# Sequence X

ASTM D8729

# Ford Chain Wear Test Surveillance Panel Meeting

December 3rd, 2020

Prepared By: Alfonso Lopez, S.P. Chairman

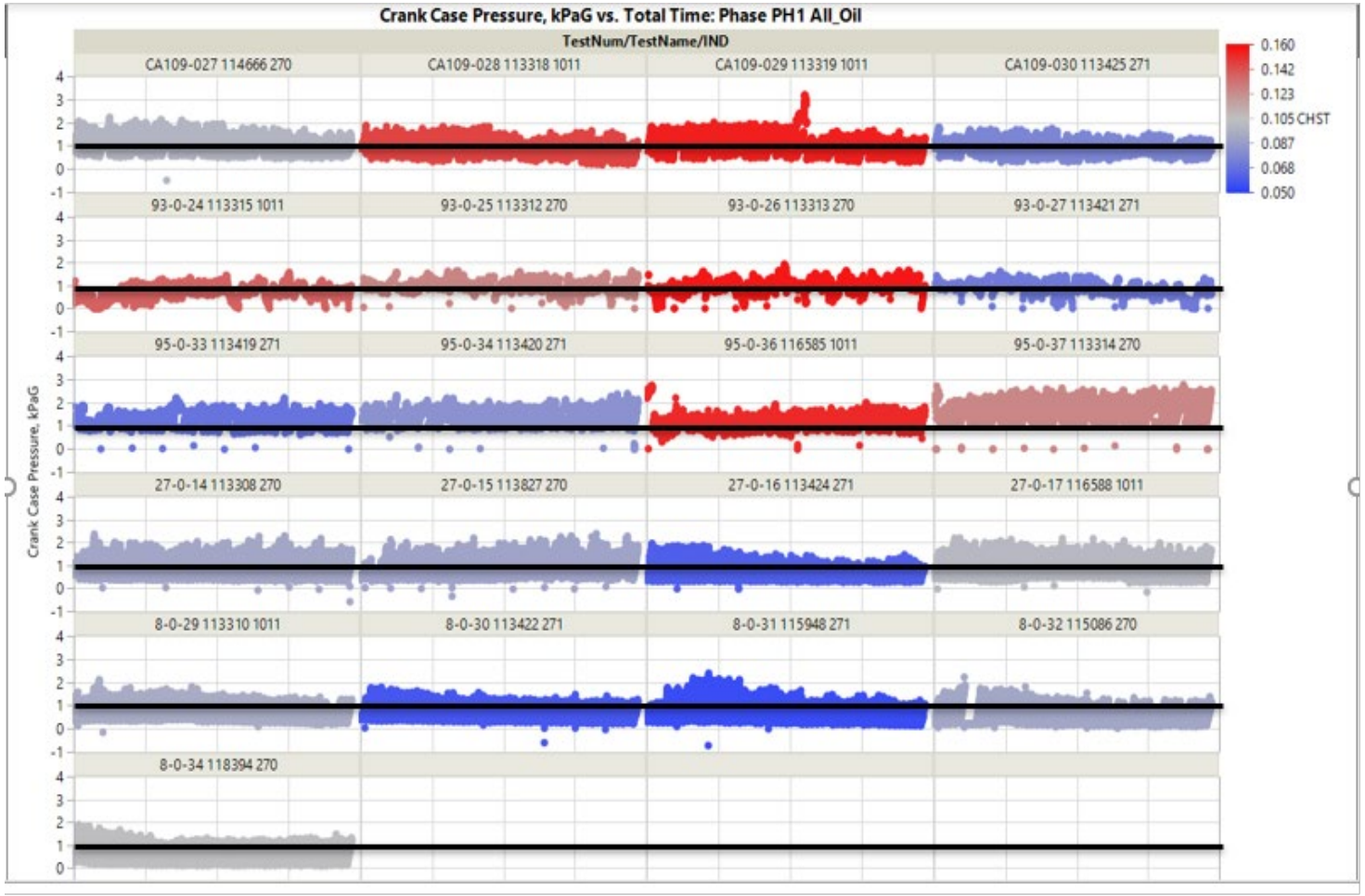
# Meeting Minutes

- Attendance roster attached below
- Meeting minutes from 06/35/20 were approved
- Fuel COA was approved.  See slide 15.  No discussion or negative votes cast.  Current fuel COA to be removed from the test procedure.  New COA common to Seq IX, X, and IIIH
- Rich gave his TMC report (attached).  The test has been in alarm for mild CHST for about a year.

