032A	09/02/97

675 A		Q	??9199 0147816	09/13/99
486 L		Q	M165135 98028	09/17/98
1021 L		Q	000040 BT-0049A	09/17/98
1087 L		Q	8812 M214548	09/17/98
1088 L		Q	N/A Luechow	09/21/98
1089 L		Q	N/A Luechow	09/21/98
490 ?		Q		10/02/98
?89 A		Q	?99 0198777	10/12/00
497 A		Q	Too rusty - Aiken	10/14/98
1011 L		Q	000679 BTF-0032A	10/17/97
404 L		Q	001178 98105	10/20/97
505 L		Q	LUCHOW HUB	10/20/98
695 A		Q	Too rusty - Aiken	10/26/99
701 A		Q	Too rusty - Aiken	11/05/99
1004 ?		Q		11/12/99
408 A		Q	N/A AIKEN	11/13/97
410 L		Q	M270297 001016	11/17/97
706 A		Q	Too rusty - Aiken	11/22/99
413 L		Q	Luechow	11/24/97
414 L		Q	Too rusty -	11/24/97
1012 L		Q	M065046 844-	11/24/97
1013 L		Q	000848	11/24/97
707 ?		Q		11/26/99
710 A		Q	Too rusty - Aiken	12/06/99
718 A		Q	TOO RUSTY-	12/14/99
719 A		Q	??999 0193640	12/14/99
726 A		Q	?2199 0212732	12/30/99
897 A	1/12/99	Q	01299-0035370	02/18/99
571 A	1/14/99	Q	01499 0078913	04/15/99
575 A	1/16/99	Q	01599-0088767	04/30/99
763 A	1/24/99	Q	2499 0151760	04/20/00
563 A	1/24/99	Q	02499 0105929	05/18/99
951 A	1/25/99	Q	02599 0087964	
566 A	1/25/99	Q	02599-0083987	04/01/99
1075 A	1/27/99	Q	02799-0084833	02/26/99
756 A	1/3/00	Q	00300 0227103	03/31/00
757 A	1/3/00	Q	00300 0227115	03/31/00
1094 A	10/1/99	Q	27499-0193537	11/05/99
790 A	10/18/99	Q	29199-0196975	10/27/00
533 A	10/22/98	Q	29595 0030265	01/01/99
891 A	10/27/99	Q	30099 0202971	10/21/99
717 A	10/8/99	Q	28199-0184382	12/13/99
1061 A	11/1/99	Q	30599-0206373	12/28/99
535 A	11/10/98	Q	31499 0037090	01/05/99
537 A	11/13/98	Q	31799 0038360	01/07/99
538 A	11/15/98	Q	31999 0058735	01/07/99
705 A	11/15/99	Q	31599 0211138	12/28/00
1081 A	11/16/98	Q	32299 005136	
735 A	11/23/99	Q	32799 0214928	01/20/00
760 A	11/23/99	Q	32799-0214436	04/10/00
482 A	11/24/98	Q	32999 0081970	09/13/99
528 A	11/9/98	Q	30999 0035602	
1058 A	12/15/99	Q	34499 0222354	03/17/00
544 A	12/16/98	Q	35099-0067514	02/01/99
549 A	12/22/98	Q	35599 0069539	02/17/99
550 A	12/22/98	Q	35995 0069530	02/17/99
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764 A	2/25/00	Q	05700-0247924	04/27/00
1057 A	3/10/00	Q	07000-0263345	06/06/00
774 A	3/16/00	Q	07600- 0255280	06/06/00
584 A	3/16/99	Q	07799-0106158	06/06/99
579 A	3/2/99	Q	06199 0098764	06/10/99
1103 A	3/22/99	Q	06199 0109092	
736 A	3/23/99	Q	06299 0110102	01/13/00
580 A	3/24/99	Q	06399 0109382	05/14/99
1064 A	3/25/99	Q	06499 011256	
627 A	3/26/99	Q	06499 0111901	
561 A	3/27/99	Q	06499 0112373	05/15/99
672 A	3/3/99	Q	06299-0106148	04/16/99
573 A	3/3/99	Q	06299-0099049	04/16/99
627 A	3/31/99	Q	06999-0114223	07/01/99

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625 A	4/18/99	Q	07799 0106097	07/01/99
617 A	4/20/99	Q	11099 0121402	06/24/99
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592 A	4/21/99	Q	11199 0122833	06/02/99
602 A	4/21/99	Q	11199 0122545	06/15/99
606 A	4/21/99	Q	11199 0122896	06/18/99
831 A	4/21/99	Q	11199 0123021	07/10/99
609 A	4/23/99	Q	11399 0124025	06/22/99
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601 A	4/30/99	Q	12099 0127740	06/11/99
608 A	5/10/99	Q	13099 0132359	
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1069 A	5/10/99	Q	13099-0132164	
1034 A	5/10/99	Q	13099	06/25/99
965 A	5/11/99	Q	13199 0132962	
1007 A	5/12/99	Q	13299 0131117	06/08/99
1046 A	5/12/99	Q	13299-0133654	09/20/99
618 A	5/18/99	Q	13399 0135833	06/30/99
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666 A	5/21/99	Q	14199 0138701	08/13/99
1108 A	5/22/99	Q	14299 0136968	03/01/99
614 A	5/3/99	Q	12399 0126480	
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1070 A	5/4/99	Q	12499-029318	
610 A	5/4/99	Q	12499 0126377	06/22/99
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612 A	5/4/99	Q	12499 0126691	06/22/99
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642 A	5/5/99	Q	12599 0129615	07/21/99
647 A	5/5/99	Q	12599 0129943	07/28/99
1042 A	5/5/99	Q	12599 0130375	08/18/99
1002 A	5/5/99	Q	12699 0130031	08/14/99
865 A	5/5/99	Q	12699-0130922	08/20/99
1041 A	5/7/99	Q	12799-	08/17/99
671 A	5/7/99	Q	12799-0131259	09/24/99
694 A	5/7/99	Q	12799 0131259	10/27/99
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884 A	5/16/99	Q	15699-0151437	08/19/99
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738 A	5/25/99	Q	17699 0158158	01/24/00
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683 A	7/28/99	Q	21099- 0169718	09/27/99
684 A	7/28/99	Q	21099 0169716	09/27/99
1058 A	8/12/99	Q	22499-0012181	03/31/99
493 A	8/12/99	Q	22599 0012782	10/07/99
606 A	8/14/99	Q	22699	06/21/99
449 A	8/16/99	Q	22799-0013407	04/21/99
516 A	8/17/99	Q	22899-0013587	11/13/99
714 A	8/2/99	Q	21599 0010545	12/02/99
496 A	8/30/99	Q	23699 0016413	10/14/99
525 A	8/30/99	Q	24199-0015425	
861 A	8/31/99	Q	24399 0016621	
540 A	8/9/99	Q	21899 0011335	02/01/99
1022 A	8/6/99	Q	21599-001270	10/05/99
758 A	8/7/99	Q	21999 0011546	03/25/00
988 A	9/1/99	Q	24499 0101753	
504 A	9/15/99	Q	25099 0021428	10/30/99
533 A	9/15/99	Q	25499-0021699	11/27/99
1050 A	9/21/99	Q	25499-018350	11/26/99
1095 A	9/22/99	Q	25599-0188900	04/14/99
615 A	9/24/99	Q	25799-0024011	11/08/99
1102 A	9/25/99	Q	25899 0024542	
624 A	9/25/99	Q	25899-0024532	11/27/99
785 A	9/30/99	Q	27399-0192298	09/14/00
488 A	9/7/99	Q	25099 0018454	10/14/99

Response
to Main Document

Rick P Morrow/AMER/SKF
10/19 07:10 PM

Subject:	Torque Analysis Including Knight Descriptive Stats
Response to:	Statistical Evaluations
Category:	Statistics

THU Torque.ppt

THU Torque Study

Data from Chuck Smith and Mike Lewis with Hub Production data from Warranty Analysis

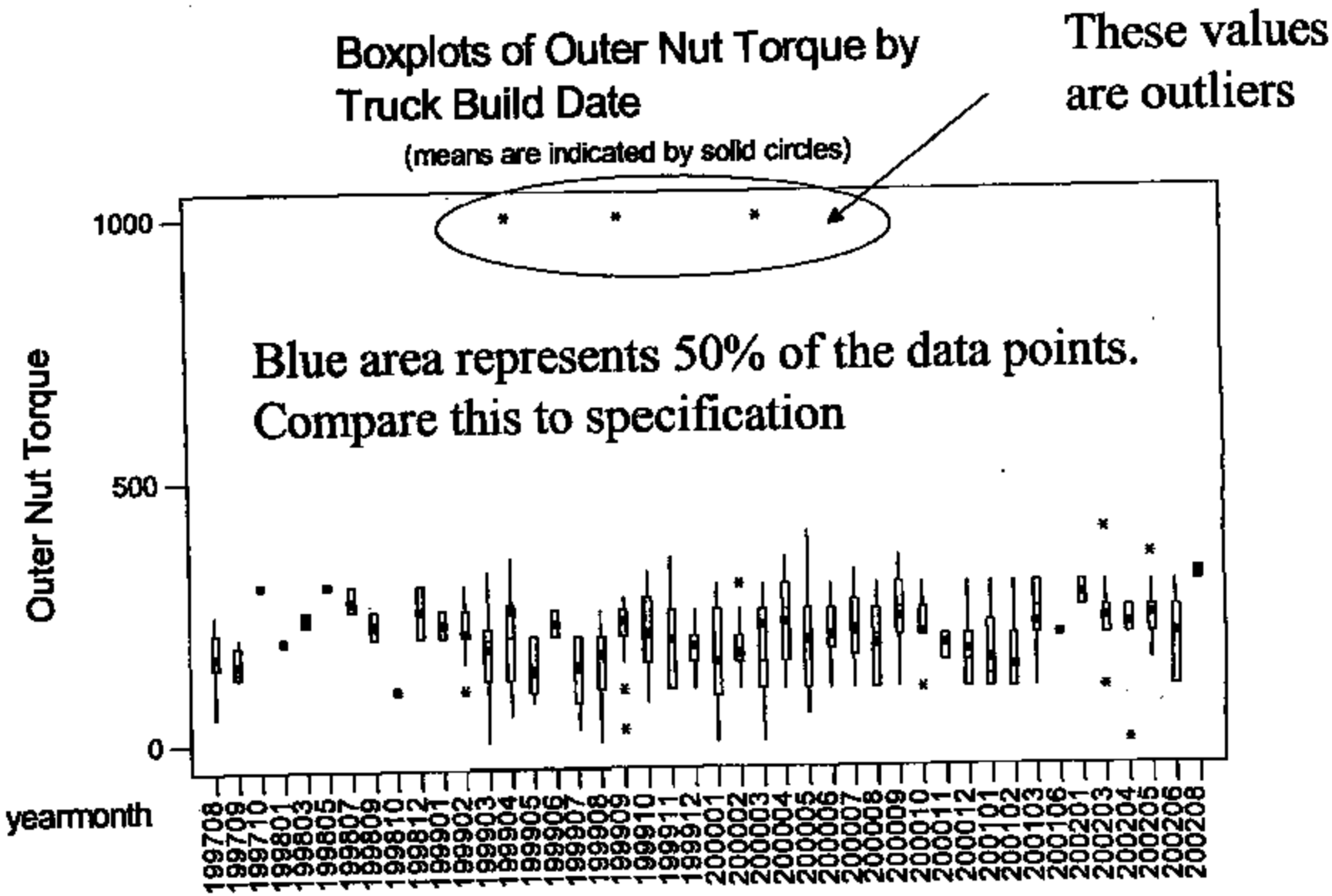
Includes Knight Torque data

Analysis

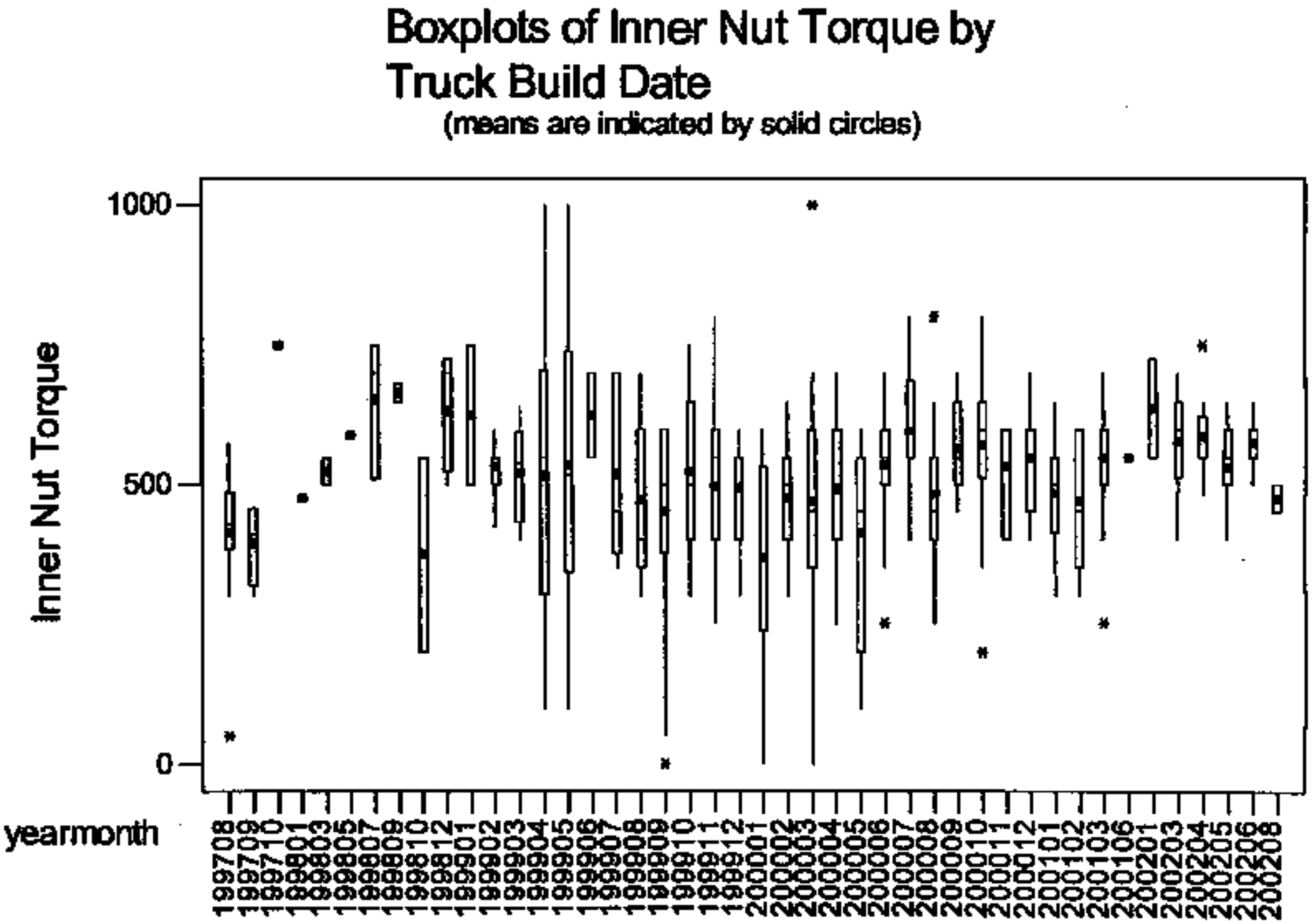
- There is significant variation in torques. Suggest Measurement System Analysis to ensure conclusions are valid.
- I studied mean and variance in inner and outer torques and mileage using factors including OEM, Build Dates of Trucks, Build Dates of Hubs,Luechow Vs Aiken and other analyses.
- May be some correlation to variation in torque and warranty claim, but weak and inconclusive. May be a function of timing between hub production date and truck build date.
- Difference in mileage and torque between OEM's but other factors could invalidate
- Little correlation between outer and inner nut torques
- Also include Knight Descriptive Statistics of torques.
- Suggest Mike and others review and continue hypothesis testing

Torques

OEM s	MeanOuter1	MeanInner	StDevOuter	StDevInner	N1
Freightliner	199.092	511.885	112.510	145.029	358
International	191.154	534.231	85.906	149.260	13
Mack	162.826	411.304	43.402	103.674	23
Volvo	224.464	537.500	54.964	135.243	84

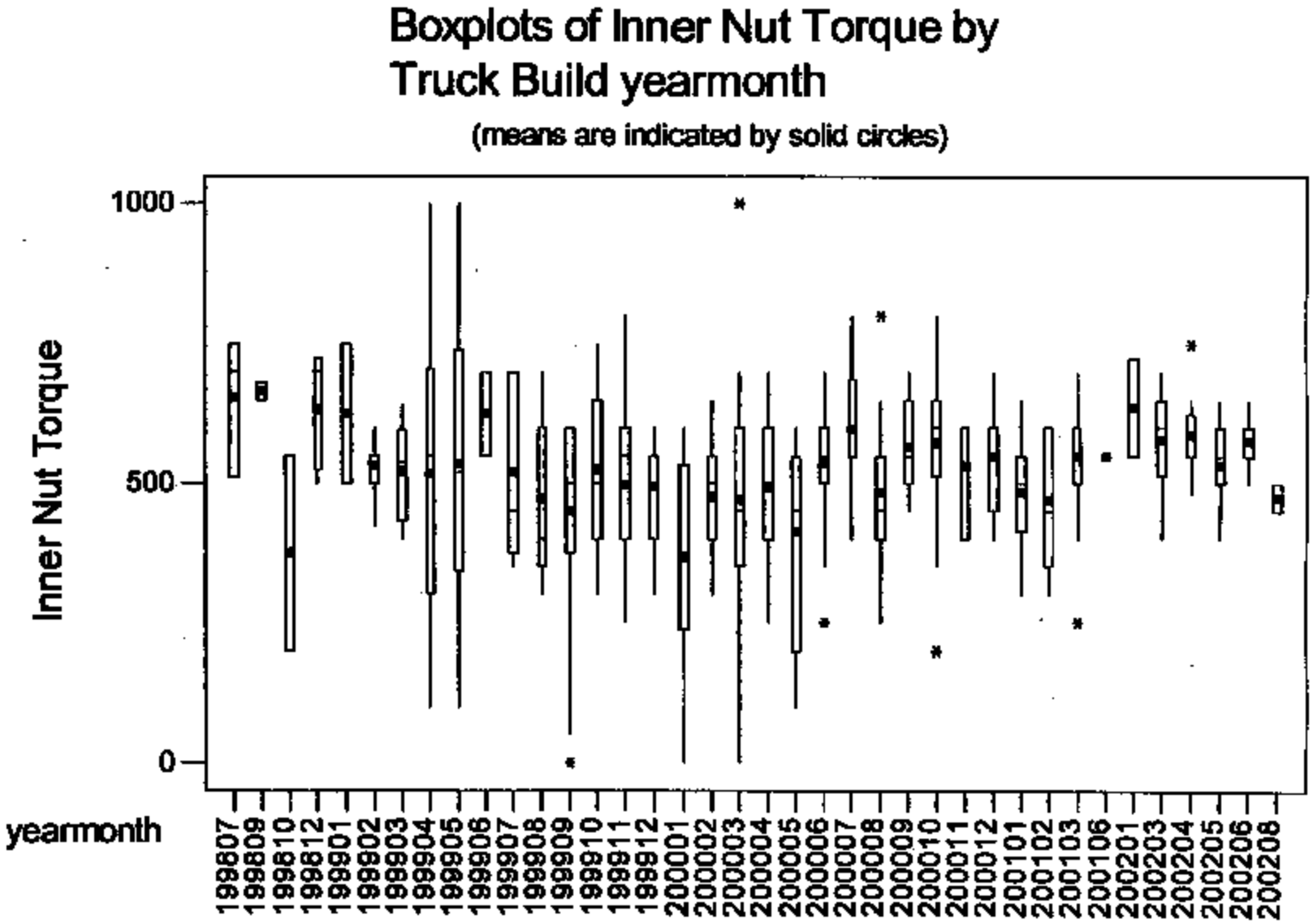

Boxplots of Outer Nut Torque by Truck Build Date
(means are indicated by solid circles)
These values are outliers
Blue area represents 50% of the data points.
Compare this to specification
Outer Nut Torque
1000
500
0
yearmonth

