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## Committee D02 on PETROLEUM PRODUCTS AND LUBRICANTS

*Chairman:* KENNETH O. HENDERSON, Cannon Instrument Co., 2139 High Tech Road, State College, PA 16803, (814) 353-8000, Fax: (814) 353-8007, e-mail: kenohenderson@worldnet.att.net
*First Vice-Chairman:* BEN R. BONAZZA, TI Group Automotive Systems, Caro Research Center, 326 Green Street, Caro, MI, 48723 (989) 673-8181 ext. 227, Fax: (989) 673-3241, e-mail: bbonazza@us.tiauto.com
*Second Vice-Chairman:* JANET L. LANE, ExxonMobil Research & Engrg., 600 Billingsport Rd, Paulsboro, NJ 08066-0480 (856) 224-3302, Fax: (856) 224-3616, e-mail: janet.l.lane@exxonmobil.com
*First Secretary:* RALPH A. CHERRILLO, Shell Global Solutions (US) Inc., Westhollow Tech Ctr., 3333 Highway 6 South, Houston, TX 77082 (281) 544-8789, Fax: (281) 544-8150, e-mail: ralph.cherrillo@shell.com
*Second Secretary :* MICHAEL A. COLLIER, Petroleum Analyzer Co. LP, PO Box 206, Wilmington, IL 60481, (815) 458-0216, Fax: (815) 458-0217, e-mail: macvarlen@aol.com
*Staff Manager:* DAVID R. BRADLEY, (610) 832-9681, Fax: (610) 832-9668, e-mail: dbradley@astm.org

December 06, 2013
Reply to:
Larry Hamilton
The Lubrizol
Corporation
29400 Lakeland Blvd.
Wickliffe, Ohio 44092
(440) 347-2326
Larry.hamilton@lubrizol.com

ASTM D02.B0.03 L-60-1 Surveillance Panel

Members and Guests:

Attached for your review and comments are the unconfirmed minutes of the November 06, 2013 L-60-1 Surveillance Panel meeting held at Automation Alley, Troy, MI.

Please direct any corrections or comments to my attention.

Sincerely,

Larry Hamilton

Larry Hamilton; Chairman
L-60-1 Surveillance Panel

ASTM L-60-1 (D5704) Surveillance Panel Meeting Minutes

Automation Alley, Troy, MI

11/06/2013

Meeting was called to order at 0

Attendees: voting member in **BOLD**

| | |
|---|---|
| AAM | No Rep |
| Afton | **M. Keisler;** T. Boschert; D. Bell; B. Kearney; T. Gottwald; K. Hobson |
| AMSTA-TAR | **A. Comfort;** B. Dwornick |
| BASF | No Rep |
| Eaton | T. Marougy, D. Mosher |
| ExxonMobil | **No Rep** |
| G. M. | K. Zreik |
| Intertek | **D. Smith;** A. Trader; T. Barrera |
| Lubrizol | **L. Hamilton** (Chairman); J. Gropp; M. Umerley; C. Prengaman |
| Meritor | **B. McGlone**; T. Muransky |
| SwRI | **B. Koehler** |
| TMC | **S. Parke** |
| Volvo | **No Rep** |

Sign-in and review of membership

Attendance was taken and voting membership reviewed.

The sign-in sheets, identifying attendance and voting membership, is included; see attachment # 1

Review of Agenda

The Agenda was reviewed and is included; see attachment # 2

Approval of meeting minutes

Chairman entertained motion for acceptance of the August 14th; 2013, Surveillance Panel Meeting.

**Motioned** by Marc Keisler (Afton) and **Seconded** by Dale Smith (Intertek) to except the minutes.

**Passed** 6-0-1

Review of L-60-1 Targets, Severity and Gear Batch See attachment # 3

Scott Parke (TMC) led discussion and shared targets on overhead.

The current targets and several variations were shared for 148,148-1 and 151-2. The variations included the first 30 tests, the last 30 tests. 148 and 148-1 share the same targets at the moment. 151-2 was set on the first 10 tests and has not changed since.

S. Parke shared the delta/s performance of the labs as compared to the targets. All three labs show a severity trend compared to targets, the largest being ACV. These trends are longstanding and have always been this way. S. Parke reviewed the LTMS update document with the group.

S. Parke reviewed the gear batch comparison for targets. The new hardware batch currently uses the old batch targets. There are some differences between what new hardware targets could be at the 95% significant level. Looking at just newer data from 2010 and newer, there still remains some differences.

Lab D has made most of these runs on the new batch (references) and they do appear to have differences that drive some of these differences. 13/15 & 10/14 tests at the moment are from Lab D.

A number of different plots were shown to show the differences to the group.

L. Hamilton shared that he would like to see comparable number of runs coming from all the labs, as to not hide a lab severity issue, and we properly look at the data.

S. Parke does not have a recommendation at this point yet.

B. Koehler reminded the group that we have severity adjustments turned on in this test and asked if we are using the appropriate levels of severity adjustments?

S. Parke shared that labs have severity adjustments in place.

M. K shared that he is in favor of adjusting targets since for many years that we are not running on target (on average).

J. Gropp shared that he sees two things here, the first being the hardware (get to later), he is not in favor of moving the targets as it can mask a severity issue in the test.

S. Parke shared that moving targets can mask things, however doesn't feel that the targets are set accurately for the current oils since we just pulled the old targets forward and didn't change the numbers.

M. K asked about shelf life concern of reference oils since 148-1 goes back to the early 90's

S. Parke shared that generally shelf life is not a concern. TMC does QC checks for drop out on the oils.

C. Prengaman asked how quickly the severity adjustments would change – fairly quickly but not instantaneously due to how it is weighted in EWMA. Also reminded the group as in many other areas as we've said – if it passed yesterday, it needs to pass tomorrow, and changing how the severity adjustments are at each lab could do this.

J. Gropp asked if the trend we're seeing is driven by 1 lab as opposed to all labs, since the lab by lab plots don't look the same.

D. Smith, if the shift is oil or gear batch related, then adjusting the targets makes sense, if it is an industry shift then that is another discussion.

L. Hamilton, This topic will be brought up again at a later meeting as it has run over the time allotted.

**New Business**

There was no New Business.

**Adjournment**

**Motioned** by Dale Smith (Intertek) and **Seconded** by Marc Keisler (Afton); to adjourn meeting. **Motion Passed** unanimous by voice vote

Respectfully Submitted;

Larry Hamilton

Larry Hamilton
L-60-1 Surveillance Panel Chairman

ATTACHMENT #1

## ASTM L-60-1 Surveillance Panel Membership/Mailing List

**Meeting Date: November 06, 2013**

| Present / Initial | Name | Voting Status | Company Name & Address | Phone & Fax & E-Mail |
|---|---|---|---|---|
| | Aguirre, Nancy | Non-voting | Intertek Automotive Research<br>5404 Bandera Rd<br>San Antonio TX 78238 | Phone: 210-647-9428<br>Fax:<br>E-Mail: Nancy.Aguirre@intertek.com |
| | Athey, Allison | **Voting** | Volvo Group Trucks Technology<br>13302 Pennsylvania Avenue<br>Hagerstown, Maryland 21740 | Phone: 301-573-5684<br>Fax:<br>E-Mail: allison.athey@volvo.com |
| | Banas, Rob | **Voting** | ExxonMobil Fuels Lubricants & Specialties<br>114 Arcadia Park Drive<br>Canton, GA 30114 | Phone: 678-493-3930<br>Fax:<br>E-Mail: rob.banas@exxonmobil.com |
| CB | Barrera, Tony | Non-voting | Intertek Automotive Research<br>5454 Bandera Rd<br>San Antonio TX 78238 | Phone: 210-523-4653<br>Fax:<br>E-Mail: tony.barrera@intertek.com |
| Don Bell | Bell, Don | Non-voting | Afton Chemical Corporation<br>500 Spring Street<br>Richmond, Virginia 23219 | Phone: 804-788-6332<br>Fax: 804-788-6342<br>E-Mail: Don.Bell@aftonchemical.com |
| | Boschert, Tom | Non-voting | Afton Chemical Corporation<br>500 Spring Street<br>Richmond, Virginia 23219 | Phone: 804-788-5202<br>Fax: 804-788-6342<br>E-Mail: Tom.Boschert@aftonchemical.com |
| | Bubonic, Brad | Non-voting | The Lubrizol Corporation<br>29400 Lakeland Boulevard<br>Wickliffe, Ohio 44092 | Phone: 440-347-5321<br>Fax: 440-347-2878<br>E-Mail: brad.bubonic@lubrizol.com |
| | Chambers, Harold | Non-voting | 43945 Merrill Rd.<br>Sterling Hts., MI 48314 | Phone: (586) 770-4694<br>Fax:<br>E-Mail: haroldchambers@gmail.com |
| | Clark, Jeff | Non-voting | ASTM Test Monitoring Center<br>6555 Penn Avenue<br>Pittsburgh, Pensylvania 15206 | Phone: 412-365-1032<br>Fax: 412-365-1047<br>E-Mail: fmf@astmtmc.cmu.edu |
| A.C. | Comfort, Allen | ~~Non-voting~~ VOTING | AMSTA-TR-D/210 (Allen Comfort)<br>U S Army Tank, Automotive, and Armament Command<br>Warren, Michigan 48397-5000 | Phone: 586-282-4225<br>Fax: 586-282-4244<br>E-Mail: allen.s.comfort.civ@mail.mil |

* Initial to indicate attendance at subject meeting

## ASTM L-60-1 Surveillance Panel Membership/Mailing List

**Meeting Date: November 06, 2013**

| Present / initial | Name | Voting Status | Company Name & Address | Phone & Fax & E-Mail |
|---|---|---|---|---|
| | Dharte, John | Non-voting | American Axle<br>1 Dauch Dr<br>Detroit, MI 48212 | Phone: 313 758-4687<br>Fax:<br>E-Mail: DharteJ@aam.com |
| BD | Dwornick, Bridget | Non-voting | AMSTRD-TAR-D/210<br>6501 E.11 Mile Rd<br>Warren,MI 48397-5000 | Phone: 586-282-4221<br>Fax: 586-282-4244<br>E-Mail: bridget.dwornick@us.army.mil |
| | Gottwald, Thomas | Non-voting | Afton Chemical Corporation<br>500 Spring Street<br>Richmond, Virginia 23219 | Phone: 804-788-5230<br>Fax: 804-788-6358<br>E-Mail: thomas.gottwald@aftonchemical.com |
| | Greene, Galen | **Voting** | BASF Corporation<br>100 Pash Ave<br>Florham Pash, NJ | Phone: 973-873-4816<br>Fax:<br>E-Mail: galen.greene@basf.com |
| JLG | Gropp, Jerry | Non-voting | The Lubrizol Corporation<br>29400 Lakeland Boulevard<br>Wickliffe, Ohio 44092 | Phone: 440-347-1223<br>Fax: 440-347-1555<br>E-Mail: jerrold.gropp@lubrizol.com |
| LH | Hamilton, Larry | **Voting** | The Lubrizol Corporation<br>29400 Lakeland Boulevard<br>Wickliffe, Ohio 44092 | Phone: 440-347-2326<br>Fax: 440-347-2878<br>E-Mail: larry.hamilton@lubrizol.com |
| KH | Hobson, Kevin | Non-voting | Afton Chemical Corporation<br>500 Spring Street<br>Richmond, Virginia 23219 | Phone: 804-788-5375<br>Fax: 804-788-6358<br>E-Mail: kevin.hobson@aftonchemical.com |
| | Huron, John | Non-voting | Chevron Oronite<br>4502 Centerview Drive, Suite 210<br>San Antonio, Texas 78228 | Phone: 210-731-5609<br>Fax: 210-731-5699<br>E-Mail: HURO@ChevronTexaco.com |
| | Jackson, Matt | Non-voting | Southwest Research Institute<br>6220 Culebra Road Bldg.209<br>San Antonio, TX 78238-5166 | Phone: (210) 522-6981<br>Fax:<br>E-Mail: matt.jackson@swri.org |
| | Kanga, Percy R. | Non-Voting | Commercial Vehicle, Marine & Gas Engine Lubricants<br>ExxonMobil Research & Engineering<br>600 Billingsport Road<br>Paulsboro, NJ. 08066 | Phone: 856-224-2094<br>Fax: 856-224-3613<br>E-Mail: percy.r.kanga@exxonmobil.com |

* Initial to indicate attendance at subject meeting

**ASTM L-60-1 Surveillance Panel Membership/Mailing List**

**Meeting Date: November 06, 2013**

| Present / Initial | Name | Voting Status | Company Name & Address | Phone & Fax & E-Mail |
|---|---|---|---|---|
| | | | | |
| WAK | Kearney, Bill | Non-voting | Afton Chemical Corporation<br>~~500 Spring Street~~ 2000 Town Center<br>~~Richmond, Virginia 23219~~ Southfield, MI 48075 | Phone: 248-350-0640<br>Fax:<br>E-Mail: bill.kearney@aftonchemical.com |
| MSK | Keisler, Marc | **Voting** | Afton Chemical Corporation<br>500 Spring Street<br>Richmond, Virginia 23219 | Phone: 804-788-5617<br>Fax:<br>E-Mail: marc.keisler@aftonchemical.com |
| | Koehler, Brian | **Voting** | Southwest Research Institute<br>6220 Culebra Road Bldg.209<br>San Antonio, TX 78238-5166 | Phone: (210) 522-3588<br>Fax: (210) 684-7523<br>E-Mail: bkoehler@swri.org |
| | Koglin, Cory | Non-voting | Afton Chemical Corporation<br>2000 Town Center Suite 1160<br>Southfield, MI 48075 | Phone: 248-996-0386<br>Fax:<br>E-Mail: |
| TM | Marougy, Thelma | Non-voting | Eaton Corporation<br>26201 Northwestern Highway<br>Southfield, Michigan 48037 | Phone: 248-354-6985<br>Fax: 248-354-2739<br>E-Mail: thelmaemarougy@eaton.com |
| | McGlone, Bruce | **Voting** | Meritor<br>2135 West Maple<br>Troy, Michigan 48084 | Phone: 248-435-9929<br>Fax: 248-435-6602<br>E-Mail: Bruce.McGlone@meritor.com |
| DMM | Mosher, Donna | Non-voting | Eaton Corporation 13100E Michigan Ave<br>~~26201 Northwestern Highway~~ Galesburg, MI<br>~~Southfield, Michigan 48037~~ 49053 | Phone: 269-342-3039<br>Fax:<br>E-Mail: donnammosher@eaton.com |
| | Muransky, Troy | Non-voting | Meritor<br>2135 West Maple<br>Troy, Michigan 48084 | Phone: 248-435-1409<br>Fax:<br>E-Mail: troy.muransky@meritor.com |
| | O'Brien, Cheryl | Non-voting | General Motors | Phone: 248-343-7347<br>Fax:<br>E-Mail: cheryl.obrien@gm.com |
| PRESENT | Parke, Scott | **Voting** | ASTM Test Monitoring Center<br>6555 Penn Avenue<br>Pittsburgh, Pensylvania 15206 | Phone: 412-365-1030<br>Fax: 412-365-1047<br>E-Mail: fmf@astmtmc.cmu.edu |

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**Meeting Date: November 06, 2013**

| Present / Initial | Name | Voting Status | Company Name & Address | Phone & Fax & E-Mail |
|---|---|---|---|---|
| | | | | |
| CP | Prengaman, Chris | Non-voting | The Lubrizol Corporation<br>29400 Lakeland Boulevard<br>Wickliffe, Ohio 44092 | Phone: 440-347-4225<br>Fax: 440-347-2878<br>E-Mail: chris.prengaman@lubrizol.com |
| | Recinos, Will | Non-voting | Afton Chemical Corporation<br>500 Spring Street<br>Richmond, Virginia 23219 | Phone: 804-788-5323<br>Fax:<br>E-Mail: william.recinos@aftonchemical.com |
| | Shah, Rajesh | Non-voting | Koehler Instrument Company<br>1595 Sycamore Avenue<br>Bohemia, New York 11716 | Phone: 516-589-3800<br>Fax: 516-589-3815<br>E-Mail: |
| | Smith, Dale | **Voting** | Intertek Automotive Research5404 Bandera Rd<br>San Antonio TX 78238 | Phone: 412-855-6854<br>Fax:<br>E-Mail: Dale.Smith@intertek.com |
| | Sullivan, Bill | Non-voting | WTSullivan, Inc.<br>5 Scheiber Drive<br>Brick, New Jersey 08723 | Phone: 908-930-3512<br>Fax: 267-220-7750<br>E-Mail: wtsullivan@comcast.net |
| | Suresh, Arunya | Non-voting | BASF Corporation<br>100 Pash Ave<br>Florham Pash, NJ | Phone: 914-262-8715<br>Fax:<br>E-Mail: arunya.suresh@basf.com |
| | Thorpe, Ryan | Non-voting | Southwest Research Institute 6220 Culebra Road<br>Bldg.209<br>San Antonio, TX 78238-5166 | Phone: (210) 522-6404<br>Fax: (210) 684-7523<br>E-Mail: ryan.thorpe@swri.org |
| AT | Trader, Angela | Non-voting | Intertek Automotive Research<br>5404 Bandera Rd<br>San Antonio TX 78238 | Phone: 210-706-1533<br>Fax:<br>E-Mail: angela.trader@intertek.com |
| MU | Umerley, Matt | Non-voting | The Lubrizol Corporation<br>29400 Lakeland Boulevard<br>Wickliffe, Ohio 44092 | Phone: 440-347-4589<br>Fax: 440-347-2878<br>E-Mail: matthew.umerley@lubrizol.com |
| | Ved, shintan | Non-voting | Ford- Trans & Driveline Lubrication<br>35500 Plymouth Rd.<br>Livonia, MI 48150 | Phone: 313-805-9695<br>Fax: 267-220-7750<br>E-Mail: cved@ford.com |

* Initial to indicate attendance at subject meeting

**ASTM L-60-1 Surveillance Panel Membership/Mailing List**

**Meeting Date: November 06, 2013**

| Present / Initial | Name | Voting Status | Company Name & Address | Phone & Fax & E-Mail |
|---|---|---|---|---|
| | | | | |
| | Villahermosa, Luis | Non-voting | AMSTA-TR-D/210 (Luis Villahermosa)<br>U S Army Tank, Automotive, and Armament Command<br>Warren, Michigan 48397-5000 | Phone: 586-574-4207<br>Fax: 586-574-4123<br>E-Mail: villahel@cc.tacom.army.mil |
| | Zakarian, Jack | Non-voting | Chevron Products Company<br>100 Chevron Way<br>Richmond, California 94802-0627 | Phone: 510-242-3595<br>Fax: 510-242-3758<br>E-Mail: jaza@chevron.com |
| KZ | Zreik, Khaled | Non-voting | General Motors | Phone: 248-977-9214<br>Fax:<br>E-Mail: khaled.zreik@gm.com |
| | | | | Phone:<br>Fax:<br>E-Mail: |
| | | | | Phone:<br>Fax:<br>E-Mail: |
| | | | | Phone:<br>Fax:<br>E-Mail: |
| | | | | Phone:<br>Fax:<br>E-Mail: |
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| | | | | Phone:<br>Fax:<br>E-Mail: |
| | | | | Phone:<br>Fax:<br>E-Mail: |

* Initial to indicate attendance at subject meeting

**ASTM L-60-1 Surveillance Panel Membership/Mailing List**

**Meeting Date: November 06, 2013**

| Present / Initial | Name | Voting Status | Company Name & Address | Phone & Fax & E-Mail |
|---|---|---|---|---|
| | | | | |
| | | | | Phone:<br>Fax:<br>E-Mail: |
| | | | | Phone:<br>Fax:<br>E-Mail: |
| | | | | Phone:<br>Fax:<br>E-Mail: |
| | | | | Phone:<br>Fax:<br>E-Mail: |
| | | | | Phone:<br>Fax:<br>E-Mail: |

* Initial to indicate attendance at subject meeting

ATTACHMENT #2

# L-60-1 Surveillance Panel

November 6, 2013

## Automation Alley Troy, MI

## Agenda

For those not traveling, the call-in number will be 216-706-7052; Code 324160

I. Call to Order

II. Membership and agenda review

III. Approval of the August 2013 SP meeting minutes.

IV. L-60 1 Severity

V. Gear Batch (Old Vs. New)

VI. New Business

VII. Adjournment

**Voting Members**

1. **Allison Athey**
2. **Allen Comfort**
3. **Bob Banas**
4. **Brian Koehler**
5. **Bruce McGlone**
6. **Dale Smith**
7. **Galen Greene**
8. **Larry Hamilton**
9. **Marc Keisler**
10. **Scott Parke**

ATTACHMENT #3

A Program of ASTM International

**Test Monitoring Center**

@ Carnegie Mellon University
6555 Penn Avenue, Pittsburgh, PA 15206, USA

http://astmtmc.cmu.edu
412-365-1000

MEMORANDUM: 13-054

DATE: October 16, 2013

TO: Larry Hamilton, Chairman, L-60-1 Surveillance Panel

FROM: Scott Parke

SUBJECT: L-60-1 Reference Oil Testing from April 1, 2013 through September 30, 2013

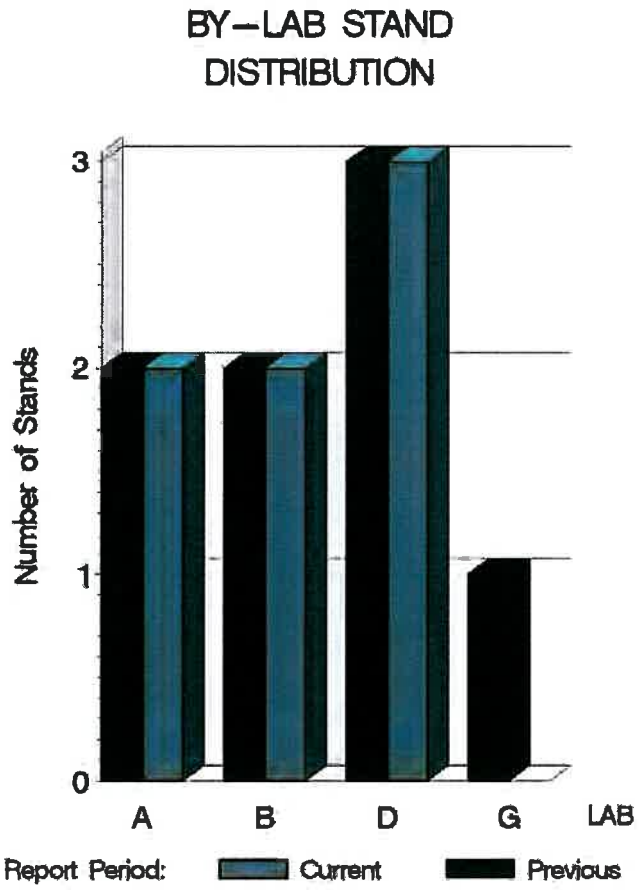
Please find attached a summary of testing activity this period.