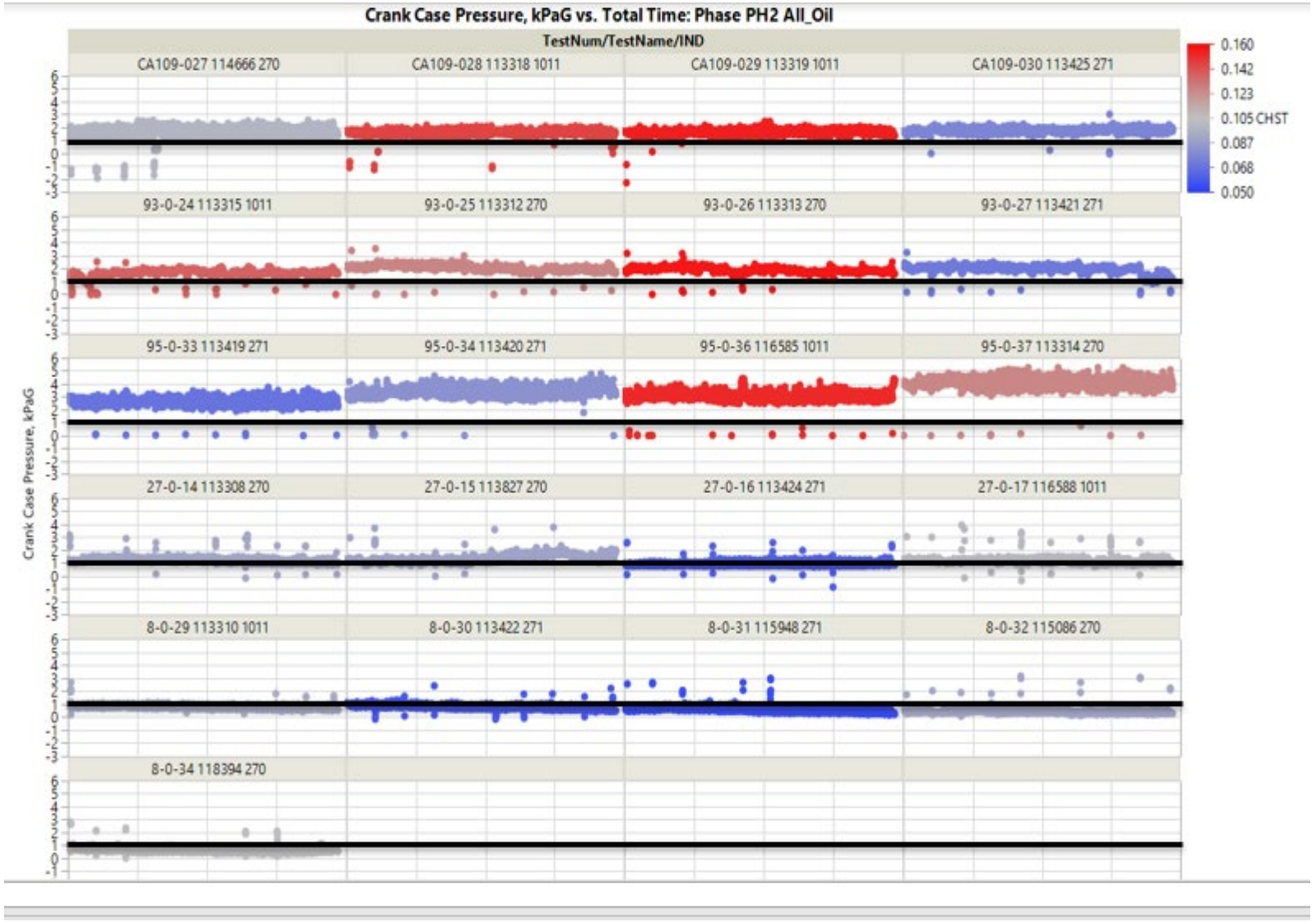
# Meeting Minutes Continued

- Test update
  - Task force for mild severity was formed in June and met in August. Meeting minutes posted on TMC website. Review of lab data and hardware yielded no smoking gun to explain the mild trends at 3 of the 4 labs.
  - Pre-meeting discussion with Ron on the 2nd on December - Jason at Intertek discovered a correlation between crank case pressure and severity. The Surveillance Panel was informed and discussion with the group further strengthened our suspicion of CC pressure correlation
    - George at Lubrizol pointed out that his last reference test had a very high CC pressure and resulted in on target results. TMC data shows this test as severe of target.
      This test was one of only two this past 6 months that were not mild.
    - The mechanism for CC pressure and severity was discussed.
      - High CC pressure maintains blowby gasses in the crankcase longer.
      - Low cc pressure is an indication of vacating the crankcase of gasses and may produce mild results.
      - High crankcase pressure was being caused by fouled oil separator screens. These screens were not being cleaned on a regular basis at Intertek. Ultimately the high cc pressure lead to excessive oil consumption. At that point, a filter cleaning procedure was initiated and the test began trending mild from that point. Jason observed the cc pressure of those time periods and found correlation to the mild shift.
    - Ron pulled up operational plots from the precision matrix. Slides 3 and 4.
  - The panel agreed to continue with Task Force meetings to discuss crankcase pressure and control.
    - Labs to retrieve reference test cc pressure data for review. This parameter was only recently added to the TMC data base.
    - A meeting of the task force was scheduled.
- Jason informed the panel that Intertek is running low on the 2016 crank gears. The 2018 version that is replacing them does not use the diamond washer. Ron to investigate the print. Labs to review at the task force meeting.