SKF 002189



Inner nut torque has higher variation than outer nut torque

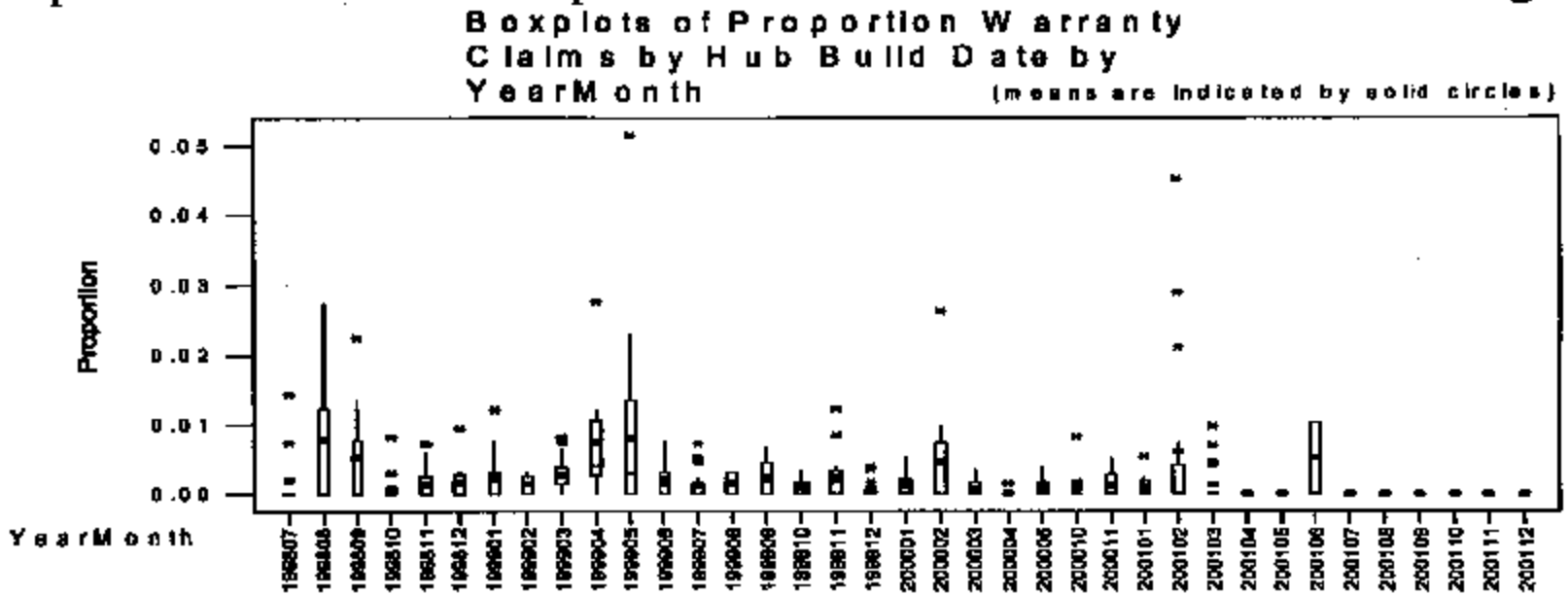
SKF 002190

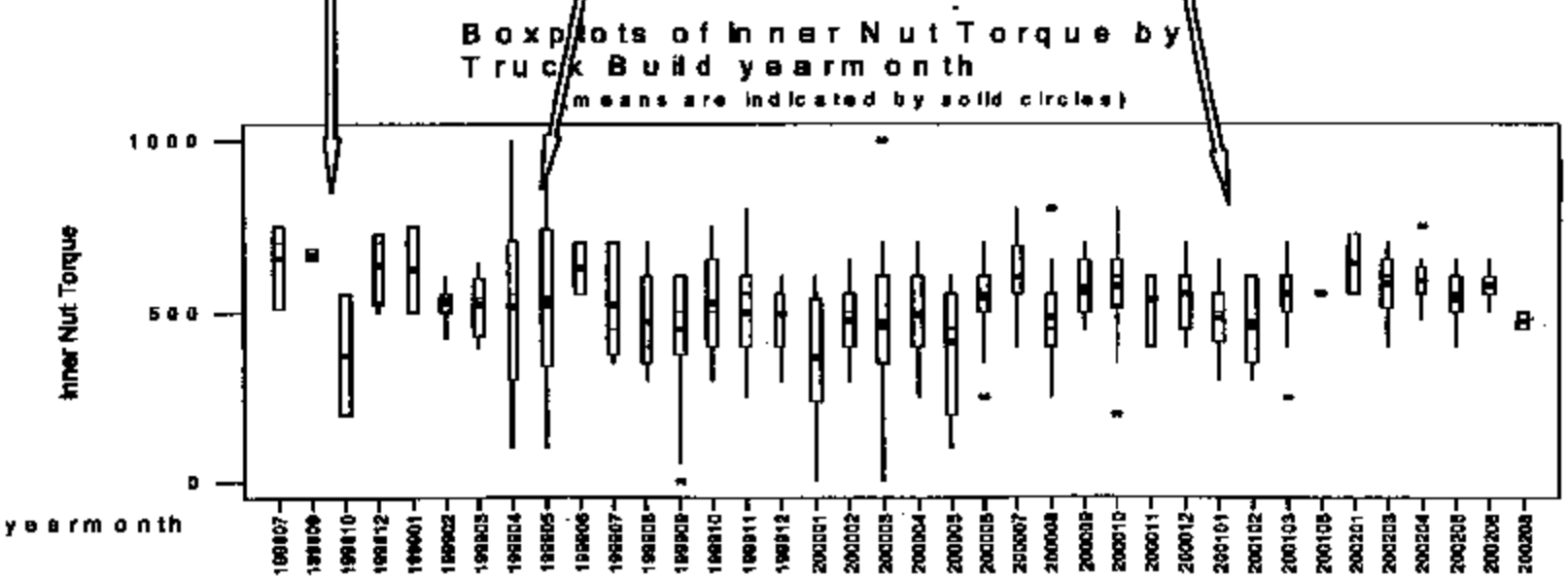


Omitted dates prior to 199807

SKF 002191

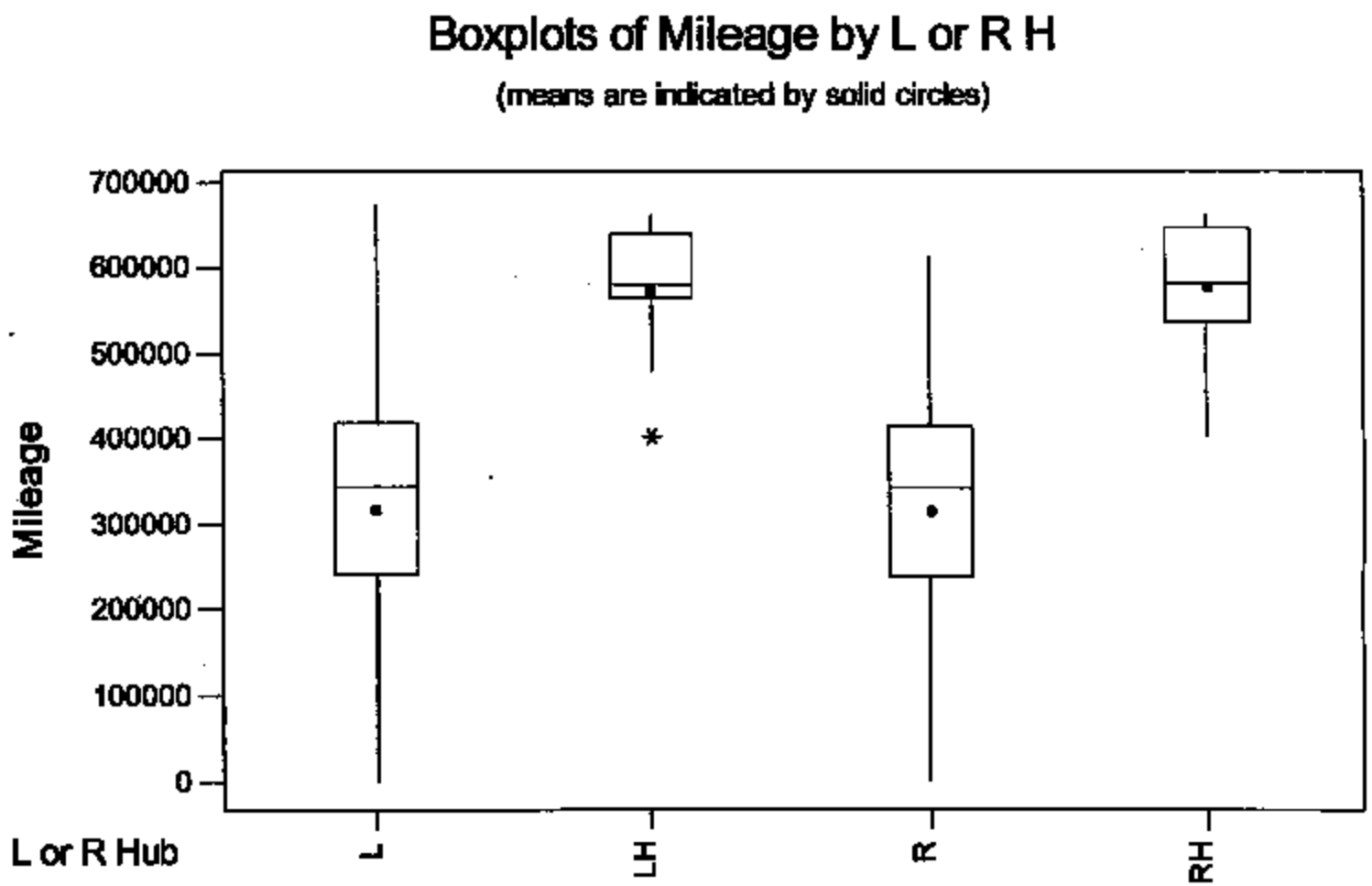
Compare Truck Build Date Torque to Hub Build Date. Note some months missing





SKF 002192

No difference in mileage by L or R



Mack is LH and RH

SKF 002193

Torque varies between single L or R or LH or RH

File Edit Manip Calc Stat Graph Editor Window Help

Analysis of Variance for Inner Nu

Source	DF	SS	MS	F	P
L or R H	3	635973	211991	10.94	0.000
Error	474	9189157	19386		
Total	477	9825131			

Level	N	Mean	StDev
L	229	489.7	139.2
LH	11	385.5	127.4
R	226	546.2	142.2
RH	12	495.0	73.9

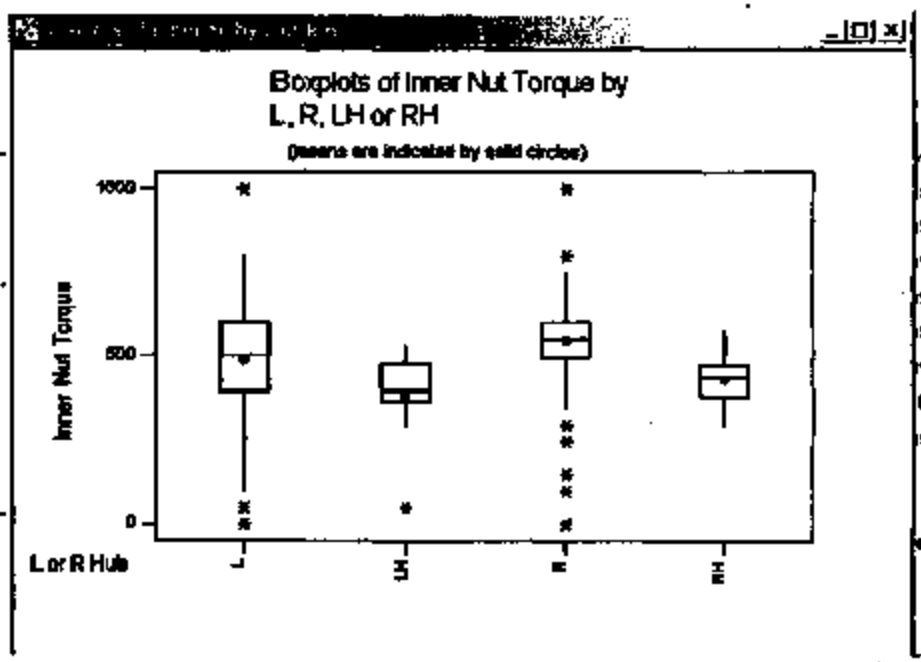
Pooled StDev = 139.2

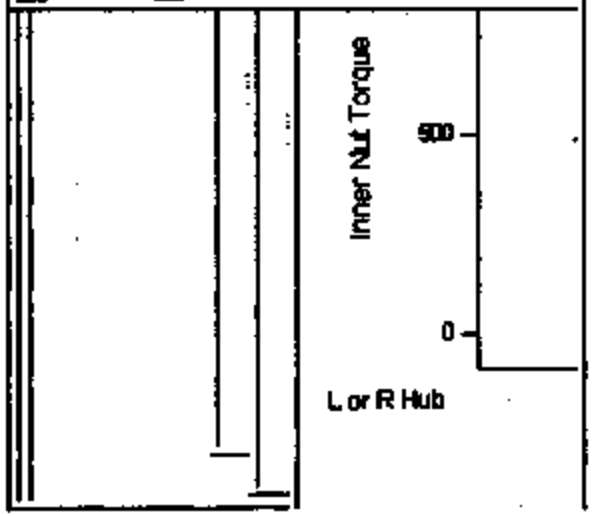
Individual 95% CIs For Mean
Based on Pooled StDev

320 400 480 560

Hsu's MCB (Multiple Comparisons with the Best)

Family error rate = 0.0500





Current Worksheet: Worksheet 2

5:09 PM

SKF 002194

File Edit Manip Calc Stat Graph Editor Window Help

Projects

Worksheet 2

Exclusion before 199807

Worksheet 2 ***

Boxplots of Outer Nu by Truck OE

Nut To

Session

One-way ANOVA: Outer Nut Torque versus Truck OEM

Analysis of Variance for Outer Nu

Source	DF	SS	MS	F	P
Truck OE	3	82162	27387	2.65	0.048
Error	474	4899830	10337		
Total	477	4981992			

Individual 95% CIs For Mean
Based on Pooled StDev

Level	N	Mean	StDev
Freightl	358	199.1	112.5
Internat	13	191.2	85.9
Mack	23	162.8	43.4
Volvo	84	224.5	55.0

Pooled StDev = 101.7

140 175 210 245

Hsu's MCB (Multiple Comparisons with the Best)

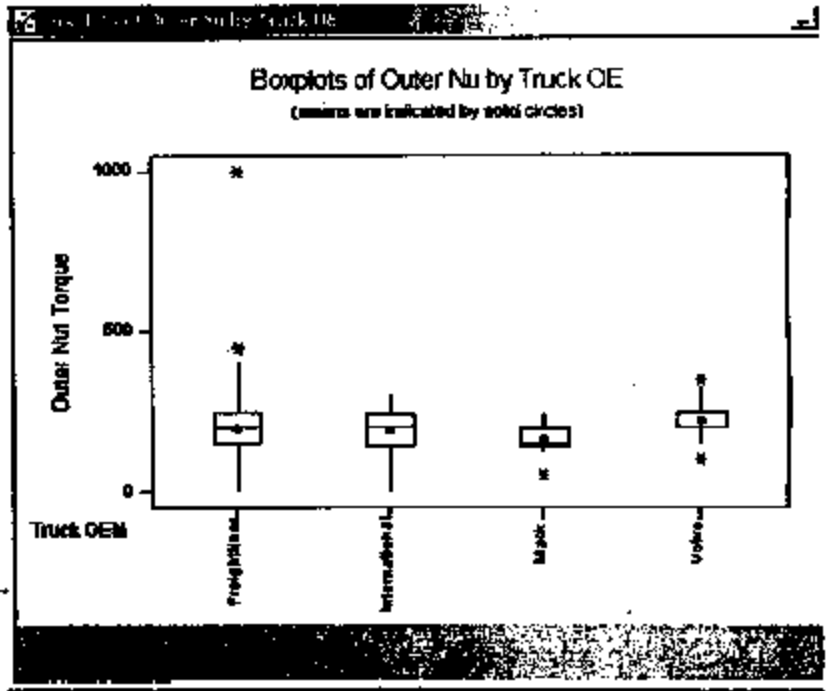
Family error rate = 0.0500

Critical value = 2.12

Intervals for level mean minus largest of other level means

Level	Lower	Center	Upper
Freightl	-52.8	-25.4	0.7
Internat	-97.5	-33.3	30.6
Mack	-112.3	-61.6	0.0
Volvo	-30.8	25.4	51.5

-100 -50 0 50



Current Worksheet: Worksheet 2

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Start 100% 5:13 PM

SKF 002195

File Edit Manip Calc Stat Graph Editor Window Help

Analysis of Variance for Inner Nu

Source	DF	SS	MS	F	P
Truck OE	3	284250	94083	4.68	0.002
Error	474	9530880	20107		
Total	477	9825131			

Individual 95% CIs For Mean
Based on Pooled StDev

Level	N	Mean	StDev
Freight	358	511.9	145.0
Internat	13	534.2	149.3
Mack	23	411.3	103.7
Volvo	64	537.5	135.2

Pooled StDev = 141.8

420 490 560

Hsu's MCB (Multiple Comparisons with the Best)

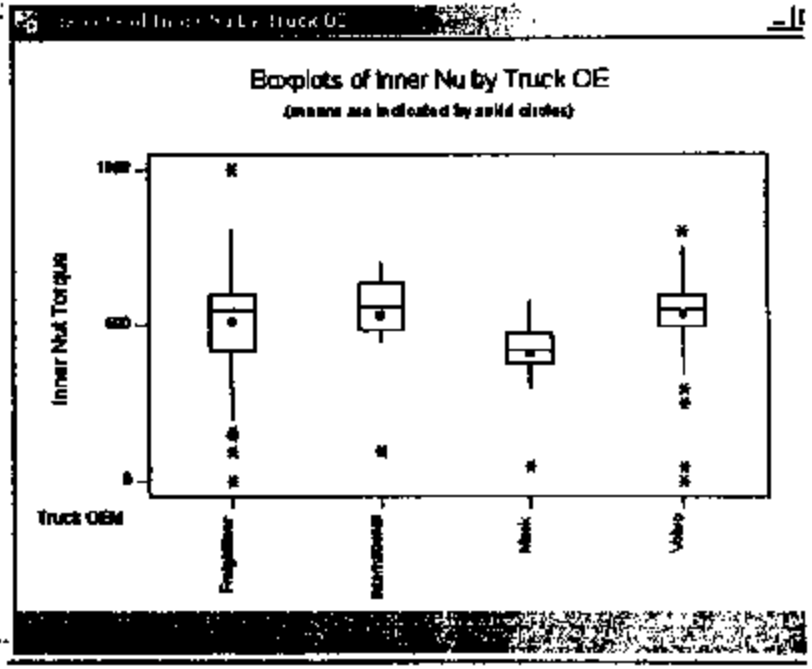
Family error rate = 0.0500

Critical value = 2.12

Intervals for level mean minus largest of other level means

Level	Lower	Center	Upper
Freight	-107.1	-25.6	10.8
Internat	-92.7	-3.3	86.2
Mack	-227.1	-126.2	0.0
Volvo	-86.2	3.3	62.0

-200 -100 0 100



Dotplots of Inner Nu by Truck OE

Boxplots of Inner Nu by Truck OE

Mack has lower mean inner nut torque

Current Worksheet: Worksheet 2

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Start 100% 5:15 PM

SKF 002196

File Edit Manip Calc Stat Graph Editor Window Help

Boxplots of Mileage by SKF Site

One-way ANOVA: Mileage versus SKF Site

```
Analysis of Variance for Mileage
Source     DF        SS        MS        F        P
SKF Site    1 1.399E+12 1.399E+12    70.49    0.000
Error     477 9.467E+12 1.985E+10
Total     478 1.087E+13
                                  Individual 95% CIs For Mean
                                  Based on Pooled StDev
Level       N      Mean     StDev ---+---------+---------+---------+---
Aiken     449    313448    142754  (*-)
Luechow    30    536488    107862                        (-----*-----)
                                  ---+---------+---------+---------+---
Pooled StDev =   140879          320000    400000    480000    560000

Hsu's MCB (Multiple Comparisons with the Best)

    Family error rate = 0.0500

Critical value = 1.64

Intervals for level mean minus largest of other level means

Level        Lower    Center     Upper -------+---------+---------+---------
Aiken     -266738   -223040         0 (--*-------------)
Luechow        0    223040    266738                   (-------------*--)
                                     -------+---------+---------+---------
                                         -150000         0    150000
```

Aiken hubs have significantly lower mileage than Luechow, but Luechow hubs more likely installed on vehicles in service longer.