SDP/sdp/mem13-054.sdp.doc
cc: Frank Farber
Jeff Clark
L-60-1 Surveillance Panel
ftp://ftp.astmtmc.cmu.edu/docs/gear/l601/semiannualreports/l601-10-2013.pdf

Distribution: email

# L-60-1 (D5704)

| | Reporting Data | Calibrated on 9-30-13 |
|---|---|---|
| Number of Labs | 3 | 3 |
| Number of Stands | 7 | 7 |



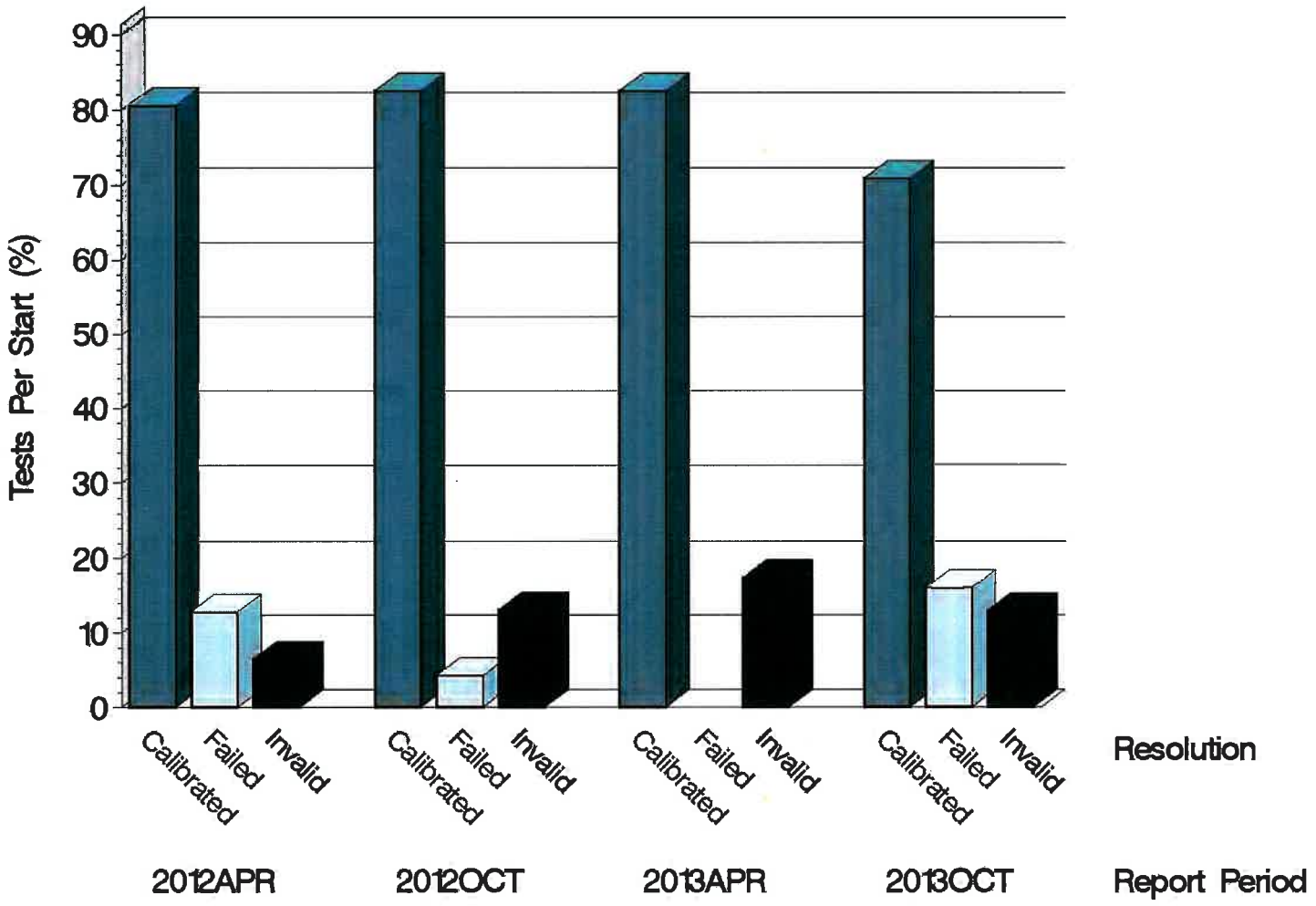
# L-60-1 (D5704)

## Test Distribution by Oil and Validity

| | | 148-1 | 151-2 | Totals | |
|---|---|---|---|---|---|
| | | | | Last Period | This Period |
| Accepted for calibration | AC | 9 | 13 | 19 | 22 |
| Rejected (Mild) | OC | 0 | 0 | 0 | 0 |
| Rejected (Severe) | OC | 4 | 1 | 0 | 5 |
| Rejected (Precision) | OC | 0 | 0 | 0 | 0 |
| Invalidated calibration | LC | 2 | 1 | 2 | 3 |
| Hardware approval | NI | 0 | 0 | 1 | 0 |
| Operationally invalid | RC | 0 | 0 | 0 | 0 |
| Aborted | XC | 0 | 1 | 2 | 1 |
| Total | | 15 | 16 | 24 | 31 |

# L-60-1 (D5704)

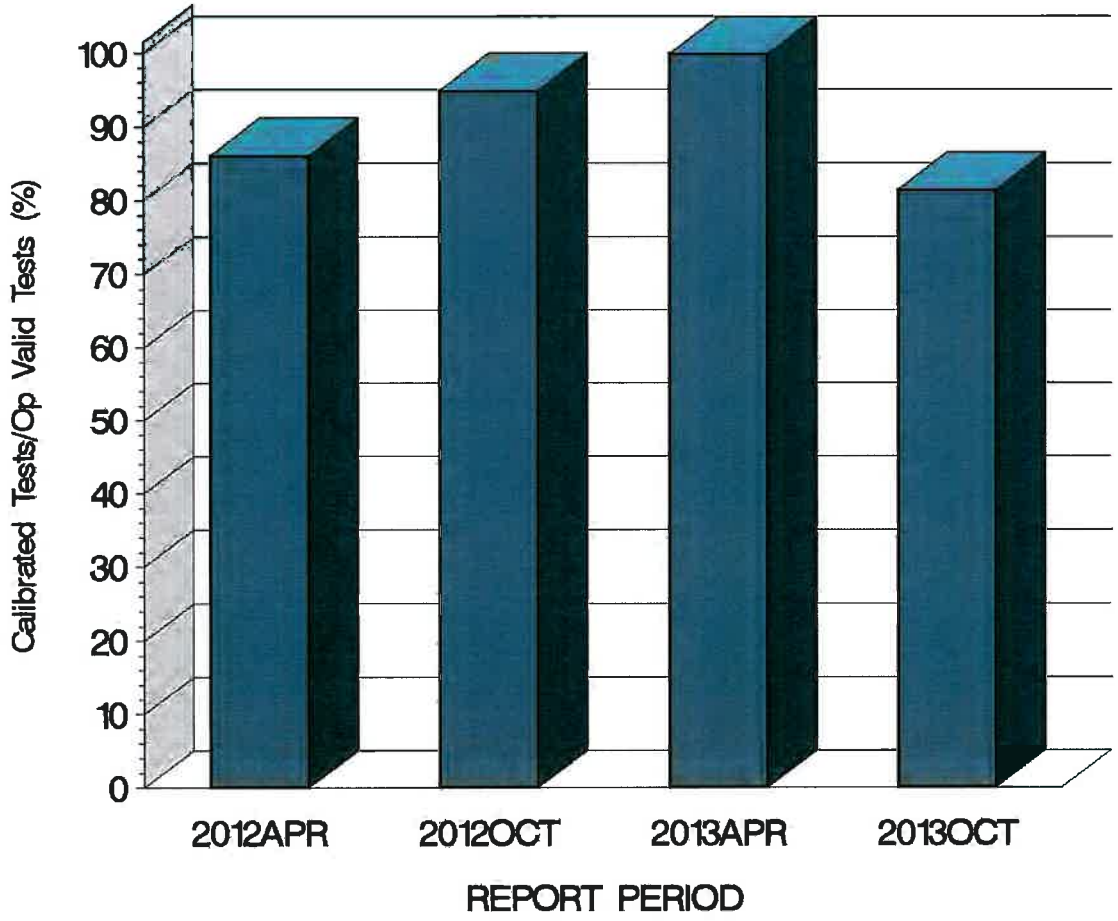
## CALIBRATION ATTEMPT SUMMARY




11:20:44 14OCT2013

# L-60-1 (D5704)

## OPERATIONALLY VALID TESTS
## MEETING ACCEPTANCE CRITERIA




11:20:44 14OCT2013

# L-60-1 (D5704)

## CAUSES FOR LOST TESTS

| | | Oil | | Validity | | | Loss Rate | | |
|---|---|---|---|---|---|---|---|---|---|
| Lab | Cause | 148-1 | 151-2 | RC | LC | XC | Lost | Starts | % |
| B | Oil loss > 20% | • | | | • | | 2 | 11 | 18% |
| | Oil loss > 20% | | • | | • | | | | |
| D | Alternator failure resulting in low load | • | | | • | | 2 | 15 | 13% |
| | Warmup <45 min & oil temp control problems | | • | | | • | | | |
| | Lost | 2 | 2 | 0 | 3 | 1 | | | |
| | Starts | 15 | 16 | 31 | 31 | 31 | | | |
| | % | 13% | 13% | 0% | 10% | 3% | | | |

# L-60-1 (D5704)

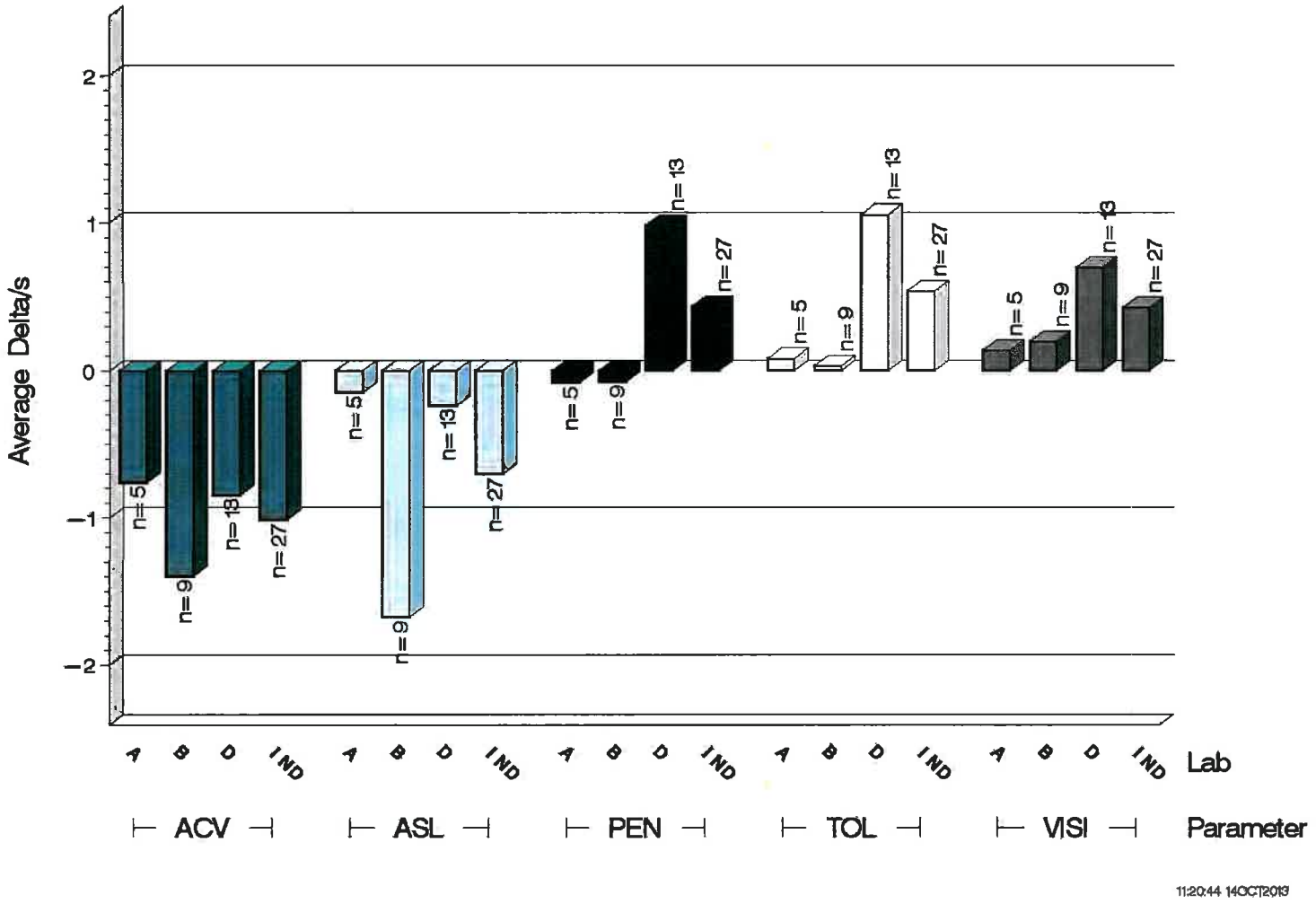
| Average Δ/s by Lab | | | | | | |
|---|---|---|---|---|---|---|
| **Lab** | **n** | **VISI** | **PEN** | **TOL** | **ACV** | **ASL** |
| A | 5 | 0.138 | -0.085 | 0.082 | -0.761 | -0.149 |
| B | 9 | 0.198 | -0.077 | 0.032 | -1.396 | -1.673 |
| D | 13 | 0.701 | 0.987 | 1.058 | -0.847 | -0.238 |
| Industry | 27 | 0.429 | 0.434 | 0.535 | -1.014 | -0.700 |
| Shift* | 27 | 3.491% | 0.272% | 0.399% | -0.924 merits | -0.071 merits |

*computed using severity adjustment standard deviation

# L-60-1 (D5704)

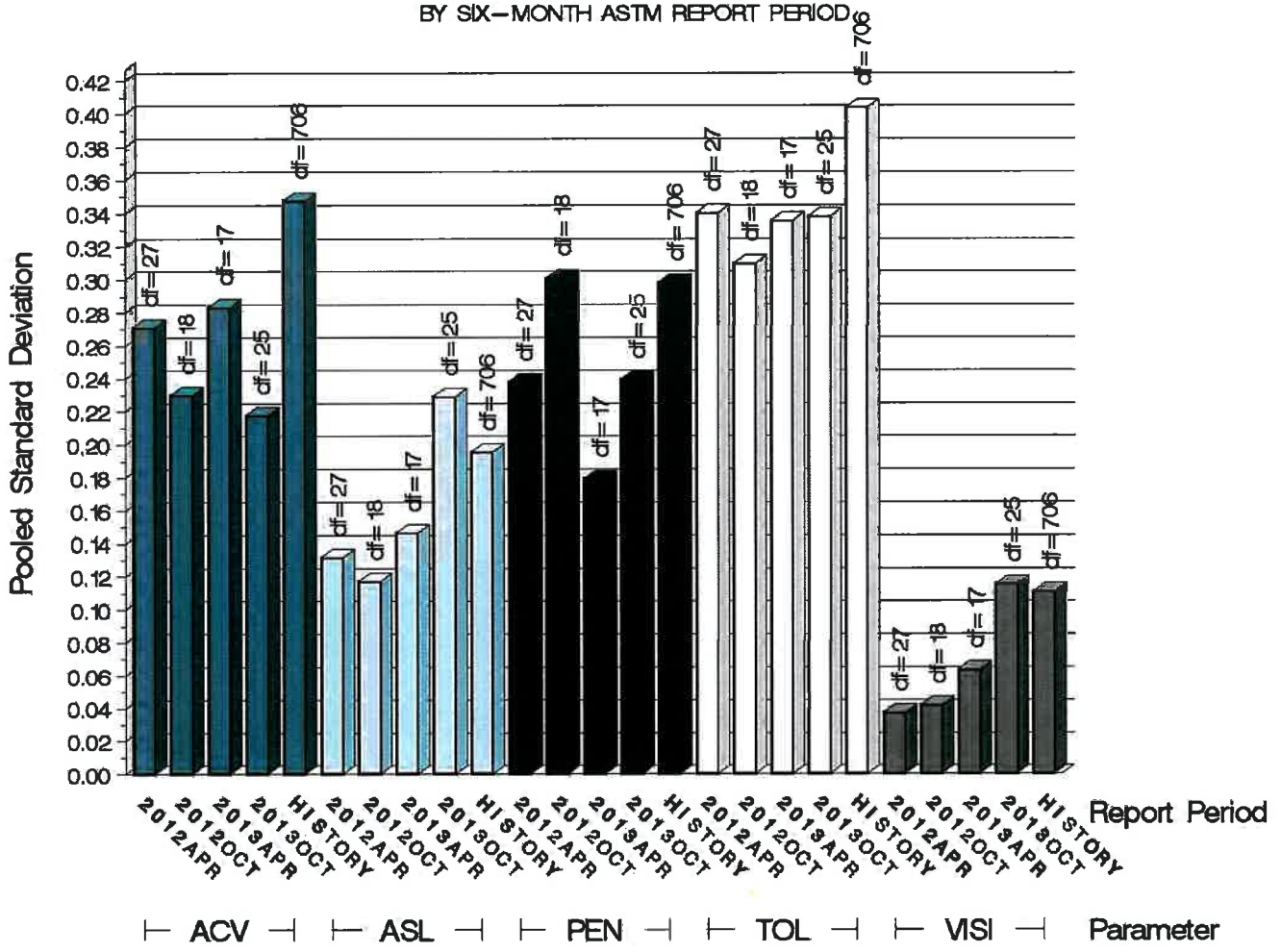
## TEST SEVERITY

DELTA/S BY LAB




11:20:44 14OCT2013

# L-60-1 (D5704)


TEST PRECISION
POOLED STANDARD DEVIATION
BY SIX-MONTH ASTM REPORT PERIOD
Pooled Standard Deviation
0.42
0.40
0.38
0.36
0.34
0.32
0.30
0.28
0.26
0.24
0.22
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
df= 27
df= 18
df= 17
df= 25
df= 706
2012APR
2012OCT
2013APR
2013OCT
HISTORY
Report Period
ACV
ASL
PEN
TOL
VISI
Parameter
11:20:44 14OCT2013

# L-60-1 (D5704)

## SUMMARY OF SEVERITY & PRECISION

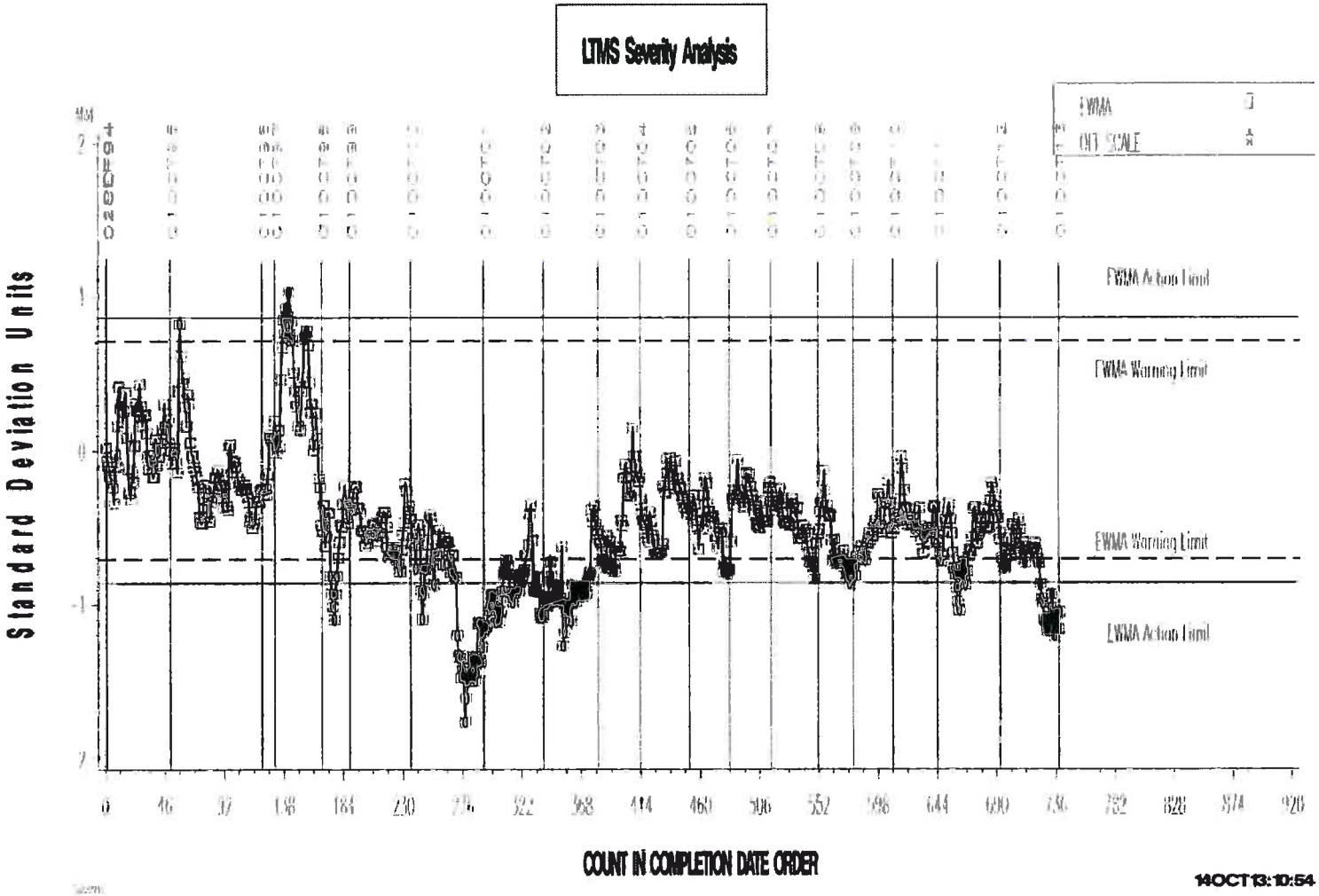
| Severity |
| --- |
| All parameters continue to be more or less severe of target. ACV and ASL currently exceed the control chart action limit. The test targets in use for the currently used oil blends may not accurately reflect the true performance of those oils. The 148-1 targets were a carryover from 148 targets set in 1994. The 151-2 targets were set on the first 9 tests of that oil in 2000. In several discussions, first during a May 9, 2012 meeting and a few other times since, the surveillance panel chose to retain the present targets. |
| **Precision** |
| Precision for all parameters continues to be good. |

Industry control charts follow.