# Sequence X Precision Matrix CC Pressure Stage 1



# Sequence X Precision Matrix CC Pressure Stage 2



# Sequence X SP Meeting Agenda 12/03/20

- Attendance – Roster attached
- Approval of the minutes of SP meeting 06/25/20
  - XMinutes20200625ConferenceCall.pdf
- Candidate Testing
- TMC Report
- New Items
  - Fuel COA
- Test Update
- Hardware Status

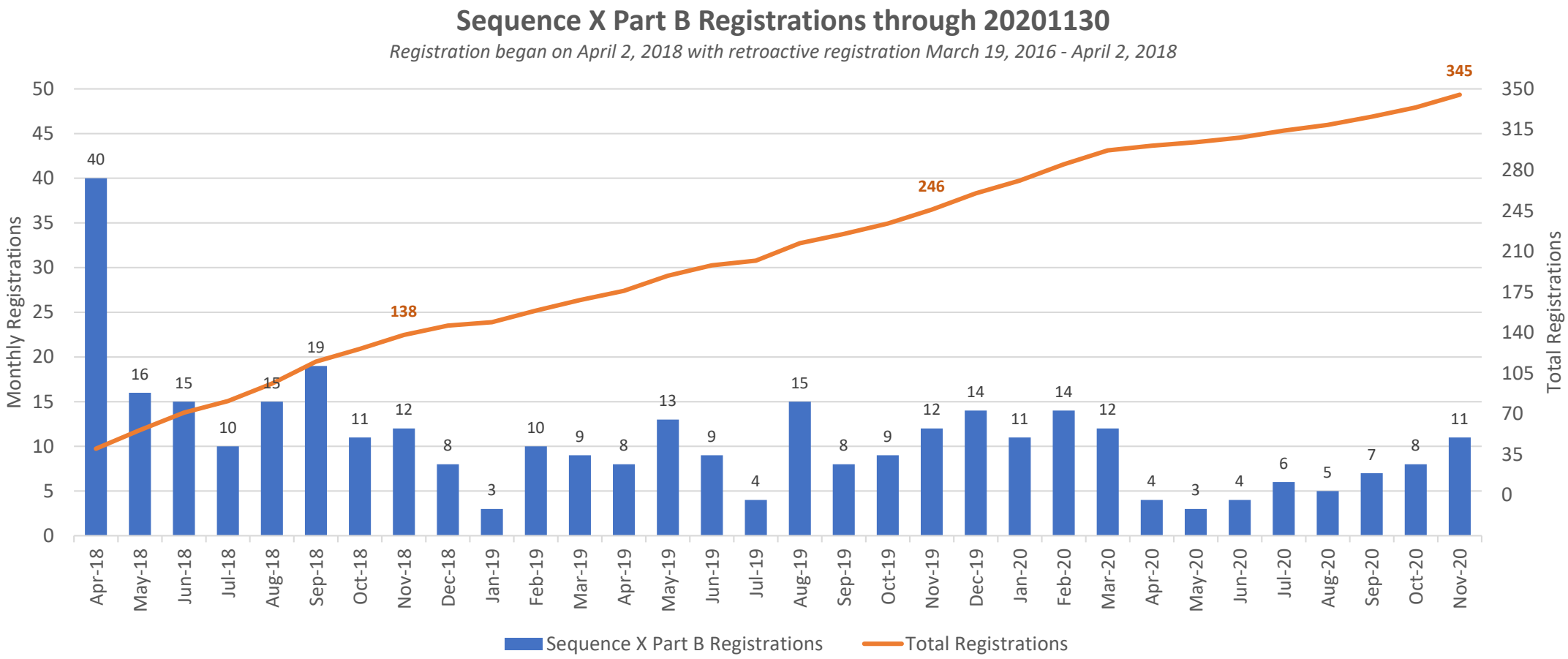
# Sequence X Test Update

- Test continues in industry alarm for mild Chain Wear.  Action items from last SP meeting.
  - Labs to confirm BC pistons and rings
  - Todd data plots review by panel
  - Jason to report on crank gear and washer
  - Hardware Task Force Formed – Meeting Minutes posted
    - Sequence X Hardware Task Force 20200813.pdf
    - Seq X Hardware Purchase Summary 2020.xlsx
- Test Hardware availability
  - Projected outages
  - engine wire harness, DU5Z-12A581-U.