Current Worksheet: Worksheet 1

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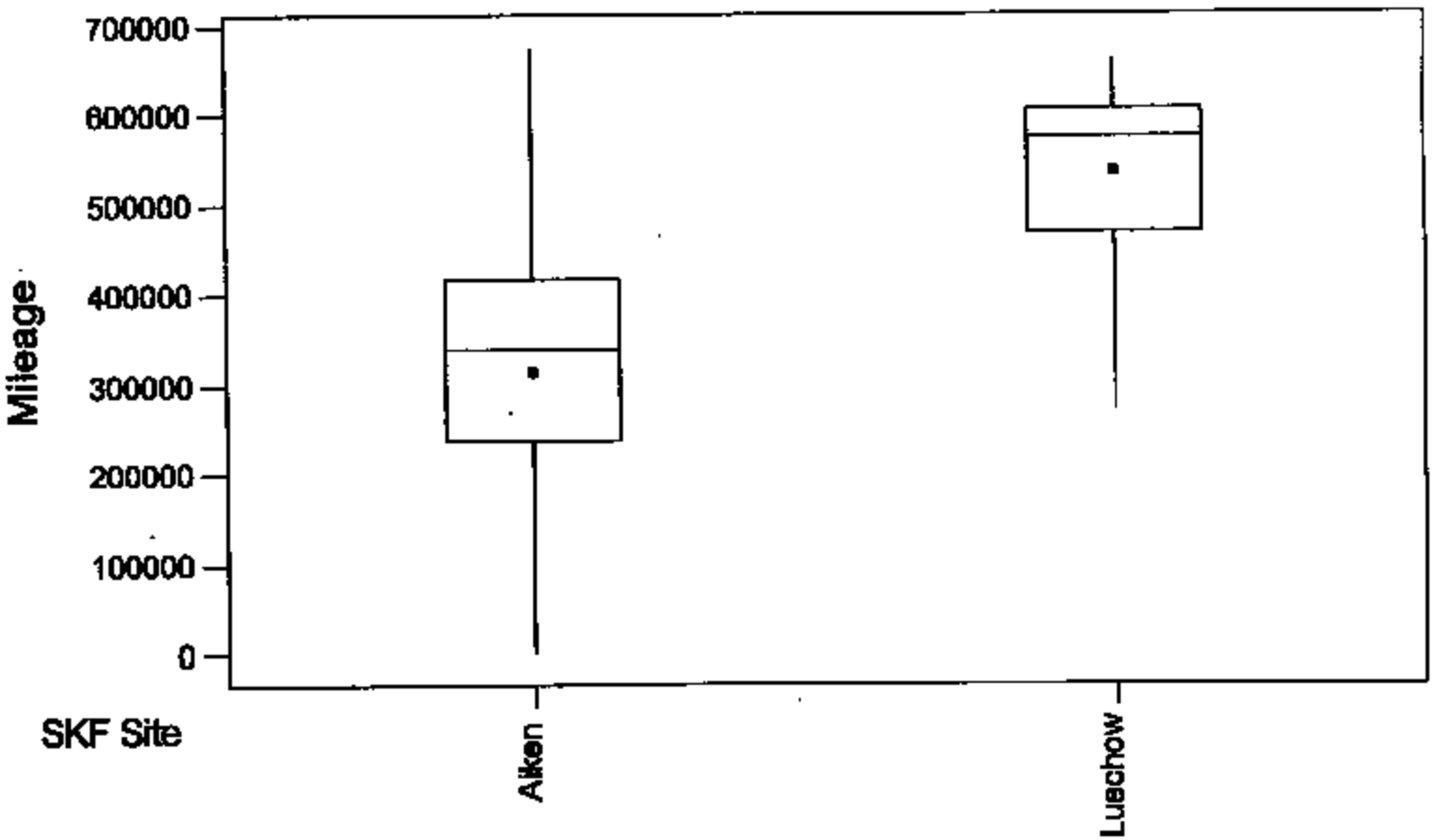
Start 100% 3:47 PM

Boxplots of Mileage by SKF Site

(means are indicated by solid circles)



SKF 002198

Mileage Comparison by OEM

One-way ANOVA: Mileage versus Truck OEM

```
Analysis of Variance for Mileage
Source      DF        SS        MS        F        P
Truck OE     3 2.106E+12 7.019E+11    38.00    0.000
Error      474 8.755E+12 1.847E+10
Total      477 1.086E+13
                                   Individual 95% CIs For Mean
                                   Based on Pooled StDev
Level        N      Mean     StDev  --+---------+---------+---------+----
Freightl   358    296420    145465  (-*)
Internat    13    443829     81985          (------*--+----)
Mack        23    575265     74838                        (-----*----)
Volvo       84    372753    109582       (--*--)
                                   --+---------+---------+---------+----
Pooled StDev =   135904          300000    400000    500000    600000
```

May differ due to time in service and other factors unknown

SKF 002199

Knight Only

Knight Year Month	Outer DS Mean	Inner DS Mean	OUter DS Std Dev	Inner DS Std Dev	Data points	Outer PS Mean	Inner OS Mean	StDev Outer PS	StDev Inner PS
199807	250	510	*	*	1	100	500	*	*
199809	200	575	0	106.066	2	250	640	0	56.569
199810	150	237.5	70.711	53.033	2	125	500	35.355	70.711
199902	250	550	*	*	1	250	550	*	*
199903	137.5	437.5	47.871	43.301	4	200	543.75	20.412	100.778
199904	164.29	351.43	85.217	176.109	7	335.71	542.86	301.336	255.65
199905	166.67	488.33	76.376	96.997	3	433.33	566.67	493.288	450.925
199906	250	350	*	*	1	200	700	*	*
199907	87.5	400	88.388	70.711	2	200	700	0	0
199908	266.67	455.56	286.138	215.703	9	219.44	611.11	72.648	194.9
199909	*	300	*	*	0	250	500	*	*
199910	75	300	*	*	1	150	400	*	*
199911	133.33	416.67	57.735	125.831	3	225	533.33	66.144	76.376
200003	1000	1000	*	*	1	1000	1000	*	*
200004	100	500	*	*	1	300	550	*	*
200005	100	250	0	70.711	2	100	250	70.711	212.132
200010	200	200	*	*	1	250	650	*	*
200101	150	450	*	*	1	250	550	*	*
200105	150	525	*	*	1	100	650	*	*
200106	200	550	*	*	1	200	650	*	*

Discussion Main Topic Class Rehmberg/GHQ/GOT/SKF 05/13 12:24 PM	Subject:	Actions and responsibilities of Competence Areas
	Category:	Projects

Response
to Main Document

Achim Mueller/SCH/SKF
05/16 06:29 AM

Subject:	Visual Inspection of Returned Truck Hub Unit
Response to:	Actions and responsibilities of Competence Areas
Category:	Projects

visualinspection.doc

Purpose of the Inspection

To verify findings of earlier visual inspections performed by ADNA personal. In total 13 inboard inner rings, roller complements and seals of Truck Hub Units BTF-0032 were returned. These bearings have been identified earlier to be spalled, thus not reaching the expected service life of a million miles. It had been determined that the spalls are caused by lubricant film break down due to water ingress through the inboard seal.

Findings of Visual Inspection

Hereunder are listed the findings and conclusions of the visual inspection performed in the Schweinfurt test laboratory. To identify individual bearings, the findings are summarized under the respective claim number and mileage.

E1752364 308,528 miles
Two shallow spalls in roller distance over 3/4 of the inner ring raceway length. The seal main lip wear is 0.6 mm wide. No signs of corrosion on seal counterface. Corrosion is found in the clip ring groove.
Shallow raceway spalls are indicating surface distress. Such a damage is typically caused by either vibrations or lubricant film break down. The most common reason for lubricant film break down is the presence of water in the bearing. The presence of rust in the bearing bore and the appearance of the seal are indicating a leak path along the axle.

Ryder 3617 393,580 miles
Ring and roller raceways as well as the guiding flange are in good condition. The seal main lip wear is 3.1 mm wide. The seal counterface is partially corroded. No corrosion is found in the clip ring groove.
The bearing has not failed yet. The heavily worn seal indicates a reduced sealing function, allowing water and other contamination entering the bearing.

E1755559 438,508 miles
The guiding flange is heavily worn over about 90° of the circumference ("hot runner"). Ring and roller raceways are in good condition. The seal main lip wear is 0.6 mm wide. Corrosion is found in the clip ring groove. No evidence of water in the bearing. Fretting corrosion in the bearing bore is indicating two load zones.
Seizing on guiding flange surfaces is considered to be an unusual occurance. It may be caused by either heavy axial loading, extremely high preload (clamp load), lubricant film break down or misaligned mating parts (perpendicularity of spindle and shoulder). Due to the good overall appearance of the bearing components, lubricant film break down is an unlikely root cause for the damage. Two load zones typically show up when the bearing is disassembled and put back onto the spindle.

Ryder 33623 615,339 miles
Ring and roller raceways as well as the guiding flange are in good condition. The seal main lip wear is 1.6 mm wide. The seal counterface appears to be in good condition. The clip ring groove is not corroded. No evidence of water ingress is found. However, there are traces of over rolled particles.
The source of those particles could not be clarified. The findings on this bearing do not lead to a conclusion.

Ryder 33620 482,615 miles
One shallow spall over about 130° of the ring raceway. The areas close to the spall appear shiny. The seal main lip wear is 2.5 mm wide. The seal counterface is not corroded. Rust can be found in the clip ring groove. The ring and the seal are damaged by disassembly tools.
Shallow spalls and/or shiny, mirrorlike, raceways are indicating a lubricant film break down. Both, the shiny raceway surface and the heavily worn seal, are indicating water ingress into the bearing. There is, however, also evidence of a leak path along the spindle.

E1755522 403,280 miles
One shallow spall over about 160° of the ring raceway. In addition, the guiding flange is heavily worn over about 90°. The seal main lip wear is 2.7 mm wide, the main lip is torn away over about 90° of the circumference. Rust can be found in the clip ring groove.

Shallow spalls are typical for lubrication problems. The heavy seal wear indicates contamination ingress into the bearing, there is also evidence of a leak path along the spindle.

E1752375 273,721 miles
The ring raceway is spalled over about 90° of its circumference. The roller raceways are shiny. A 2 cm long particle (chip?) is found in the guiding flange undercut. The seal main lip wear is 1.6 mm wide. The seal counter face appears in good condition, however, the trace of the dust lip shows some corrosion. Rust is found in the clip ring groove.
Shiny raceways are evidence of lubricant film break down. Both corrosion traces, on the seal counterface and the bearing bore, indicating potential leak paths.

E1750339 689,347 miles
The ring raceway is spalled over about 90° of its circumference. The seal main lip wear is 3.8 mm wide. The seal counterface is heavily corroded. Rust is present in the clip ring groove. The roller raceways are shiny. The seal main lip exhibits several voids, up to five mm long, on the bearing side.
The spall appears to be caused by lubricant film break down due to water entering the bearing. The voids in the seal lip may be explained by roller skewing as a consequence of the spall.

CWA06549 385,007 miles
The ring raceway is spalled, while the roller raceways are shiny. The seal main lip wear is 1.3 mm wide. The seal counter face is in good condition. Rust can be found in the clip ring groove.
Shallow spalls and shiny raceways are indicating a lubricant film breakdown due to water ingress. A leak path along the spindle appears to be possible.

CWA07833 mileage ?
Ring and roller raceways are in good condition. The guiding flange is seized. The seal main lip wear is 3.0 mm wide. The seal counter face appears to be in good condition. The seal spring is missing. Only little rust can be seen in the bearing bore.
The reason for this damage is not determined. The seal is heavily worn. However, since the mileage of the bearing is not known, a conclusion about the seal performance is hardly possible.

E1744715 268,745 miles
The appearance of the raceways and the guiding flange is good. Traces of over rolled particles are to be seen. The seal main lip wear is 0.9 mm wide. The seal counterface is in good condition. Rust can be found in the clip ring groove. The dust lip of the seal has a five mm long cut.
The source of those particles could not be clarified. The findings on this bearing do not lead to a conclusion.

E1752410 192,639 miles
The raceways are shiny, while the guiding flange is seized. The seal main lip wear is 3.5 mm wide. The seal counterface is heavily corroded. The bearing bore is also heavily corroded. Multiple dark lines on the ring raceway in roller distance are indicating contact corrosion between rollers and ring raceway.
The overall appearance of the bearing components leads to the conclusion that the bearing was submerged in water. Free water was present in the bearing, causing a lubricant film break down. Since multiple lines of contact corrosion can be seen, it can be assumed that the bearing was operating for a while after the submersion happened.

E1727708 1,165,385 km
The ring raceway is polished. Reaction layers on the roller raceways are indicating elevated operation temperatures. The seal main lip wear is 3.6 mm wide. The seal counterface is corroded.
The appearance of the bearing is typical for a lubricant film break down. The heavy seal wear supports the assumption that water passed the seal lip.

Summary

A total of 13 returned bearing cones and seals have been inspected. All of those bearings had been classified by ADNA as being damaged after inboard seal leakages.
The findings reported above do not fully support this earlier assessment.
It may be confirmed that the vast majority of the bearing damages are due to lubricant film break down caused by water intrusion into the bearing. It is, however, not verified in all cases that water entered the bearings through the seal. There is also a potential leak path along the spindle.
This conclusion is supported by the presence of rust in the inner ring's clip ring groove and the good overall appearance of the seal lips and their counterfaces in about half of the inspected bearings.

A total of five bearings out of 13 are concluded not to have seal leaks. One bearing damage is not conclusive since the service mileage is not known. The remaining seven bearings show evidence of seal leakage. It has to be pointed out, that in almost all cases, water was present in the bearing bore. Therefore it is not to be determined whether some of these seven cases may also be linked to water intrusion along the spindle.

Response
to Main Document

Achim Mueller/SCH/SKF
05/18 05:31 AM

Subject:	Truck Hub Unit Assembly Test
Response to:	☐ Actions and responsibilities of Competence Areas
Category:	Projects

THUassy.doc

Purpose

Purpose of this investigation was to prove that clamping a Truck Hub Unit (THU) without rotating the outer ring may lead to damages on ring or roller raceways.

Test Description

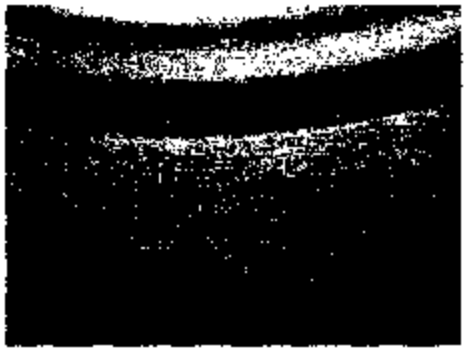
A THU (BTF-0032) was disassembled and cleaned. The condition of the raceways was documented (see picture 1). After that, the unit was lubricated with a total of 61 gr. of GWZ grease.

Picture 1: Condition of inboard outer ring raceway before Assembly Test

The unit was put on a horizontally installed test spindle. The inner lock nut was torqued until a clamp load of approximately 90 kN was reached. Before respectively during clamping of the unit, it was taken care that the outer ring of the bearing was not rotated. As a second step, the outer lock nut was installed with a torque of 300 ftlbs. After that, the bearing was disassembled, cleaned and inspected for damages.

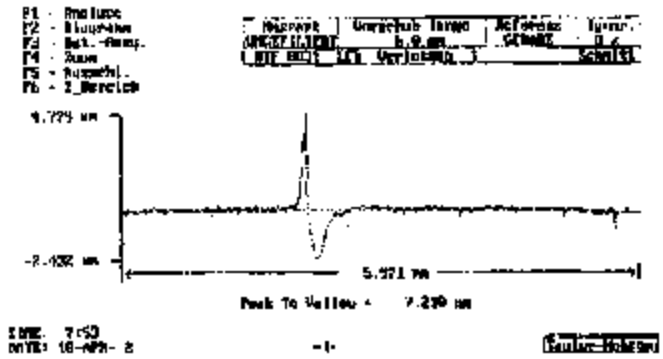
Test Results

Upon disassembly of the unit, several indentations were found on the inboard outer ring raceway (picture 2).



Picture 2: Typical indentation on outer ring raceway after test

The extension of the indentation in picture 2 was determined to be 0.35 mm in circumferential direction and approximately 7.2 µm from peak to valley (picture 3).



Picture 3: Raceway surface and indentation

Conclusion

This test proves that non rotation of the THU outer ring during clamping can cause considerable damage of the bearing. This kind of damage is considered to be detrimental to the bearing performance.

Response
to Main Document

Achim Mueller/SCH/SKF
05/17 02:16 AM

Subject: X-Ray Diffraction Analysis Interim Result 1

Response to: Actions and responsibilities of Competence Areas

Category: Projects

To all,

Attached file depicts the comparison between a returned THU BTF-0052 (service life appr. 500 kmiles) and an unrun one. It is obvious that the b/B value is still close to 1, i.e. there is very little life consumed. The threshold value of b/B indicating fatigue is 0.65. It is still to early for a remaining life prediction, but it can be estimated, that this bearing could still have run for one million miles under the same operation conditions.

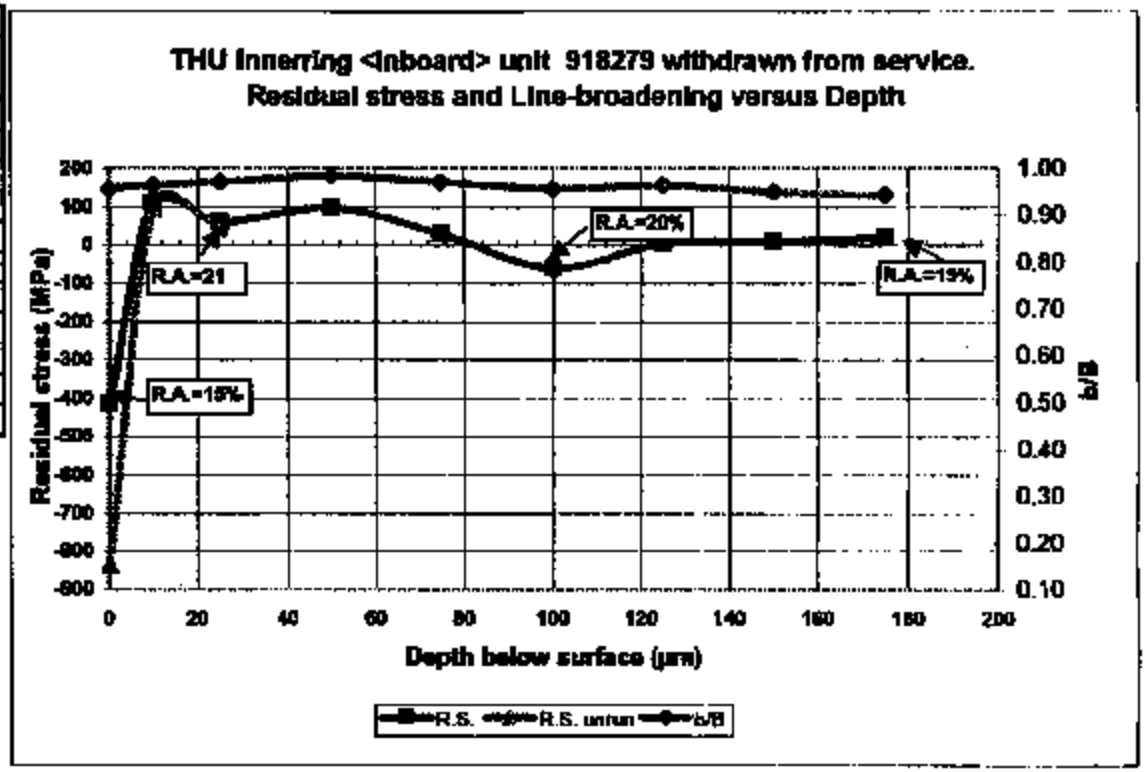
Best regards

Achim Mueller

XRDinterim1.xls

THU #918279 I.R. in HLZ				
Depth (um)	R.S. (MPa)	L.B. (deg. 2-th.)	b/B	R.A. (vol.%)
0	-415	6.85	0.96	15
10	110	6.90	0.97	
25	60	6.95	0.97	21
50	100	7.05	0.99	
75	30	6.95	0.97	
100	-60	6.85	0.96	20
125	5	6.90	0.97	
150	10	6.80	0.95	
175	20	6.75	0.94	19
Core		7.15		

THU #..... I.R. <unrun>			
Depth (um)	R.S. (MPa)	L.B. (deg. 2-th.)	R.A. (vol.%)
0	-835	7.00	9
10	95	7.00	
25	45	7.15	
100			
150			
175			



Response
to Main Document

Achim Mueller/SCH/SKF
05/24 04:16 AM

Subject:	Steer Axle Action Items Update I, 24.05.2002
Response to:	Actions and responsibilities of Competence Areas
Category:	Projects

amprogrep1.doc

PROJECT - PROPOSAL

Title: Investigations of ARM – THUs (field incidents)

Project-Manager: **Achim Müller**

Objectives:

➔ To make detailed visual and material inspections, inclusive THU application interfaces, to identify the root cause of the ARM Truck "wheel off" incidences on THUs which were used on trucks in North America.