# L-60-1 (D5704)

## L—60—1 INDUSTRY OPERATIONALLY VALID DATA

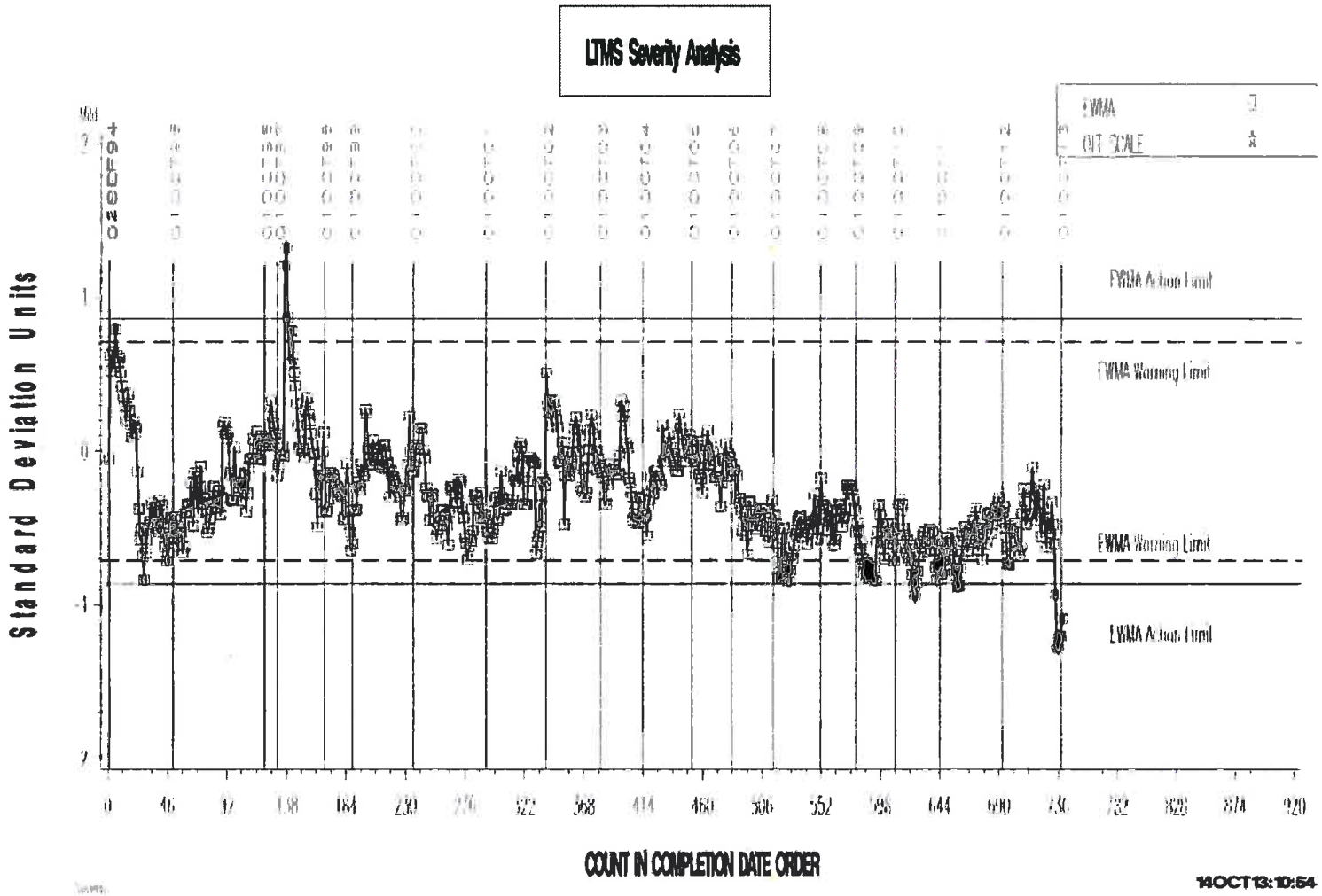
### REF. FINAL AVERAGE CARBON/ VARNISH



# L-60-1 (D5704)

## L—60—1 INDUSTRY OPERATIONALLY VALID DATA

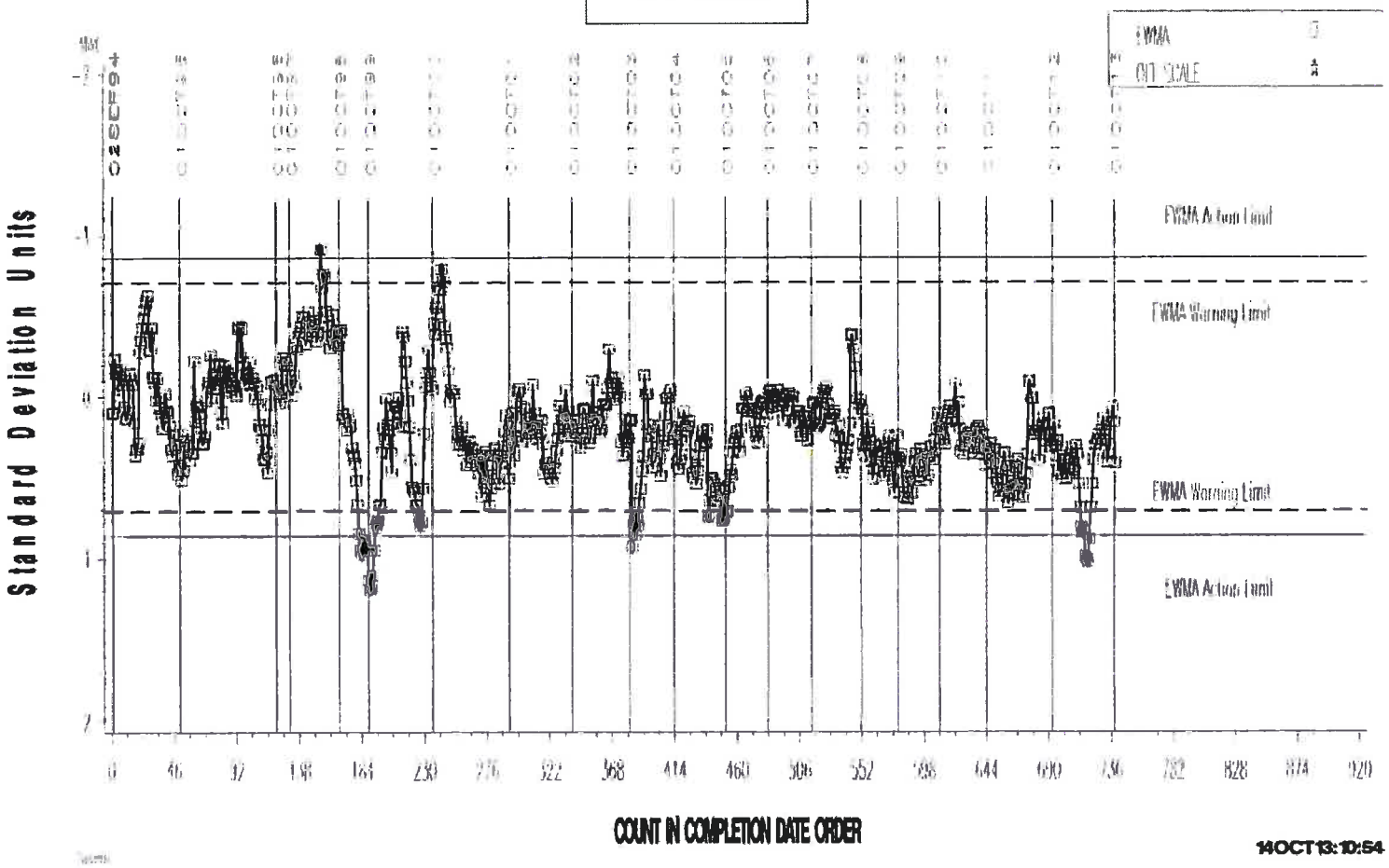
### REF: FINAL AVERAGE SLUDGE



# L-60-1 (D5704)

## L—60—1 INDUSTRY OPERATIONALLY VALID DATA

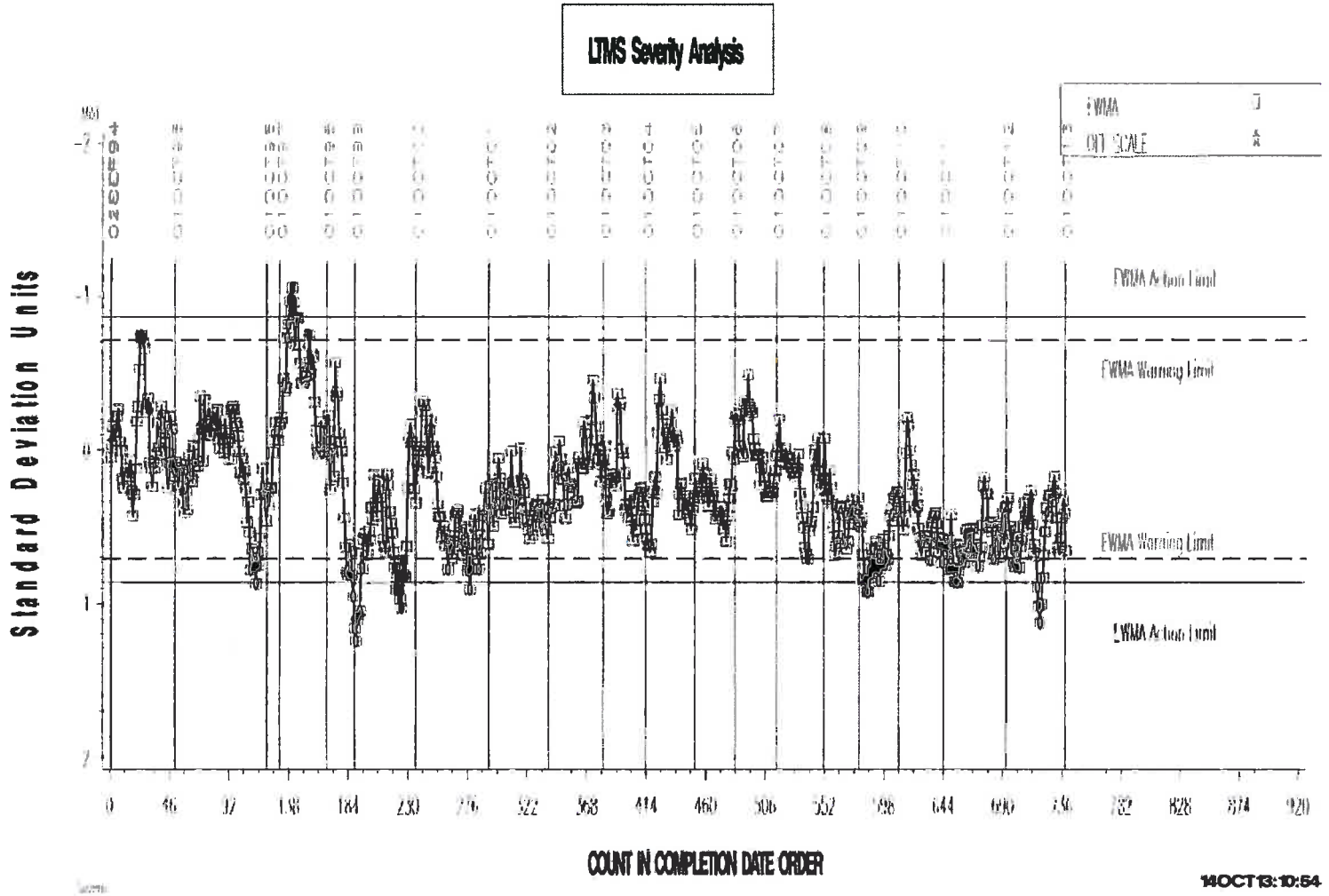
### REF. FINAL PENTANE INSOLUBLES



# L-60-1 (D5704)

## L—60—1 INDUSTRY OPERATIONALLY VALID DATA

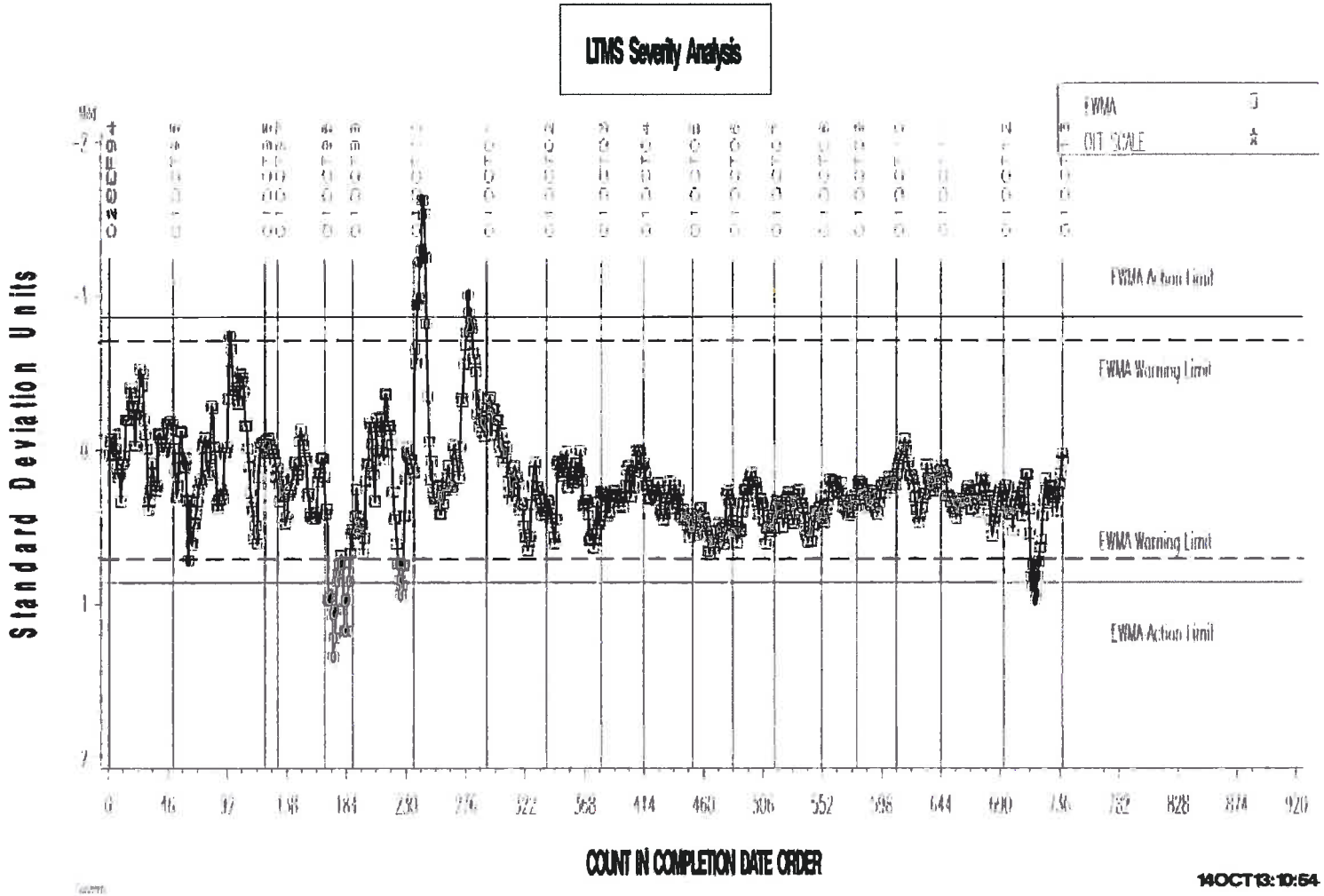
### REF. FINAL TOLUENE INSOLUBLES



# L-60-1 (D5704)

## L—60—1 INDUSTRY OPERATIONALLY VALID DATA

### REF: FINAL VISCOSITY INCREASE

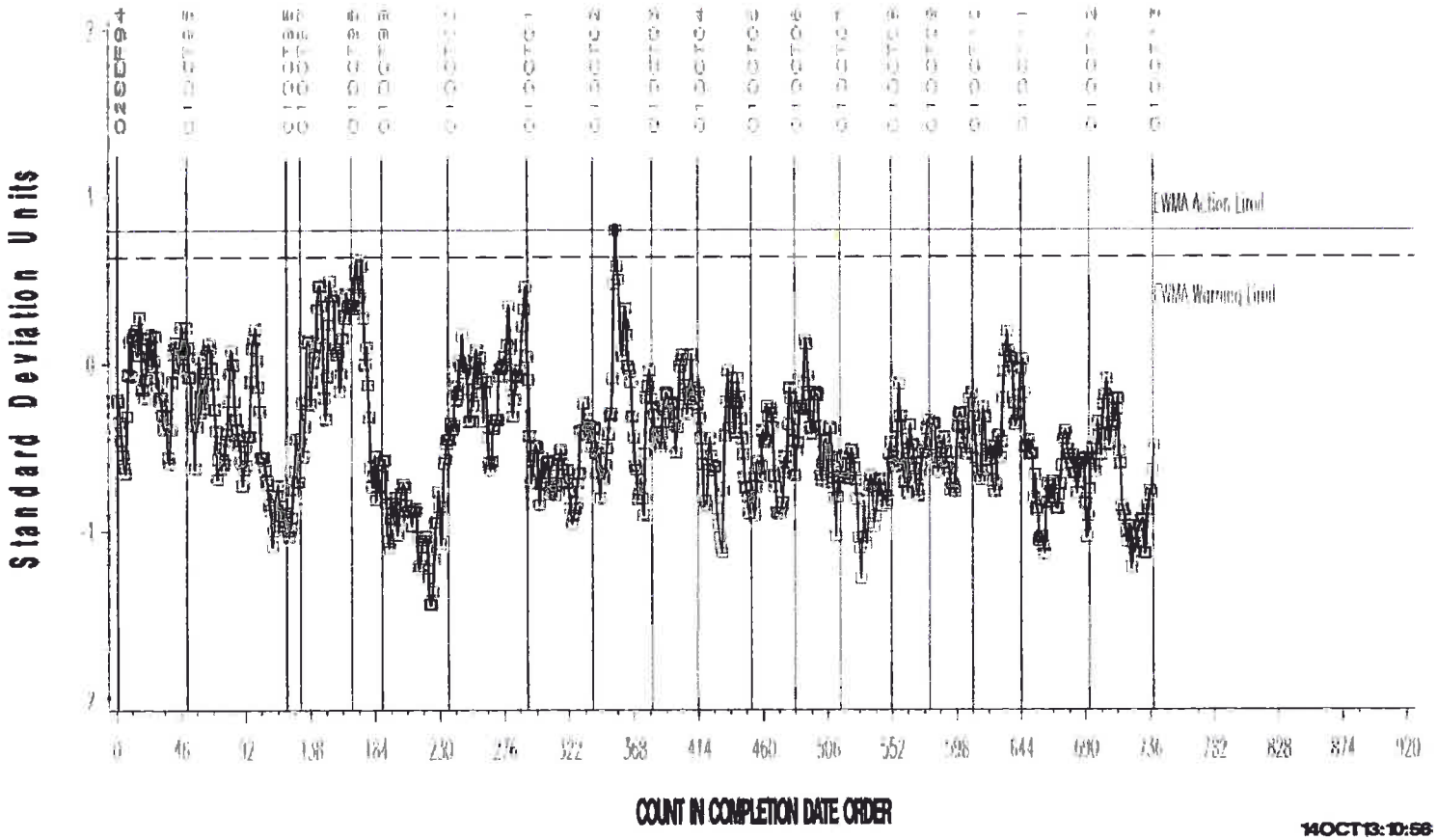


# L-60-1 (D5704)

## L—60—1 INDUSTRY OPERATIONALLY VALID DATA

### REF. FINAL AVERAGE CARBON/ VARNISH

LTMS Precision Analysis



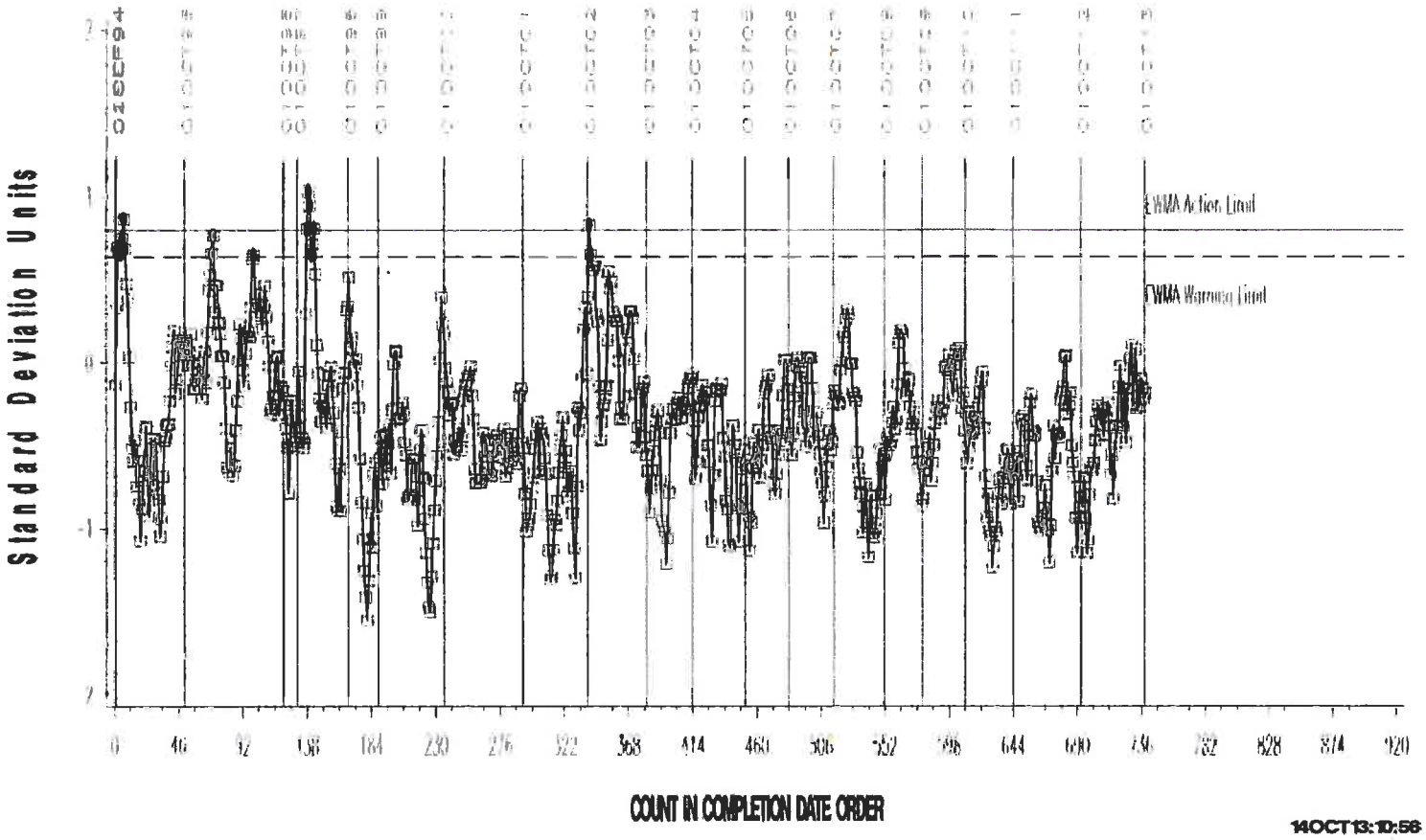

14OCT13:10:56

# L-60-1 (D5704)

## L—60—1 INDUSTRY OPERATIONALLY VALID DATA

### REF. FINAL AVERAGE SLUDGE

**LTMS Precision Analysis**



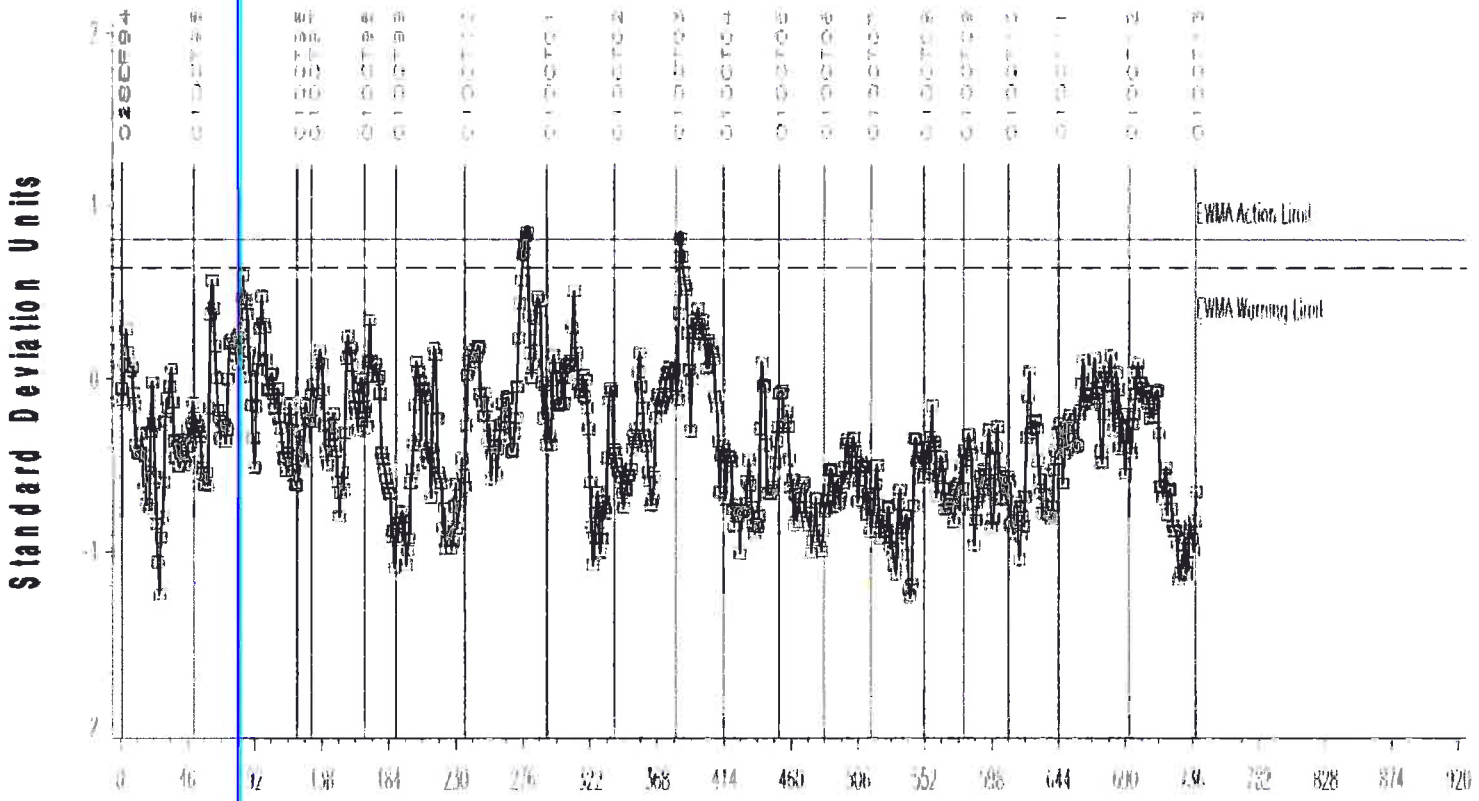

14OCT13:10:56

# L-60-1 (D5704)

## L—60—1 INDUSTRY OPERATIONALLY VALID DATA

### REF. FINAL PENTANE INSOLUBLES

**LTMS Precision Analysis**

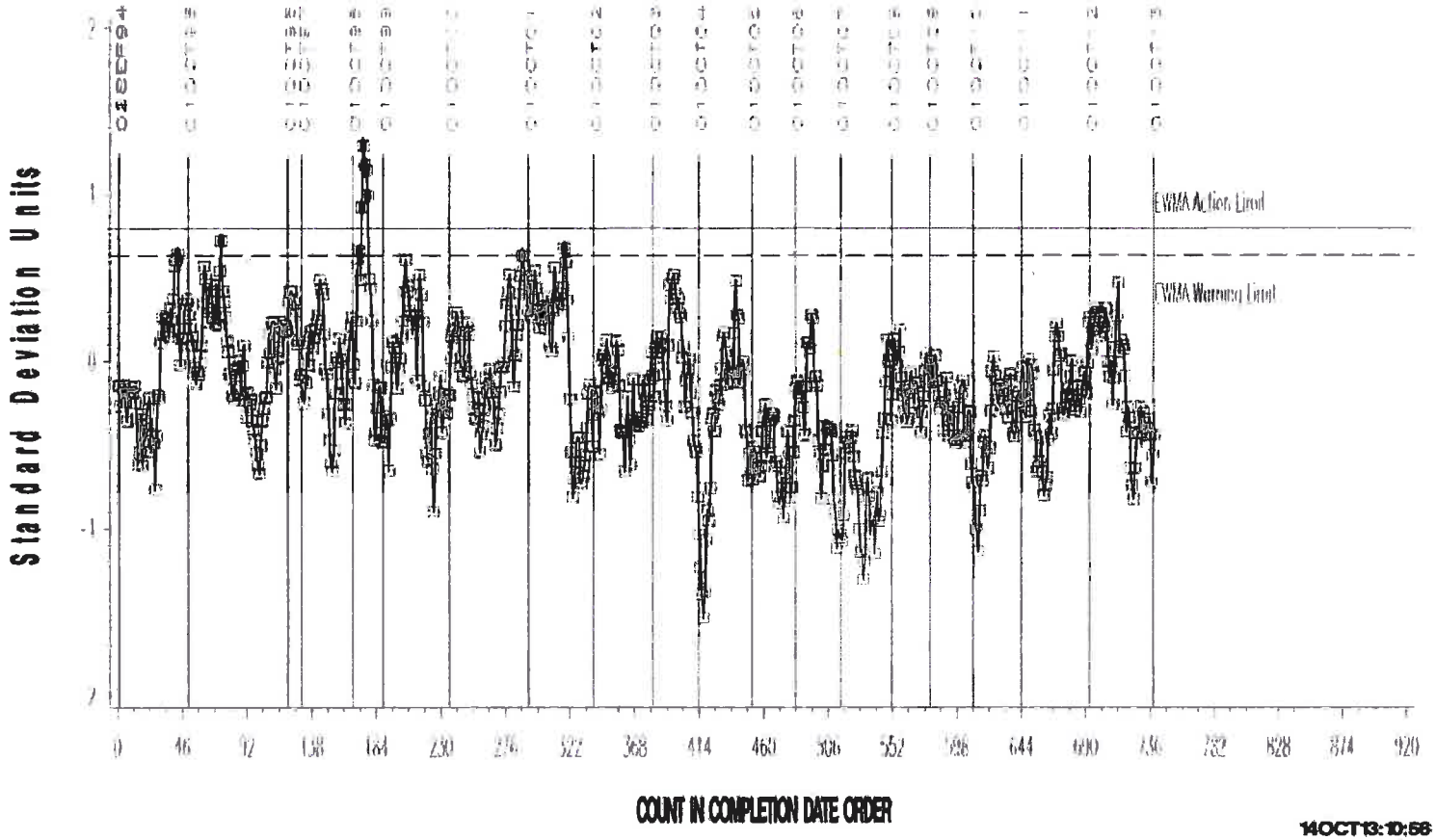


# L-60-1 (D5704)

## L—60—1 INDUSTRY OPERATIONALLY VALID DATA

### REF. FINAL TOLUENE INSOLUBLES

**LTMS Precision Analysis**



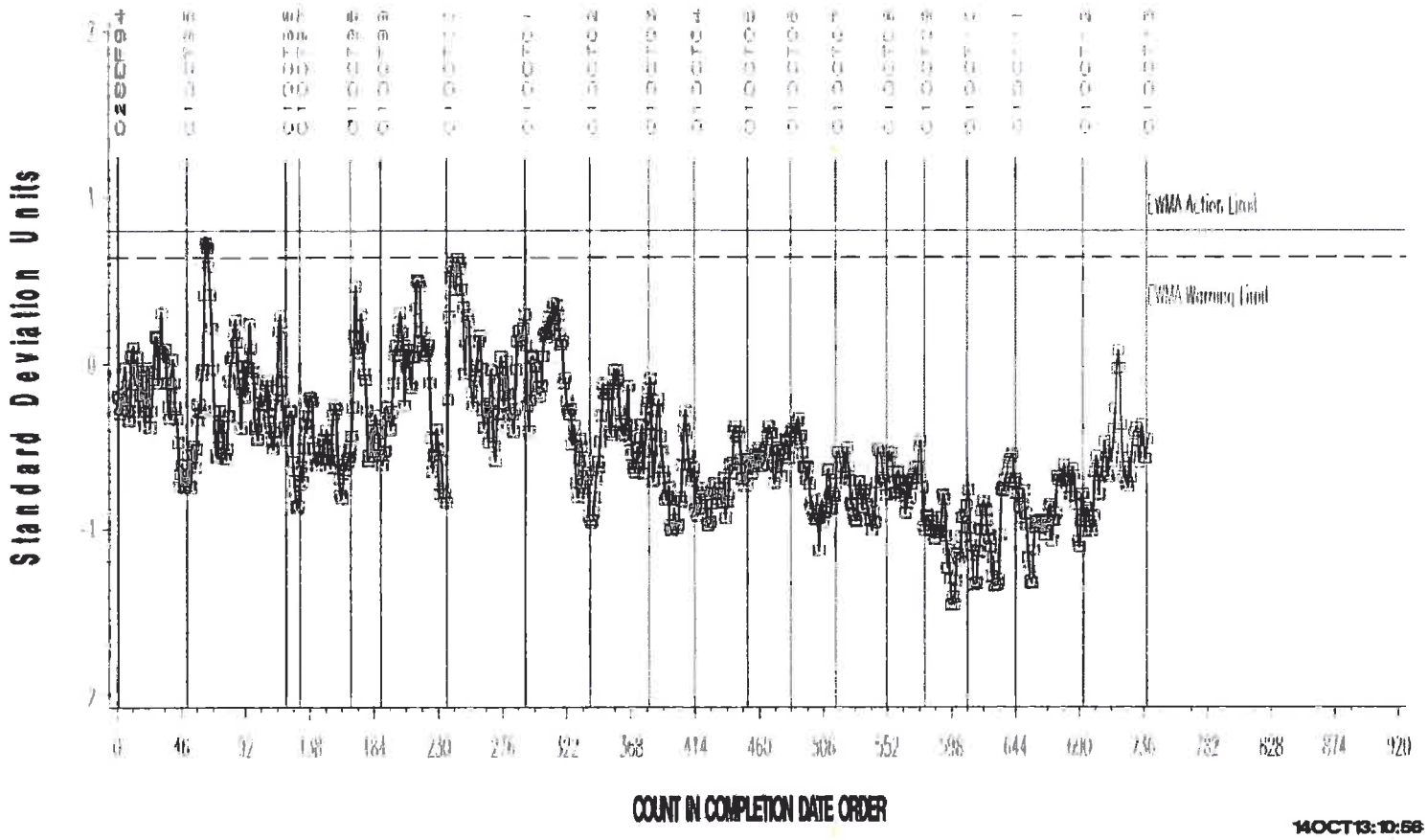

14OCT13:10:58

# L-60-1 (D5704)

## L—60—1 INDUSTRY OPERATIONALLY VALID DATA

### REF. FINAL VISCOSITY INCREASE

LTMS Precision Analysis

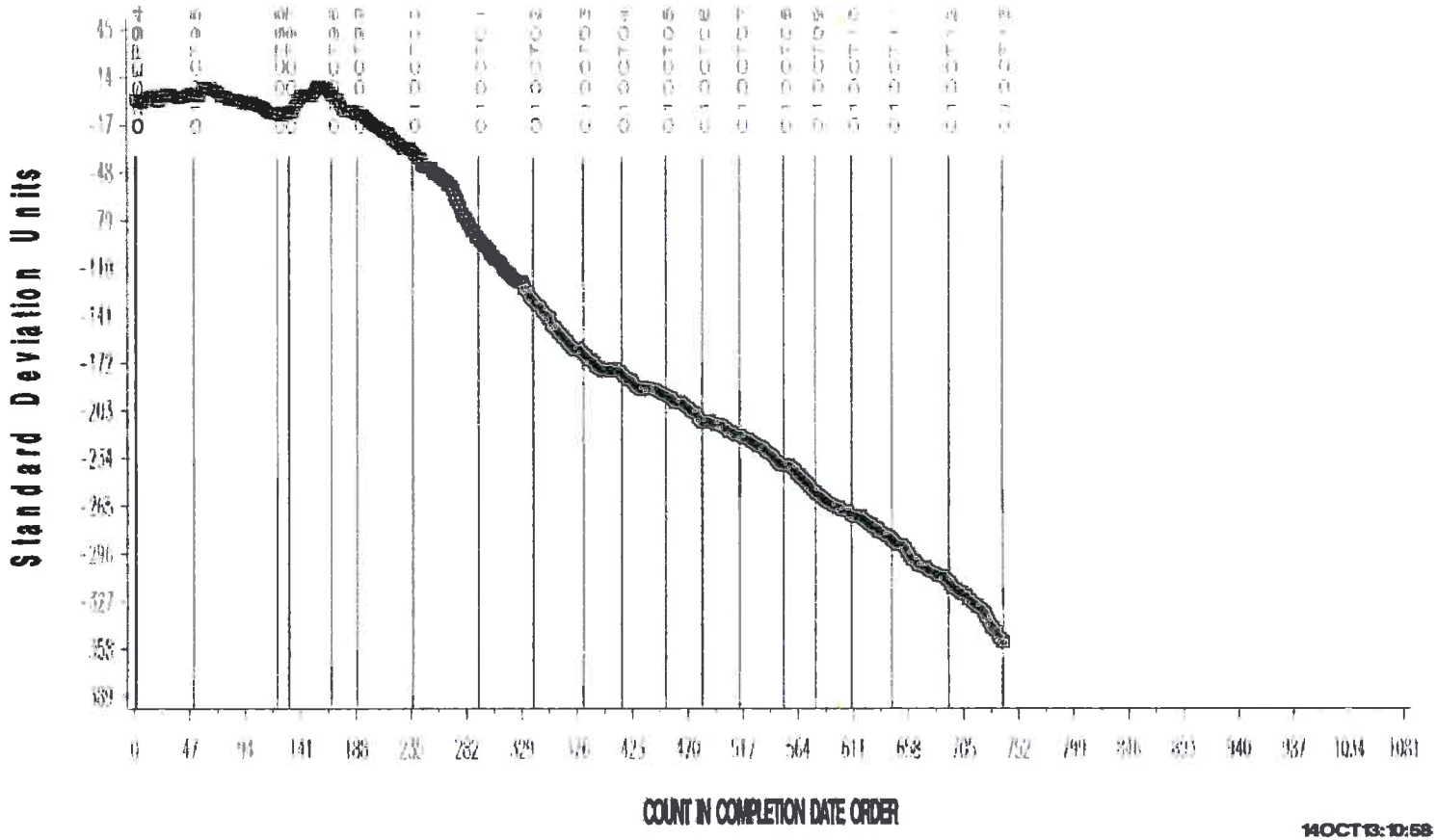


# L-60-1 (D5704)

## L—60—1 INDUSTRY OPERATIONALLY VALID DATA

### REF. FINAL AVERAGE CARBON/ VARNISH

**CUSUM Severity Analysis**



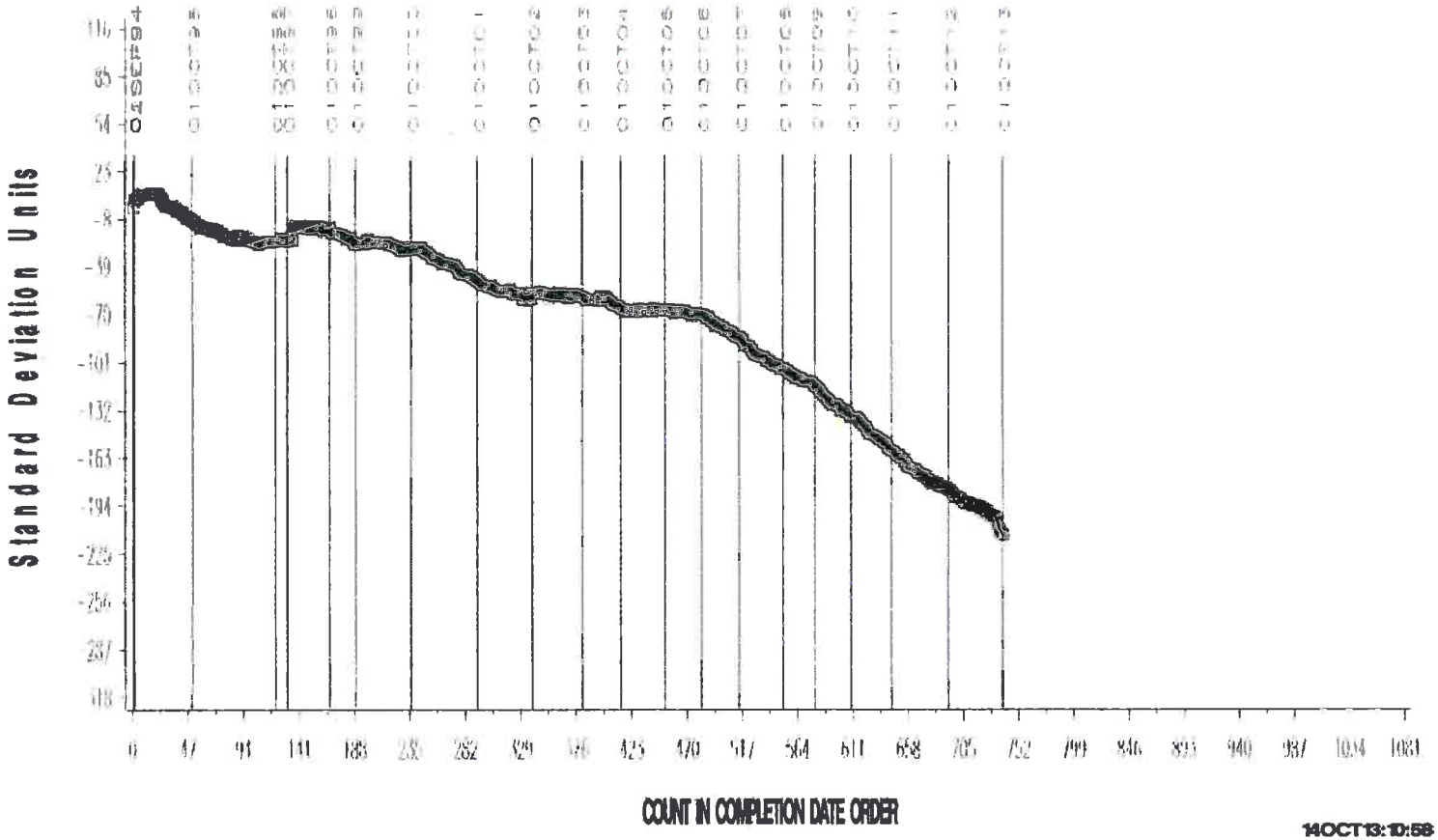

14OCT13:10:58

# L-60-1 (D5704)

## L—60—1 INDUSTRY OPERATIONALLY VALID DATA

### REF: FINAL AVERAGE SLUDGE

**CUSUM Severity Analysis**



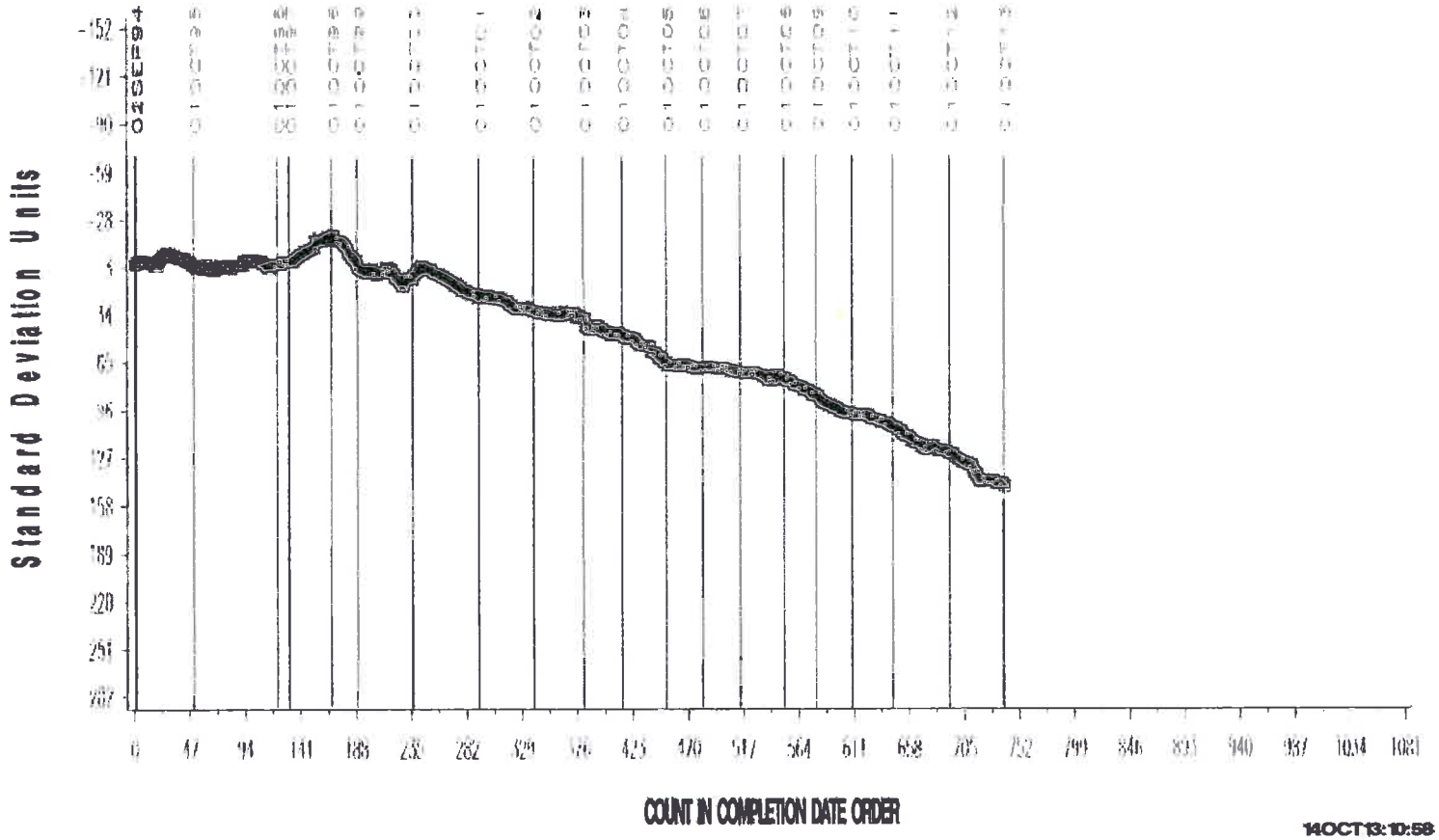

14OCT13:10:58

# L-60-1 (D5704)

## L—60—1 INDUSTRY OPERATIONALLY VALID DATA

### REF. FINAL PENTANE INSOLUBLES

**CUSUM Severity Analysis**



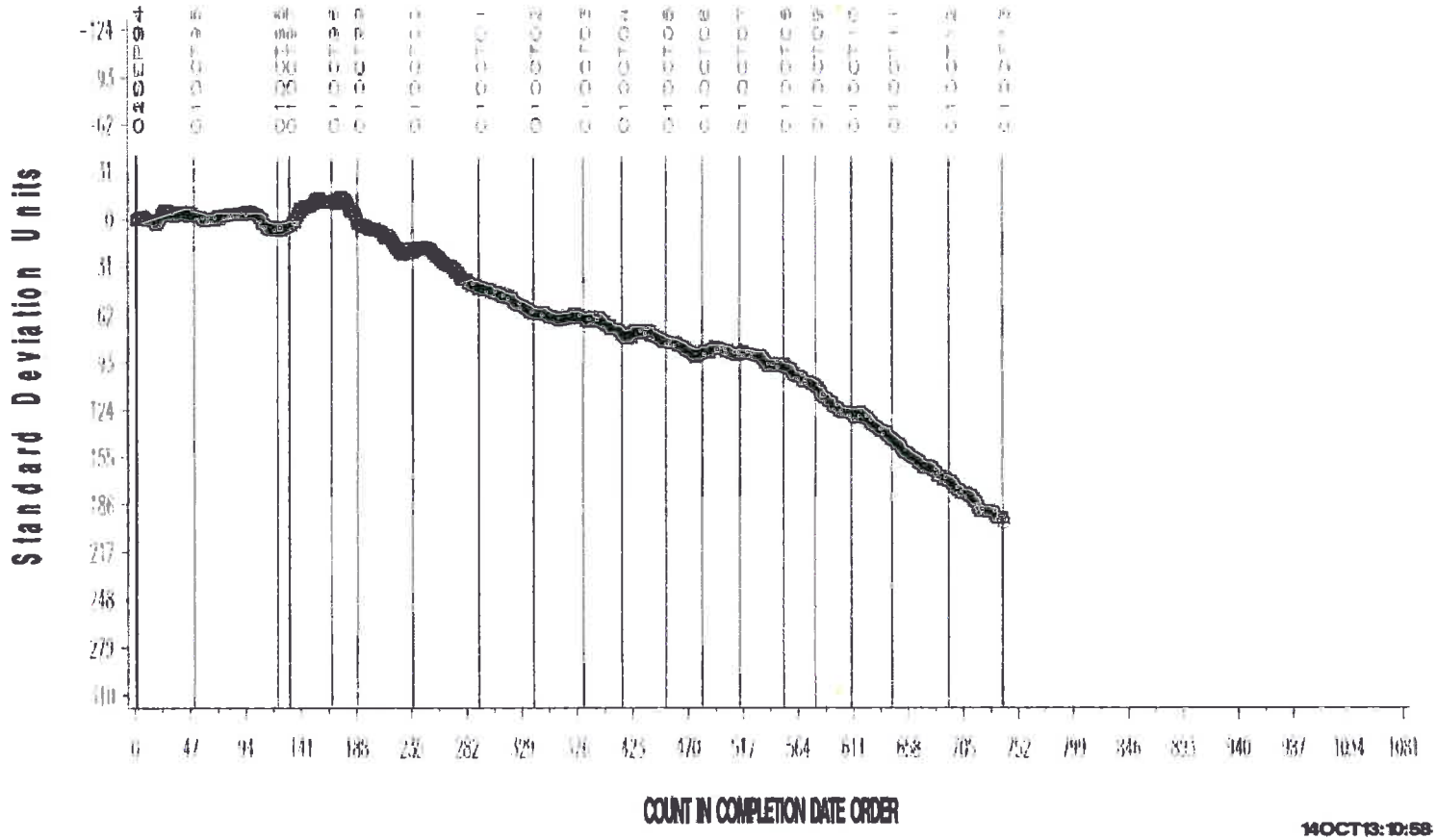

14OCT13:10:58

# L-60-1 (D5704)

## L—60—1 INDUSTRY OPERATIONALLY VALID DATA

### REF. FINAL TOLUENE INSOLUBLES

**CUSUM Severity Analysis**



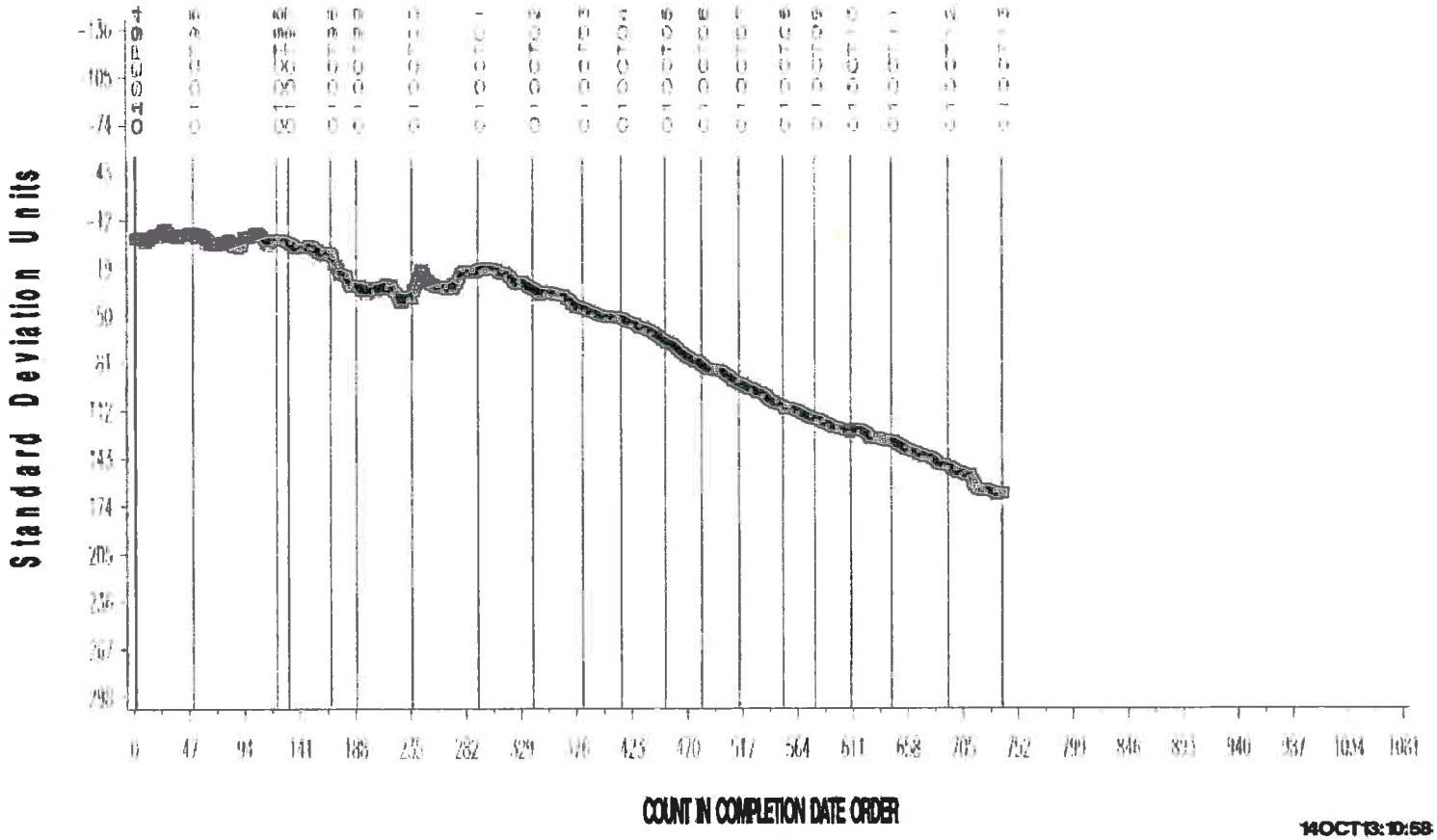

14OCT13:10:58

# L-60-1 (D5704)

## L—60—1 INDUSTRY OPERATIONALLY VALID DATA

### REF: FINAL VISCOSITY INCREASE

**CUSUM Severity Analysis**

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# L-60-1 (D5704)

## TIMELINE ADDITIONS

| Effective Date | Information Letter | Event |
|---|---|---|
| 20130903 | 13-2 | Revision to model number for Sierra Top Trak airflow meter. |

# L-60-1 (D5704)

## LAB VISITS

Lab visits were made to all 4 L-60-1 testing labs to verify that all revisions to the D893 insolubles procedure had been implemented. One lab was found to be using additional solvent to balance tubes for centrifuging, covering tubes in the drying oven to prevent spatter, and using an equation for final insoluble % other than that in the procedure.

## INFORMATION LETTERS

Information Letter 13-2 was issued on September 3, 2013 to revise the model number specified for the Sierra Top Trak airflow meter. The manufacturer has revised the coding scheme for the available options.

# L-60-1 (D5704)

## STATUS OF REFERENCE OIL SUPPLY

| | | @ TMC | |
|---|---|---|---|
| Oil | Cans @ Labs | Cans | Gallons |
| 133 | 5 | 1693 | 105.8 |
| 148-1 | 23 | 525 | 32.8 |
| 151-2 | 24 | 38 | 2.4 |
| Total | 52 | 2256 | 141.0 |

