



Test Monitoring Center

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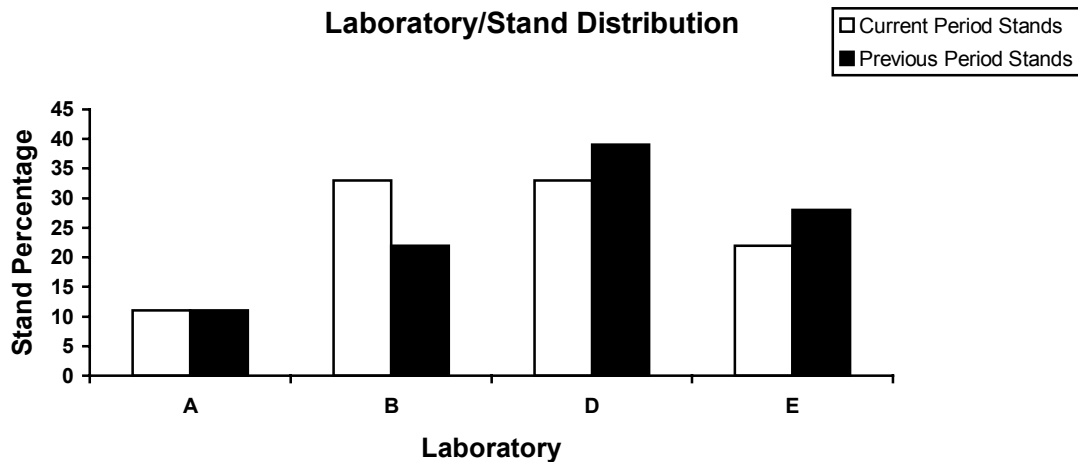
MEMORANDUM: 01-116
DATE: October 1, 2001
TO: Dale Smith, Chairman, L-33 Surveillance Panel
FROM: Donald Lind
SUBJECT: L-33 Reference Test Status from April 1, 2001 through September 30, 2001

The following is a summary of the L-33 reference oil tests that were reported to the Test Monitoring Center during the period April 1, 2001 through September 30, 2001.

Lab and Stand Summary

	Reporting Data	Calibrated as of 9/30/01
Number of Laboratories	4	0
Number of Storage Boxes	9	0

The following chart shows the laboratory/stand distribution:

