

August 6, 2018

**Meeting Minutes: Surveillance Panel Meeting February 7, 2018, 9:30 am –10:00 am EST**

See attendance sheet for members in attendance. Additional members joined by phone: Jeff Milner and Vera Marsic

- The L33-1 committee membership was reviewed
  - Eaton – no replacement has been identified yet
  - BASF – Arjun was added as a voting member
- Meeting minutes from November 2017 ASTM meeting and December 2017 Conference Call were reviewed. Motion was made by Eric Donovan to approve. Motion was seconded by Arjun Goyal. Motion carried unanimously all voting members present.
- The topic of Downtime Limits, particularly during the Storage Phase, was discussed. Per Rebecca Warden, the limitation of three occurrences for a total downtime not to exceed 30 minutes creates problems with possible facility maintenance and other possible causes of downtime. A motion was made by Angela Trader to remove Section A6.2.3 from the procedure and allow unlimited downtime as long as the Validity Calculations still meet the criteria outlined in the procedure for Oil Temperature. The motion was seconded by Rebecca Warden. TMC (Scott Parke) voted to abstain but all other voting members voted to approve the motion.
- Reference test data was presented that shows the number of occurrences or ratings of 8 for each area. In addition, similar data was presented by Wes Venhoff the showed the same data in a different manner. Discussion continued about the severity of the AAM hardware and the LRI's strict limit of no more than three areas with an 8 or less. The group decided to present the data to the LRI board during the Open Meeting the following day and ask the LRI panel if they would consider allowing more 8's as long as there were no 5s and the final corrected Rust was 9.0 or greater.
- Motion was made to adjourn the meeting by Rebecca Warden and seconded by Eric Donovan and carried unanimously.

Respectfully

**Angela Trader**  
Senior Project Engineer





# L33-1 SURVEILLANCE PANEL MEETING

**PRI Headquarters - Warrendale, PA**

Angela Trader – Senior Project Engineer  
February 7, 2018 9:30 am – 10:00 am EST



# AGENDA

01 Call to Order

02 Membership Review

03 Approval of Meeting Minutes

04 Shutdown

05 K2XX Severity Shift

06 New/Open Issues

07 Adjournment





# MEMBERSHIP REVIEW

## Voting Members:

- Greg Shank – Mack
- Allen Comfort – US Army
- John Dharte – AAM
- Eric Donovan – Afton
- Rob Banas – ExxonMobil
- ?? – Eaton
- Jule Rucker – Meritor
- Scott Parke – TMC
- Angela Trader – Intertek
- Kristijan Drlja – Lubrizol
- Chintan Ved – Ford
- Rebecca Warden – SwRI
- Khaled Zreik - GM



# APPROVAL OF MEETING MINUTES

## Surveillance Panel Meeting Minutes

- SP Meeting 08NOV2017
  - (20171108 SP.pdf)
  
- Conference Call 19DEC2017
  - (20171219 Conference Call.pdf)

# DOWNTIME LIMITS



## A6.2 Downtime Limits:

A6.2.1 *Motoring–Warm–up Phase*—No limit on number of occurrences.

A6.2.2 *Motoring Phase*—A maximum number of two downtime occurrences are permitted with a total downtime not to exceed 15 min.

A6.2.2.1 A downtime occurrence is defined as a time at which the test is shut down until the time the test returns to test operating specifications.

A6.2.3 *Storage Phase*—A maximum number of three occurrences for a total downtime not to exceed 30 min.

A6.2.4 Do not calculate percent deviations during downtime occurrences.

# STORAGE PHASE



## 11.2 *Transition Phase:*

11.2.1 Move the test unit to the storage box within 30 min of the end of the motoring phase. See Fig. A5.6 for physical position. Set the controller at  $125 \pm 1^\circ\text{F}$  ( $52 \text{ }^\circ\text{C} \pm 0.6 \text{ }^\circ\text{C}$ ). Position the axle such that the axle tube openings and the pinion shaft are on a horizontal plane.

11.2.2 Switch on the internal fan. Activate the control system to maintain a test oil temperature of  $125 \pm 6 \text{ }^\circ\text{F}$  ( $52 \text{ }^\circ\text{C} \pm 0.6 \text{ }^\circ\text{C}$ ). The maximum allowable time for the test oil to reach operating temperature of  $125 \pm 1^\circ\text{F}$  ( $52 \text{ }^\circ\text{C} \pm 0.6 \text{ }^\circ\text{C}$ ) from the end of the motoring phase of the test as stated in 11.1.8 is 1 1/2 h.