A reblend of 151-2 (151-3) was acquired by TMC in 1999 but has since been consumed in other test types. That oil was then replaced by 155 which is also nearly depleted. A 155 reblend (155-1) is on hand at TMC and will be available for L-60-1 testing when the need arises. TMC inventory records indicate that 2.4 gallons of 151-2 remain. While this does provide oil for 38 tests, be advised that quantities that low can unexpectedly be depleted by even minor spills or transfer losses. The panel is advised to begin thinking about an introduction plan for 155-1. Five hundred and twenty five tests of oil 148-1 remain in TMC inventory; however, this is only 32.8 gallons. When the need arises, it will not be possible to obtain a reblend of this oil. The panel may also want to begin considering a possible replacement for this oil.

# L-60-1 Gear Batch Comparisons

GEAR batch (all data)
IND=148-1

| | NEW | OLD |
|---|---|---|
| | 15 | 195 |
| ACVTI | 1.319 | 1.287 |
| ASLTI | 0.626 | 0.657 |
| PENTI | -0.478 | -0.711 |
| TOLTI | -0.569 | -1.004 |
| VISITI | 3.713 | 3.704 |

N size for the group

Test parameter means

GEAR batch (all data)
IND=151-2

| | NEW | OLD |
|---|---|---|
| | 14 | 237 |
| ACVTI | 1.352 | 1.593 |
| ASLTI | 0.545 | 0.489 |
| PENTI | 0.829 | 0.703 |
| TOLTI | 0.286 | 0.214 |
| VISITI | 3.626 | 3.613 |

# L-60-1 Gear Batch Comparisons

GEAR batch (all data)
IND=148-1

| | NEW | OLD |
|---|---|---|
| | 15 | 195 |
| ACVTI | 1.319 | 1.287 |
| ASLTI | 0.626 | 0.657 |
| PENTI | -0.478 | -0.711 |
| TOLTI | -0.569 | -1.004 |
| VISITI | 3.713 | 3.704 |

N size for the group

Test parameter means

GEAR batch (all data)
IND=151-2

| | NEW | OLD |
|---|---|---|
| | 14 | 237 |
| ACVTI | 1.352 | 1.593 |
| ASLTI | 0.545 | 0.489 |
| PENTI | 0.829 | 0.703 |
| TOLTI | 0.286 | 0.214 |
| VISITI | 3.626 | 3.613 |

Highlighting indicates statistically significant difference at 95% confidence

# L-60-1 Gear Batch Comparisons

Restricting analysis to more recent data as was done for initial gear batch approval

GEAR batch (all data)
IND=148-1

| | NEW | OLD |
|---|---|---|
| | 15 | 195 |
| ACVTI | 1.319 | 1.287 |
| ASLTI | 0.626 | 0.657 |
| PENTI | -0.478 | -0.711 |
| TOLTI | -0.569 | -1.004 |
| VISITI | 3.713 | 3.704 |

GEAR batch (date >=20100101)
IND=148-1

| | NEW | OLD |
|---|---|---|
| | 15 | 61 |
| ACVTI | 1.319 | 1.324 |
| ASLTI | 0.626 | 0.607 |
| PENTI | -0.478 | -0.723 |
| TOLTI | -0.569 | -0.943 |
| VISITI | 3.713 | 3.696 |

GEAR batch (all data)
IND=151-2

| | NEW | OLD |
|---|---|---|
| | 14 | 237 |
| ACVTI | 1.352 | 1.593 |
| ASLTI | 0.545 | 0.489 |
| PENTI | 0.829 | 0.703 |
| TOLTI | 0.286 | 0.214 |
| VISITI | 3.626 | 3.613 |

GEAR batch (date >=20100101)
IND=151-2

| | NEW | OLD |
|---|---|---|
| | 14 | 64 |
| ACVTI | 1.352 | 1.590 |
| ASLTI | 0.545 | 0.425 |
| PENTI | 0.829 | 0.736 |
| TOLTI | 0.286 | 0.299 |
| VISITI | 3.626 | 3.621 |

# L-60-1 Gear Batch Comparisons

Considering only Lab D data.

GEAR batch (all data)
IND=148-1

| | NEW | OLD |
|---|---|---|
| | 15 | 195 |
| ACVTI | 1.319 | 1.287 |
| ASLTI | 0.626 | 0.657 |
| PENTI | -0.478 | -0.711 |
| TOLTI | -0.569 | -1.004 |
| VISITI | 3.713 | 3.704 |

GEAR batch (date >=20100101)
IND=148-1

| | NEW | OLD |
|---|---|---|
| | 15 | 61 |
| ACVTI | 1.319 | 1.324 |
| ASLTI | 0.626 | 0.607 |
| PENTI | -0.478 | -0.723 |
| TOLTI | -0.569 | -0.943 |
| VISITI | 3.713 | 3.696 |

GEAR batch (Lab D alldata)
IND=148-1

| | NEW | OLD |
|---|---|---|
| | 13 | 89 |
| ACVTI | 1.335 | 1.352 |
| ASLTI | 0.581 | 0.628 |
| PENTI | -0.459 | -0.560 |
| TOLTI | -0.515 | -0.878 |
| VISITI | 3.723 | 3.708 |

GEAR batch (all data)
IND=151-2

| | NEW | OLD |
|---|---|---|
| | 14 | 237 |
| ACVTI | 1.352 | 1.593 |
| ASLTI | 0.545 | 0.489 |
| PENTI | 0.829 | 0.703 |
| TOLTI | 0.286 | 0.214 |
| VISITI | 3.626 | 3.613 |

GEAR batch (date >=20100101)
IND=151-2

| | NEW | OLD |
|---|---|---|
| | 14 | 64 |
| ACVTI | 1.352 | 1.590 |
| ASLTI | 0.545 | 0.425 |
| PENTI | 0.829 | 0.736 |
| TOLTI | 0.286 | 0.299 |
| VISITI | 3.626 | 3.621 |

GEAR batch (Lab D alldata)
IND=151-2

| | NEW | OLD |
|---|---|---|
| | 10 | 99 |
| ACVTI | 1.283 | 1.509 |
| ASLTI | 0.620 | 0.528 |
| PENTI | 0.926 | 0.782 |
| TOLTI | 0.374 | 0.194 |