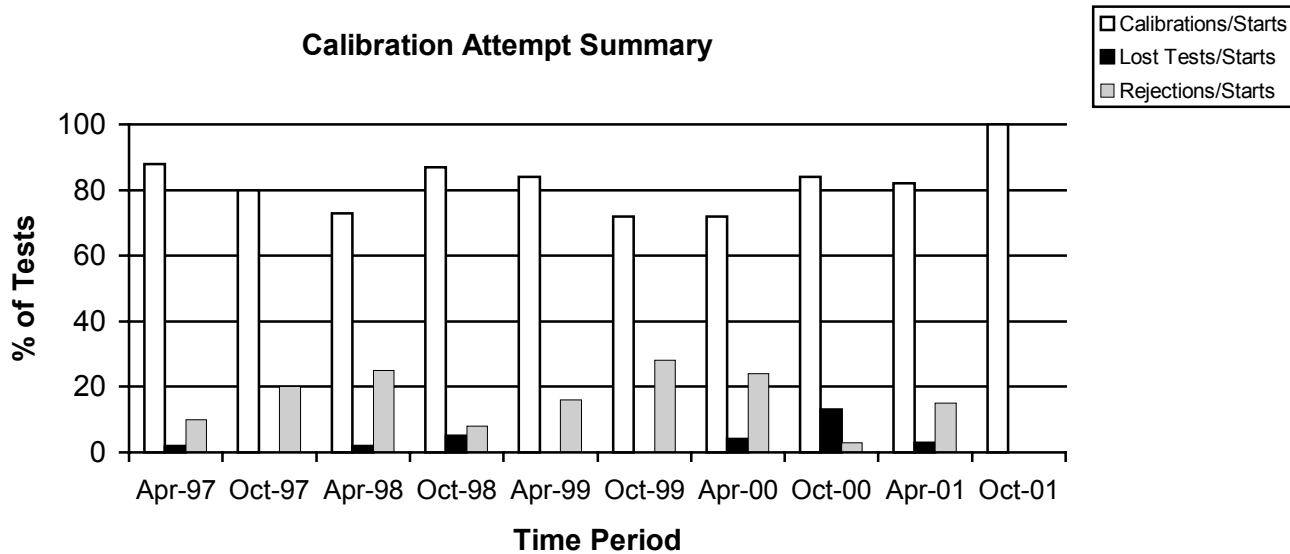


The following summarizes the status of the reference oil tests reported to the TMC:

	TMC Validity Codes	No. of Tests
Operationally and Statistically Acceptable	AC	2
Failed Acceptance Criteria	OC	0
Operationally Invalid (Lab Judgement)	LC	0
Operationally Invalid (Lab / TMC Judgement)	RC	0
Aborted	XC	0
Total		2

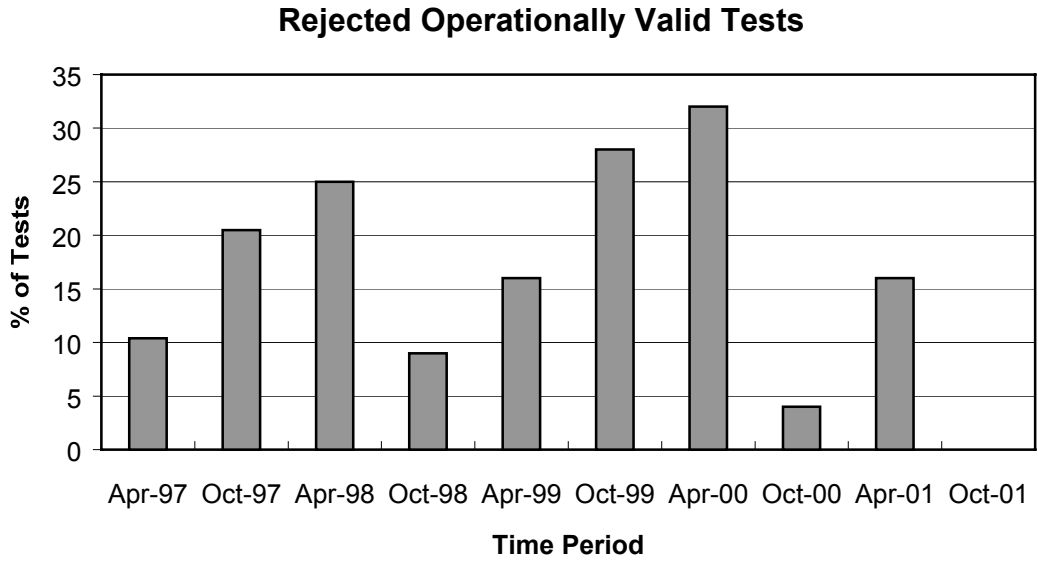
There were 34 additional tests conducted to evaluate the current industry severity problem.

Calibrations per start, lost tests per start and rejection per start rates are summarized below:

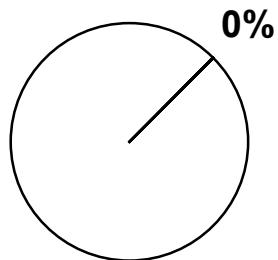


Due to the low calibration test activity no comparisons between the current period rates and past periods is meaningful.