# Motion List 12/3/20

- Motion 1 Approval of the SP Meeting minutes from 01/27/20
  - Motioned: Rich Grundza
  - Second: Bob Campbell
  - Passed - unanimous
- Motion 2  Approval of fuel COA:  The Sequence X Surveillance panel adopts the EEE Lube Cert specification as proposed by the TGC Fuels Task force.  The COA will be posted on the TMC website.  The current fuel specification will be removed from the test procedure.
  - Motioned: Al Lopez
  - Second: Ron Romano
  - Passed -Unanimous

# Sequence X S.P. Report
# Candidate Test Activity



# Sequence X TMC Activity

April 2020 to October 2020

# Sequence  X Activity

| Test Status | Validity Code | # |
|---|---|---|
| Acceptable Calibration Test | AC | 6 |
| Statistically Unacceptable Calibration Test | OC | 1 |
| Operationally Invalid Calibration Test (Lab determination) | LC | 1 |
| Aborted Calibration Test | XC | 1 |
| **Total Number of Tests** | | **9** |

# Sequence X - Failed Tests

| Test Status | Number of Tests |
|---|---|
| CHST Ei Level 3 alarm | 1 |
| **Total** | **1** |

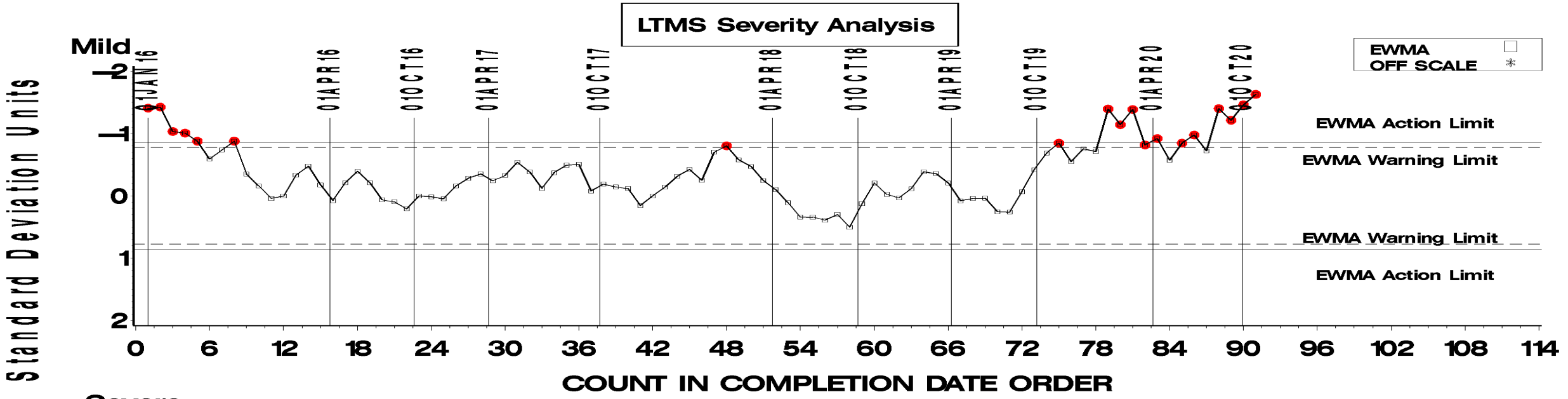
# Sequence X - Lost Tests*

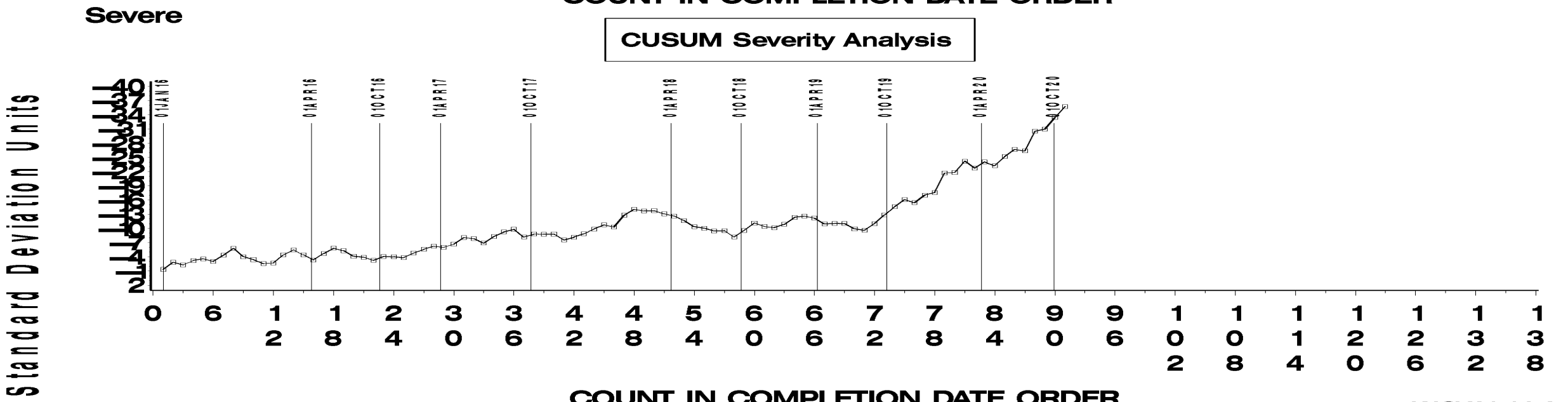
| Test Status | Cause | # |
|---|---|---|
| Invalid | Computer Issues | 1 |
| Aborted | Engine mount failure | 1 |
| Totals | | 2 |