| VISITI | 3.634 | 3.630 |

# L-60-1 Gear Batch Comparisons

Considering only more recent Lab D data.

GEAR batch (all data)
IND=148-1

| | NEW | OLD |
|---|---|---|
| | 15 | 195 |
| ACVTI | 1.319 | 1.287 |
| ASLTI | 0.626 | 0.657 |
| PENTI | -0.478 | -0.711 |
| TOLTI | -0.569 | -1.004 |
| VISITI | 3.713 | 3.704 |

GEAR batch (date >=20100101)
IND=148-1

| | NEW | OLD |
|---|---|---|
| | 15 | 61 |
| ACVTI | 1.319 | 1.324 |
| ASLTI | 0.626 | 0.607 |
| PENTI | -0.478 | -0.723 |
| TOLTI | -0.569 | -0.943 |
| VISITI | 3.713 | 3.696 |

GEAR batch (Lab D alldata)
IND=148-1

| | NEW | OLD |
|---|---|---|
| | 13 | 89 |
| ACVTI | 1.335 | 1.352 |
| ASLTI | 0.581 | 0.628 |
| PENTI | -0.459 | -0.560 |
| TOLTI | -0.515 | -0.878 |
| VISITI | 3.723 | 3.708 |

GEAR batch (Lab D >=20100101)
IND=148-1

| | NEW | OLD |
|---|---|---|
| | 13 | 27 |
| ACVTI | 1.335 | 1.421 |
| ASLTI | 0.581 | 0.587 |
| PENTI | -0.459 | -0.562 |
| TOLTI | -0.515 | -0.701 |
| VISITI | 3.723 | 3.696 |

GEAR batch (all data)
IND=151-2

| | NEW | OLD |
|---|---|---|
| | 14 | 237 |
| ACVTI | 1.352 | 1.593 |
| ASLTI | 0.545 | 0.489 |
| PENTI | 0.829 | 0.703 |
| TOLTI | 0.286 | 0.214 |
| VISITI | 3.626 | 3.613 |

GEAR batch (date >=20100101)
IND=151-2

| | NEW | OLD |
|---|---|---|
| | 14 | 64 |
| ACVTI | 1.352 | 1.590 |
| ASLTI | 0.545 | 0.425 |
| PENTI | 0.829 | 0.736 |
| TOLTI | 0.286 | 0.299 |
| VISITI | 3.626 | 3.621 |

GEAR batch (Lab D alldata)
IND=151-2

| | NEW | OLD |
|---|---|---|
| | 10 | 99 |
| ACVTI | 1.283 | 1.509 |
| ASLTI | 0.620 | 0.528 |
| PENTI | 0.926 | 0.782 |
| TOLTI | 0.374 | 0.194 |
| VISITI | 3.634 | 3.630 |

GEAR batch (Lab D >=20100101)
IND=151-2

| | NEW | OLD |
|---|---|---|
| | 10 | 26 |
| ACVTI | 1.283 | 1.481 |
| ASLTI | 0.620 | 0.522 |
| PENTI | 0.926 | 0.852 |
| TOLTI | 0.374 | 0.487 |
| VISITI | 3.634 | 3.616 |

# L-60-1 Gear Batch Comparisons

GEAR batch (all data)
IND=148-1

| | NEW | OLD |
|---|---|---|
| | 15 | 195 |
| ACVTI | 1.319 | 1.287 |
| ASLTI | 0.626 | 0.657 |
| PENTI | -0.478 | -0.711 |
| TOLTI | -0.569 | -1.004 |
| VISITI | 3.713 | 3.704 |

GEAR batch (date >=20100101)
IND=148-1

| | NEW | OLD |
|---|---|---|
| | 15 | 61 |
| ACVTI | 1.319 | 1.324 |
| ASLTI | 0.626 | 0.607 |
| PENTI | -0.478 | -0.723 |
| TOLTI | -0.569 | -0.943 |
| VISITI | 3.713 | 3.696 |

GEAR batch (Lab D alldata)
IND=148-1

| | NEW | OLD |
|---|---|---|
| | 13 | 89 |
| ACVTI | 1.335 | 1.352 |
| ASLTI | 0.581 | 0.628 |
| PENTI | -0.459 | -0.560 |
| TOLTI | -0.515 | -0.878 |
| VISITI | 3.723 | 3.708 |

GEAR batch (Lab D >=20100101)
IND=148-1

| | NEW | OLD |
|---|---|---|
| | 13 | 27 |
| ACVTI | 1.335 | 1.421 |
| ASLTI | 0.581 | 0.587 |
| PENTI | -0.459 | -0.562 |
| TOLTI | -0.515 | -0.701 |
| VISITI | 3.723 | 3.696 |

GEAR batch (all data)
IND=151-2

| | NEW | OLD |
|---|---|---|
| | 14 | 237 |
| ACVTI | 1.352 | 1.593 |
| ASLTI | 0.545 | 0.489 |
| PENTI | 0.829 | 0.703 |
| TOLTI | 0.286 | 0.214 |
| VISITI | 3.626 | 3.613 |

GEAR batch (date >=20100101)
IND=151-2

| | NEW | OLD |
|---|---|---|
| | 14 | 64 |
| ACVTI | 1.352 | 1.590 |
| ASLTI | 0.545 | 0.425 |
| PENTI | 0.829 | 0.736 |
| TOLTI | 0.286 | 0.299 |
| VISITI | 3.626 | 3.621 |

GEAR batch (Lab D alldata)
IND=151-2

| | NEW | OLD |
|---|---|---|
| | 10 | 99 |
| ACVTI | 1.283 | 1.509 |
| ASLTI | 0.620 | 0.528 |
| PENTI | 0.926 | 0.782 |
| TOLTI | 0.374 | 0.194 |
| VISITI | 3.634 | 3.630 |

GEAR batch (Lab D >=20100101)
IND=151-2

| | NEW | OLD |
|---|---|---|
| | 10 | 26 |
| ACVTI | 1.283 | 1.481 |
| ASLTI | 0.620 | 0.522 |
| PENTI | 0.926 | 0.852 |
| TOLTI | 0.374 | 0.487 |
| VISITI | 3.634 | 3.616 |

ORIGINAL UNITS Same analyses repeated for original units (no transformation)

GEAR batch (all data)
IND=148-1

| | NEW | OLD |
|---|---|---|
| | 15 | 195 |
| ACV | 7.887 | 7.815 |
| ASL | 9.460 | 9.475 |
| PEN | 0.627 | 0.517 |
| TOL | 0.573 | 0.389 |
| VISI | 41.267 | 40.662 |