## 11.3 *Storage Phase:*

11.3.1 Record the time of the first occurrence of the test oil temperature reaching  $125 \pm 1^\circ\text{F}$  ( $52 \text{ }^\circ\text{C} \pm 0.6 \text{ }^\circ\text{C}$ ). This is the start of the storage phase.

11.3.2 Continue the storage phase for a total of  $(162 \pm 0.2)$  h.

11.3.3 At the end of the storage phase, record the time, then switch off the storage box-heating unit and circulating fan. The end of the storage phase is the end of the test.

# K2XX VS. DANA HARDWARE RUST RATING FOR 123-2 OIL



| Hardware | Rating | Rating Area |       |       |       |       |       |     |     |       |     |
|----------|--------|-------------|-------|-------|-------|-------|-------|-----|-----|-------|-----|
|          |        | 1           | 2     | 3     | 4     | 5     | 6     | 7   | 8   | 9     | 10  |
| Dana     | 10     | 46.8%       | 1.3%  | 4.6%  | 27.3% | 32.5% | 23.4% | 29% | 30% | 8.4%  | 3%  |
| AAM      | 10     | 54.6%       | 0%    | 0%    | 0%    | 0%    | 0%    | 18% | 23% | 0%    | 0%  |
| Dana     | 9      | 35.1%       | 13.6% | 23.4% | 34.4% | 33.8% | 26%   | 39% | 32% | 25.3% | 19% |
| AAM      | 9      | 13.6%       | 4.6%  | 0%    | 4.5%  | 9.1%  | 4.6%  | 9%  | 41% | 13.6% | 18% |
| Dana     | 8      | 18.2%       | 82.5% | 69.5% | 38.3% | 33.8% | 50.6% | 32% | 38% | 66.2% | 77% |
| AAM      | 8      | 27.3%       | 77.3% | 90.9% | 95.5% | 90.9% | 95.4% | 73% | 36% | 86.4% | 82% |
| Dana     | 5      | 0%          | 2.6%  | 2.6%  | 0%    | 0%    | 0%    | 0%  | 0%  | 0%    | 0%  |
| AAM      | 5      | 4.6%        | 18.2% | 9.1%  | 0%    | 0%    | 0%    | 0%  | 0%  | 0%    | 0%  |

Dana: n = 154

AAM: n = 22



# K2XX VS. DANA HARDWARE RUST RATING FOR 155-1 OIL



| Hardware | Rating | Rating Area |       |       |       |       |       |      |      |       |      |
|----------|--------|-------------|-------|-------|-------|-------|-------|------|------|-------|------|
|          |        | 1           | 2     | 3     | 4     | 5     | 6     | 7    | 8    | 9     | 10   |
| Dana     | 10     | 80.8%       | 32.1% | 34.6% | 29.5% | 94.9% | 94.9% | 90%  | 88%  | 94.9% | 91%  |
| AAM      | 10     | 95.6%       | 21.7% | 8.7%  | 13%   | 87%   | 82.6% | 100% | 100% | 95.6% | 100% |
| Dana     | 9      | 14.1%       | 24.4% | 20.5% | 41%   | 5.1%  | 5.1%  | 9%   | 10%  | 5.1%  | 8%   |
| AAM      | 9      | 0%          | 0%    | 13%   | 17.4% | 13%   | 17.4% | 0%   | 0%   | 4.4%  | 0%   |
| Dana     | 8      | 15.3%       | 43.6% | 44.9% | 29.5% | 0%    | 0%    | 1%   | 1%   | 0%    | 1%   |
| AAM      | 8      | 4.4%        | 78.3% | 78.3% | 69.6% | 0%    | 0%    | 0%   | 0%   | 0%    | 0%   |
| Dana     | 5      | 0%          | 0%    | 0%    | 0%    | 0%    | 0%    | 0%   | 0%   | 0%    | 0%   |
| AAM      | 5      | 0%          | 0%    | 0%    | 0%    | 0%    | 0%    | 0%   | 0%   | 0%    | 0%   |

Dana: n = 78

AAM: n = 23

## NEW/OPEN ISSUES



Any new business?