➔ To draw conclusions, considering all our investigation results, which actions have to be taken in order to help solving the "wheel off" problems, by improving the ARM – THU or wheel end design if necessary.

Background:

Facts (acc. Minutes PLB THU, Arvin Meritor, e-mail Claes Rehnberg 050402)

→ **400.000 bearings in the market**
→ **120.000 of those produced in Luechow**
→ **280.000 produced in Aiken whereof 61.000 with R-Safe seals**
→ **Freudenberg seals were used up to April 2000**
→ **R-Safe seals were used from April 2000 in Aiken produced bearings**
→ **117 bearing have been claimed by AM as "severely advanced" parts out of which 18 wheel-offs from start of the year all with Freudenberg seals**
→ **Average service life of claimed units approx. 350 kMiles**
→ **SKF notified around week 12 by ARM after the 15 first wheel-offs occurred**

In order to get a clear and complete picture of the "wheel off" incident mode, a detailed ARM THU investigation will be done by the specific competence areas within SKF.

This project will be split into working packages linked to the investigating competences.

Actions and responsibilities of competence areas.

Working Package I Seal

Responsible: **A. Müller**

➔ Spec's on Freudenberg seal (material compound, design)
CFW compound 75FKM595 released for use in garter seals by ERC (NL89C802, A.v.d.Berg). Design (SG-BTFB 446329 E) released for RVI THU in 1989. Virtually no further documentation available.

➔ Spec's on R-Safe Seals (material compound, design)
CR compound SIRVENE490 released for use in R-Safe seals by ERC (NL92C815, A.v.d.Berg). Design principle tested and reported by IPD TRB (ST94T201, L.Winslott) and CRA (CIC1231-102, G.Poll).Other standard tests comparing CFW and CR seal at CRA were

supporting decision . Since then, the basic VOLVO mud/slurry test has been adapted and is used as acceptance criterium.

➔ Approval process of both these two seals (who signed)

The approval process for the CFW seal is not documented. Approval of the CR seal was given based on comparative tests (see above), using the VOLVO seal test specification. The decision for the CFW seal to be used in the ARM front axle THU was taken, based on the field experience with the RVI unit (MEST dated 93-04-07, U. Brockmueller).

➔ Visit to Freudenberg to clarify design, material compound, production process

No documentation about the seal development available at CFW.

➔ Water splash test on defective R-Safe seals to confirm failure mode

ongoing at RFT

➔ Wear test on CFW seals

ongoing at CRA

➔ Water splash test on CFW with different grease fills

Test confirms that reduced grease fill reduces the time until water passes the main seal lip.

➔ Cure state analysis

SKF not equipped for analysis, CRA in charge.

Working Package II Total inspection THU

ERC activities

1 THU new
3 THU returned long mileage

Coordinator: A. Kerrigan

→ Visual inspection **G. de Wit**

Visual inspection on long mileage bearings without unusual findings. Inspection of additional 34 units will start in Schweinfurt on May 27.

→ Investigation composition, microstructure, forging fibre flow conformance, surface quality, if necessary SEM investigation **C. Vieillard**

Inner rings over hardened, hardness in tolerance but retained austenite content above pecification.

→ X-ray investigation of run and unrun (reference) THU to identify rolling contact fatigue damage accumulated in the microstructure **H. Verschorr**

First result on bearing 918279 (mileage 570.000 miles) shows virtually no decay of retained austenite. It is estimated that this bearing could have run for another million miles.

Schweinfurt lab activities

3 THU returned long mileage

→ visual inspection (SEM if necessary) and X-ray investigation **W. Nierlich**

Activity ongoing

Working Package III General Application Features

Responsible: Achim Müller (M. Lewis)

→ Ideas for truck drivers warning system **A. Müller / M. Lewis**
Definition of preferred warning system missing.
→ Tensile fracture wheel bolt test
Failure mode not duplicated even at nut torques exceeding 1200 ft-lbs.
→ Wheel bolt replacement
Damages on ring and roller raceways visible, measurement to be done.
→ Inspection of returned seals (CFW)
Ongoing, see above activity "Visual inspection"
→ Inspection returned CR seal bearings
Ongoing, see above activity "Visual inspection"
→ Mounting test with and without run down (**support:** FEM calculation **G.-J. Dop**)
Test done, results reported
→ Summary of release/homologation documentation
Documentation in SW already about 15 binders. Summary will take about 5 manweeks. We do not know if the documents are complete.

Working Package IV Customer Related Application Features

Responsible: **M. Lewis**

→ Documentation of approval process **B. Weeks**
→ Comparison European users **F. Caron**
Fleets contacted, search for long mileage vehicle ongoing.

Mike please define your actions for the following areas
e.g.
→ Identification of vehicle set up (chassis,...) in relation to returns, claims, incidents
→ Update of customer and SKF warranty/claim data base
→ Application Engineering contacts to customer

Working Package V Quality

Responsible: **J. Schulthels**

Please define your action

e.g.
→ Collect available PPAP documentation of units, seals and bolts
→ Collect quality data of individual production runs from ARM 10/1998; 6,7,8/1999 in service dates

Working Package VI conclusions and identification of further actions concerning improvement of THU if necessary

Responsible: all involved participants

Project Team:

Leader:	A. Mueller
Application Engineering:	M. Lewis
Investigations:	A. Kerrigan
	W. Nierlich
Quality:	J. Schultheis

Other issues

Studs

Issue report of failure analysis (NATC)
Issue report of testing (tensile, impact,...) by Ingersoll
Identification of root cause
Identify affected quantity of bolts
Disposition of parts in the field with supporting documentation

Business Gate:

B. Stephan, W. Farrell, A. Stubenrauch

Distribution:

Working package responsibles; PLB members

Response
to Main Document

Achim Mueller/SCH/SKF
05/28 09:49 AM

Subject:	Statement to Recommended Inspection Interval
Response to:	Actions and responsibilities of Competence Areas
Category:	Projects

The attached document contains a draft of an SKF statement about the 50,000 miles inspection intervals between "Basic Inspections" as proposed by ARM. Comments are very much appreciated.

Achim Mueller

Insprecom.doc

DRAFT

Before publishing this statement, more data from field tests must be available and evaluated.

Background

ArvinMeritor is recommending in their Technical Bulletin TP-0251 (revision 05-02) to run "Basic Inspections" in intervals of not more than 50.000 miles after the first "Detailed Inspection" which is due after an operational time of 200,000 miles.
SKF is requested to take a stand on the length of the intervals between the "Basic Inspections".

Field and Rig Testing

Several field and rig tests are run by ArvinMeritor and SKF, with the target to support the recommended inspection interval to be a safe interval for the possible detection of progressive bearing damages.

1. SKF Test Truck (operated by Southwest)

A test truck is equipped with predamaged unitized wheel end bearings (THU). The bearing temperatures and vibration levels are monitored. The truck is operating under linehaul conditions. The test started on May 21, a mileage of approximately 1000 miles per day is accumulated.
"Basic Inspections" are performed every second day.

2. ArvinMeritor Test Truck

ARM is running a test vehicle on the Bosch proving ground under operating conditions, which are come close to linehaul conditions. The test started beginning of May, it is reported, that a mileage of more 25,000 miles has been accumulated. Unfortunately, not more details are known at SKF Schweinfurt.

3. Rig Test at SKF Schweinfurt

A THU has been predamaged due to non rotation during assembly (see report A. Mueller in database). This bearing was then put on a THU test rig and run under "Raceway Qualification Test" conditions.

These test conditions are chosen such, that heavy but realistic corner loads, which may occur under normal operation, are simulated. The dominant loading condition (85% of the test time) simulates + 0.25 g cornering load. Road recordings ("Service Condition Recordings...", NL93T035, G.-J. Scheers) are proposing that this condition occurs with a percentage of less than 0.3% under linehaul service. It is assumed that during city delivery, a similar cornering condition is present for less than 2% of the total service life of a vehicle.
Based on this information it is a safe assumption that every hour of test time, the test rig operates at 500 rpm, simulates approximately 2650 miles of operation under city delivery condition, while it represents more than 8000 miles under linehaul conditions.

The reported bearing was operating for 395 hours when a vibration level, which was twice as high as the base level of the already damaged bearing was measured. These 395 hours would be already equivalent to approximately 1,000,000 miles of city delivery condition. Upon inspection small damages on the inboard outer ring raceways were detected (see picture 1).

Picture 1: circumferential operation traces and scratches on run. predamaged THU outer ring raceway

During a Design Verification Test, these scratches would have been evaluated as bearing damage, and the test would have been terminated.

Since the target of this test was to demonstrate the feasibility of a 50.000 miles inspection interval, it has been decided to continue the test instead of investigating the observed damage in detail.
Upon restarting of the test, the bearing was overloaded by mistake. The overload was such that an axial load equivalent to approximately 1 g was acting on the THU. The bearing was immediately heavily damaged on the raceways and inner ring guiding flanges (see picture 2). Nevertheless the test was continued with this, now excessively, damaged bearing.

Picture 2: THU cone after overload

The bearing has been operating since for 32.5 hours under the earlier described test condition. The test time would translate into approximately 86,300 miles of field operation under city delivery conditions.

Conclusion

SKF BU Trucks Product Engineering supports the proposed 50,000 miles intervals between "Basic Inspections" for all unitized front wheel end bearings.
SKF BU Trucks Product Engineering considers the proposed intervals as being sufficient to detect progressive bearing damages prior to uncontrolled failure of such a wheel end bearing.

Response
to Main Document

Achim Mueller/SCH/SKF
05/28 10:36 AM

Subject: Potential Root Causes for Bearing Damages

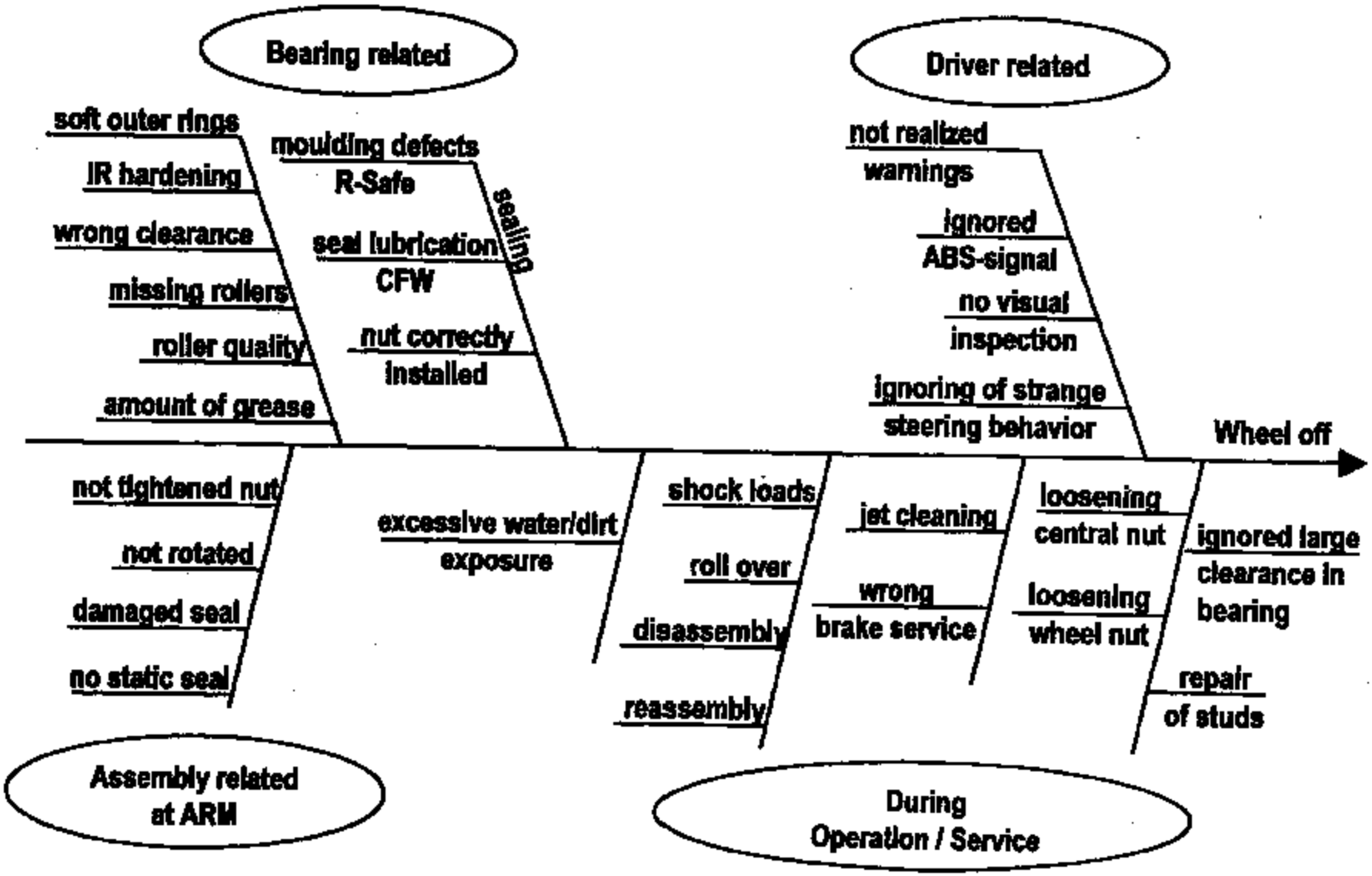
Response to: ☐ Actions and responsibilities of Competence Areas

Category: Projects

Attached document contains a "Fishbone" Diagram prepared by A. Stubenrauch depicting potential root causes for bearing damages

Root Causes.ppt

Potential Root Causes for THU-damages



Response
to Main Document

Arno Stubenrauch/SCH/SKF
05/29 09:54 AM

Subject: Conclusions and Recommended Actions

Response to: Actions and responsibilities of Competence Areas

Category: Projects

Attached is a draft for discussion purposes

Recommended actions.pj

Recommended Actions

- Reduced inspection intervalls 50.000 miles
- To follow consequently the ABS-Signal concerning THU
- To check the function of the static seal
- To retrofit the static seal
- To retrofit the heat indicator, preferable Wabash-Bolt
- To discuss improvements with ARM about the other causes for bearing damages

Dominating Root Cause for early bearing failures

Observation/Detection: too much water inside the bearing unit

There are different paths for water ingress:

- Trough the thread of the HUB-Cap (happened)
- Creeping along the OD of CRW (not detected)
- Passing the seal lip, after excessive wear and lost seal function (happened)
- Creeping along the spindle and passing the contact area of the IR side faces (this phenomenon is supported by micromovements) (happened)

Consequences due to water ingress:

- A certain amount of water will be absorbed by the grease
- Grease is loosing viscosity and lubrication capability
- Lubrication film will break through and rolling contact surface will suffer from surface distress (shallow spalling)
- After spalling the internal clearance will increase

- High stress in rolling contact
- Pitting starting
- Spalling develops
- Noise and vibration develops
- Extreme clearance
- Damage seal perhaps push out
- Water dust ingress
- Acceleration of wear
- Roller scew
- Heating up
- Grease out
- Metal to metal
- Seizure/Blocking
- Roller ejection
- Raceway riding
- Drum touches brake shoes
- Wear off of central nut
- Ignition possible
- Wheel off

Overall Conclusions

- Bearing suitable, when correctly manufactured and installed
- Main problem: water ingress/water creep
- Manufacturing problems:
  - Aiken, CFW missing grease
  - CR - R-Safe moulding defects
- Other causes for bearing damages:
  - Assembly
  - Transport
  - Studs replacement
  - Disassembly

Response **to Main Document** **Achim Mueller/SCH/SKF** 05/30 01:40 AM	**Subject:**	**Seal Wear Comparison between Luschow and Alken Parts**
	Response to:	Actions and responsibilities of Competence Areas
	Category:	Projects

sealwear.doc

Background

The purpose of this investigation was to determine, if there is a difference wear pattern on Freudenberg seals, depending on the assembly plant of the Truck Hub Unit.

Findings

Seven seals were inspected (Note: a out of a total of 18 inspected THUs, only seven seals were available) and the wear of the main lip was measured. Five of these seven seals were assembled in Aiken, the remaining two in Luechow. The wear width of the seals assembled in Aiken was in a range of 0.5 to 1.5 mm, while the measured values were 0,9 and 1.2 mm respectively for the seals assembled in Luechow (see table).

Manufacturing Location	Claim No.	Seal Wear	Mileage
Aiken	2821334 ?	1.5 mm	?
Aiken	918290	0.9 mm	559,290
Luechow	918289	0.9 mm	569,477
Luechow	918289	1.2 mm	569,477
Aiken	348970	0.8 mm	571,884
Aiken	918276	1.0 mm	610,074
Aiken	918274	0.5 mm	444,064

Conclusion

These results do not show a significant difference of seal wear between Aiken and Luechow assembled parts.

Response to Main Document Achim Mueller/SCH/SKF 05/30 01:43 AM	Subject:	Interim Result of XRD Investigation
	Response to:	☐ Actions and responsibilities of Competence Areas
	Category:	Projects

Measurements done in the Schweinfurt laboratory confirm so far the earlier reported results from ERC. Band width reduction values b/B of 0.9, 0.92 and 0.95 have been reported, indicating that no major material response occured on these (Ryder) parts.
Final report is anticipated to be distributed by June 14.

Response
to Main Document

Achim Mueller/SCH/SKF
05/30 03:17 AM

Subject: **Revised Statement on Recommended Inspection Interval**

Response to: Actions and responsibilities of Competence Areas

Category: Projects

revinsprecom.doc

Background

ArvinMeritor is recommending in their Technical Bulletin TP-0251 (revision 05-02) to run "Basic Inspections" in intervals of not more than 50,000 miles after the first "Detailed Inspection" which is due after an operational time of 200,000 miles.
SKF is requested to take a stand on the length of the intervals between the "Basic Inspections".

Field and Rig Testing

Several field and rig tests are run by ArvinMeritor and SKF, with the target to support the recommend inspection interval to be a safe interval for the possible detection of progressive bearing damages.

1. SKF Test Truck (operated by Southwest)

A test truck is equipped with predamaged unitized wheel end bearings (THU). The bearing temperatures and vibration levels are monitored. The truck is operating under linehaul conditions. The test started on May 21, a mileage of approximately 1000 miles per day is accumulated.
"Basic Inspections" are performed every second day.

2. ArvinMeritor Test Truck

ARM is running a test vehicle on the Bosch proving ground under operating conditions, which are come close to linehaul conditions. The test started beginning of May, it is reported, that a mileage of more 25,000 miles has been accumulated. Unfortunately, not more details are known at SKF Schweinfurt.

3. Rig Test at SKF Schweinfurt

A THU has been predamaged due to non rotation during assembly (see report A. Mueller in database). This bearing was then put on a THU test rig and run under "Raceway Qualification Test" conditions.