GEAR batch (date >=20100101)
IND=148-1

| | NEW | OLD |
|---|---|---|
| | 15 | 61 |
| ACV | 7.887 | 7.872 |
| ASL | 9.460 | 9.449 |
| PEN | 0.627 | 0.498 |
| TOL | 0.573 | 0.410 |
| VISI | 41.267 | 40.328 |

GEAR batch (Lab D alldata)
IND=148-1

| | NEW | OLD |
|---|---|---|
| | 13 | 89 |
| ACV | 7.915 | 7.936 |
| ASL | 9.439 | 9.463 |
| PEN | 0.639 | 0.608 |
| TOL | 0.600 | 0.443 |
| VISI | 41.692 | 40.843 |

GEAR batch (Lab D >=20100101)
IND=148-1

| | NEW | OLD |
|---|---|---|
| | 13 | 27 |
| ACV | 7.915 | 8.048 |
| ASL | 9.439 | 9.441 |
| PEN | 0.639 | 0.582 |
| TOL | 0.600 | 0.507 |
| VISI | 41.692 | 40.296 |

GEAR batch (all data)
IND=151-2

| | NEW | OLD |
|---|---|---|
| | 14 | 237 |
| ACV | 7.929 | 8.254 |
| ASL | 9.414 | 9.378 |
| PEN | 2.350 | 2.051 |
| TOL | 1.421 | 1.300 |
| VISI | 37.714 | 37.165 |

GEAR batch (date >=20100101)
IND=151-2

| | NEW | OLD |
|---|---|---|
| | 14 | 64 |
| ACV | 7.929 | 8.263 |
| ASL | 9.414 | 9.339 |
| PEN | 2.350 | 2.133 |
| TOL | 1.421 | 1.408 |
| VISI | 37.714 | 37.391 |

GEAR batch (Lab D alldata)
IND=151-2

| | NEW | OLD |
|---|---|---|
| | 10 | 99 |
| ACV | 7.820 | 8.169 |
| ASL | 9.460 | 9.407 |
| PEN | 2.570 | 2.227 |
| TOL | 1.560 | 1.317 |
| VISI | 38.100 | 37.788 |

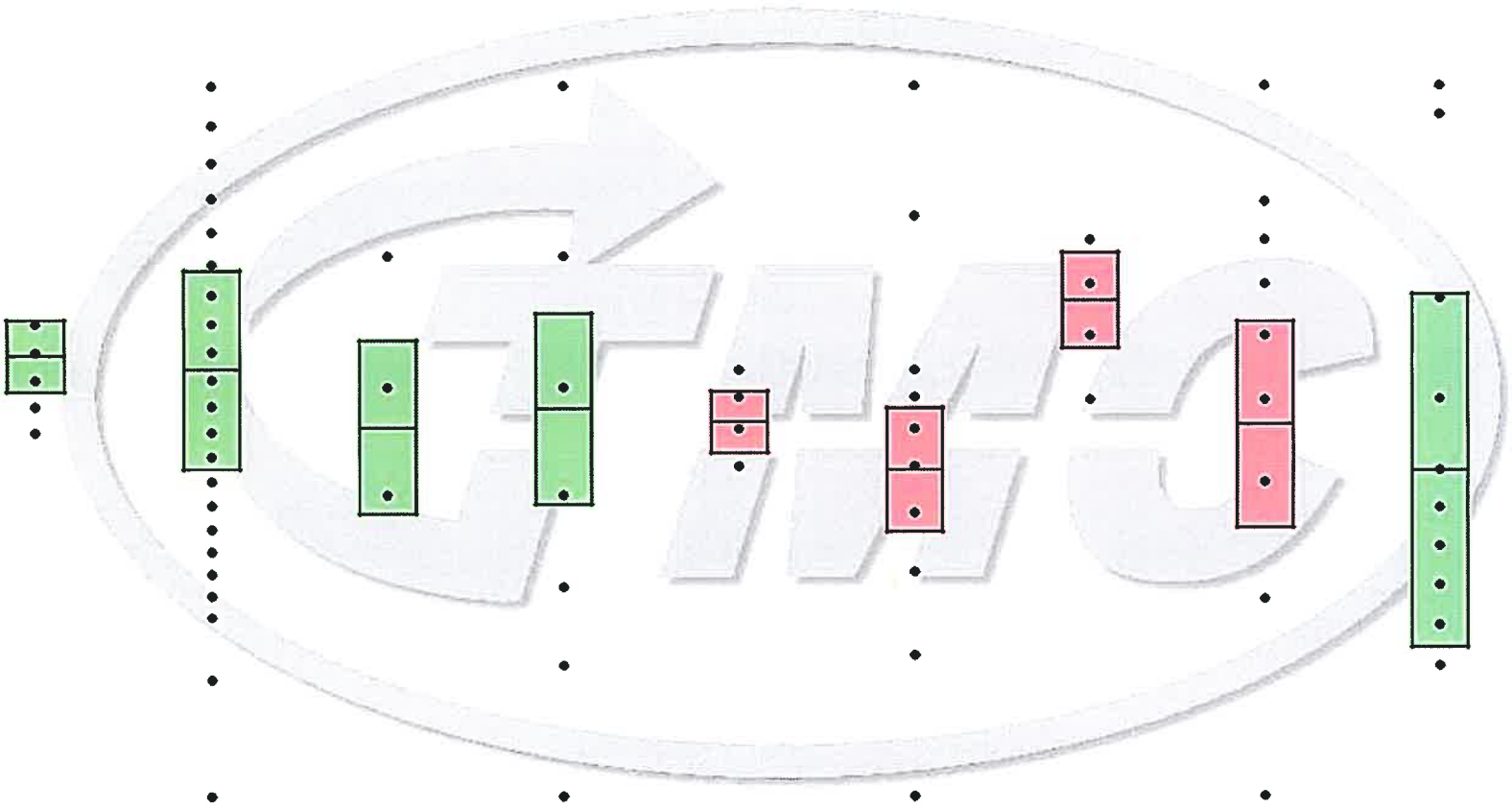
GEAR batch (Lab D >=20100101)
IND=151-2

| | NEW | OLD |
|---|---|---|
| | 10 | 26 |
| ACV | 7.820 | 8.127 |
| ASL | 9.460 | 9.404 |
| PEN | 2.570 | 2.415 |
| TOL | 1.560 | 1.689 |
| VISI | 38.100 | 37.231 |

# L-60-1 New vs Old Gears

**All Data**

**UNITS=TRANSFORMED IND=148-1**



| | ACVTI NEW | ACVTI OLD | ASLTI NEW | ASLTI OLD | PENTI NEW | PENTI OLD | TOLTI NEW | TOLTI OLD | VISITI NEW | VISITI OLD |
|---|---|---|---|---|---|---|---|---|---|---|
| N | 15 | 195 | 15 | 195 | 15 | 195 | 15 | 195 | 15 | 195 |
| Min | 1.153 | 0.364 | 0.511 | 0 | -0.69 | -2.3 | -0.92 | -2.3 | 3.584 | 3.497 |
| Max | 1.386 | 1.901 | 0.916 | 1.204 | -0.22 | 1.163 | -0.36 | 0.182 | 3.97 | 3.85 |
| Mean | 1.319 | 1.287 | 0.626 | 0.657 | -0.48 | -0.71 | -0.57 | -1 | 3.713 | 3.704 |
| Std | 0.077 | 0.216 | 0.146 | 0.161 | 0.151 | 0.299 | 0.167 | 0.36 | 0.118 | 0.057 |

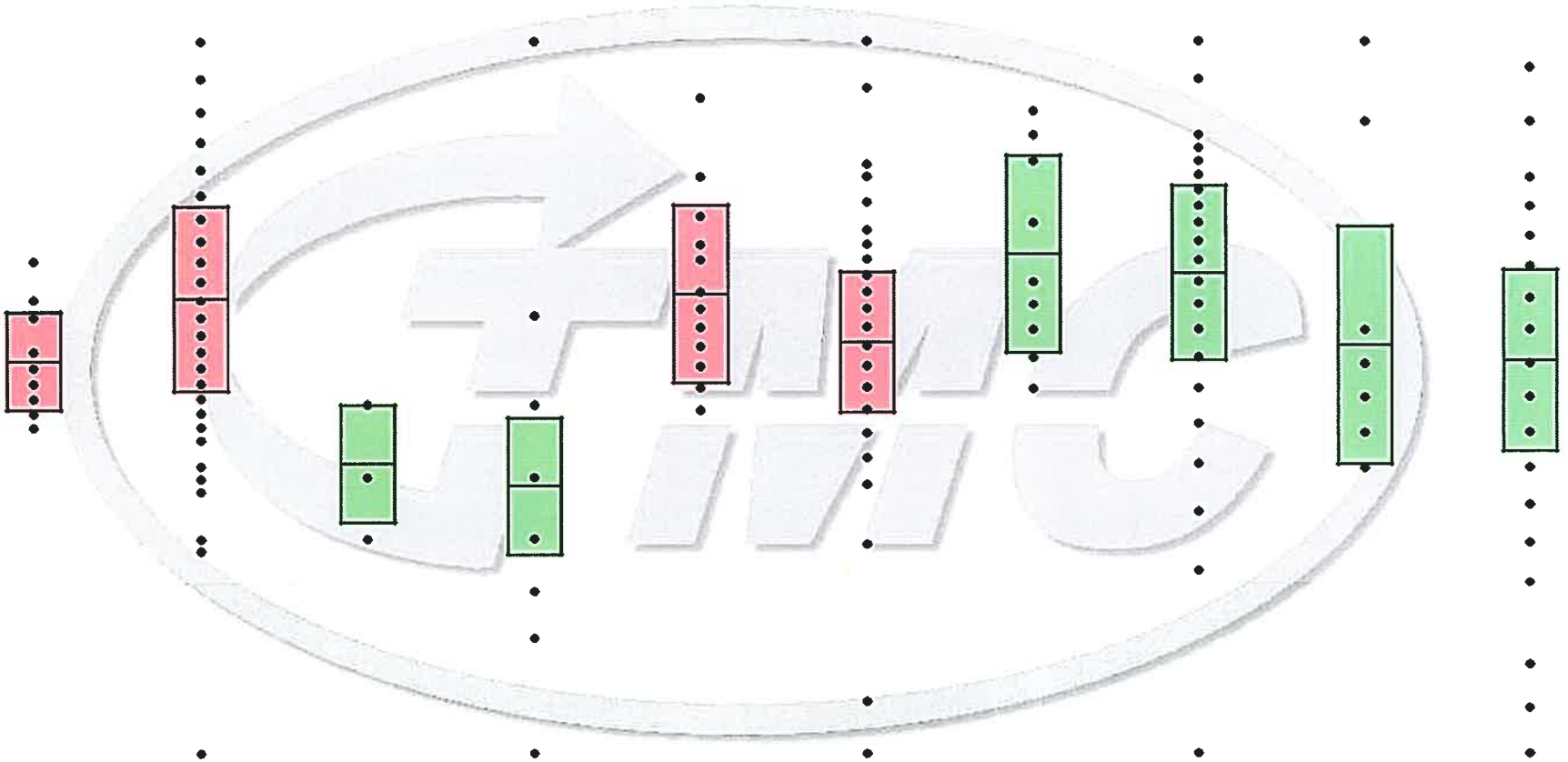


10:29:10 29OCT2013

# L-60-1 New vs Old Gears

**All Data**

**UNITS=TRANSFORMED IND=151-2**



| | ACVTI NEW | ACVTI OLD | ASLTI NEW | ASLTI OLD | PENTI NEW | PENTI OLD | TOLTI NEW | TOLTI OLD | VISITI NEW | VISITI OLD |
|---|---|---|---|---|---|---|---|---|---|---|
| N | 14 | 237 | 14 | 237 | 14 | 237 | 14 | 237 | 14 | 237 |
| Min | 1.099 | -0.16 | 0.357 | -0.18 | 0.531 | -0.36 | -0.22 | -1.61 | 3.526 | 3.296 |
| Max | 1.735 | 2.587 | 0.693 | 1.609 | 1.335 | 1.482 | 0.833 | 1.099 | 3.871 | 3.85 |
| Mean | 1.352 | 1.593 | 0.545 | 0.489 | 0.829 | 0.703 | 0.286 | 0.214 | 3.626 | 3.613 |
| Std | 0.186 | 0.355 | 0.146 | 0.172 | 0.229 | 0.181 | 0.375 | 0.332 | 0.096 | 0.073 |

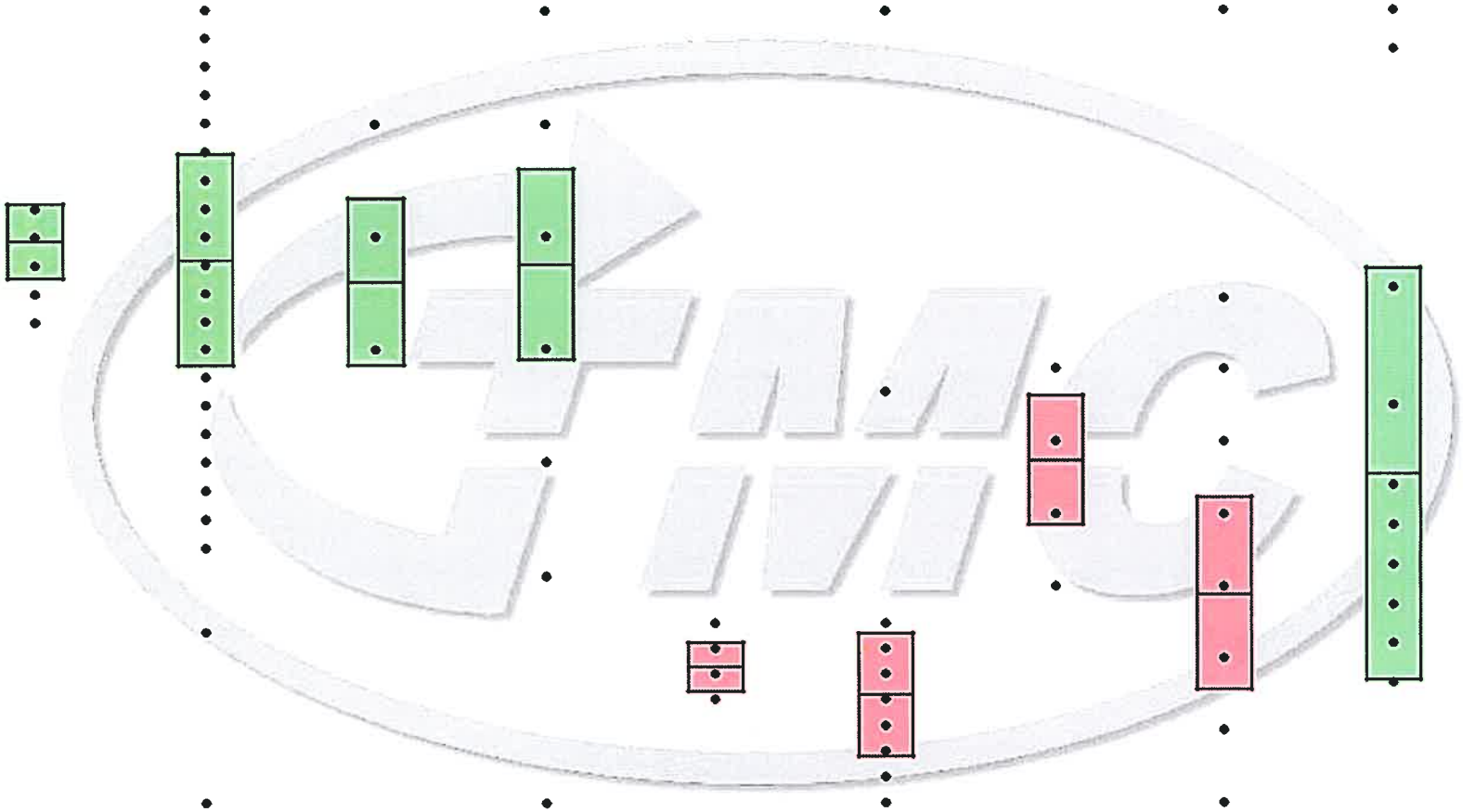


10:29:10 29OCT2013

# L-60-1 New vs Old Gears

**All Data**

**UNITS=ORIGINAL IND=148-1**



| | ACV NEW | ACV OLD | ASL NEW | ASL OLD | PEN NEW | PEN OLD | TOL NEW | TOL OLD | VISI NEW | VISI OLD |
|---|---|---|---|---|---|---|---|---|---|---|
| N | 15 | 195 | 15 | 195 | 15 | 195 | 15 | 195 | 15 | 195 |
| Min | 7.6 | 5.9 | 9.4 | 9 | 0.5 | 0.1 | 0.4 | 0.1 | 36 | 33 |
| Max | 8 | 8.7 | 9.6 | 9.7 | 0.8 | 3.2 | 0.7 | 1.2 | 53 | 47 |
| Mean | 7.887 | 7.815 | 9.46 | 9.475 | 0.627 | 0.517 | 0.573 | 0.389 | 41.27 | 40.66 |
| Std | 0.13 | 0.375 | 0.074 | 0.085 | 0.096 | 0.24 | 0.088 | 0.133 | 5.203 | 2.299 |

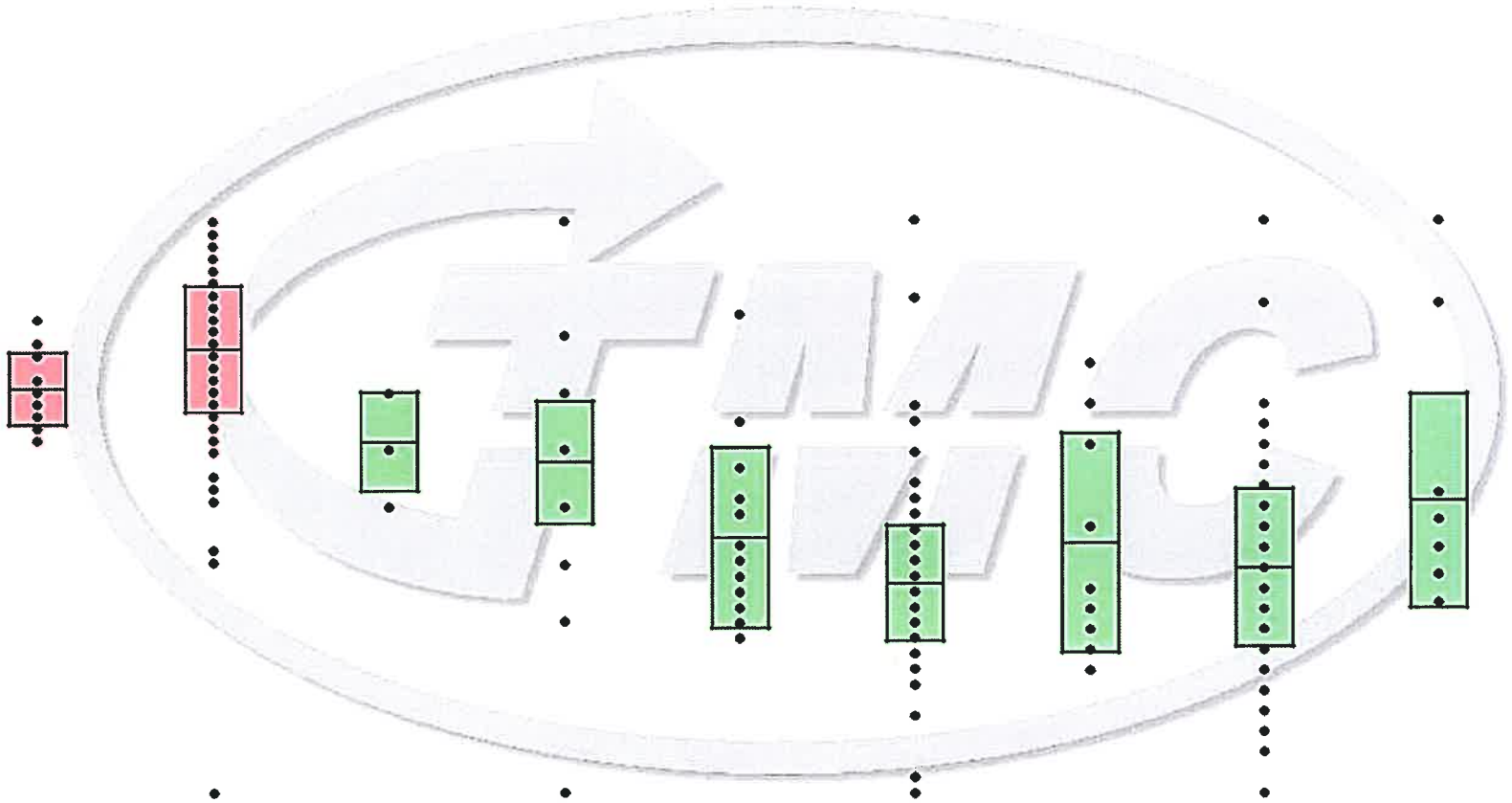


10:29:10 29OCT2013

# L-60-1 New vs Old Gears

**All Data**

**UNITS=ORIGINAL IND=151-2**



| | ACV NEW | ACV OLD | ASL NEW | ASL OLD | PEN NEW | PEN OLD | TOL NEW | TOL OLD | VISI NEW | VISI OLD |
|---|---|---|---|---|---|---|---|---|---|---|
| N | 14 | 237 | 14 | 237 | 14 | 237 | 14 | 237 | 14 | 237 |
| Min | 7.5 | 4.6 | 9.3 | 8.8 | 1.7 | 0.7 | 0.8 | 0.2 | 34 | 27 |
| Max | 8.5 | 9.3 | 9.5 | 9.8 | 3.8 | 4.4 | 2.3 | 3 | 48 | 47 |
| Mean | 7.929 | 8.254 | 9.414 | 9.378 | 2.35 | 2.051 | 1.421 | 1.3 | 37.71 | 37.16 |
| Std | 0.297 | 0.52 | 0.086 | 0.107 | 0.581 | 0.371 | 0.532 | 0.383 | 3.911 | 2.645 |