## ANGELA TRADER



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| TESTKEY    | LTMSLAB | LTMSAPP | VAL   | IND   | CHART | LTMSDATE | LTMSTIME | SPECIAL | RUST | RUSTyi  | RUSTzi | RUSTqi |
|------------|---------|---------|-------|-------|-------|----------|----------|---------|------|---------|--------|--------|
| 119047-L3: | A1      |         | 15 AC | 155-1 | Y     | 20160805 | 10:27    | K2XX    | 9.1  | -1.3333 | .      | .      |
| 119048-L3: | A1      |         | 14 AC | 155-1 | Y     | 20160810 | 09:52    | K2XX    | 9.1  | -1.3333 | .      | .      |
| 119642-L3: | A1      | 14A     | AC    | 155-1 | Y     | 20170117 | 12:09    | K2XX    | 9.1  | -1.3333 | .      | .      |
| 123084-L3: | A1      | 14A     | AC    | 155-1 | Y     | 20170126 | 10:03    | K2XX    | 9.1  | -1.3333 | .      | .      |
| 108361-L3: | G       |         | 1 AC  | 155-1 | Y     | 20170317 | 08:53    | K2XX    | 9.3  | 0.3333  | .      | .      |
| 112370-L3: | B1      | 3A      | AC    | 155-1 | Y     | 20170502 | 07:14    | K2XX    | 9.1  | -1.3333 | .      | .      |
| 123085-L3: | A1      | 15A     | AC    | 155-1 | Y     | 20170627 | 09:28    | K2XX    | 9.1  | -1.3333 | .      | .      |
| 123087-L3: | A1      | 15A     | AC    | 155-1 | Y     | 20171013 | 09:53    | K2XX    | 9.1  | -0.7368 | .      | .      |
| 122898-L3: | B1      | 2A      | AC    | 155-1 | Y     | 20171031 | 08:18    | K2XX    | 9.5  | 1.3684  | .      | .      |

| TESTKEY    | LTMSLAB | LTMSAPP | VAL   | IND   | CHART | LTMSDATE | LTMSTIME | SPECIAL | RUST | RUSTyi | RUSTzi | RUSTqi |
|------------|---------|---------|-------|-------|-------|----------|----------|---------|------|--------|--------|--------|
| 87357-L33: | G       |         | 2 AC  | 155-1 | Y     | 20120404 | 01:55    | V01.1   | 9.3  | -1.12  | .      | .      |
| 87358-L33: | G       |         | 2 AC  | 155-1 | Y     | 20120420 | 01:30    | V01.1   | 9.5  | -0.32  | .      | .      |
| 87801-L33: | G       |         | 1 AC  | 155-1 | Y     | 20120905 | 09:55    | V01.1   | 9.4  | -0.72  | .      | .      |
| 84748-L33: | B1      |         | 3 AC  | 155-1 | Y     | 20130110 | 09:11    | V01.1   | 9.7  | 0.48   | .      | .      |
| 89623-L33: | G       |         | 2 AC  | 155-1 | Y     | 20130214 | 11:13    | V01.1   | 9.3  | -1.12  | .      | .      |
| 84749-L33: | B1      |         | 2 AC  | 155-1 | Y     | 20130423 | 09:59    | V01.1   | 9.4  | -0.72  | .      | .      |
| 84750-L33: | B1      |         | 3 AC  | 155-1 | Y     | 20130819 | 10:02    | V01.1   | 9.4  | -0.72  | .      | .      |
| 92773-L33: | G       |         | 1 AC  | 155-1 | Y     | 20131104 | 09:01    | V01.1   | 9.8  | 0.88   | .      | .      |
| 90500-L33: | A1      |         | 15 AC | 155-1 | Y     | 20131216 | 10:35    | V01.1   | 9.6  | 0.08   | .      | .      |
| 89964-L33: | B1      |         | 3 AC  | 155-1 | Y     | 20140107 | 08:53    | V01.1   | 9.5  | -0.32  | .      | .      |
| 92774-L33: | G       |         | 1 AC  | 155-1 | Y     | 20140307 | 11:43    | V01.1   | 9.5  | -0.32  | .      | .      |
| 97706-L33: | B1      |         | 2 AC  | 155-1 | Y     | 20140528 | 09:42    | V01.1   | 9.7  | 0.48   | .      | .      |
| 90501-L33: | A1      |         | 14 AC | 155-1 | Y     | 20140610 | 10:32    | V01.1   | 9.3  | -1.12  | .      | .      |
| 98038-L33: | A1      |         | 14 AC | 155-1 | Y     | 20140619 | 10:19    | V01.1   | 9.7  | 0.48   | .      | .      |
| 101906-L3: | A1      |         | 15 AC | 155-1 | Y     | 20140915 | 10:52    | V01.1   | 9.3  | -1.12  | .      | .      |
| 98305-L33: | G       |         | 2 AC  | 155-1 | Y     | 20140919 | 10:29    | V01.1   | 9.6  | 0.08   | .      | .      |
| 98306-L33: | G       |         | 1 AC  | 155-1 | Y     | 20141001 | 10:19    | V01.1   | 9.6  | 0.08   | .      | .      |
| 101102-L3: | G       |         | 1 AC  | 155-1 | Y     | 20150420 | 10:29    | V01.1   | 9.4  | -0.72  | .      | .      |