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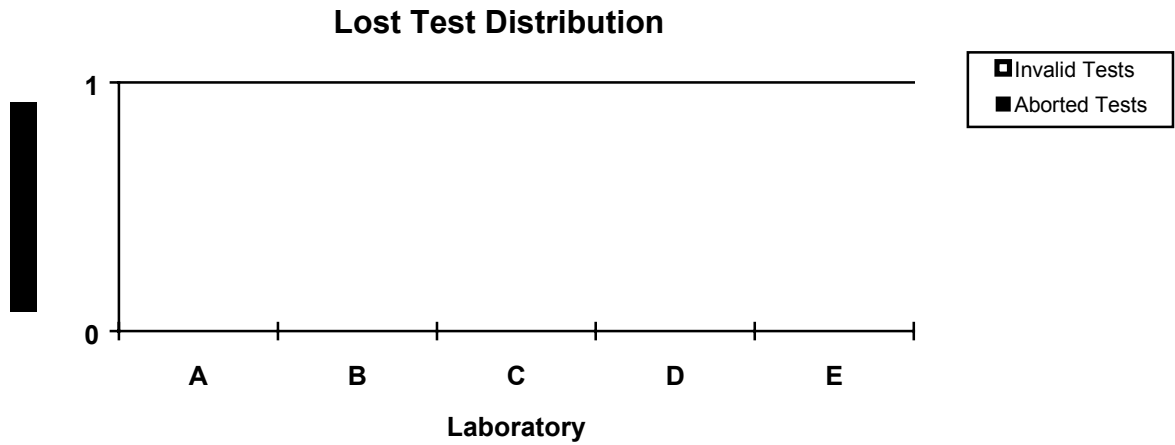


Distribution of LTMS Stand Alarms



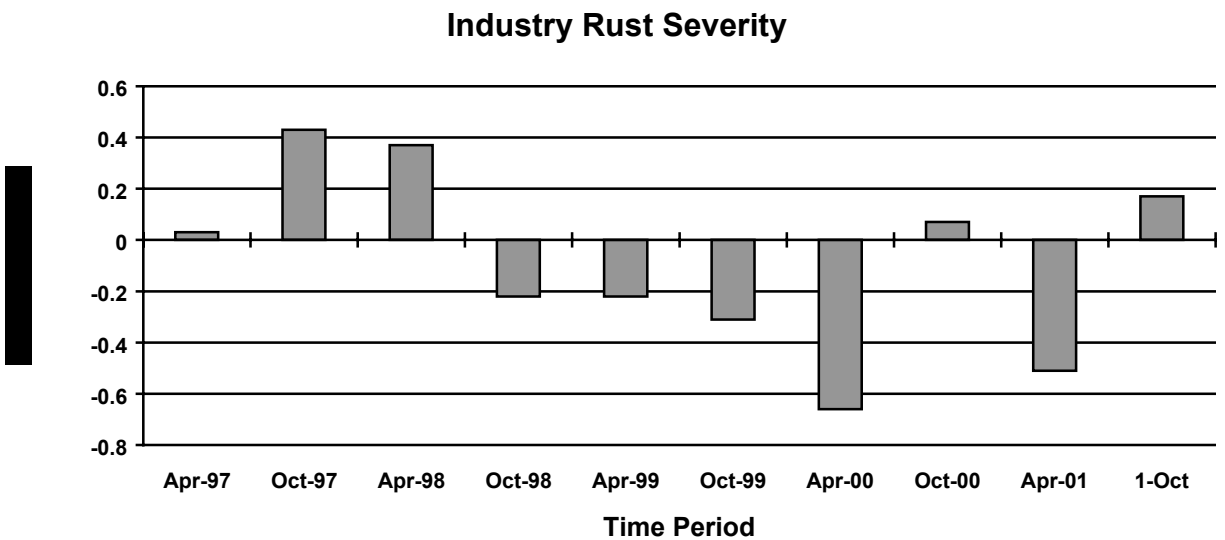
There were no tests that failed the acceptance criteria this report period.

The laboratory distribution of lost tests is shown below. There were no lost tests this report period.