These test conditions are chosen such, that heavy but realistic corner loads, which may occur under normal operation, are simulated. The dominant loading condition (85% of the test time) simulates + 0.25 g cornering load. Road recordings ("Service Condition Recordings...", NL93T035, G.-J. Scheers) are proposing that this condition occurs with a percentage of less than 0.3% under linehaul service. It is assumed that during city delivery, a similar cornering condition is present for less than 2% of the total service life of a vehicle.
Based on this information it is a safe assumption that every hour of test time, the test rig operates at 500 rpm, simulates approximately 2650 miles of operation under city delivery condition, while it represents more than 8000 miles under linehaul conditions.

The reported bearing was operating for 395 hours when a vibration level, which was twice as high as the base level of the already damaged bearing was measured. These 395 hours would be already equivalent to approximately 1,000,000 miles of city delivery condition. Upon inspection small damages on the inboard outer ring raceways were detected (see picture 1).

Picture 1: circumferential operation traces and scratches on run, predamaged THU outer ring raceway

Picture 1a: operation traces on undamaged THU outer ring raceway

During a Design Verification Test, these scratches would have been evaluated as bearing damage, and the test would have been terminated.

Since the target of this test was to demonstrate the feasibility of a 50,000 miles inspection interval, it has been decided to continue the test instead of investigating the observed damage in detail.
Upon restarting of the test, the bearing was overloaded by mistake. The overload was such that a axial load equivalent to approximately 1 g was acting on the THU. The bearing was immediately heavily damaged on the raceways and inner ring guiding flanges (see picture 2). Nevertheless the test was continued with this, now excessively, damaged bearing.

Picture 2: THU cone after overload

The bearing is operating since then for about 30 hours under the earlier described test condition. The test time would translate into approximately 80,000 miles of field operation under city delivery conditions.

Conclusion

SKF BU Trucks Product Engineering supports the proposed 50,000 miles intervals between "Basic Inspections" for all unitized front wheel end bearings.
SKF BU Trucks Product Engineering considers the proposed intervals as being sufficient to detect progressive bearing damages prior to uncontrolled failure of such a wheel end bearing.

Response
to Main Document

Achim Mueller/SCH/SKF
06/08 02:15 AM

Subject: **Air Leak Test on ARM Knuckle**

Response to: Actions and responsibilities of Competence Areas

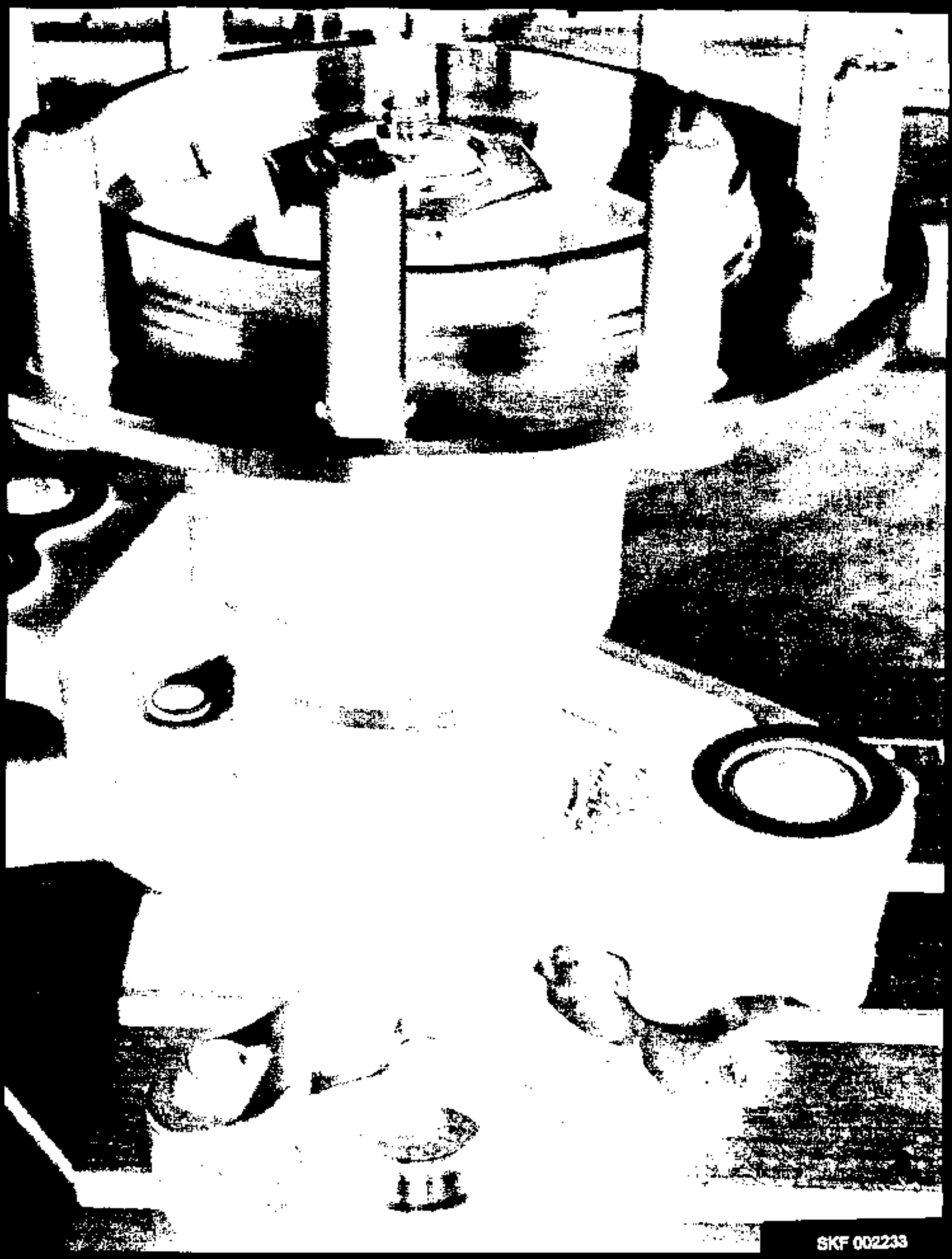
Category: Projects

We have done an "Air Leak Test" on one of the ARM Knuckles we have in our test lab.

A new THU BTF-0065 has been assembled onto the spindle and clamped with a torque of 800 Nm (590 ft-lbs). An air coupling was installed into a hub cap, and the cap assembled onto the unit. Pressurized air (1 bar) was then blown into the fub cap cavity. After the application of a leak detection spray onto the unit's inboard side, bubbles indicated a leak along the spindle.

Note that this test was a static test only. This is proving the presence of water leak paths along ARM's spindle.

airleaktest.jpg airleakbubbles.jpg



SKF 002233

Response

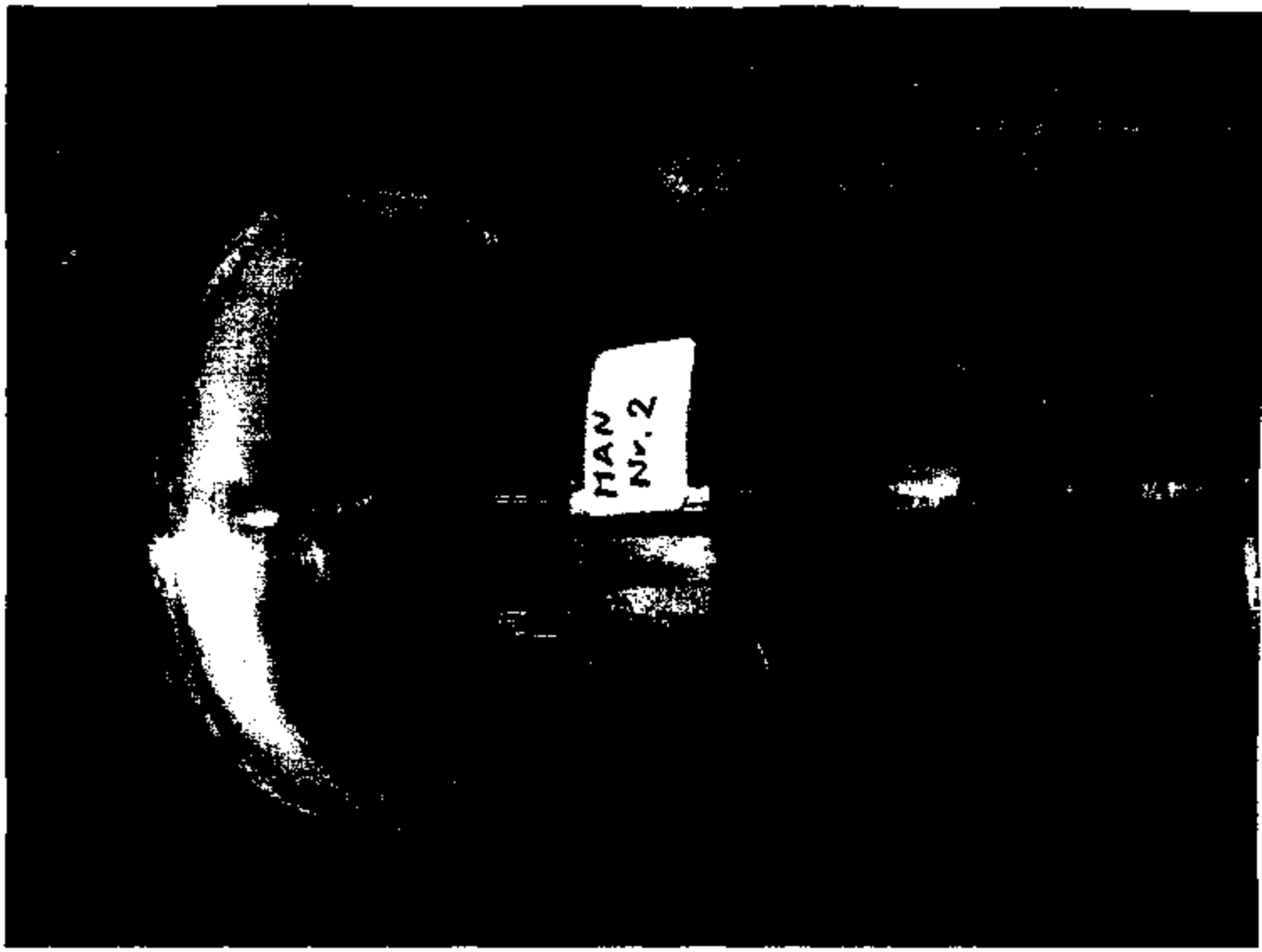
to Main Document

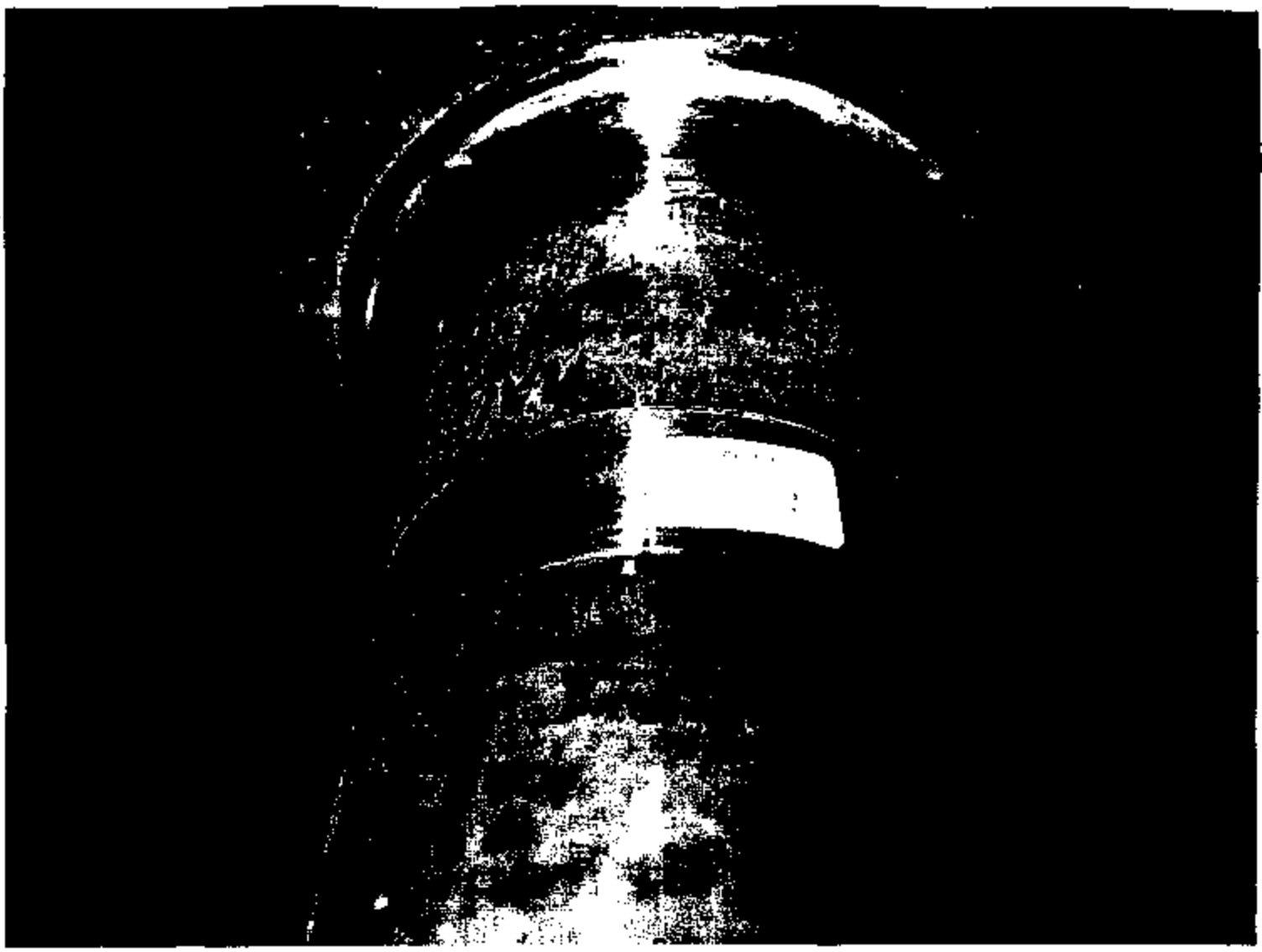
Achim Mueller/SCH/SKF
06/06 02:35 AM

Subject:	MAN 1,000,000 km Axle
Response to:	Actions and responsibilities of Competence Areas
Category:	Projects

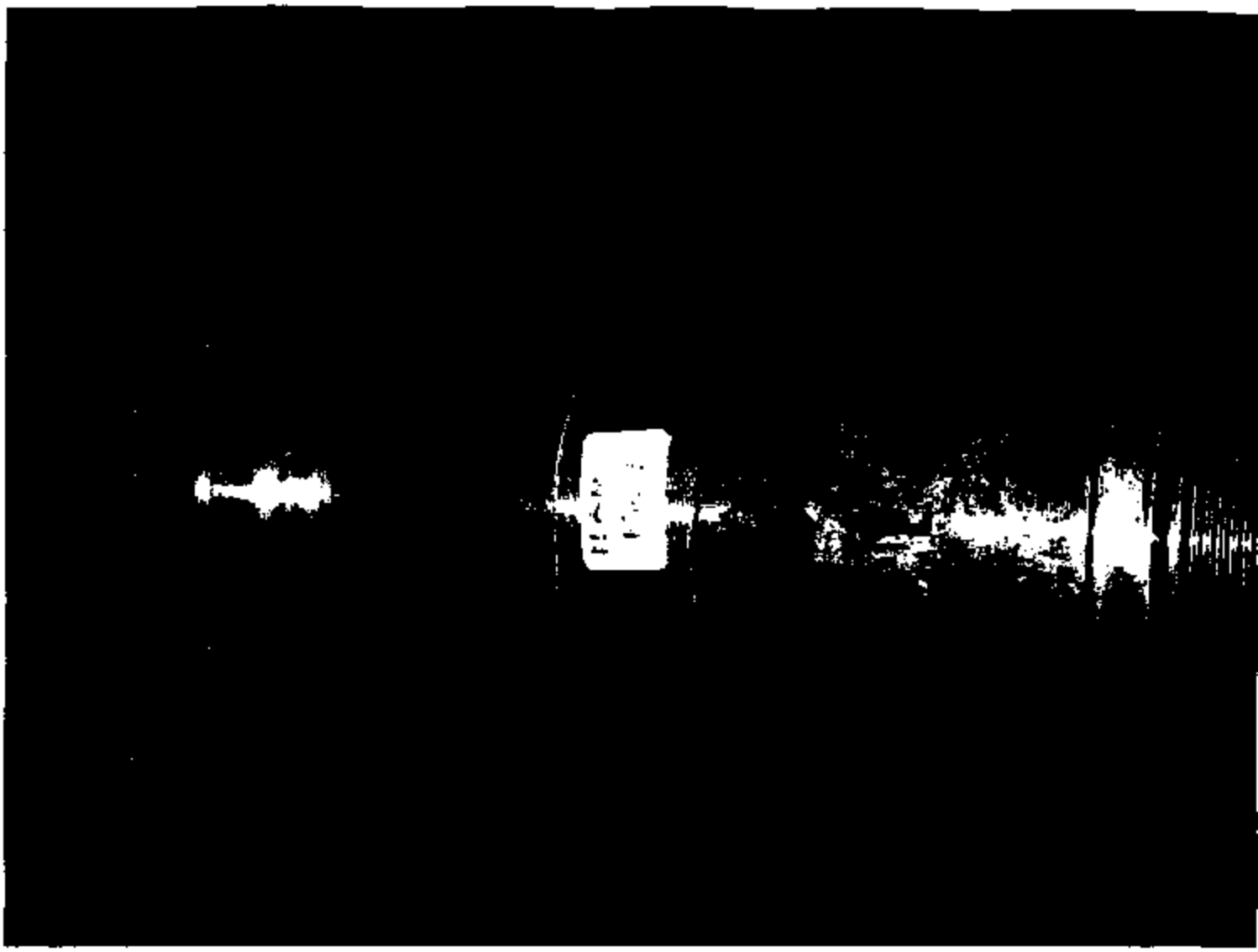
A non driven front steer axle of MAN was received after operating for about 1,000,000 km (625,000 miles). The spindle shows dry fretting corrosion on its bottom side while the "side" faces and the transition radii are as new. This proves that no water entered the wheel end system between the knuckle and the inboard inner ring side face.