| RCDCPIN | RCDCDFGC | RCDCDFGS | RCDCAXHC | RCDCDGR | RCDCDPIN | RCBDPNR | RCBDPNC | RCBDFCR | RCBDFCC | IND_SORT  | WUTIMEST | WUTIMEFN |
|---------|----------|----------|----------|---------|----------|---------|---------|---------|---------|-----------|----------|----------|
| 10      | 8        | 8        | 8        | 10      | 10       | 10      | 10      | 10      | 10      | tmc-155-1 | 10:41    | 11:25    |
| 10      | 8        | 8        | 8        | 10      | 10       | 10      | 10      | 10      | 10      | tmc-155-1 | 10:01    | 10:32    |
| 10      | 8        | 8        | 8        | 10      | 10       | 10      | 10      | 10      | 10      | tmc-155-1 | 12:29    | 13:06    |
| 10      | 8        | 8        | 8        | 10      | 10       | 10      | 10      | 10      | 10      | tmc-155-1 | 10:12    | 10:56    |
| 10      | 8        | 8        | 9        | 10      | 10       | 10      | 10      | 10      | 10      | tmc-155-1 | 8:33     | 9:07     |
| 10      | 8        | 8        | 8        | 10      | 10       | 10      | 10      | 10      | 10      | tmc-155-1 | 08:02    | 08:33    |
| 10      | 8        | 8        | 8        | 10      | 10       | 10      | 10      | 10      | 10      | tmc-155-1 | 09:47    | 10:29    |
| 10      | 8        | 8        | 8        | 10      | 10       | 10      | 10      | 10      | 10      | tmc-155-1 | 10:00    | 10:47    |
| 10      | 9        | 10       | 8        | 10      | 10       | 10      | 10      | 10      | 10      | tmc-155-1 | 08:59    | 09:30    |

| RCDCPIN | RCDCDFGC | RCDCDFGS | RCDCAXHC | RCDCDGR | RCDCDPIN | RCBDPNR | RCBDPNC | RCBDFCR | RCBDFCC | IND_SORT  | WUTIMEST | WUTIMEFN |
|---------|----------|----------|----------|---------|----------|---------|---------|---------|---------|-----------|----------|----------|
| 9       | 9        | 9        | 10       | 9       | 10       | 9       | 9       | 10      | 9       | tmc-155-1 | 10:29    | 10:57    |
| 8       | 10       | 9        | 10       | 10      | 9        | 8       | 9       | 10      | 10      | tmc-155-1 | 10:14    | 10:44    |
| 10      | 9        | 8        | 9        | 10      | 10       | 9       | 10      | 10      | 10      | tmc-155-1 | 10:24    | 10:57    |
| 10      | 10       | 10       | 8        | 10      | 10       | 10      | 10      | 10      | 10      | tmc-155-1 | 09:47    | 10:17    |
| 8       | 9        | 10       | 9        | 10      | 10       | 10      | 10      | 9       | 9       | tmc-155-1 | 11:48    | 12:15    |
| 10      | 8        | 8        | 10       | 10      | 10       | 10      | 10      | 10      | 10      | tmc-155-1 | 10:28    | 11:02    |
| 10      | 8        | 10       | 9        | 10      | 10       | 10      | 10      | 10      | 10      | tmc-155-1 | 10:40    | 11:09    |
| 9       | 10       | 10       | 10       | 10      | 9        | 10      | 10      | 10      | 10      | tmc-155-1 | 10:32    | 11:04    |
| 10      | 9        | 10       | 9        | 10      | 10       | 10      | 10      | 10      | 10      | tmc-155-1 | 11:00    | 11:28    |
| 10      | 9        | 9        | 9        | 10      | 10       | 10      | 10      | 10      | 10      | tmc-155-1 | 09:31    | 10:03    |
| 10      | 9        | 9        | 9        | 10      | 10       | 10      | 10      | 10      | 10      | tmc-155-1 | 12:11    | 12:40    |
| 10      | 10       | 9        | 9        | 10      | 10       | 10      | 10      | 10      | 10      | tmc-155-1 | 09:58    | 10:35    |
| 10      | 8        | 8        | 9        | 10      | 10       | 10      | 10      | 10      | 10      | tmc-155-1 | 10:46    | 11:17    |
| 10      | 10       | 10       | 8        | 10      | 10       | 10      | 10      | 10      | 10      | tmc-155-1 | 10:20    | 11:02    |
| 10      | 8        | 8        | 9        | 10      | 10       | 10      | 10      | 10      | 10      | tmc-155-1 | 11:06    | 11:44    |
| 10      | 8        | 10       | 10       | 10      | 10       | 10      | 10      | 10      | 10      | tmc-155-1 | 10:41    | 11:32    |
| 10      | 9        | 10       | 9        | 10      | 10       | 10      | 10      | 10      | 10      | tmc-155-1 | 10:25    | 10:54    |
| 10      | 8        | 8        | 10       | 10      | 10       | 10      | 10      | 10      | 10      | tmc-155-1 | 11:01    | 11:33    |