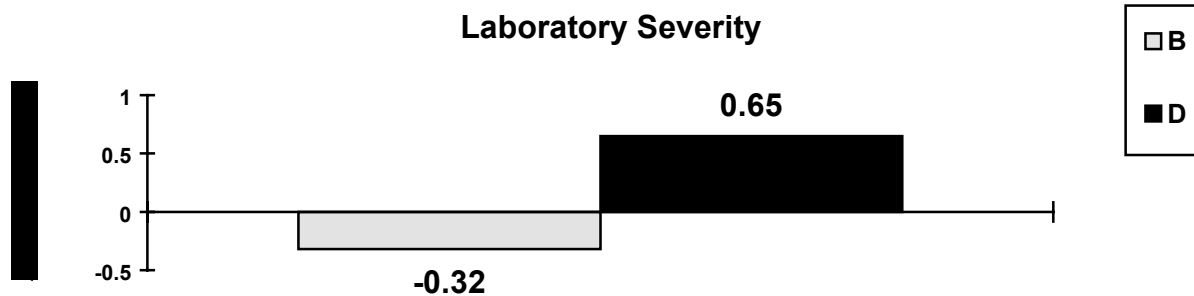


Severity and Precision

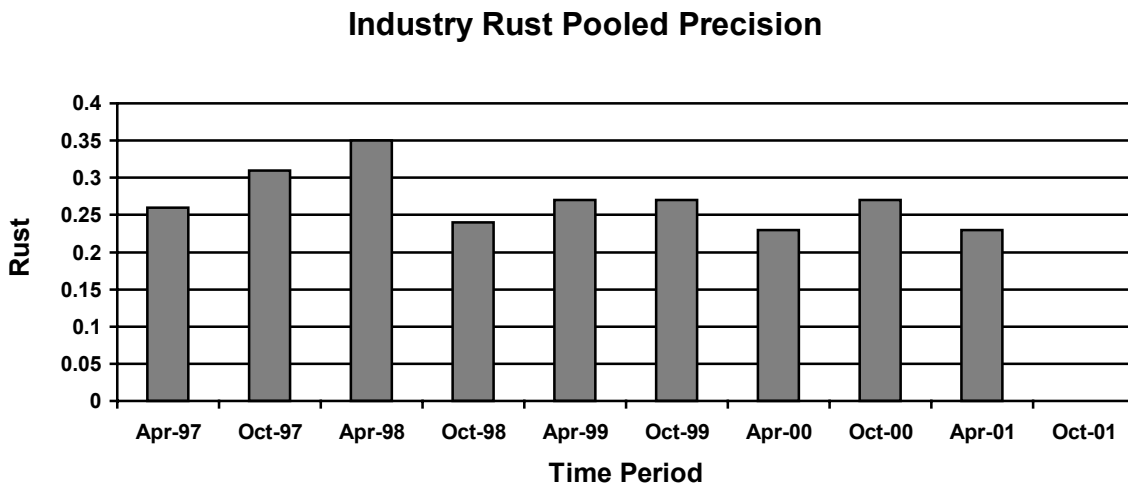
A total of 2 operationally valid test results were reported this period. Both tests were conducted on gear batch V99.1. The mean delta/s for this period is 0.17 mild, which equates to 0.04 merits. Severity is mild of target as indicated in the chart below and Figure 1. Comparison with previous periods are shown below:



Shown below is a summary of the average rust Δ/s for all laboratories reporting data this report period.



The industry precision estimate for this report period was not calculated for this period because of the low activity. Comparisons of previous periods are shown below:



Industry Control Charts

Figure 1 is the Industry EWMA severity and precision chart of tests completed through September 30, 2001. There have only been two tests reported during this report period due to a severity problem in industry. Calibration of test stands has been suspended until the severity trend issues can be resolved.

TMC Lab Visits

The L-33 Surveillance Panel requested the TMC to head a Lab Visit Task Force that included one person from each test lab. The task force visited all four tests labs during this report period and compiled a list of differences in lab practices for build-up and testing of an L33 test axle. Attached is a list of the differences found during the lab visits (Attachment 1). Please note that very few of the items listed were in conflict with the current procedure, however all the lab differences were to be noted and then reviewed by the surveillance panel for possible procedural changes.

Information Letters

There were no information letters issued this report period.