*Invalid and aborted tests

# SEQUENCE X INDUSTRY OPERATIONALLY VALID DATA

## END OF TEST CHAIN WEAR FINAL RESULT

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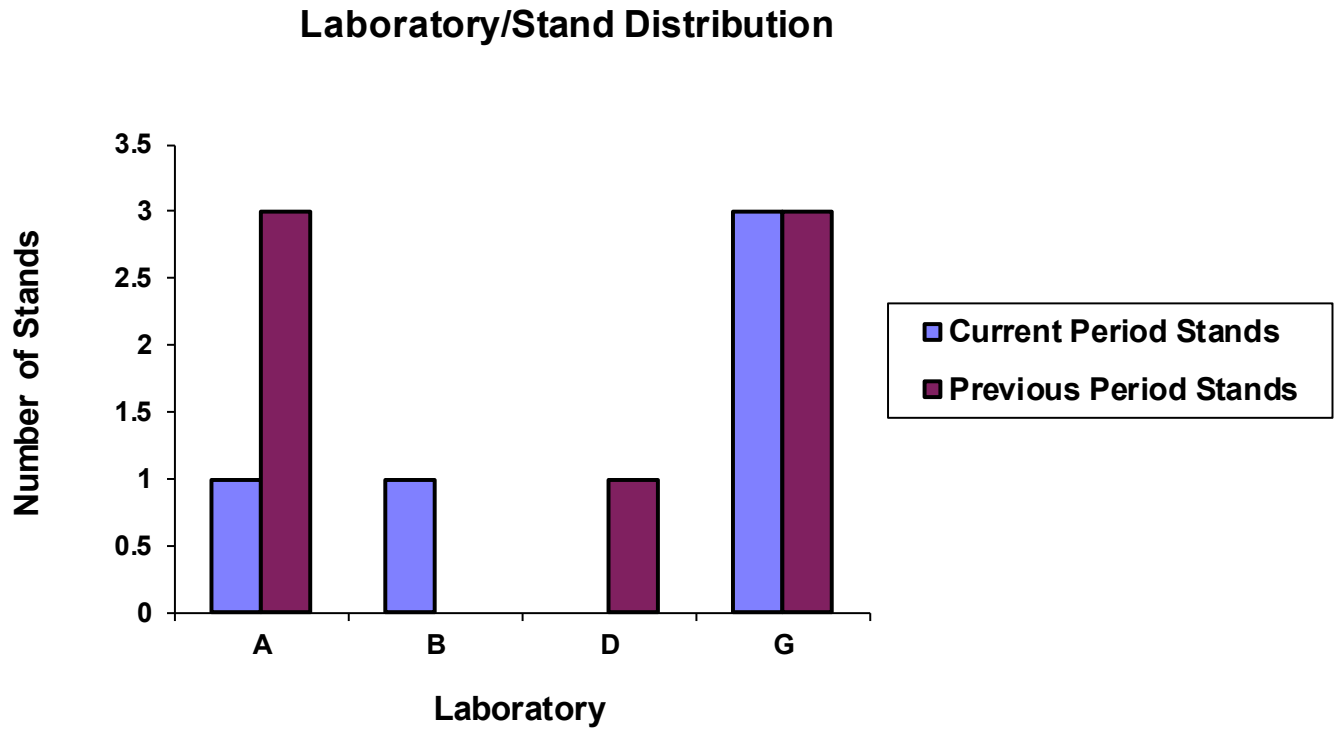
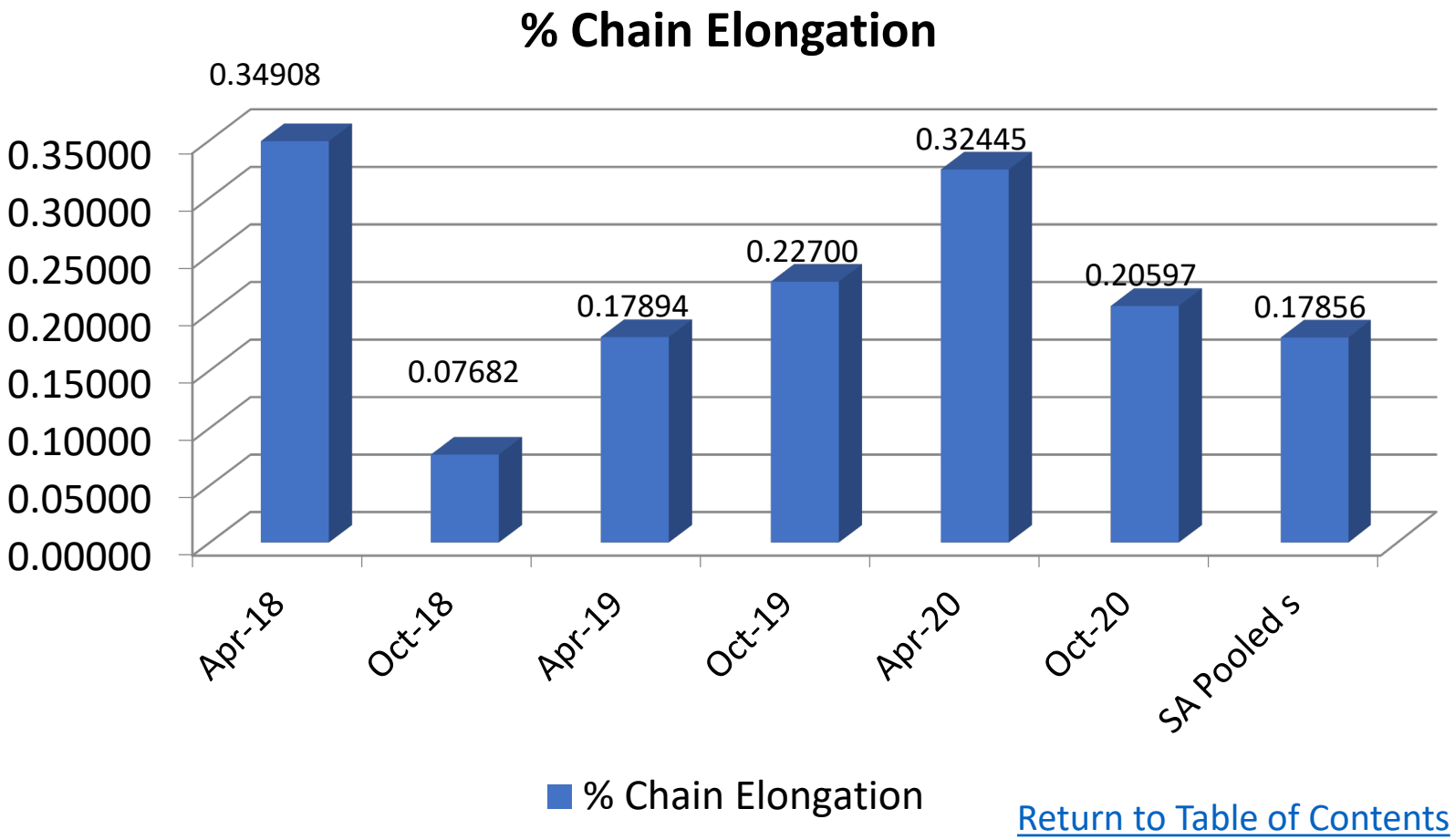
# Sequence X S.P. Report

## LTMS Laboratory/Stand Distribution

| | Reporting Data | Calibrated as of 9/30/20 |
|---|---|---|
| Number of Laboratories | 4 | 4 |
| Number of Stands | 7 | 6 |



# Sequence X Precision Estimates

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# Sequence X S.P. Report
# Reference Oils Status