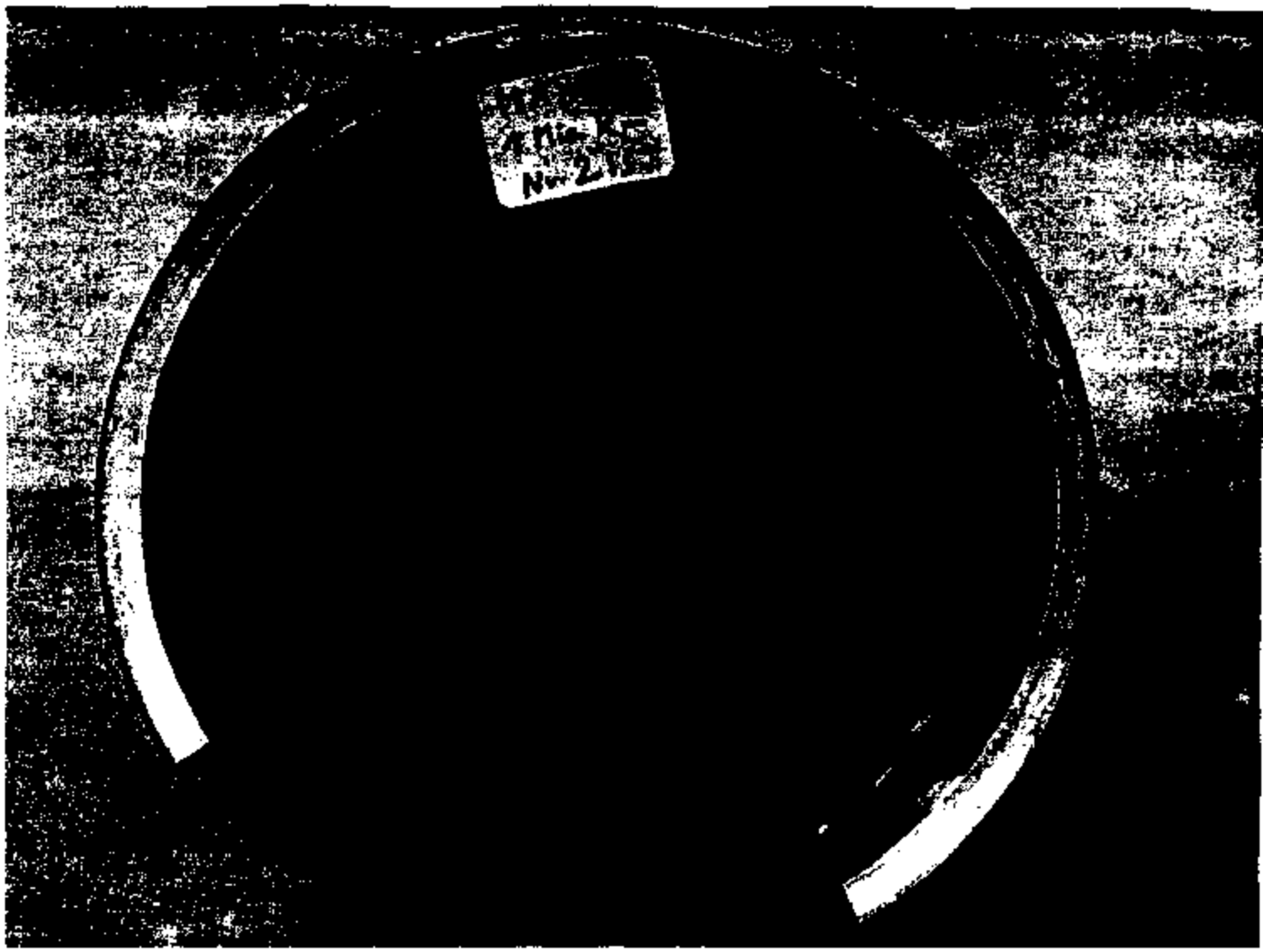
manetubtransition.jp manetub2bottomview.jp manetubside.jpg manetub1bottomview.jp maninnerring.JPG


MAN
Nr. 2



SKF 002238





Response
to Main Document

Achim Mueller/SCH/SKF
06/06 04:18 AM

Subject: Truck Hub Unit Assembly Test; Revised Report

Response to: Actions and responsibilities of Competence Areas

Category: Projects

Attached is a revised report about THU assembly tests performed in the Schweinfurt test lab.

assemblytest.doc

Purpose

Purpose of this investigation was to prove that clamping a Truck Hub Unit (THU) without rotating the outer ring may lead to damages on ring or roller raceways.

Test Description

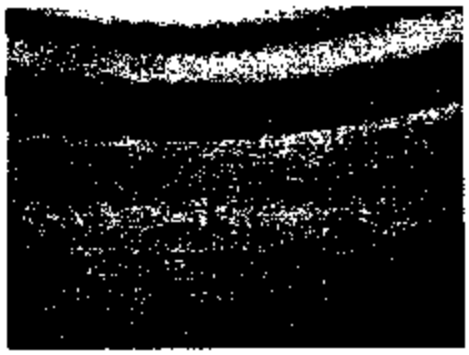
A THU (BTF-0032) was disassembled and cleaned. The condition of the raceways was documented (see picture 1). After that, the unit was lubricated with a total of 61 gr. of GWZ grease.

Picture 1: Condition of inboard outer ring raceway before Assembly Test

The unit was put on a horizontally installed test spindle. The inner lock nut was torqued until a clamp load of approximately 90 kN was reached. Before respectively during clamping of the unit, it was taken care that the outer ring of the bearing was not rotated. As a second step, the outer lock nut was installed with a torque of 300 ftlbs. After that, the bearing was disassembled, cleaned and inspected for damages.
This test was repeated with three different units.

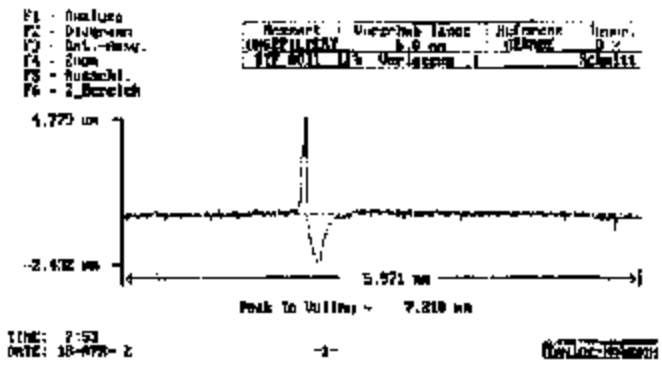
Test Results

Upon disassembly of the unit, several indentations were found on the outer ring raceways. A typical appearance form is depicted in picture 2.



Picture 2: Typical indentation on outer ring raceway after test

The extension of the indentation in picture 2 was determined to be 0.35 mm in circumferential direction and approximately 7.2 µm from peak to valley (picture 3).



Picture 3: Raceway surface and indentation

Conclusion

This test proves that non rotation of the THU outer ring during clamping can cause considerable damage of the bearing. This kind of damage is considered to be detrimental to the bearing performance.

Response **to Main Document** **Achim Mueller/SCH/SKF** **06/06 05:01 AM**	**Subject:** **Raceway Qualification Test with Predamaged Truck Hub Unit** **Response to:** ☐ Actions and responsibilities of Competence Areas **Category:** Projects

damagerqt.doc

Test Description

A THU has been predamaged due to non rotation during assembly (see report A. Mueller in database). This bearing was then put on a THU test rig and run under "Raceway Qualification Test" conditions.

These test conditions are chosen such, that heavy but realistic corner loads, which may occur under normal operation, are simulated. The dominant loading condition (85% of the test time) simulates + 0.25 g cornering load. Road recordings ("Service Condition Recordings...", NL93T035, G.-J. Scheers) are proposing that this condition occurs with a percentage of less than 0.3% under linehaul service. It is assumed that during city delivery, a similar cornering condition is present for less than 2% of the total service life of a vehicle.
Based on this information it is a safe assumption that every hour of test time, the test rig operates at 500 rpm, simulates approximately 2650 miles of operation under city delivery condition, while it represents more than 8000 miles under linehaul conditions.

Test Results

The reported bearing was operating for 395 hours when a vibration level, which was twice as high as the base level of the already damaged bearing was measured. These 395 hours would be already equivalent to approximately 1.000.000 miles of city delivery condition. Upon inspection small damages on the inboard outer ring raceways were detected (see picture 1).

Picture 1: circumferential operation traces and scratches on run, predamaged THU outer ring raceway

During a Design Verification Test, these scratches would have been evaluated as bearing damage, and the test would have been terminated.

Since the target of this test was to demonstrate the feasibility of a 50,000 miles inspection interval, it has been decided to continue the test instead of investigating the observed damage in detail.
Upon restarting of the test, the bearing was overloaded by mistake. The overload was such that a axial load equivalent to approximately 1 g was acting on the THU. The bearing was immediately heavily damaged on the raceways and inner ring guiding flanges (see picture 2). Nevertheless the test was continued with this, now excessively, damaged bearing.

Picture 2: THU cone after overload

The bearing is operating since then for 32.5 hours under the earlier described test condition. The test time would translate into approximately 86,000 miles of field operation under city delivery conditions.

During the test, inboard and outboard inner ring temperatures were recorded (see table 1). After test termination, the axial endplay of the Truck Hub Unit was determined to be 0.315 mm.

Test time [h]	Inboard inner ring temp. [°C]	Outboard inner ring temp. [°C]
6	130	not recorded
11.6	150	130
18.7	165	133
25	180	140
28.4	180	140
32.5	190	150

Table 1: Inner ring temperatures

Conclusion

From the above result it is concluded, that a damage caused by a wrong assembly method (i.e. no rotation during clamping) will not immediately affect the bearing performance. It is, however, to be expected that such damage will reduce the potential service life of a Truck Hub Unit.
The heavy bearing damage caused by mistake would have been noticed during a "Basic Inspection" of the wheel end. The wheel would have been considered as rotating rough and noisy. Continuing the test for another 32.5 hours (equivalent to 86,000 miles under city delivery condition) shows that the chosen 50,000 miles interval between two "Basic Inspections" is sufficient to detect bearing damages prior to a safety critical condition of the wheel end.

Response
to Main Document

Achim Mueller/SCH/SKF
06/06 07:38 AM

Subject: Comparison of Spindle Tolerances

Response to: ☐ Actions and responsibilities of Competence Areas

Category: Projects

Spindle Tolerance Comparison 06 Jun 200

Response
to Main Document

Achim Mueller/SCH/SKF
06/10 08:47 AM

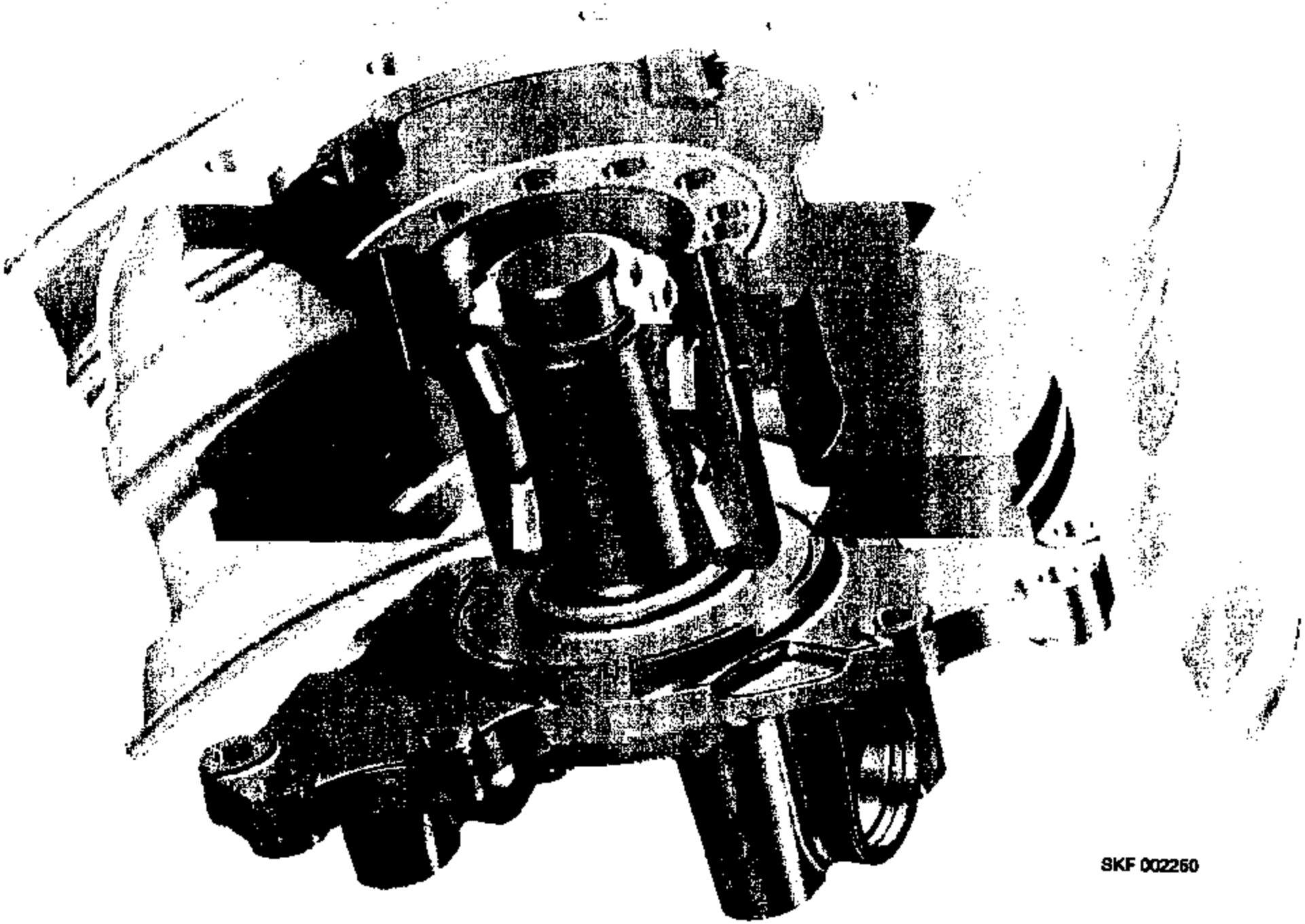
Subject: European Wheel End Design

Response to: Actions and responsibilities of Competence Areas

Category: Projects

Just for comparison a picture of an European wheel end.

Man_fr~1.jpg



SKF 002260

Discussion

Main Topic

Class
Reinnberg/GHQ/GOT/SKF
05/13 12:18 PM

Subject: Product Liability Minutes

Category: PLB

Minutes PLBs

PLB THU2 - Arvin Meritor 200204.c

PLB2 THU2 - Arvin Meritor20020408.

PLB3 THU2 - Arvin Meritor20020412.

PLB4 April 16.doc

PLB5 April 19.doc

PLB6 April 26.doc

PLB7 May 2.doc

PLB8 May 8.doc

PLB9 May 13.doc

Product Liability meeting April 8 2002
THU2 issue - Arvin Meritor

Participants:
Tom Johnstone chm.
Bernd Stephan
Bill Farrell
Juergen Schultheis
Achim Mueller
Claus Schultz
Rick Frett
Arno Stubenrauch
Michael Lewis
Claes Rehmberg secr.

1. ARM meeting Friday 5th
R-Safe seals reworked during last weekend.
ARM usage 200 pcs/day
Aiken is defining a process flow / approval and signoff for the reworked products. (Chris Jones)

2. Warranty Report as reported by ML:

Steer THU Warranty Return

B. Weeks 18 Mar 2002
530 Total Claims in SKF Database (as of 12/31/2001)

Corrective Actions Taken by SKF	Percent of Claims
Switch to GW-Z Grease	
Grease Egress	10.4
Switch to R-Safe Inboard Seal	
IB Seal Leak – Contaminant Ingress	15.6
Induction Hardening Equipment & Procedural Changes	
OR not hardened	3.8
Corrective Actions taken by ArvinMeritor	
Increased Hubcap Torque	
Bearing Failure – Run w/o Hub Cap	2.6
Switch to MolyKote D Anti-fretting Compound/O-Ring Seal	
Removal Damage	5.7
Water Intrusion Along Spindle	1.9
Rotation of Hub Unit during Torque	
Low Clamp Load	6.8
Field Bulletin on Inspection Techniques	
No problem found	27.6

Tampering	1.9

Total percent Claims Addressed by Corrective Actions 89.5

Claim Categories Not Directly Addressed	Percent of Claims
Root Cause Not Determined	**Total 14.0**
Returns too advanced to determine cause	
Customer Abuse	**Total 7.5**
Impact Damage	7.5

Total Percent claims above 91.0

By the above report it shows Sealing is the single largest reason, but there exist also other reasons for warranty issues.

- Question: Did we specify to ARM they need to rotate bearing at mounting. The answer was yes, however sometimes they have not done so.

Investigate by calculation the potential implications if bearing not rotated. (AS)
Results to be discussed with ARM. (ML)

3. Bearings from field tested
100 units were collected for testing from the field having been used since 1997.
1/3 Had no seal wear
1/3 had moderate seal wear
1/3 had heavy seal wear (contamination between seal lips)
Basically the same war pattern have been found on units running on trucks in Europe.

4. R-safe seal claims
The R-Safe seal was designed to have a better performance - especially due to better resistance from contamination.
R-Safe seal better performance than Freudenberg (hereafter called FB) seal
Conclusion: The failed 6 R-Safe seals returned shows following
15 returned for claims. 8 not justified. 7 justified, whereof 6 due to seal leakage.
Seal leakage due to not correct molding.

5. Detection methods
Two priorities:
Stop Wheel-offs and design and implement a reliable detector.
It was concluded that the majority, but not all, of trucks have ABS/warning lamp in cab. Since March 1st 1997 there is a law in US of 100% ABS/warning lamp must exist.
ABS signal are also warning for other errors/events.
Conclusion:
ABS is not a 100% reliable detection method. We therefore need an additional detection method.

It was decided to have a team working on creating several detection methods. (BS/AS). A time plan to be defined within 2 days; including development, testing on rigs in Detroit and approval from ARM (D. Bell). Possible solutions could include heat sensitive device, smoke creation, and marking colour the wheel (dye).
A complete solution could then include ABS instruction, smoke and dye. Information on detection solution to NHTSA to be done a.s.a.p.

6. Service life expectations
Questions:
Is FB good enough for 1 Mmiles ?
What is the calculated L10 life of the whole unit (AS)
Service test / mud & slurry test done ?
Answer was that RVI test was made in the 80-ties (mud and slurry)
R-Safe seal lasted all 13 weeks, FB failed after 2 weeks.
Based on the knowledge above what to do with the 340.000 units ?

- Changed when failing
  or
- Change before failing
  and
- will the R-Safe seals last for 1 Mmiles ?

(Volvo TMU specs says 650.000 Miles on a 13 week std Volvo mud & slurry)

It was concluded that L10 can only be calculated on the bearing but not on the seal. Only solution is to get high mileage units from the field for investigation. We need to renegotiate warranty terms.

7. Information to ARM
We need to answer to ARM following two questions:
(out of the required 30 days for answering we have approx 2 weeks left)

<u>1. What do we do with the current FB seals in the field</u>

<u>2. Warranty terms for R-Safe seals</u>

In other words are we happy with replacing FB with R-Safe ?
In the phone conf between ARM and Tom the following was discussed:
High failure rates in the field
High peaks of failures last 18 months
ARM want to have a vision from SKF on what to do

It was concluded that the original choice of using FB seal in the units was a mutual decision between ARM and SKF, based on the good record of field performance. These documents should be captured. (BS)
Also documentation on test. Did we show this to ARM. Capture these documents as well. (BS)

8. Actions on R-Safe seals
Get parts from the field covering the different 15 lots for investigating the occurrence of moulding defects. (ML)

How many per lot do we need. JS/CR/ML to verify the amounts.
This data is needed in 2.3 days.
Concentrate on the main moulding defects

10. Other actions
We also need to decide what to inform to Freightliner.
We need to get hold of all failed units from the field. BF will come back on how this could be done. (BF)

Moulding in Elgin (compression) Tools mfg will take 20 weeks.
Moulding in Opladen (injection) Tools mfg might take approx 4 weeks.
Bernd and Bill to work out a solution on the mfg of the seals. Tom wants decision/plan urgently. (BS / BF)

Next PLB meeting will be on Friday April 12 at 16:00 European time.

Secretary: Claes Rehmberg
Verified: Tom Johnstone

Product Liability meeting no.5 April 19 2002
THU2 issue - Arvin Meritor

Participants:
Tom Johnstone chm.
Bernd Stephan
Robert Bondy
Achim Mueller
Rick Frett
Michael Lewis
Claes Rehmberg secr.
Bill Farell
Aurelio Nervo
Info:
Juergen Schulthels
Claus Schultz
Arno Stubenrauch

1. Current status with ARM

- Deliveries OK
- EDI deliveries started April 19.

2 Rotating / not rotating the bearing

- test made in Schweinfurt lab.
  - heavy marks shown on raceway (p.t.v. 7 micron)
  - ARM notified of outcome - but no comments from them
- life test to be started on test rig - look for early spalling AM
- one good unit to be tested for reference

this test will take approx 1,5 weeks

- Other units (20 pcs) received for testing AM
  - non rotating test
  - stud removal test
- depending the outcome of the life test we shall plan how to bring this forward to ARM BB

3 Stud issue

- no broken studs given to Ingersoll. Get these from ARM ! ML / BB
- Freightliner says over torqueing is the major problem
- investigate how studs are dismounted and mounted ML

5 Detection method(s) development status

- ARM want to have a more clear signal to driver e.g. sound alarm and stains on the wheel
- we need to have a clear common position regarding detection/alarm from ARM. ML

- temperature threshold to be confirmed. ML confirm again
- tests of the chemical composition for the smoke generator to be finalized. A

6 R-Safe seal

- extra inspection (3*50 Tmiles) to be done through checking end play and rough rotation on bearing. We need to specify the inspection method and training package ML
- test report from RFT to be send to PLB members AN
- we should ask to get the 22 not failing units back (only seal). these to be send to Elgin for investigation. ML
- the May 01 to Oct 01 units to be requested back ML/BB
- Juergen S, Hans K, and Dave Young visit Bethlehem for investigating quality, scrap etc relating to the molding defects on some of the shipped lots
Report next PLB JS

7 Misc.

- information to SKF insurance company done CR
- they will be cont. updated CR

Question:
Anything we need to do additional to what is currently ongoing for the human safety ?