Reference Oils

The following is a listing of reference oils with the expected number of tests remaining at the Test Monitoring Center and at the testing laboratories. L-33 reference oils are shipped in quantities of 1 gallon per test.

Reference Oil	Lab A	Lab B	Lab D	Lab E	TMC
121-1	4	1	0	2	0
121-2	10	10	10	13	100
123	15	3	5	6	67
123-1	5	1	1	4	0
123-2	4	4	4	4	259
151-3	2	1	3	3	*

* 587 Gallons (Multiple test area usage)

Attachments

c: L-33 Surveillance Panel

<ftp://www.tmc.astm.cmri.cmu.edu/docs/gear/133/semiannualreports/133-09-2001.pdf>

J. L. Zalar

F. M. Farber

Listing of Tables and Figure Included as Part of This Report to the L-33 Surveillance Panel

Table 1 is the L-33 Industry Timeline

Figure 1 is the Industry Control Chart for L-33 Rust

Figure 2 is the Industry Control Chart for L-33 Rust Without the Four Severe Test Results From Lab D

Attachment 1 is a list of lab practice differences observed by the L-33 Lab Visit Task Force during the lab visits.

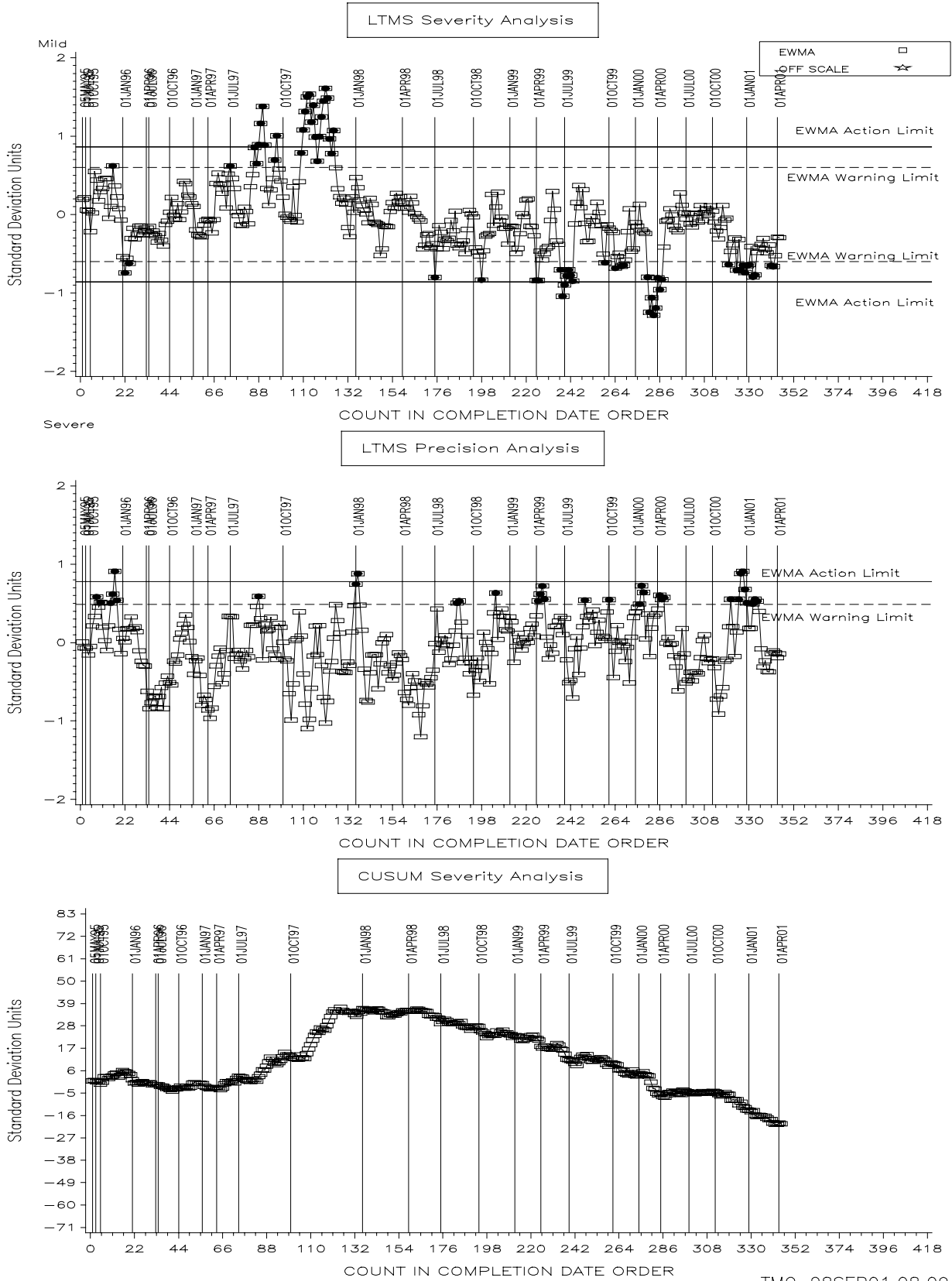
Table 1
L-33 Industry Timeline

Effective Date	Topic	Information Letter Number
19930901	Ultrasonic Parts Cleaning Requirement	1
19930901	Abrasive Blasting w/ AL Oxide Required	1
19930901	Differential Housing Cover Plate Preparation Requirement	1
19930901	Functional Surface Preparation Requirement	1
19930901	Pre-test Inspection for Rust Requirement	1
19930901	Acetone Usage Report Note Requirement	1
19931221	Report Forms and Dictionary Version 19931129	2
19941020	Test Stand Calibration Schedule Change	3
19941020	Report Forms and Dictionary Version 19940909	3
19950820	Revised Definition of Corrosion Rust and Light Rust	4
19950820	Report Forms and Dictionary Version 19950509	4