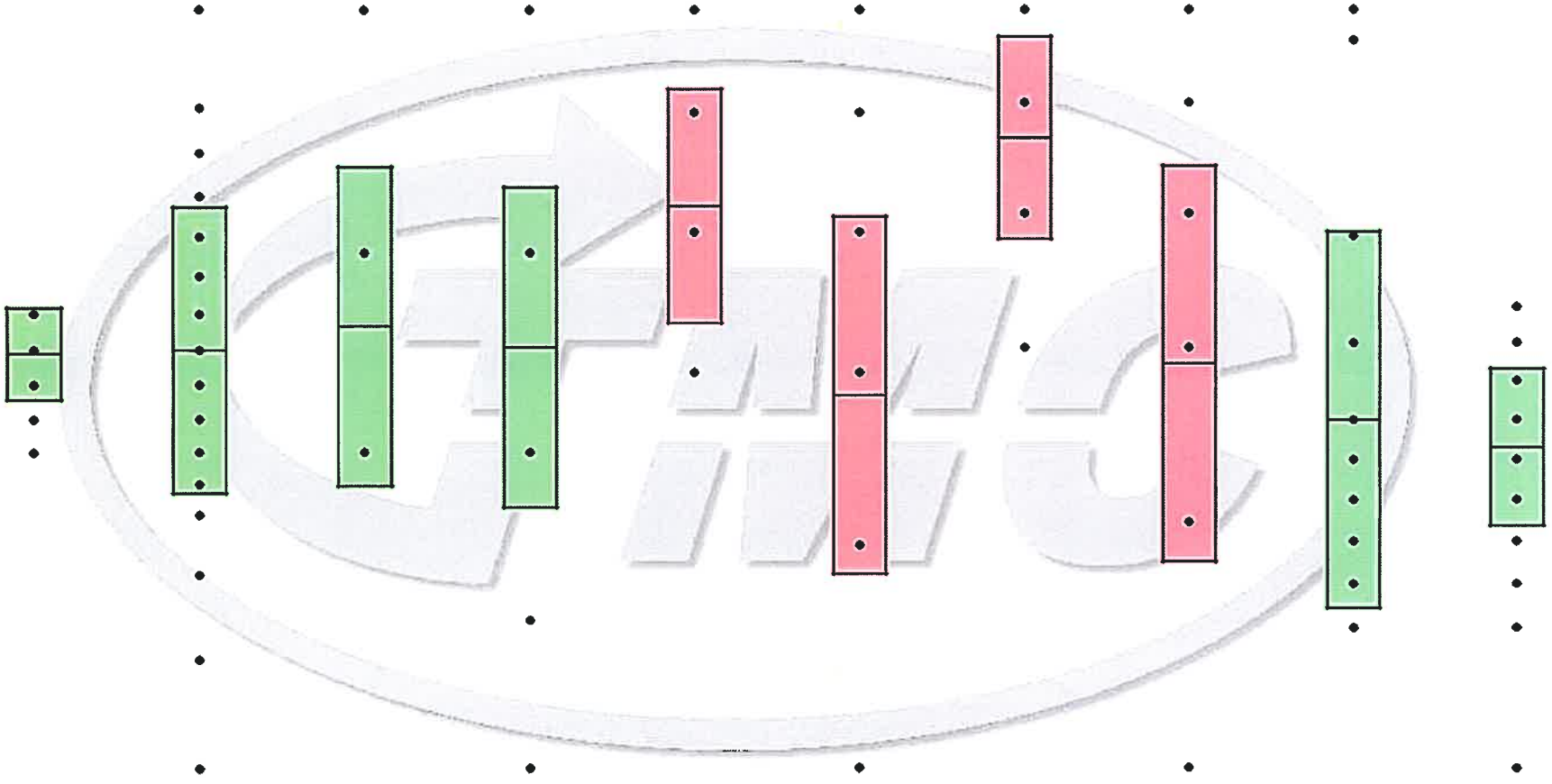


10:29:10 29OCT2013

# L-60-1 New vs Old Gears

**Date >=20100101**

**UNITS=TRANSFORMED IND=148-1**



| | ACVTI NEW | ACVTI OLD | ASLTI NEW | ASLTI OLD | PENTI NEW | PENTI OLD | TOLTI NEW | TOLTI OLD | VISITI NEW | VISITI OLD |
|---|---|---|---|---|---|---|---|---|---|---|
| N | 15 | 61 | 15 | 61 | 15 | 61 | 15 | 61 | 15 | 61 |
| Min | 1.153 | 0.619 | 0.511 | 0.223 | -0.69 | -1.2 | -0.92 | -1.61 | 3.584 | 3.497 |
| Max | 1.386 | 1.901 | 0.916 | 0.916 | -0.22 | -0.22 | -0.36 | -0.36 | 3.97 | 3.784 |
| Mean | 1.319 | 1.324 | 0.626 | 0.607 | -0.48 | -0.72 | -0.57 | -0.94 | 3.713 | 3.696 |
| Std | 0.077 | 0.241 | 0.146 | 0.146 | 0.151 | 0.231 | 0.167 | 0.327 | 0.118 | 0.049 |

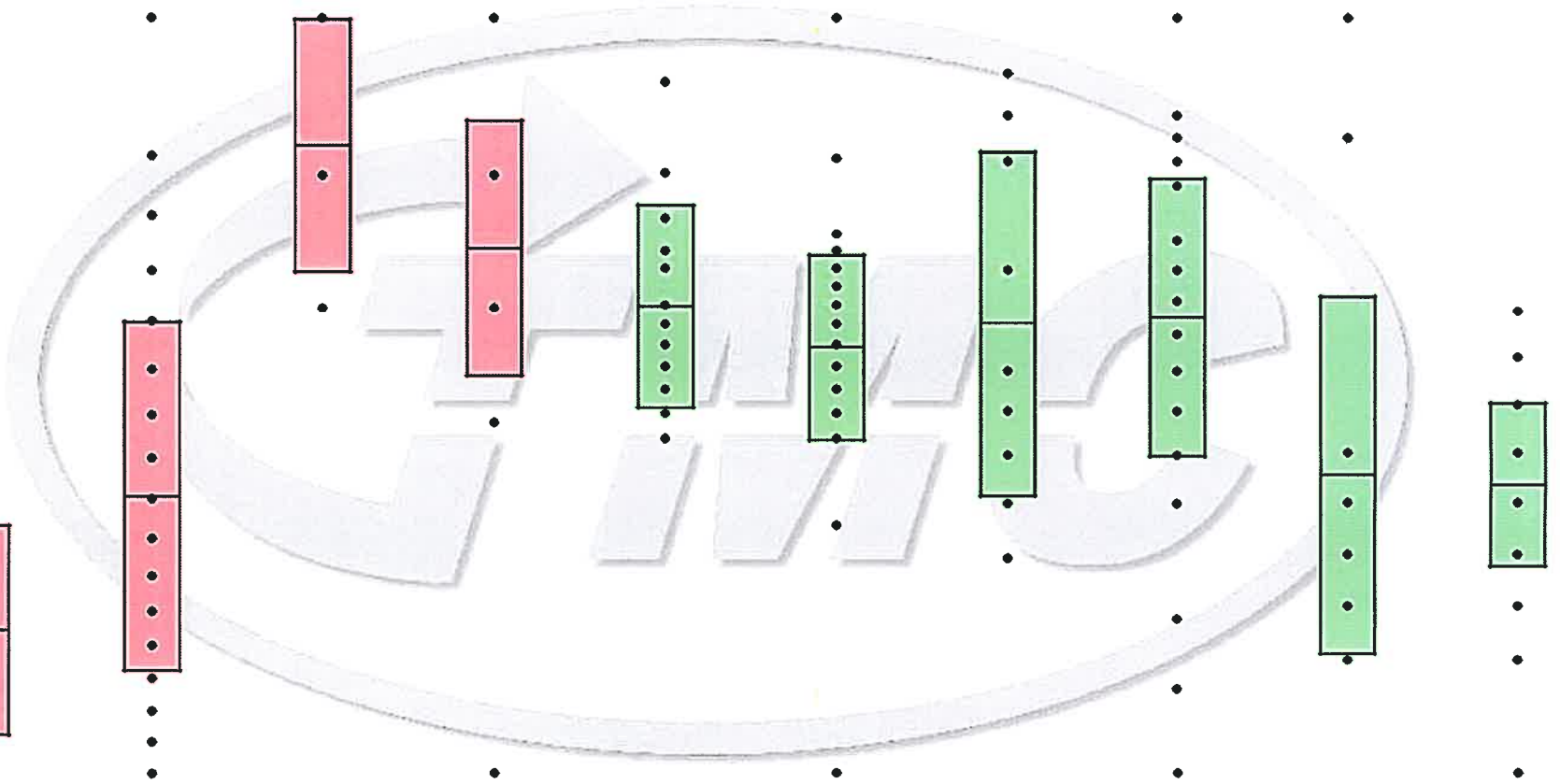


11:12:32 29OCT2013

# L-60-1 New vs Old Gears

**Date >=20100101**

**UNITS=TRANSFORMED IND=151-2**



| | ACVTI NEW | ACVTI OLD | ASLTI NEW | ASLTI OLD | PENTI NEW | PENTI OLD | TOLTI NEW | TOLTI OLD | VISITI NEW | VISITI OLD |
|---|---|---|---|---|---|---|---|---|---|---|
| N | 14 | 64 | 14 | 64 | 14 | 64 | 14 | 64 | 14 | 64 |
| Min | 1.099 | 1.099 | 0.357 | -0.18 | 0.531 | -0.22 | -0.22 | -0.69 | 3.526 | 3.466 |
| Max | 1.735 | 2.442 | 0.693 | 0.693 | 1.335 | 1.482 | 0.833 | 0.956 | 3.871 | 3.714 |
| Mean | 1.352 | 1.59 | 0.545 | 0.425 | 0.829 | 0.736 | 0.286 | 0.299 | 3.626 | 3.621 |
| Std | 0.186 | 0.31 | 0.146 | 0.148 | 0.229 | 0.21 | 0.375 | 0.303 | 0.096 | 0.043 |

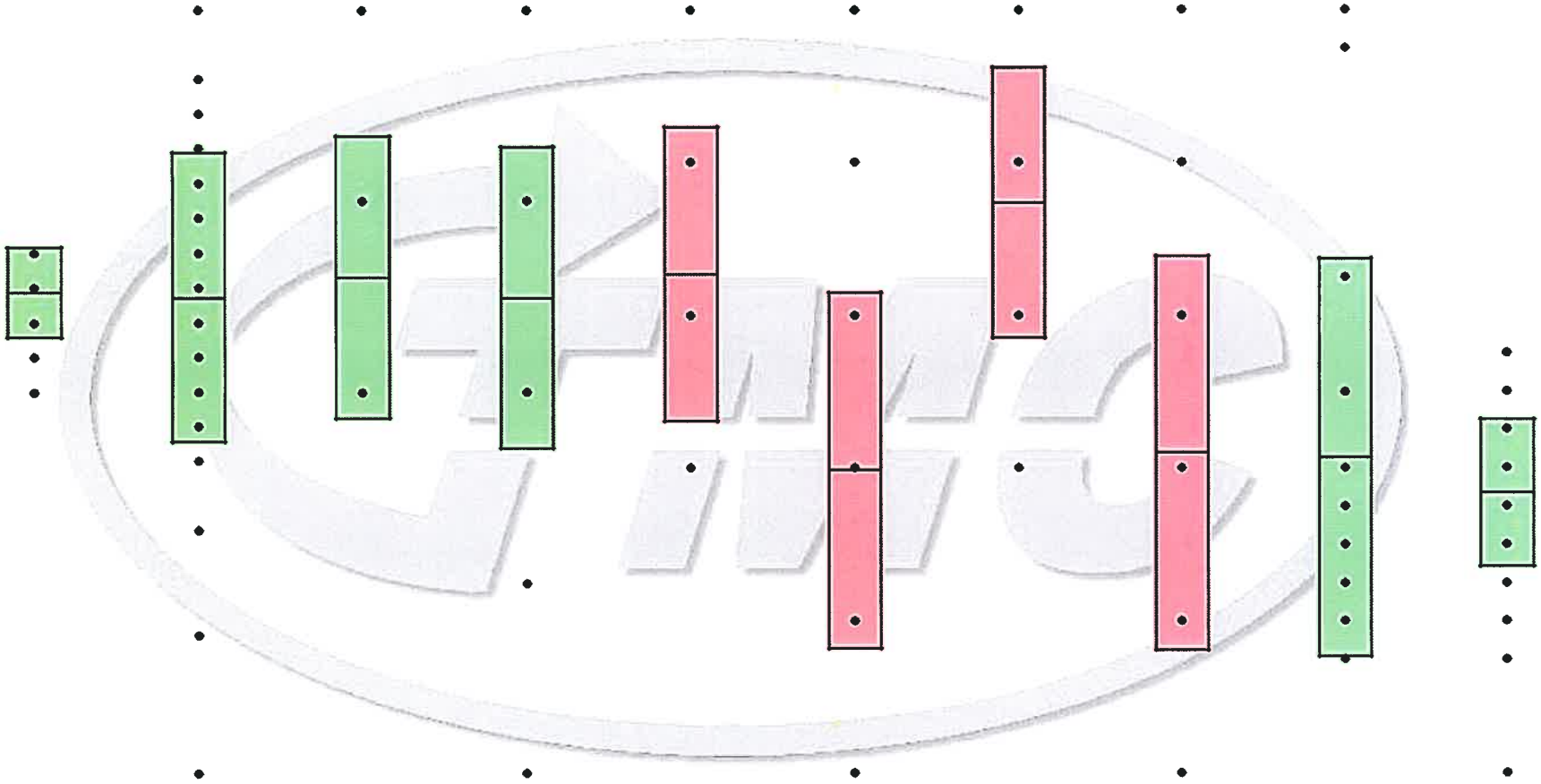


11:12:32 29OCT2013

# L-60-1 New vs Old Gears

**Date >=20100101**

**UNITS=ORIGINAL IND=148-1**



| | ACV NEW | ACV OLD | ASL NEW | ASL OLD | PEN NEW | PEN OLD | TOL NEW | TOL OLD | VISI NEW | VISI OLD |
|---|---|---|---|---|---|---|---|---|---|---|
| N | 15 | 61 | 15 | 61 | 15 | 61 | 15 | 61 | 15 | 61 |
| Min | 7.6 | 6.5 | 9.4 | 9.2 | 0.5 | 0.3 | 0.4 | 0.2 | 36 | 33 |
| Max | 8 | 8.7 | 9.6 | 9.6 | 0.8 | 0.8 | 0.7 | 0.7 | 53 | 44 |
| Mean | 7.887 | 7.872 | 9.46 | 9.449 | 0.627 | 0.498 | 0.573 | 0.41 | 41.27 | 40.33 |
| Std | 0.13 | 0.416 | 0.074 | 0.079 | 0.096 | 0.116 | 0.088 | 0.129 | 5.203 | 1.921 |

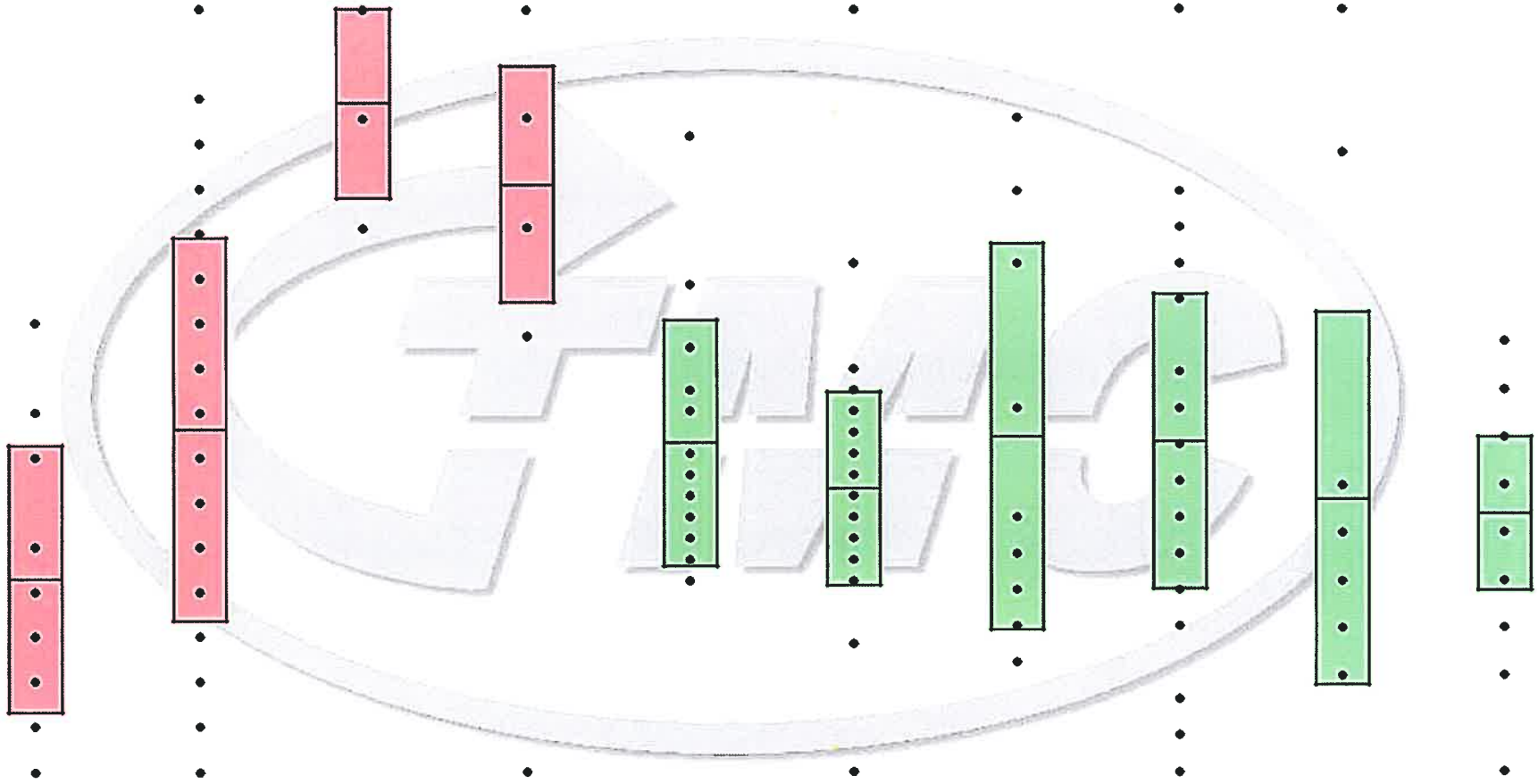


13:12:32 29OCT2013

# L-60-1 New vs Old Gears

**Date >=20100101**

**UNITS=ORIGINAL IND=151-2**



| | ACV NEW | ACV OLD | ASL NEW | ASL OLD | PEN NEW | PEN OLD | TOL NEW | TOL OLD | VISI NEW | VISI OLD |
|---|---|---|---|---|---|---|---|---|---|---|
| N | 14 | 64 | 14 | 64 | 14 | 64 | 14 | 64 | 14 | 64 |
| Min | 7.5 | 7.5 | 9.3 | 8.8 | 1.7 | 0.8 | 0.8 | 0.5 | 34 | 32 |
| Max | 8.5 | 9.2 | 9.5 | 9.5 | 3.8 | 4.4 | 2.3 | 2.6 | 48 | 41 |
| Mean | 7.929 | 8.263 | 9.414 | 9.339 | 2.35 | 2.133 | 1.421 | 1.408 | 37.71 | 37.39 |
| Std | 0.297 | 0.427 | 0.086 | 0.108 | 0.581 | 0.455 | 0.532 | 0.405 | 3.911 | 1.6 |

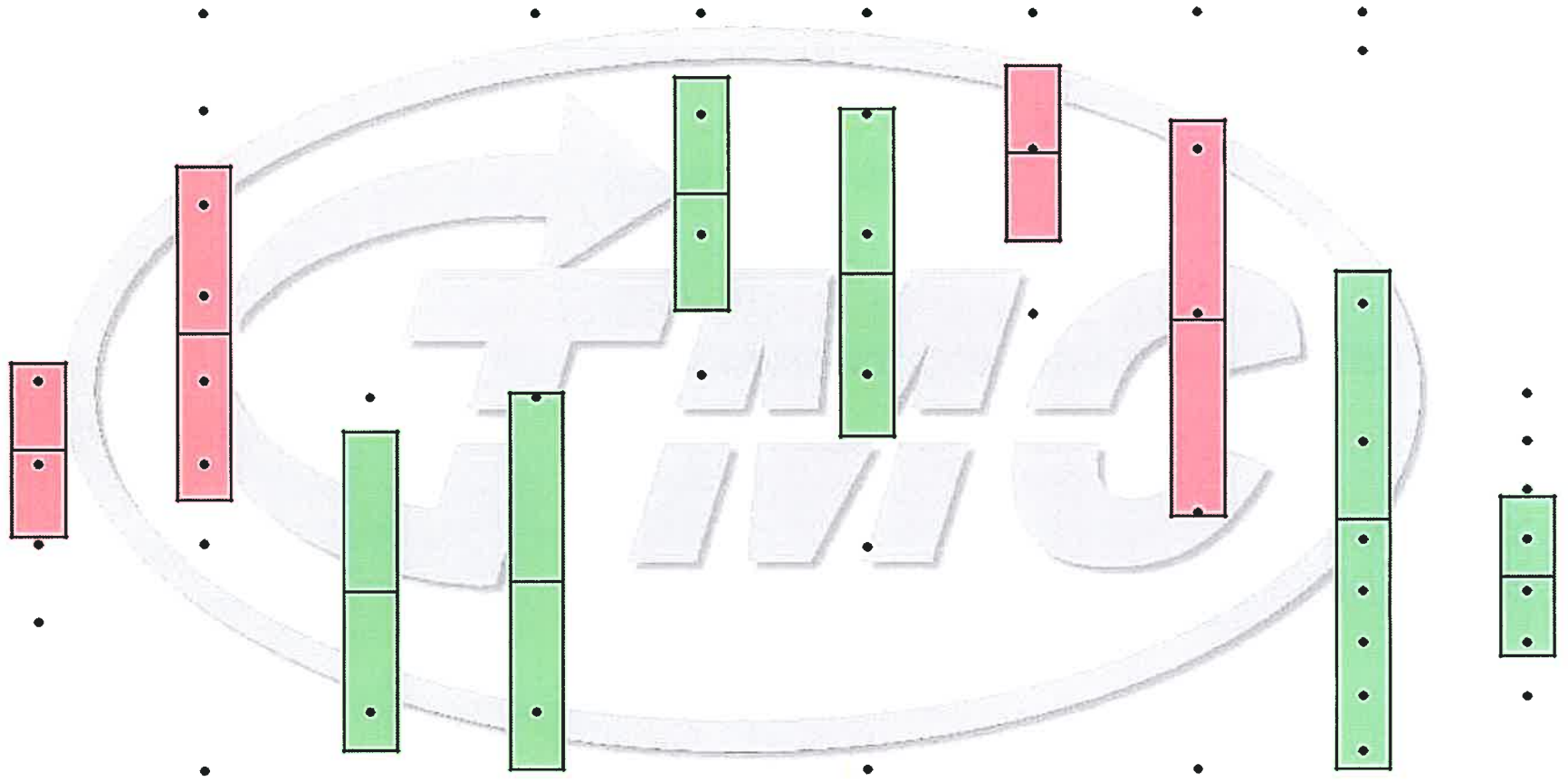


11:12:32 29OCT2013

# L-60-1 New vs Old Gears

**Lab D Date >=20100101**

**UNITS=TRANSFORMED IND=148-1**



| | ACVTI NEW | ACVTI OLD | ASLTI NEW | ASLTI OLD | PENTI NEW | PENTI OLD | TOLTI NEW | TOLTI OLD | VISITI NEW | VISITI OLD |
|---|---|---|---|---|---|---|---|---|---|---|
| N | 13 | 27 | 13 | 27 | 13 | 27 | 13 | 27 | 13 | 27 |
| Min | 1.208 | 1.099 | 0.511 | 0.511 | -0.69 | -1.2 | -0.69 | -1.2 | 3.611 | 3.638 |
| Max | 1.386 | 1.658 | 0.693 | 0.916 | -0.22 | -0.22 | -0.36 | -0.36 | 3.97 | 3.784 |
| Mean | 1.335 | 1.421 | 0.581 | 0.587 | -0.46 | -0.56 | -0.52 | -0.7 | 3.723 | 3.696 |
| Std | 0.064 | 0.123 | 0.092 | 0.109 | 0.15 | 0.211 | 0.097 | 0.221 | 0.121 | 0.038 |