- **PLB unanimously agreed that we are doing the right things.**
- **this is also confirmed by our customers**

8 Next PLB will take place April 26 at 15:00 Euro time
(same number +46 8 500 528 01)

Secretary: Claes Rehmberg
Verified: Tom Johnstone

Product Liability meeting no.6 April 26 2002
THU2 issue - Arvin Meritor

Participants:
Bernd Stephan
Robert Bondy
Achim Mueller
Rick Freit
Michael Lewis
Claes Rehmberg Chm & secr.
Bill Ferell
Aurelio Nervo
Juergen Schulthels
Tim Gifford (partly)
Info:
Tom Johnstone
Claus Schultz
Arno Stubenrauch

1. Current status with ARM

- Deliveries: Shipment from Aiken increased due to sales increase
- Deliveries OK. (see below for stud out of conformance)

2 Rotating / not rotating the bearing

- life test started on test rig - aim to have test results for PLB7
- one good unit to be tested for reference: ongoing

- Other units (20 pcs) received for testing AM
  - test results aim to be finished for PLB7

3 Stud issues

Stud hardness:
-Studs found out of conformance on hardness
specs: 39 - 43 HRC
found: up to 51HRC
- Ingersoll got samples last week. Awaiting their response.
- Check the ISIR in Aiken. JS
- Hardness etc counter measured in connection to ISIR ? JS
- Impossible to break studs in SKF labs.

Broken Studs:
- not possible to duplicate fractured studs in SKF lab.
- questionable if over torqueing is the reason for the broken studs in the field.
- important to find the rootcause
- concluded that the fracture is impact not fatigue based.
- question: why was 6000 studs ordered by customer last year ?
- fractured studs to be send to Schweinfurt for material test ML/AM
- Challenger fleet: 115 trucks with broken studs (reported from 3 garages)
- Ingersoll to be fully involved in this issue.
- involve purchasing. They need to inform Ingersoll / letter RF
- replacement of studs May 6th

- Check stud lots in Aiken / correlate with brgs. JS
- one person hurt in Canada while torqueing due to breakage
  - compensation rules in Canada to be checked RF
- point still due:
- investigate how studs are dismounted and mounted ML

- Procedure how to deal with the stud issues to be defined BF / RF
- BB to communicate with ARM BB

4 Freightliner meeting

- 7000 units on Ryder trucks with Rsafe seals. They want us to replace all.
  - (depends of the result of the track test) see below

Testing on track

Testing ordered an will start immediately. (test program was send out to PLB)

- decided to have noisy Rsafe with low mileage on test
  - conclude whether 50 Tmiles will take that.
- check test procedure with ARM and Ryder BB
  - BB to check that test conditions satisfy ourselves, ARM and Ryder
  Speed is vital ! BB

5 Detection method(s) development status

- ARM want to have a more clear signal to driver e.g. sound alarm and stains on the wheel
  - decided to do this in 2 phases in order to quickly come to a workable solution:
    phase 1:
    - finalise and present the smoke generator device (with HW cost and cost for adaptation)
    phase 2:
    - look into audible / visual devices
  - we must inform our customer about this plan and get approval quickly BB

- ask ARM to put ABS signal as one warning into a ARM bulletin. BF
  - investigate feasibility of using pen with temp. indicator to be used by the driver BF
    (e.g. thermocouple on key ring)

6 R-Safe seal

- no lot found in Bethleham with increased scrap i.e. no correlations found between scrap and molding defects.
- inspection process in Bethleham found not to be sufficient.
- ALL PLB agrees on the need for the 3*50 Tmiles inspection plan
  - need to specify the inspection method and training package ML
- in the investigations on returned bearings found in several cases different reasons from customers and our findings (and in several cases no reason for return)
  - decided to make a spreadsheet showing "given customer complaint reason" in one axis and our findings in the other axis. BF

8 Next PLB will take place May 2 at 15:00 Euro time
(same number +46 8 500 626 01)

Secretary: Claes Rehmberg
Verified: Bernd Stephan

16

Monday
December 2002

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November 2002

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January 2003

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✓ Task Completed
— Planned Forward
Task Delayed
Delegated Task
In Process

↓ ABC Prioritized Daily Task List

Brad Arnold
— What are next
Steps in what to
do with Ports in
the Field.
100% inspection
of all 3 Peak
Peak Periods.

1- Technical Review
2- Commercial Discussion

~~[illegible]~~
list of what is
needed to Answer

Daily Expenses

Appointment Schedule

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13

Friday
December 2002

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29	30	31				

November 2002 | January 2003

✓ Task Completed
— Planned Forward
× Task Deleted
Delegated Task
● In Process

ABC Prioritised Daily Task List

Greg Neil – Aiken
Kim Lang
1. What is the Root Cause
2. I want his ABC
Making today
good.
3. [illegible] Process
in place to make
good Parts.
5. Does not want
His Buyer Tying up
[illegible] Daily
Conference Calls
Expediting Parts

Daily Expenses

Appointment Schedule

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Monthly Power Focus—
How will you utilize your energy, time, and talents?

— Muhammad Ali

Frida
December 200

Daily Record of Events

Fri
866 624-9381 Code 69850

Bach Test, will be wrapped up by NEXT week. 131,000 miles under TP0251

Restart Southwest Test - when are we going to start

Most Recent Failure date of A 1995 Hub.
9/20/98 Failed in June 2002
Now Freightliner claim.
300,000 miles plus

[illegible]/2002

NO NEW incidents.
ONE CR England was not a highly progressed incident.

A Customer - Old Dominion wants to order 981 Axles - what is ARM willing to do to ensure that they can use the product.

Meeting on the 20th
Stand only.

4888 — Kaplan — Wait Sym

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14

Saturday
December 2002

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November 2002

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January 2003

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✓ Task Completed
— Planned Forward
X Task Rotated
Delegated Task
In Process

ABC Prioritised Daily Task List

Ol Stevenson
Fred Stone
Reflections
[illegible] 525-3592 Chad Mado
Mentor Tolerance

Daily Expenses

Appointment Schedule

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11

Monday
November 2002

Veterans Day
Remembrance Day (Canada)

✓ Task Completed
→ Planned Forward
✗ Task Delayed
Delegated Task
● In Progress

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October 2002 | December 2002

1 ABC Prioritized Daily Task List

Phone 1 - Ryder
732 Hotel
2.19
less than 1%
actual [illegible]
Phone 2 732 Hotel - Non Ryder
Fork rate 2.05%
Fr Elmer [illegible] 2.7 [illegible] R/100
Early Wear [illegible]
(1) 8/98 to 3/00
Crowd Closure
(2) 4/00 to 5/02
inboard [illegible]
(3) 3/00 to 4/02
~~[illegible]~~ Spill
network spill

Freyhan has 86% of Progressive [illegible]
and 59% of the value of Parts

Daily Expenses

Appointment Schedule

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Doing the best at this moment puts you in the best place for the next moment.
— Oprah Winfrey

Monthly Teams Planning—
Effective planning doesn't limit freedom; effective planning promotes it.

11
Menda
November 200

Daily Record of Events

NHTSA Review Summary
4/23/08
Purpose
actions taken

Command Stand of life in the field
Next Steps
Develop End of life Criteria
Final Reference of GTP 025
Lessons Rollers for Electronics
Lessons Communication

T. Bluetooth
Tackle the spike periods
will need to be recalled.

58 Highly Progressive Events
out of 400,000 Hours
will meet again in
mid January.

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Daily Record of Events

Hotel
1-800 225-5288

Knight Transport - torque all over the place.

Chuck Smith 23rd Monday

Summary of all the [illegible] Unit

Disposal to keep the wheel on

Inspection procedure is 7 pos

Keeping [illegible] out any problem

[illegible] Inspection procedure [illegible]

[illegible] the procedure are key problem

Communication Field Communication to follow including Drive [illegible]

Madeline 2700

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11

Friday
October 2002

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September 2002 | November 2002

✓ Task Completed
— Planned Personal
× Task Deleted
Delegated Task
● In Process

ABC Prioritized Daily Task List

(1) 529 miles on the track
.090 end play

Field Evaluations
Phase 1 371 trucks
Phase 2 376 trucks

Failure Rate 2% for total study
Rate less than 2% due to maintenance practices.

Further 1.5 Normal Failure rate.

Maintenance Practices have a high effect on Propulsion incidents

YP 2501 is effective as of [illegible].

Daily Expenses

Appointment Schedule

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Daily Record of Events

SSt VL – Dom. Pk Pat Rent

CAt

Deere – 350 $

Deere 250 Rear – 133,750
Front 25,000
158,750
Throttle Shft – 13,500
172,250

10/

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1

Thursday
August 2002

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July 2002 | September 2002

✓ Task Completed
— Personal Reminder
X Task Deleted
Delegated Task
In Process

↓ ABC Prioritized Daily Task List

Tim Blubaugh – Prod Safety
Steve T – Ombudsman
Dan Fuchs – Eng
Jeff Shaw – Purchase
Billy Wortham – Test
Tony Moore – Director of Engineering
Bob Rockbaugh – Eng.

There were incidents of wheel off prior to 1998.

* – [illegible] to original inspection procedure of 200K will be reinstated on Nov 2002

Sample 800 trucks for [illegible] Health [illegible]
Focus on the 3 [illegible]
– [illegible] 60 days
3 [illegible]

Daily Expenses

Appointment Schedule

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Monthly Focus: Habits—
You shape your habits; then your habits shape you.

When the intensity of emotional conviction outstrips, a man who is in the habit of reasoning will search for logical grounds in favour of the belief which he finds in himself.
— Bertrand Russell

1
Thursday
August 2002

Daily Record of Events

Freightliner Position.
- 50,000 mile inspection is not acceptable for product that was sold as maintenance free

- Want to temporarily suspend usage of the product until they know that problems are not repeated.

[- Want Recommendation on Safety related recall or not.

[What were the Ludlow problems that show up as progressive incidents.

- Freightliner wants ARM recommendation on what to do - ARM recommendation today is to inspect 500 trucks

- Freightliner made plans to go to 961 Cycle,

Would like Ed play check done at Arden.

Moved to the 14th

10 Weeks

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2

Friday
August 2002

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July 2002 | September 2002

✓ Task Completed
→ Planned Forward
✕ Task Deleted
Delegated Task
In Process

ABC Prioritized Daily Task List

John Hoffman

Jim Albanese
248-703-8815

Bob Bondy
734-414-6822

Russell -

Ed Mcdaffe
Hap Bush
734-737-5660

Terry - mobile

Russell -

Daily Expenses

Appointment Schedule

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14

Friday
June 2002

Flag Day

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May 2002

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July 2002

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✓ Task Completed
→ Planned Forward
✗ Task Deleted
Delegated Task
★ In Process

↓ ABC Prioritized Daily Task List

Freightliner
Rest
40,000 Test Miles

S.W. Test
Continuing 12,000
Size disk for RF Front
LFt Front 7800

Ryder Meeting
Screen – 3 wheel
off and 2 on 3 wheel
Steering damper

17% fuel mileage
Coming for PM
and 8.5% dry
Coming for Truck
Design to the Fuel

Ryder Parts
25,000 to 50,000
Miles

Product is still
Low cost per Mile

Daily Expenses

9	Ryder wants a proposal for a product change list. To take the parts for an 18 month out of the and of service
10	Meyer Company to Vehicle Action 200,000 & 400,000 miles
11	Freightliner Recall Advisory Committee
12	Met 6/13/02 to review issues for possible Recall
1	– Chassis Tested for further evaluation.
2	Team will go to Pennsylvania and Monday. It is not a low Maintenance item.
3	– What is a useful life of the Heavy Duty
4	Open issue with Stella
5	SKF Needs to go out and get the Stella
6	
7	
8	

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Monthly Focus: Seaward—Sustain a reserve of physical, social, emotional, mental and spiritual energy.

and social well-being, and not merely the absence of disease or infirmity.
— The World Health Organization

Thursd
June 20

Daily Record of Events

Dave Mang Dale were made on May 3 1999

Congress - April 20 to May 15

Hul manufacture Points

65 Failures closing

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6

Thursday
June 2002

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May 2002

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July 2002

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✓ Task Completed
→ Planned Forward
N Task Deleted
D-Z Delegated Task
● In Process

Appointment Schedule

8

9

↓ ABC Prioritized Daily Task List

Trendline Item
-Wenatchee Employee
1995-33000 769 Hours -15 Wkoff 11-Fri = 2.9%
Rush 14,316 53 Hours -1-Wkoff 1 Fri - 3%
Oil Rel/Int 29,520 1,101 - 1 Fri 3 Wkoff 3.6%

SKF-Army 30 K miles w/ failure
No further reports of any additional incidents
Have flown 30 hours. Catastrophic inventory
app for catastrophic events 30

TPO 257 Plane inspection
Southwest test 2800 miles

Stud-Bogy Axle collected 40 More
all Hard - 1 Cracked Head

Ryder-SKF Army - investigation in
Tennessee - 3 Pilots of Pink Bus to
Meridian & Vehicle were looked at.

Expected To 10 Ale vs Stanton
with agreement Not Forgiving

1-866-684-9391
Code 69850

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Daily Expenses

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20

Monday
May 2002

Victoria Day (Canada)

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April 2002

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June 2002

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✓ Task Completed
— Planned Forward
✗ Task Deleted
Delegated Task
● In Process

ABC Prioritized Daily Task List

★ Need Date
Air leak test
instituted
Will initiate
a Service company
to inspect at 50,000
mile. – Basic inspection
Want to pick a
Fleet and jointly
SKF [illegible] –
go [illegible] out and
run Basic Test.
Want to do [illegible]
[illegible] a week

Daily Expenses

Appointment Schedule

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10

Friday
May 2002

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April 2002 | June 2002

✓ Task Completed
→ Planned Forward
✗ Task Deleted
Delegated Task
In Process

ABC Prioritized Daily Task List

Freightliner
Tom Blubaugh
Mike Hatch
Tom Rogers
Steve Payne

Hub Durability
ARM TEST Vehicle
Driver Feedback Test

SKF - Southwest
Research - Start up
Monday & Tuesday
To Validate the
50,000 mile Test

Wheel off
Portland - 3mo ago
Tacoma - 2 mo

Freightliner has
58% of the
warranty
Freightliner 1981

1996	8,158	85.%
1997	12,394	69.7%
1998	21,960	56.%
1999	32,908	58.7%
2000	23,882	53.%
2001	9,480	53%

Daily Expenses

Appointment Schedule

8 The 11 Post 2000
Lip Seal Situation
70100

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4 Reduction (Oct-Sept)
Fiscal yr

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Monthly Focus: Change—What can you change to lead your life forward?

There is nothing like returning to a place that remains unchanged to find the ways in which you yourself have altered.
— Nelson Mandela

9
Thursday
May 2002

Daily Record of Events

R - Life test - when

2nd Sit of [illegible] -
- Stile Running -

(1) [illegible] Brown -

(1) Dr Chatelin -

TEXTRON - CAM CAR

George [illegible]

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7

Thursday
May 2002

Ascension Day

April 2002

June 2002

Appointments

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ABC Prioritized Daily Task List

Daily Expenses

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Original Classic

25

Monday
March 2002

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31					1	2
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February 2002 | April 2002

✓ Task Completed
→ Planned Forward
✗ Task Deleted
Delegated Task
● In Process

↓ ABC Prioritized Daily Task List

FF987

→ 3 Components
→ unsatisfactory performance Rate of 2%
— do not see any improvement in performance
— 100 occurrences of fire or wheel off
— SKF needs to come back in 30 days with a comprehensive plan to fix the problem to an Acceptable Level
— 16 wheel offs — 12-13 since Jan
1 Remove
2 Change Suppliers
3 Can not live with current situation

Looking at other Suppliers

Market share has dropped from 50 to 25%.

SKF has not been as responsive as expected

Daily Expenses

Have 2 Pending Lawsuits today.
Failure Rate must be 1% or less

Appointment Schedule

8 will come to us to pay for trucks that burned up above $60,000 per unit.

9 * Prime wants to Retro fit 2500 trucks.

10 KLLM — wants definitive answers — who will pay for added maintenance?

11

12 * 72 First Time claims
20 previous Service

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Freightliner / ARM - Martin Pentwork

Date 4/17/03

75,000 Vehicles Since 2001
250,000 Units

2.4% incidents
30% have no problem (623 Hubs)
[illegible]% Seal issues

.03% is Progressive Events

July 2000 - New Seals in Hubs.

Bulletin 0251 - Specific inspection
Every 50,000
- Bulletin Sent out from Mentor
Customer Dept.
* Freightliner Concern a portion of the
Customers are not notified - Small customers
Fleets etc.
* Concern - Customer Backlash to inspection
Schedule.
90% of Progressive incidents occurred on the right hand Side

Land Warranty disposition requirements beginning May 1st.
Concern Need to ensure that all customers
are notified. - Safety campaign - outside

Ryder - returned [illegible] Hubs for inspection
20 Have been inspected - 3 have bearing Spalling
400 to 600K
CR England has - 3 issues

Concern - what happened prior to July 2000
where the concentration of failures is concentrated

Freightliner Docks
301,000 - 1999-2000 (560 Claims)

Concern - [illegible] [illegible]
[illegible] - Could [illegible] be out in field
[illegible] on Unsold Trucks sitting on
lots. (1999-2000)

Concern - More than one failure
[illegible] - [illegible]
Concern - Not doing anything Positive
[illegible] field to Notify Customers
do the inspection enough to protect
the Customer.

Concern - as soon as Customer notified
[illegible] will be notified Automatically
Concern - IS Notification by Bulletin
or Service Campaign Notification Enough
to Protect Customer & US.

Campaign Bulletin will go to NHTSA

Concern - How Much Warning would
the Hub Cap Detection System give.

Wabash Trailer - Has incorporated
Turkey pop up in a Hub.

ARM - Needs to communicate with Ryder
about

[illegible] - [illegible]
R-Safe Seal in Field - what do
we do about the current population?

Ryder needs to know what they do about
inspection
Suspect Seals.

No Lot 1 & 2 Seals found

* Ryder will want to know who will pay for the

Integrity is doing the right thing, even if nobody is watching.
—Jim Stovall

Monthly Focus: Values—
Are the things you value most governing your decisions?

17
Wednesday
April 2002

Daily Record of Events

107th Day 259 Left Week 15

added inspections

Steel
- Freightliner aware that Steels due fail due to overtorque etc.
- Consensus - all defective material gets in the field.
Freightliner uses standard practice for steels and Not High Strength Steel - Would like Steels to Break rather than yield.

Ryder — Needs confirm 50,000!
will recommend inspections at 50,000 miles including Units with Rear Seal after 7/2000.

Ryder currently purchasing 200 Vehicles per Month with SKF Hubs.
→ Repeat test

Steels - Hammered out - Damaged
Flange Repair Etc.

Freightliner
Reduction

Who Days?

50,000 miles
① Driver Feedback — Recommendation
② NEED to Confirm 50,000 mile Inspection INTERVAL. Will Use Hubs Retrieved from Ryder with Rough Rotation.