| gearver | RINIT1 | # of 8s        |
|---------|--------|----------------|
| K2XX    | AS     | 3              |
| K2XX    | BT     | 3              |
| K2XX    | AS     | 3              |
| K2XX    | AS     | 3              |
| K2XX    | NPA    | 2              |
| K2XX    | BJF    | 3              |
| K2XX    | BT     | 3              |
| K2XX    | AS     | 3              |
| K2XX    | VAD    | 1              |
|         |        | <hr/> 2.666667 |

| gearver | RINIT1 | # of 8s        |
|---------|--------|----------------|
| V01.1   | TCB    | 0              |
| V01.1   | TCB    | 2              |
| V01.1   | TCB    | 1              |
| V01.1   | PDR    | 1              |
| V01.1   | NPA    | 1              |
| V01.1   | BJF    | 2              |
| V01.1   | CL     | 1              |
| V01.1   | NPA    | 0              |
| V01.1   | AS     | 0              |
| V01.1   | CL     | 0              |
| V01.1   | NPA    | 0              |
| V01.1   | BJF    | 0              |
| V01.1   | AS     | 2              |
| V01.1   | AS     | 1              |
| V01.1   | AS     | 2              |
| V01.1   | NPA    | 1              |
| V01.1   | NPA    | 0              |
| V01.1   | NPA    | 2              |
|         |        | <hr/> 0.888889 |

ASTM D 7038 L-33-1 SURVEILLANCE PANEL PARTICIPANTS LIST

*Feb* November 9, 2017

| Initials   | Name                     | Voting V/NV   | Company Name<br>Company Address  | Phone / Fax / E-Mail   |
|------------|--------------------------|---------------|--|--|
|            | Aguirre, Nancy           | NV            | Intertek Automotive Research<br>5404 Bandera Road<br>San Antonio, Texas 78238              | Phone:<br>Fax:<br>E-mail: nancy.aguirre@intertek.com                           |
| <i>RB</i>  | Banas, Rob               | V             | ExxonMobil<br>114 Arcadia Park Dr.<br>Canton, GA 30114                                     | Phone: 678-493-3930<br>Fax:<br>E-mail: rob.a.banas@exxonmobil.com              |
|            | Barrera, Tony            | NV            | Intertek Automotive Research<br>5404 Bandera Road<br>San Antonio, TX 78238                 | Phone:<br>Fax:<br>E-mail: tony.barrera@intertek.com                            |
| <i>DB</i>  | Beck, Dylan              | NV            | TMC<br>6555 Penn Avenue<br>Pittsburgh, PA 15206  | Phone: 724-355-1854<br>Fax:<br>E-mail: djb@astmtmc.cmu.edu                     |
| <i>DRB</i> | Bell, Don                | NV            | Afton Chemical Corp<br>500 Spring Street<br>Richmond, Virginia 23219                       | Phone: 804-788-6332<br>Fax: 804-788-6243<br>E-mail: don.bell@aftonchemical.com |
|            | Bryson, Tom              | V             | Mack Trucks<br>13302 Pennsylvania Avenue<br>Hagerstown, Maryland 21740                     | Phone: 301-790-5454<br>Fax: 301-790-6744<br>E-mail: tomas.bryson@volvo.com     |
|            | <del>Bubonic, Brad</del> | <del>NV</del> | <del>The Lubrizol Corporation<br/>29400 Lakeland Boulevard<br/>Wickliffe, Ohio 44092</del> | <del>Phone: 440-347-5325<br/>Fax:<br/>E-mail: @lubrizol.com</del>              |