19960312	Revised Time Limit for Parts Rating	96-1
19960506	Report Forms and Dictionary Version 19960329	96-2
19970602	Rating Scale Revisions	97-1
19970602	Discrimination Oil Test Requirement	97-1
19970602	Area Weighting Factors for Reference Oil Tests	97-1
19970602	Report Forms and Dictionary Version 19970411	97-1
19970602	New TMC Address and Test Reporting Clarifications	97-1
19970602	Discrimination Oil Test Correction	97-2
19970602	Rust Rating Correction	97-2
19970602	Report Forms and Dictionary Version 19970609	97-3
19980303	Report Forms and Dictionary Version 19971218	98-1
19980701	Pinion torque requirements for assembled unit	98-2
19990104	Removal of Discrimination Oil Test Requirement	99-1
19990430	Reference Oil 121-1 Targets 45 Test Update	
20000419	Approval of Teflon Gasket and Water Column for V99.1 Hardware Testing	00-1, Sequence No. 13
20000730	Standardization of Abrasive Blasting Equipment	00-2, Sequence No. 14
20010411	Calibration of Test Stands Suspended Until Severity Trend Issues Resolved	

L-33 INDUSTRY OPERATIONALLY VALID DATA

REFERENCE FINAL RUST CORROSION MERIT RATING

Figure 1



L-33 Lab Visit Task Force (Differences Between Laboratories)

- **STORAGE**
 - Warehouse temperature no greater than 80° F (Cooled only)
 - Warehouse temperature no less than 65° F (Heated only)
 - Warehouse has dehumidified air (No heating or cooling)
 - Warehouse at ambient conditions

- **TEARDOWN**
 - Some labs do break and turn before teardown and some do not
 - Different procedure for axle housing temperature sensor
 1. Different tap oil.
 2. Different setup jigs
 3. Different hole location
 - Differential case bearings are not removed by all labs prior to abrasive blasting