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18

Thursday
April 2002

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

March 2002

S	M	T	W	T	F	S
31					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

May 2002

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

✓ Task Completed
→ Planned Forward
X Task Deleted
Δ Δ Delegated Task
■ In Process

↓ ABC Prioritized Daily Task List

Dale Bell
Ryder
– Next week
Spalled Units
running by end of
next week
248-435-1031

OEMO Off Pkwy
Magazine
920 53°
Chester

(7)

Daily Expenses

Appointment Schedule

8

9

10

11

12

1

2

3

4

5

6

7

8

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EMBASSY SUITES
HOTELS®

Freightliner
400 Trucks – 200 Hubs –
Ryde & [illegible] England (Forget
Less than 1% of all Hubs
Had problems
Mileage Range (New to [illegible]
Bad test [illegible] Miles and
45° [illegible]
S.W. test
77,000 Miles and .075" End Pl[illegible]
250° Spike – Drivers Complain
of vibration with Braking
(moving) to Truck

1-800-EMBASSY
www.embassysuites.com

2 more Fires (Prior)
1 wheel flb
no injuries

PLT 4/25/02

Rockwell Hardness —

39-43 - Rings, 40-48

1. Deliveries OK
   accruals - Debits
   Inventory Replaced.
2. Rotating
   life Test - in process - Some information possible
   actual failed Ports show inner ring Spalling.
   20 ports in Schweinfurt - Hope to have results by
   end of Next week.
3. Rotation Avg of 2000 in production
4. Detection — Warning - Contain Risk
5. Stud issue
   out of Spec with Hardness
   Both in inventory and in the Field.
   180 pcs. Shipping to ARM (400 to 500 Ft LBS - Spec)
   Challenger - 115 Trucks - want the Studs Changed out
   — ON (11/2001 - 1/2002)
   Cost of replacing Studs
   2 Hrs per Truck x 75.00 per Hour
6. Rich will work with Purchasing to Make Ingersoll

Data agreed to change Studs
— Challenger.

Thermal Couple — Key Chain

Hub UNIT - If problem exists at 25,000
will the unit last 50,000

Issue - 3 Ryder Parts
OnBoard Roller Issue -
step in the Raceway of Bearing

what does Ryder Really want
From our truck Test as compared
to Pric Bell

tom Quatso
Root cause
Corrective Action

1) plan to go out and get more Parts

2) 99 & 2000 vintage

PLT 5/2/02

Delivery – Now Stud Problem
Ingersol is shipping Parts that are harder than Spec
appears Shipments started July 2001 (SKF Hubs)
currently Shipping on Deviation
Spec. 43 Parts 44.5. We need to validate these
Parts for ATM to accept the deviation.

* Dave Zimmerman – 3/05
– Take picture of units that the Studs
show witness Marks of Hammer Blows.

Ryder – is 50,000 mile * Sufficient to
~~[illegible]~~ or should it be Less?

DAVE SIMMS - TIME LINE FOR DAVE'S
TEST 100 HRS

OK ☆ Compare Seal Parts with Aiken
Parts with High Mileage.
- Call Dave Zimmerman

OK ☆ Send 120 Units to Germany
Unexpired Height Mileage
Leichau & Aiken
R Safe Seals

Ed Cotter - Ingersol
- Davy Turney - 8D - Corrective action
Shipments going fine

PLT

5/7/02

① 199810 – increase in IB Seal leak & No problem found

② 199906 } Need to Study what happened
199907 } during these dates at both
199908 } Aiken and ARM.

– analyze Seals from above dates ~~as well~~ vs Seals from another dates. – look for Cure State.
Luchau Seals vs Aiken Seals
– vs Wares.

R Safe – changed out all Bethlehem & Aiken Inventory.
Started actions for Southwest Truck Test.

Need to talk to:
* Doug Bayers – Contact Aurelio Nervo
2 Programs
1. What can we do to reduce Scrap rate
2. Can we enhance design & Material

What does it take new tools Etc.

★ Need to call Brad Arnold.

2000

Monday – PLT 9:00.

O.Rings Depletion & Rotation –

SKF 002290

Action Items

I Brad Randall in on Friday

II Fred. Seals - Dave Cure State Test in progress

III Boyers on Vacation.

5/15/02

Studs from Ingersoll
Soft on the core?- [redacted] Rockwell C (33-39C spec)
Hard on the outside 45-48 39-43.
lot Size. 450+ VIKERS (380-420 spec)
Core is ok as is. If it goes again it would affect the core.
All A's & B's Have been within Spec.
Except the Parts Recieved under deviation.
Ingersoll Has a continuous flow furnace
Batch Size is Heat of Steel
A NATC and Aiken both showing the same measurements. Ingersoll is showing difference.
Aiken out of B's
will be out of As showing 450+
When is Ingersoll Expecting to Have Virgin Product - would be. May 27 if we change Lower Surface to 354.
Ingersoll can Run Parts at Lower Spec to see if serations cut into the groove's
Retempering to Run Test.
All Studs that Have been Returned Have been over 50 RC., All Parts in House are below 50
~~Parts under Deviation 23-43~~
Parts Recieved under deviation were 423-431
What is the best outside date we can get another Stud Source up and running?
- wire diameter 26 mm.

Option #1 – Ship parts to OEM and have OEM change them out in rework area.

★ If we contact our customers the Steel issue comes out and everyone knows becomes aware Then we must Notify NHTSA

Wire diameter.
40 - 42 H
26mm

★ WHO owns the tooling at Ingersoll? If SKF owns the tooling can we move the tooling from Ingersoll to another Vendor (MASCO Tech)

★ Can we have Masco tech Heat Treat Ingersoll Virgin product?

ARM will have Parts until 5/22 –

★ Pull Studs from SKF Allentown and take out Studs that are 1mm longer. Use them temporarily Perina. to SC – Plant will change out.

5/30/02

EUROPE — what is the Amount used in Europe.
— Amount of Grease in R-Safe — How was
— what is the teeknage of grease installation between NA & Lucshow

Bethlehem
WORK INSTRUCTION
what was criteria used for Inspection
what is Quality Blend into the field.

SALT Spray

5/31/02

Water intrusion along the Spindle —
— Inner Ring Sealed with O Ring —

~~pop up~~
temp Bolt — problem PAINT 400°?
Seal Lip pattern —
Low Clamp load — Disputed.

Bernd Stephan — coming over next week to meet with ARM.
M. Hunter
T. Bogan
K. Pluhan
T. Moore

~~Dove Wilkes~~

Freightliner

Customer doing PM's at 25,000 Miles Finding (+P 0251) Hubs showing End play without checking end play.

Service Parts Shipments

	1997	98	99	2000	01	02
[illegible]	105	352	1022	1783	3291	3517
[illegible]	14	133	568	1154	2024	2462
Freightliner %	13.3%	37.8%	55.5%	66.4%	61.5%	70%

1999 AAA total Asfls 56,941 Freightliner (32,907)

Freightliner warranty 2-3% range

- Apache -

Service Campaign -

200,000 (50,000)
17,000 Accrual $77,000

847-742-7845
Service Campaign
ARM - Contact Name & Number
Targeted Units - Need information from ARM & Freightliner.
Chuck Smith - TPO 251 ( )
Units for replacement.
Co-ordinate

- 200 replacement Units
60,000 trucks?

22nd global

How Many Units

13,000 - Start up
15,000 - April May Hawaii
plus "R Sofe"
15,000 Trucks

Cleveland
120 Units Build or WOP - NO repairs yet. (60 at Freyblen 60 at Drive away Carpet
3,000 stock on hand.

Santiago
4 Trucks in yard - on hold
~~X~~ -

Correspondence

12/02 Cleveland Complete
Santiago MX - 5 Truck get out
Replaced 100 Stock or 47 Trucks.

2.4
+ 3

Stud lots -
Need to change out all stud for ~~lot~~ suspect ~~lot~~ dates
~~1,000~~ that had break away torque of less than
600 ft lbs.

OK

H

Stud Issue
- Sporadic Spinning of Studs on Torque
1 or 2 Studs per Hub. (Short Studs)

CR SERVICES

Mentor has been retrofitting studs at Cleveland Plant.

Studs that have been pushed out show that the stud is not biting into the Hub.
- Hole size is Nominal
- Chamfer is in Spec.

2805
2801

2802

On Hold
- 61 Truck at Transportation
31 at the Plant
Suspect Trucks

$300 to $500 a day for holding Trucks up

Call Arno —
91 Trucks on Hold
Will Send 2800 Studs to start changing out Studs. 100 to Santiago Mx

8,500 On Hand

16 Trucks have been Shipped that will need

2 Batches of Studs 9/23 - 10/7

500 FT LBS

1,500 Oyles Maximum

Studs - Min 4.02 a Dia - 1200 Newton Meters

Measured is. 410 - 450 Nickel

SKF 002298

SAP	2002	Fcast	BP
2001	YTD		
2071	1299	1651	2084

CR SERVICES

more Production Back to Luchow

Temporary Change — 400-450 Vickers

Clear manufacturing Problem.

Total improvement system — need to change - Wash & Nut.

Freightliner 7/24

Southwest test 42,000 miles

End play detected

1 to 2 ounces of water detected in Hub Cap.

Do not know source of water ingress

Bosh Test

71 923 miles to date - No change in Status reported

Temperature has risen but no end play detected.

Inspection device

Mike Lewis at Ryder location in La Vern Tenn. Mileages varried from 720,000 up to 890,000. One Vehicle out of 8 had had hubs replaced.

7/14 CR England Vehicle that Burned last week - NO Details - 278,000 Mile 9/8/00 in Service Dt

KLM Vehicle reported Some incident last Friday.

SKF Building Bank of 5,000 Hubs based on Weibul Analysis to replace increased Hubs that may come in due to new inspection device.

1,400 Hub Failures to date.

SKF 002300

Freightliner

981 axle Has no confidence in current production being any better than past production.

- Feeling at Freightliner is that they will shut off usage of 981 axle.
- Decision will be made in a few days.

Southwest Test

38,580 miles as of yesterday 7/17/02

Bash 57,898 miles

- CR England Tuesday - Tractor Run up and Trail.

- LAVERNE TENN - TOOL TRY OUT. (20 Hubs)
- Need to increase the service - 2,000 pcs + 2,000 more.

6847
6834
563-340
0327
Bob Banks
Bar Cox
-770 967
5221

4236 Hubs Sold as replacements.

40% of Hub returned for NO Valid Reason.

Combine builds Increase

4,000 to 5,000 ☆

25%

Tom Sonko
Chuck Smith
- Campaign issues
500 - Vehicle
NOVEMBER - NEW Hub Cap. ?
200,000 Mile
Root Cause and Inspection -
Go back to other OEM's and give
SAME presentation.
E-MAIL SAYS 10 WEEKS
NEED TO UNDERSTAND the decision
- other ISSUES
- make sure How we play... the production

981 - Loss of Profit
Is our Hub & System Adequate for the
Application?

- Con Met.
Merits 6,000,000 Cost reduction
to Freightliner

8/29/02

1) Units Made Shipped in Spec. are Still Showing End Play at ARM 10-50 microns
Usually Run 15 to 44 microns -

2) Will run 10 Units that Measure the Same and take them to ARM install them to see what if any Variation is

3) Need to get 6 units to Arno that have Clearance to Test.

4) 150 Truck = 3,000 wheels and 9 resets.
27 replacements have already been done on these Vehicles.

★ - Arden working thru the Weekend
- need a number

8/30/02

Freightliner 866-624-9391

Bash Test - update no change - No End Play detected. Came off SKF lab test - so we know it had a spall to start with.

500 Unit Field test - 100,000 to 700,000 Ave 400,000

364 Hubs checked (264 in Data Base)

12 Units Rejected at greater than 2.0 looking to see where threshold should be set.

No Noise or End Play detected.

5 of the 12 are in Troy.

only one showed up at PM

3 units looked show no problem Found.

2 units show damage (4.0 or Better)

- 1 Failing
- 1 does not show Failure State

Most of the population registers Below 1

1) Mount & check for End play & noise
2) look at Bearings
3) look at Cone & Rollers
4) look at Seal.

- No Reported additional incidents

CR England - Satisfied with information given want their Units checked by the Monitor.

SKF 002305

1-866-624-9391
4351406

mandy the [illegible]

350 Trailer — 8 hr Set up

Need — 16 hrs to run [illegible]

Grinding
Honing
Assembly

> seeing if Germany can grind & Hone Post

Need - To prioritize

Trailer 100 Day

Arden 300 Day

what

Is Arden working over the weekend.

Arden	Florence			
working weekends	32 - 1200	Past due	Steer	(600-arden)
200 of Each Per day.	34 - 700	Past Due	Steer	150-arden)

32 - 890 - Thru tomorrow
34 - 387 - Thru tomorrow — 650 replacing 34's to Florence

Steer Build rate
270 - 315 pcs per day. — working - 10 hrs per day and over the weekend
- Could make 315 per Shift - Second Shift Trained by Mid - September
1) Working full Shift plus 2nd Shift for Assembly.
2) Problem is people power.

Need Plan

SKF 002306

From Ch vertical [illegible]

PLB 10/22/02

Add

Title - Page 4 — Objection FF981 (And) SKF Hub Unit
— Sealed for Life — Replace with

Page 5 — product designed to Operate in preload to slight Clearance
.001 preload to .001 clearance

Page 9 — Last Bullet is it tied to page 12

Page 9 — Root Causes
Water Ingress
* — along Spindle
— Hub Cap

Slide 10 — Add — Increase in end play Causes ABS Light AS - 3 post

Slide 12 — ARM/SKF jointly developed?

Slide 13 — Last Point — Phase I & Phase II

Page 16 — Driver (Visor Notice etc.)

* Can we see the final draft of your agree to our changes

Patrick Bailey —
46308 - ~~SSF 14~~ Scotsend
Bedford Heights -

FORGINGS – Oct 21, 600 to 800 pcs.
Due to not getting

to Debut Oct 10 – 9:54 – 12:09 – AA 1708
Notes Oct 11 ~~2:59 3:18~~ AA 1430
5:00 170.00
Omega Sector Laronic

① Mike – Dick
Tom Sonko – Drive Industry

Claes Rehnberg
10/08/2002 08:11 AM

To: Bernd Stephan/SCH/SKF@SKF, William J Farrell/ELG/SKF@SKF, Juergen Schultheis/SCH/SKF@SKF, Achim Mueller/SCH/SKF@SKF, Richard W Frett/ELG/SKF@SKF, Arno Stubenrauch/SCH/SKF@SKF, Michael D Lewis/DET/SKF@SKF, Robert J Bondy/DET/SKF@SKF, Rick P Morrow/AMER/SKF@SKF, Edward F Cotter/AMER/SKF@SKF
cc: Tom Johnstone/GHQ/GOT/SKF@SKF
Subject: PLB Agenda Oct 9th

PLB Oct 9th 15:00 - 17:00
THU2 - ARM

Tel: +46 8 500 526 01

To be able to keep the meeting to max 2 hours, please report the status brief and concisely.

Agenda

1. Warranty analysis update (Lewis) 240 Highly progressive -21 Fires -20 wheel offs
   Update of failure rate vs production dates (new info only) (Morrow)
   Rate updates
   Field incidents > may 3 Higher Failure Rate Lower Mileage to failure

2. Aiken Process/Product improvement activities (Cotter) as of Aug. 15 process in Control
   Clearance gage performance update Meritor Questions Aug 26
   Correlation/confidence of clearance measurement between Aiken, Luschow, and Schweinfurt ?
   Training of Aiken personnel
   Raceway form improvement
   End drop change (Mueller) - CAN start ordering as of today (Diamond Dressers)
   New Inner Ring Diamond Dresser delivery date - End of November.
   Bernd gave Looking into Sending people from Luschow for training Aiken People

3. Vibration Pen Production (Lewis) - First production pens Received
   Kit plan - ARM
   Field test results - 270 Ryder Trucks = .7% Failure Rate - Ryder using TP051 (99, 98, 2000) will be reviewed with Freightliner on Nov 1. - CR England failure rate 15%

4. Schweinfurt investigation into mating components (Mueller / Stephan) Meritor Paying for 1st 500 Kits today
   Retaining hardware
   Spindle/knuckle
   Need to understand outering spalling & Axial Clearance along with tightness of System

5. Conclusions (Stephan, Lewis, Mueller)
   Main cause of failure update
   Update on measurements on the peaks
   Communication to ARM
   - Knight Transport results will force ARM to notify NTSA

6. Studs (Weeks) - Ingersol -
   Test results summary 2 more Bolts at Challenger - were they Broken on Replaced Studs or New Studs.
   Aftermarket stud sales (as an indication of field issues)
   Expected performance of parts in the field 10,600 1999
   Forward plan - 6 wks to complete tests. 4 Run 2001
   LAKE ERIE IS NOW APPROVED. 9,500 2002
   5,100 Feet

7. Reporting requirements (Frett/All)
   "Driver education"
   Draft letter
   Forward Plan

Regards,
Claes

PLB 4/4/02

- Saftey #1 objective

F. Seal used until May of 2000

12,000 - 13,000 on

14,000 LB Axle - NEED to Find out what Axles weights are used on these trucks

Grease Pack Amount

Luechow vs Aiken

1998 - ABS Required

which Vehicles Have Warning Lights - Law Says March 2001

Does ABS Pick up the Steer Axle?

Is ABS a Reliable detection devise?

March 1, 1997 - ABS Law

July 1998 to April 2000 - what changes have taken place.

- Dave Simms - Need pictures of failed R-Safe Seals

Gastonia original production site of R-Safe. Early 1990's start of production

* Rework Wrist Pads - 3-4000 loose seal
- Disassembly
- Clean Seal
- Inspect
- grease amount

* Send Set of Metals & Mold Drawings Spring Etc

SKF 002311

R-Safe Seal

2-ISSUES

Identified correctable issues with the mold

- Eliminate Tears
- Eliminate unfills

· Grease fill can be corrected

3 weeks to do all work.

total 5 weeks to supply Volumes

Pickers — Does not work well — Tears

Change fill Parts

- Change Metals
- Recommendation — Part needs to be redesigned

PLB 4/8/02

Friday meeting at ARM

Shutting down ARM & ARM customers would kill the product line.

CR Reworked Parts to keep production going at Akien & ARM

200 pcs per day.

180 } additional 500 shipped
90 }

molded new Parts yesterday

Hubs marked a serial number recorded.

Chart repairs per Qtr.

Hub rotation - ARM not doing consistently prior to 6/2001. 6.8% of current failures.

Problems

inboard Seal Problems 16% seal related failures.

Need to develop Primary detection system.

Warranty Terms - May need to renegotiate mileage of contract.

What do we do with the units in the Field with R Safe Units

Brad Arnold
Integrity
Supply issue
Waste -

Field Sales people to call in a month and Home Posts Shipped
back that are not usually sent back by same fleets

Sufficient Volume

* Need to add all information on New graff of Octavia.

PLT 4/19/02

- Deliveries - ahead of Schedule
- Rotating vs/Not Rotating - A Mueller
  Found Some damage on First Test
  Second Test 1K weeks to see if damage affects life.
- Stud Replacement - ARM recommends removing the Unit to replace the Stud.
  SKF Studs a modified 10.9 - Higher Case Hardened.
- Is SKF stud replacement higher than Normal? What is the Norm?
- Current Stud Situation
  Higher than Normal Hardness
  Material Yield Strength vs Coating
  Need Coefficient of Friction Test.
- Ingersoll largest Stud Supplier
  ~~Prior to 5~~
  Inspection - up to 200,000 ~~we~~ the First two we should probably be responsible
- ★ Talk to Rosenthal about preferred Detection Device
  1) Smoke 2) Audio 3) Staining the wheel
- ★ Production Numbers with Extra grease 3,000
- Dale Bell wants us to give him a flut.
  After Market Studs are marked with an X
- ★ Mike Lewis & Prepare Document to response to Meritor.

6/7/02

NHTSA - Request - THU2

Paragraph
1- Bob Will Do
2- ARM - Data Base
(A.) SKF
b. - Field Reports ?
(c.) SKF
d.
e.
f.
3. Provide
4. ARM - Data Base
Munson 2 Parts
5. - Need to discuss further (Greene fit Tuber vs Adkin)
6. Changes that were made were not related to the defect.
7. Plant.
8. Freightliner Conference Calls - Notes -
9. No Changes (Hub Cap ARM)
10. Start up Problem
B. Hancing problems
11.

Mark Wagner - Freightliner
will not release - Any More Unitized Product
65 mm - Product

Arvin Monitor Data Base
L - Proportion
Brad Onald out until Friday
1998-10 could be
start up problems

R 100 with all
Data Accumulated.

Below line
% of Parts that Showed up in SKF Data Base

Box Chart
shows Spike Root Cause vs the Entire
population of failures - From SKF Data
Base. I = 95% confidence chbndls

- Possibility Parts of out of Spec. Bearing Spindle
Tolerance stack up Min Min vs MAX MAX.

Months 5 6 7 8 total Population of Spikes
Apless

3 - months 1