- 271 SAE 5W-30 passing reference oil (5yr)
- 1011 SAE 0W-16 (<1yr) Limited to lab inventories. Reblend (1011-1) available
- 270 SAE 5W-30 failing reference oil (5yr)

# Fuel Report

| | Seq III, IX, and X Lube Cert Gasoline | | | | 29-Oct-20 |
|---|---|---|---|---|---|
| **TEST** | **METHOD** | **UNITS** | | **Seq. III Specs** | |
| | | | **MIN** | **TARGET** | **MAX** |
| Distillation - IBP | ASTM D86 | °C | 23.9 | | 35.0 |
| 5% | | °C | | | |
| 10% | | °C | 48.9 | | 57.2 |
| 20% | | °C | | | |
| 30% | | °C | | | |
| 40% | | °C | | | |
| 50% | | °C | 93.3 | | 110.0 |
| 60% | | °C | | | |
| 70% | | °C | | | |
| 80% | | °C | | | |
| 90% | | °C | 151.7 | | 162.8 |
| 95% | | °C | | | |
| Distillation - EP | | °C | | | 212.8 |
| Recovery | | vol % | | Report | |
| Residue | | vol % | | Report | |
| Loss | | vol % | | Report | |
| Gravity @ 60°F/60°F | ASTM D4052 | °API | 58.7 | | 61.2 |
| Density @ 15° C | ASTM D4052 | kg/l | 0.734 | | 0.744 |
| Dry Vapor Pressure Equivalent | ASTM D5191 | kPa | 60.1 | | 63.4 |
| Carbon | ASTM D3343 | wt % | | Report | |
| Carbon | ASTM D5291 | mass % | | Report | |
| Hydrogen | ASTM D5291 | mass % | | Report | |
| Hydrogen/Carbon ratio | ASTM D5291 | mole/mole | | Report | |
| Oxygen[1] | ASTM D4815 | wt % | | | 0.2 |
| Oxygenates Ethanol | ASTM D4815 | % | | Report | |
| MTBE | | % | | Report | |
| ETBE | | % | | Report | |
| Methanol | | % | | Report | |
| Sulfur | ASTM D5453 | mg/kg | 3 | | 15 |
| **Composition, aromatics** | **ASTM D5769[3]** | **vol %** | 31.0 | | 34.0 |
| **C6 aromatics (benzene)** | **ASTM D5769** | **vol %** | | | 1.0 |
| **C7 aromatics (toluene)** | **ASTM D5769** | **vol %** | | Report | |
| **C8 aromatics** | **ASTM D5769** | **vol %** | | Report | |
| **C9 aromatics** | **ASTM D5769** | **vol %** | | Report | |
| **C10+ aromatics** | **ASTM D5769** | **vol %** | | Report | |
| **Composition, olefins** | **ASTM D6550[3]** | **wt%** | | | 2.0 |
| Lead[1] | ASTM D3237 | mg/l | | | 2.6 |
| Manganese[1] | ASTM D3831 | g/gal | | | 0.01 |
| Phosphorus[1] | ASTM D3231 | mg/l | | | 1.3 |
| Silicon[1] | ICP method | mg/kg | | | 4 |
| Particulate matter | ASTM D5452 | mg/l | | | 1 |
| Oxidation Stability | ASTM D525 | minutes | 1000 | | |
| Copper Corrosion | ASTM D130 | | | | 1 |
| Gum content, washed | ASTM D381 | mg/100mls | | | 5.0 |
| Gum content, unwashed | ASTM D381 | mg/100mls | | | 10.0 |
| Research Octane Number | ASTM D2699 | | 96.0 | | |
| Motor Octane Number | ASTM D2700 | | | Report | |
| R+M/2 | D2699/2700 | | | Report | |
| Sensitivity | | | 7.5 | | |
| Net Heating Value, btu/lb | ASTM D3338 | btu/lb | | Report | |
| Gross Heating Value, btu/lb | ASTM D240 | btu/lb | | Report | |
| Net Heating Value, btu/lb | ASTM D240 | btu/lb | | Report | |
| Water and Sediment | ASTM D2709 | vol% | | | 0.01 |
| Color[2] | VISUAL | 1.75 ptb | | Red | |

[1]no intentional addition of these elements permitted.