Note: Rust present in most of the axle housing cases

- **PRE ABRASIVE BLASTING CLEANING**
 - Different solvents
 - Different cleaning methods
 1. Parts are cleaned with solvent, wire brush and scotch brite pad
 2. Parts are pressure washed with solvent
 3. Parts are cleaned with solvent and bristle brush
 4. Some labs clean the axle housing with solvent and wire brush
 5. Cleaning is done at different time intervals (same day, night before)
 - Different drying methods
 1. Parts are allowed to dry at room temperature
 2. Parts are dried using pressurized air
 3. Parts are dried using pressurized nitrogen
 4. Parts are dried with a fan
 5. Bearings are spun dry using pressurized air/nitrogen

- **ABRASIVE BLASTING**
 - Parts are pre-rated by different raters (category 1 & 2)
 - Entire part is abrasive blasted
 - Only the rated area of the part is abrasive blasted
 - Lighting out side of the abrasive blasting cabinet varied (Dark to very bright)

- **POST ABRASIVE BLASTING CLEANING**
 - Some labs pressure wash/rinse with Stoddard solvent prior to putting parts in ultrasonic cleaner
 - Some labs put the parts directly into ultrasonic cleaner after abrasive blasting
 - Some labs put just the abrasive blasted parts into the ultrasonic cleaner

- Some labs put all the parts into the ultrasonic cleaner
 - Some labs do not put the cover plate into the ultrasonic cleaner
 - Some labs only put a couple of parts in the ultrasonic cleaner at a time and also need to rotate the parts due to the size and capacity of the ultrasonic cleaner
 - The time interval for cleaning the parts in the ultrasonic cleaner is different from lab to lab
 - Some ultrasonic cleaners have more of an aggressive cleaning than other ultrasonic cleaners
 - Some labs use water in the ultrasonic cleaner and then place the parts in a pale of Stoddard solvent that is put into the ultrasonic cleaner
 - Some labs put a spacer at the bottom of the pale for the parts to set on. This allows the displaced sand to settle at the bottom of the pale and not come in contact with the parts.
 - Some labs rinse with the parts with Stoddard Solvent when they come out of the ultrasonic cleaner, some do not
 - Some labs rinse with Toluene after spraying the parts with Stoddard Solvent when they come out of the ultrasonic cleaner
 - Different drying procedures
 1. Dry parts with the aid of a fan
 2. Dry parts with pressurized air (40 psi)
 3. Dry parts at room temperature
 4. Dry by placing parts into a dry box that has 2 – 2.5 SCFH of dry air purged through the box
 5. Cover plate is dried with the aid of a heat lamp
 - Time interval for drying varies from a few minutes to over night
- **BUILD-UP**
 - Different procedures for coating parts with test oil
 1. Parts are dipped in test oil
 2. Parts are brushed with test oil
 3. Parts are dipped and brushed with test oil
 4. Parts have test oil poured over them
 5. Parts are not coated evenly with test oil (gaskets)
 - Some labs heat the pinion bearing prior to placement on the pinion
 - Some labs coat the bolts with test oil, some do not
 - Variability in the amount of test oil in the bottom of the axle housing prior to pouring in the required 1.2 L of test oil into the assembled test axle
 - Gaskets were not placed on the cover plate as per the procedure
 - Some labs discard the axle spacer block in the differential carrier
 - Some labs change out the bearings and cups
 - Variability in the torque applied to cover plate bolts
 - Variability in temperature sensor depth and placement from the ring gear
 - Different types of temperature sensors used (Thermocouples J and K, RTD)

- TEST START-UP (Motoring Phase)
 - Variability when distilled water is put into the test axle
 - Variability with how the distilled water is put into the test axle
 - Not all labs are checking the PH level of their distilled water
 - Warm-up to 180° F varies from 22 min. to 2hr.10 min.
 - Difference in diameter of tubing going from the axle to oil collector
 - Water column did not always achieve the calibration marks

- TEST START-UP (Storage Phase)
 - Time to cool down to 125° F varies (0 min to 2hr 45min)

- EOT
 - Variability to disassembly time
 - Some labs were not always coating the parts in Mobil Arma
 - Some labs are dipping in Mobil Arma some are submerging the parts