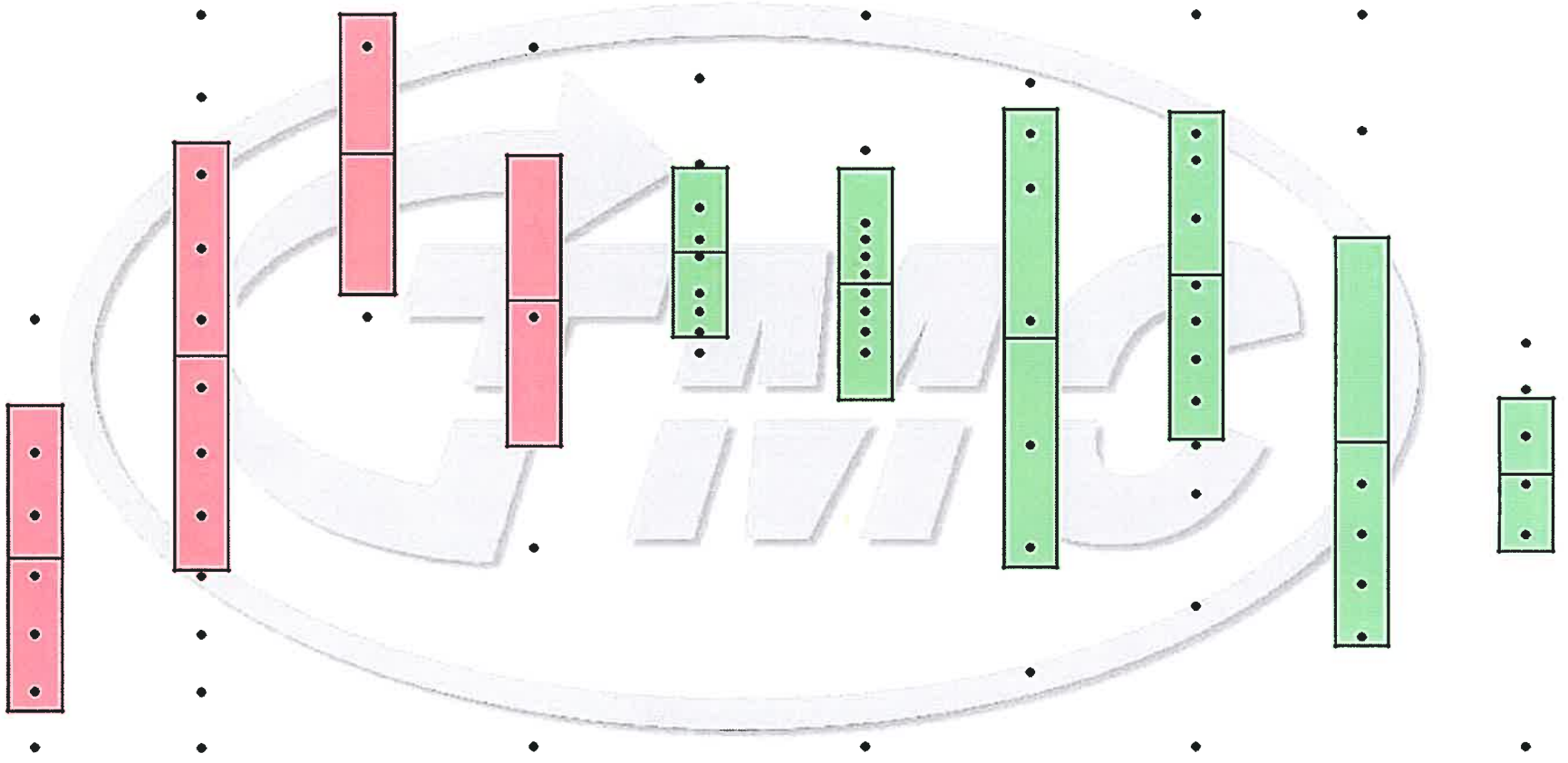


15:11:46 01NOV2013

# L-60-1 New vs Old Gears

**Lab D Date >=20100101**

**UNITS=TRANSFORMED IND=151-2**



| | ACVTI NEW | ACVTI OLD | ASLTI NEW | ASLTI OLD | PENTI NEW | PENTI OLD | TOLTI NEW | TOLTI OLD | VISITI NEW | VISITI OLD |
|---|---|---|---|---|---|---|---|---|---|---|
| N | 10 | 26 | 10 | 26 | 10 | 26 | 10 | 26 | 10 | 26 |
| Min | 1.099 | 1.099 | 0.511 | 0.223 | 0.693 | -0.22 | -0.22 | -0.36 | 3.526 | 3.466 |
| Max | 1.516 | 1.815 | 0.693 | 0.693 | 1.335 | 1.482 | 0.833 | 0.956 | 3.871 | 3.689 |
| Mean | 1.283 | 1.481 | 0.62 | 0.522 | 0.926 | 0.852 | 0.374 | 0.487 | 3.634 | 3.616 |
| Std | 0.149 | 0.209 | 0.094 | 0.097 | 0.196 | 0.268 | 0.41 | 0.293 | 0.113 | 0.042 |

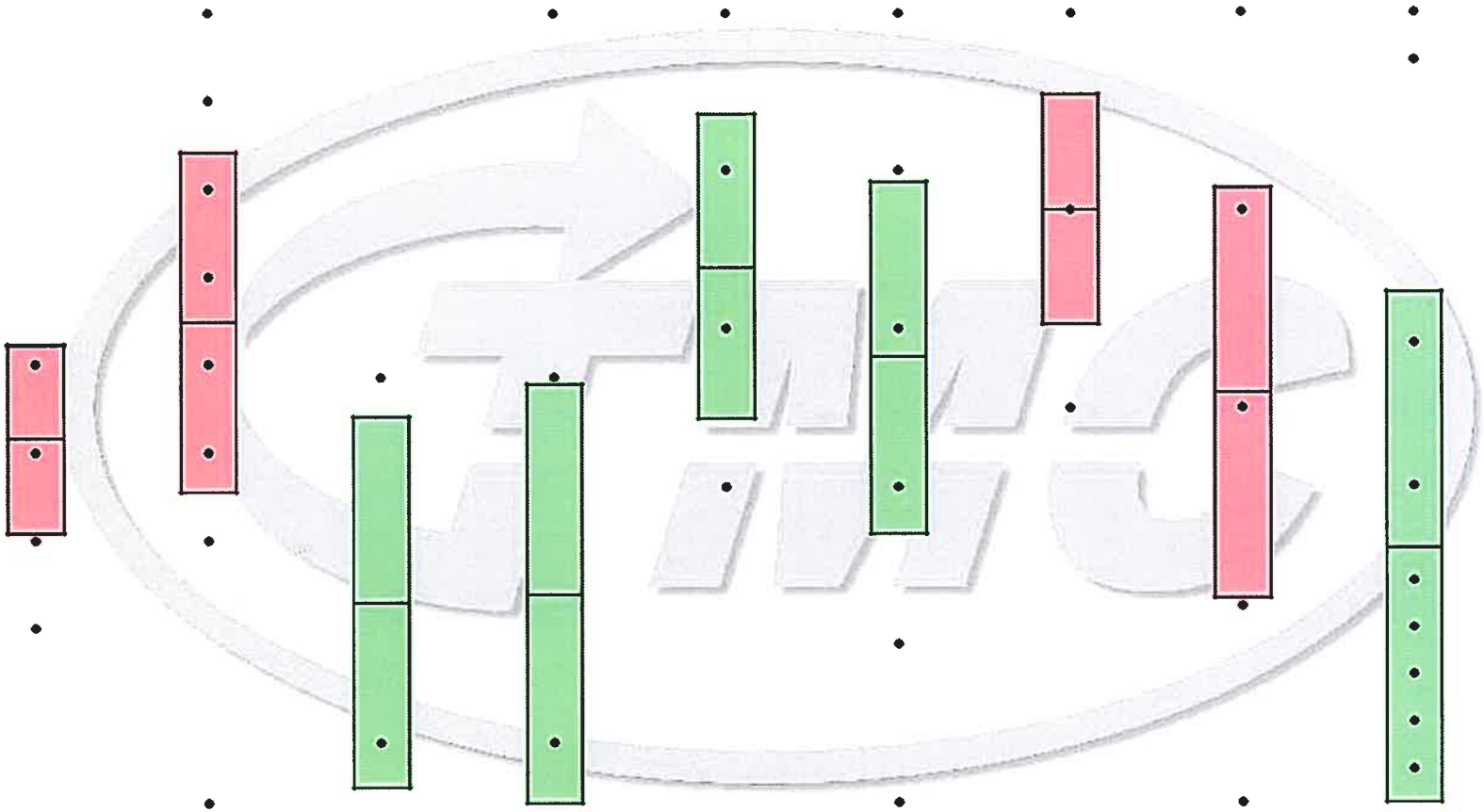


15:11:46 01NOV2013

# L-60-1 New vs Old Gears

**Lab D Date >=20100101**

**UNITS=ORIGINAL IND=148-1**



| | ACV NEW | ACV OLD | ASL NEW | ASL OLD | PEN NEW | PEN OLD | TOL NEW | TOL OLD | VISI NEW | VISI OLD |
|---|---|---|---|---|---|---|---|---|---|---|
| N | 13 | 27 | 13 | 27 | 13 | 27 | 13 | 27 | 13 | 27 |
| Min | 7.7 | 7.5 | 9.4 | 9.4 | 0.5 | 0.3 | 0.5 | 0.3 | 37 | 38 |
| Max | 8 | 8.4 | 9.5 | 9.6 | 0.8 | 0.8 | 0.7 | 0.7 | 53 | 44 |
| Mean | 7.915 | 8.048 | 9.438 | 9.441 | 0.638 | 0.581 | 0.6 | 0.507 | 41.69 | 40.3 |
| Std | 0.107 | 0.193 | 0.051 | 0.057 | 0.096 | 0.111 | 0.058 | 0.104 | 5.391 | 1.564 |

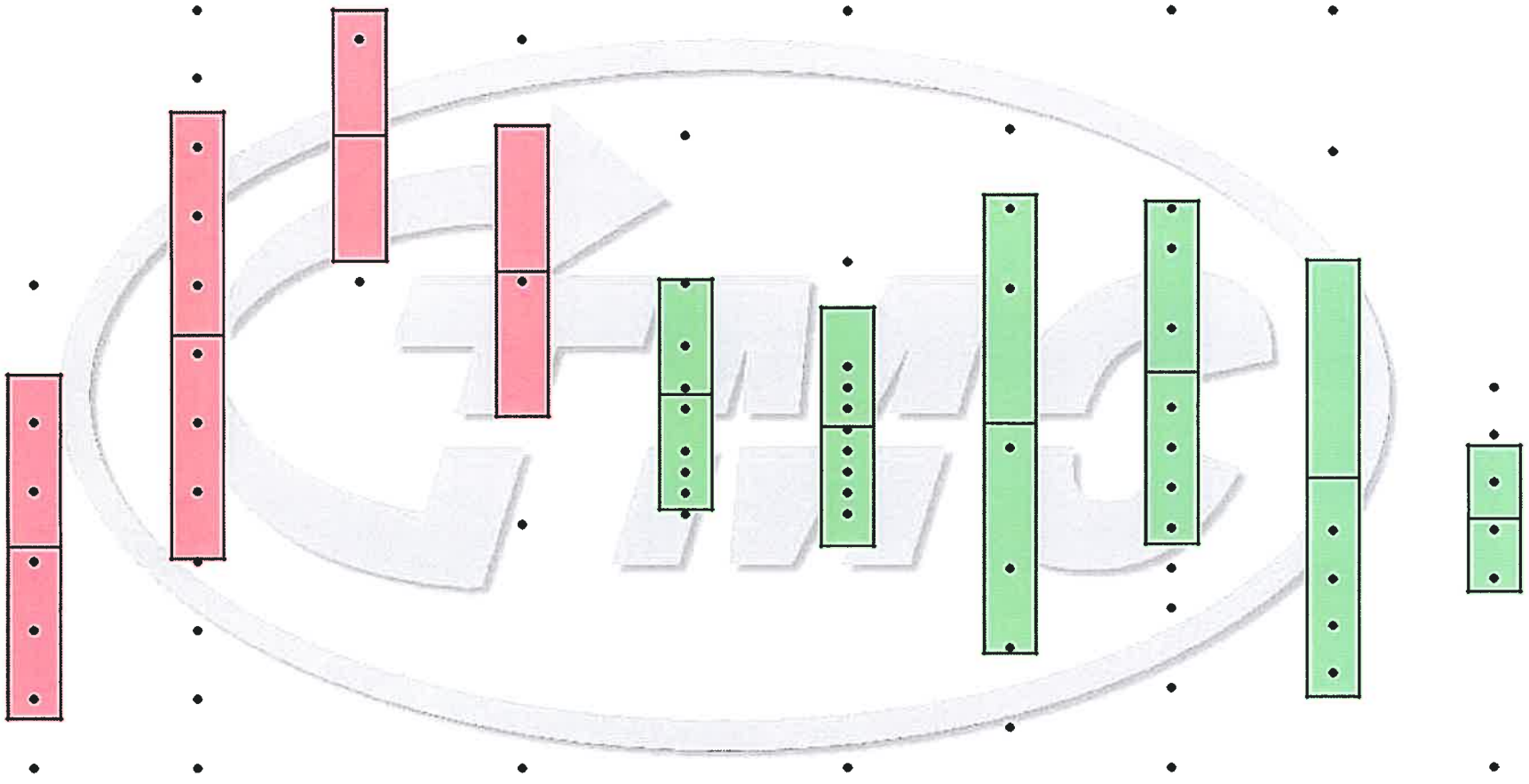


15:11:45 01NOV2013

# L-60-1 New vs Old Gears

**Lab D Date >=20100101**

**UNITS=ORIGINAL IND=151-2**



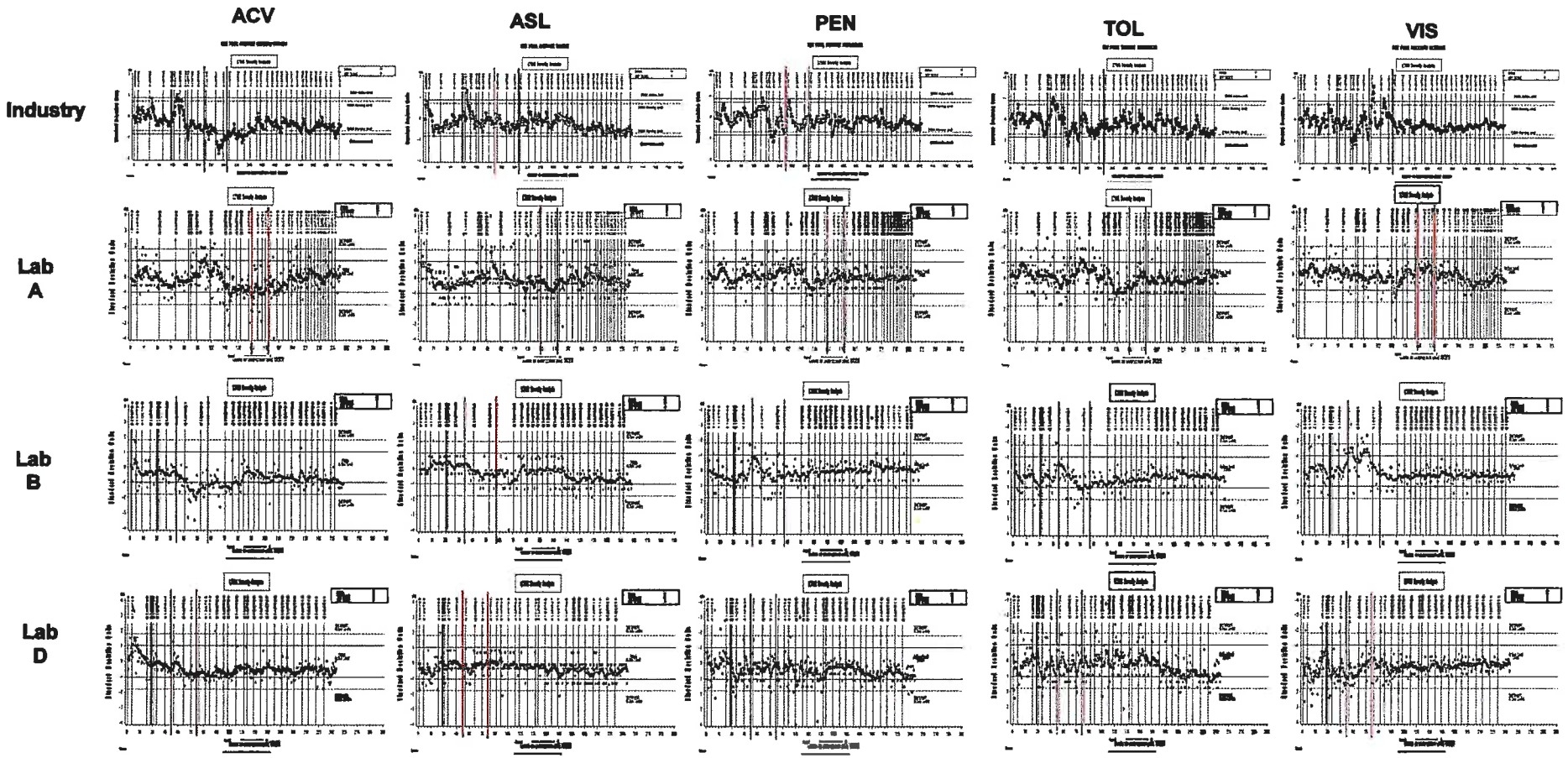
| | ACV NEW | ACV OLD | ASL NEW | ASL OLD | PEN NEW | PEN OLD | TOL NEW | TOL OLD | VISI NEW | VISI OLD |
|---|---|---|---|---|---|---|---|---|---|---|
| N | 10 | 26 | 10 | 26 | 10 | 26 | 10 | 26 | 10 | 26 |
| Min | 7.5 | 7.5 | 9.4 | 9.2 | 2 | 0.8 | 0.8 | 0.7 | 34 | 32 |
| Max | 8.2 | 8.6 | 9.5 | 9.5 | 3.8 | 4.4 | 2.3 | 2.6 | 48 | 40 |
| Mean | 7.82 | 8.127 | 9.46 | 9.404 | 2.57 | 2.415 | 1.56 | 1.688 | 38.1 | 37.23 |
| Std | 0.249 | 0.323 | 0.052 | 0.06 | 0.546 | 0.566 | 0.574 | 0.428 | 4.606 | 1.531 |



15:11:46 01NOV2013

| | | VISI | PEN | TOL | ACV | ASL | VISIti | PENti | TOLti | ACVti | ASLti | VISIyi | PENyi | TOLyi | ACVyi | ASLyi |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **target 148-1** | mean | | | | | | 3.61 | -0.95 | -1.36 | 1.59 | 0.76 | | | | | |
| **(30 148 tests, ca. 1994)** | std | | | | | | 0.15 | 0.39 | 0.49 | 0.47 | 0.19 | | | | | |
| **first 30 148** | mean | 38.27 | 0.45 | 0.30 | 8.15 | 9.49 | 3.64 | -0.88 | -1.29 | 1.53 | 0.70 | 0.19 | 0.17 | 0.14 | -0.12 | -0.32 |
| **09-1994 to 03-1996** | std | 4.38 | 0.15 | 0.12 | 0.61 | 0.09 | 0.11 | 0.45 | 0.49 | 0.41 | 0.21 | 0.73 | 1.16 | 1.00 | 0.88 | 1.13 |
| **first 30 148-1** | mean | 40.97 | 0.50 | 0.35 | 7.53 | 9.50 | 3.71 | -0.73 | -1.12 | 1.12 | 0.71 | 0.66 | 0.57 | 0.49 | -0.99 | -0.28 |
| **03-2002 to 08-2003** | std | 3.43 | 0.13 | 0.12 | 0.43 | 0.12 | 0.08 | 0.28 | 0.46 | 0.21 | 0.20 | 0.56 | 0.72 | 0.94 | 0.46 | 1.04 |
| **last 30 148-1** | mean | 41.50 | 0.54 | 0.45 | 7.90 | 9.46 | 3.72 | -0.65 | -0.86 | 1.34 | 0.62 | 0.75 | 0.76 | 1.02 | -0.54 | -0.73 |
| **03-2012 to 07-2013** | std | 3.81 | 0.13 | 0.15 | 0.33 | 0.08 | 0.09 | 0.25 | 0.37 | 0.20 | 0.15 | 0.58 | 0.65 | 0.75 | 0.42 | 0.79 |
| **target 151-2** | mean | | | | | | 3.62 | 0.75 | 0.26 | 1.81 | 0.54 | | | | | |
| **(9 tests, ca. 2000)** | std | | | | | | 0.15 | 0.37 | 0.50 | 0.40 | 0.23 | | | | | |
| **first 30 151-2** | mean | 35.07 | 1.95 | 1.35 | 7.98 | 9.36 | 3.55 | 0.66 | 0.27 | 1.41 | 0.46 | -0.46 | -0.24 | 0.03 | -1.00 | -0.35 |
| **10-2000 to 10-2001** | std | 3.68 | 0.22 | 0.29 | 0.61 | 0.09 | 0.11 | 0.12 | 0.23 | 0.38 | 0.14 | 0.72 | 0.32 | 0.45 | 0.94 | 0.59 |
| **last 30 151-2** | mean | 37.70 | 2.15 | 1.37 | 8.14 | 9.39 | 3.63 | 0.74 | 0.26 | 1.50 | 0.50 | 0.05 | -0.04 | 0.01 | -0.77 | -0.18 |
| **03-2012 to 08-2013** | std | 2.97 | 0.51 | 0.43 | 0.42 | 0.09 | 0.07 | 0.25 | 0.32 | 0.30 | 0.15 | 0.50 | 0.69 | 0.63 | 0.74 | 0.63 |

# Current 148-1 & 151-2 Targets



# 148-1 & 151-2 Targets Computed From First 30 Tests