[2]Innospec Oil Red B4 Liquid Dye

[3]or use D6839 for everything measured by D5769 and D6550

for any conflict between supplier and customer measurement, refer to ASTM D3244 assigning risk 50/50 between supplier and customer
supplier should choose a lab to perform analysis and refrain from moving samples lab to lab in order to obtain "in spec" results

- TGC Fuel Task Force adopted EEE Lube Cert specification
  - Aromatics by D5769
  - Composition aromatic window 31.0 – 34.0
- Remove fuel specification from Sequence X D8279 ASTM procedure
- Fuel specification will be posted on TMC website
- Motion to accept

# Sequence X
# Hardware Status

- 6-7 Year inventory of test engines with BC pistons
  - Non-critical parts are being purchased from the dealerships
  - Industry order planned for non-critical parts
- 2017 Ring Batch – EJ7Z6148A
- 6 tests per engine
- 1100 tests at independent labs (as of 11/01/19)
- Survey sent to labs for hardware needs

# Sequence X History

| Sequence X Milestones | |
|---|---|
| 1/1/2012 | Start of Chain Wear Test Development |
| 12/7/2017 | AOAP Approval for GF6 |
| 4/2/2018 | Live Registration (03/19/16 Retro - Registration) |
| 2/20/2019 | Surveillance Panel Procedure Acceptance Vote |
| 4/4/2019 | Subcommittee B Ballot |
| 6/16/2019 | Main Committee D02 Ballot - ASTM Procedure D8279 |
| 11/7/2019 | Memorandum 19-043 Use of Calibrated Sequence X Stands to Generate Used Oil Samples for Seq IX (LSPI) |
| 11/20/2020 | Information Letter 20-1 Procedure Edits / Drive Shaft Spec |
| 1/27/2020 | Information Letter 20-2 Criteria for Multiple Test Type Calibration |
| 9/11/2020 | Information Letter 20-3 Correction to Table 12 |
| 10/14/2020 | Information Letter 20-4 (1) Correcting PCV Flow Meters (2) Correction to Section 12.1.1 |

# Attendance List

| Se+A1:C43quence X Surveillance Panel Meeting | | |
|---|---|---|
| December 3, 2020 | | |
| | Attendance | Voting Member |
| Porter, Christian <Christian.Porter@AftonChemical.com> | | Afton |
| Todd Dvorak <Todd.Dvorak@AftonChemical.com> | x | |
| Martin Chadwick Intertek <martin.chadwick@intertek.com> | | |
| Dan Lanctot <DLanctot@tei-net.com> | x | TEI |
| Romano, Ron (R.) <rromano@ford.com> | x | Ford |
| Jason Bowden <jhbowden@OHTech.com> | x | OHT |
| 'Rich Grundza' (reg@astmtmc.cmu.edu) | x | TMC |
| Jason Soto Intertek <jason.soto@intertek.com> | | |
| doyle.boese@infineum.com | x | |
| Martinez, Jo G. (jogm) <JoMartinez@chevron.com> | | Chevron |
| J.Hsu@shell.com | x | Shell |
| Gleason, Joseph <Joseph.Gleason@lubrizol.com> | x | |
| Kostan, Travis G. <travis.kostan@swri.org> | x | |
| ptumati@jhaltermann.com | x | Haltermann |
| George Szappanos | | |
| Khaled , Zreik Khaled.zreik@gm.com | | GM |
| Chiappelli, Maria <Maria.Chiappelli@Infineum.com> | | Infineum |
| Montufar, Ashley <ashley.montufar@exxonmobil.com> | | ExxonMobil |
| Charlie Leverett <charlie.leverett@yahoo.com> | | |
| Amol C Savant <ACSavant@valvoline.com> | | Valvoline |
| Eickstead, Christine M. <christine.eickstead@swri.org> | x | SWRI |
| Brys, Jerome <Jerome.Brys@lubrizol.com> | | Lubrizol |
| 'Bob.Campbell@aftonchemical.com' | | |
| Patrick M. Lang <patrick.lang@swri.org> | x | SWRI |
| Stockwell, Robert T (Robert.Stockwell@chevron.com) | x | Chevron |
| Bill Buscher Intertek <william.buscher@intertek.com> | | |
| Ritchie, Andrew <Andrew.Ritchie@Infineum.com> | | |
| Rais, Khaled <khaled.rais@swri.org> | | |
| Stevens, Andrew <Andrew.Stevens@Lubrizol.com> | | |
| Matthews, Tim <Tim.Matthews@uk.bp.com> | | BP |
| Lopez, Alfonso <al.lopez@intertek.com> | | Intertek |
| Deegan, Michael (M.D.) <mdeegan@ford.com> | x | Ford |
| Lochte, Michael D. <michael.lochte@swri.org> | x | |
| joshua cooley valvoline | | |
| George Szappanos | x | LZ |
| Khaled , Zreik Khaled.zreik@gm.com | | |
| Timothy Cushing <timothy.cushing@gm.com> | | GM |
| Wingert, Dean (D.) <dwingert@ford.com> | | |
| Michael Luhard | x | Afton |
| Ben Maddock | x | Afton |