ASTM D 7038 L-33-1 SURVEILLANCE PANEL PARTICIPANTS LIST

Feb ~~November 9, 2010~~

| Initials | Name                           | Voting<br>V/NV | Company Name<br>Company Address   | Phone / Fax / E-Mail  |
|----------|--------------------------------|----------------|---|---|
|          | Clark, Jeff                    | NV             | TMC<br>6555 Penn Avenue<br>Pittsburgh, PA 15206   | Phone: 412-365-1032<br>Fax:<br>E-mail: jac@astmtmc.cmu.edu                          |
|          | Comfort, Allen                 | V              | US Army TACOM<br>Mail Stop 110<br>6501 E. 11 Mile Road<br>Warren, MI 48397-5000<br>AMSTA-TR-D / 210 | Phone: 586-282-4225<br>Fax: 586-282-4244<br>E-mail: allen.s.comfort.civ@mail.mil    |
| EPD      | Donovan, Eric                  | V              | Afton Chemical Corp<br>500 Spring Street<br>Richmond, Virginia <del>23218</del><br>23219            | Phone: 804-788-5097<br>Fax:<br>E-mail: eric.donovan@aftonchemical.com               |
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|          | Dwornick, Bridget<br>(Brosnan) | NV             | US Army TACOM<br>Mail Stop 110<br>6501 E. 11 Mile Road<br>Warren, MI 48397-5000<br>RDTA-DP/210      | Phone: 586-282-4221<br>Fax: 586-574-4224<br>E-mail: bridget.l.dwornick.civ@mail.mil |
|          | Dharte, John                   | V              | AAM<br>1 Dauch Drive<br>Detroit, Michigan 48211   | Phone: 313-758-4687<br>Fax: 313-758-4237<br>E-mail: Dhartej@aam.com                 |

ASTM D 7038 L-33-1 SURVEILLANCE PANEL PARTICIPANTS LIST

*Feb* *November 9, 2017*

| Initials     | Name             | Voting<br>Y/N/V                        | Company Name<br>Company Address   | Phone / Fax / E-Mail   |
|--------------|------------------|--|---|--|
| <i>BDF</i>   | Foecking, Brian  | NV                                     | The Lubrizol Corporation<br>29400 Lakeland Boulevard<br>Wickliffe, Ohio 44092       | Phone: 440-347-2130<br>Fax:<br>E-mail: brian.foecking@lubrizol.com               |
|              | Gottwald, Thomas | NV                                     | Afton Chemical Corp<br>500 Spring Street<br>Richmond, Virginia 23219                | Phone: 804-788-5230<br>Fax:<br>E-mail: thomas.gottwald@aftonchemical.com         |
| <i>Arjun</i> | Goyal, Arjun     | <input checked="" type="checkbox"/> NV | BASF<br>500 White Plains Road<br>Tarrytown, NY 10951                                | Phone: 914-785-2083<br>Fax:<br>E-mail: arjun.goyal@basf.com                      |
|              | Hobson, Kevin    | NV                                     | Afton Chemical Corp<br>500 Spring Street<br>Richmond, Virginia 23218                | Phone: 804-788-<br>Fax: 804-788-<br>E-mail: kevin.hobson@aftonchemical.com       |
|              | Kanga, Percy     | NV                                     | ExxonMobil Research Engineering Co.<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 |
| <i>WAX</i>   | Kearney, Bill    | NV                                     | Afton Chemical Corp<br>2000 Tower Center<br>Southfield, MI 48075                    | Phone: 248-302-8531<br>Fax:<br>E-mail:   |
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*Feb* November 9, 2017

| Initials | Name        | Voting<br>V/NV | Company Name<br>Company Address | Phone / Fax / E-Mail                                       |
|----------|-------------|----------------|---------------------------------|--|
|          | Klein, Rick | NV             | Valvoline                       | Phone: 248-513-2538<br>Fax:<br>E-mail: rmklein@ashland.com |



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| Initials  | Name           | Voting<br>V/NV | Company Name<br>Company Address   | Phone / Fax / E-Mail  |
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|           | Marsic, Vera   | NV             | The Lubrizol Corporation<br>29400 Lakeland Boulevard<br>Wickliffe, Ohio 44092 | Phone: 440-347-8024<br>Fax:<br>E-mail: vera.marsic@lubrizol.com       |
|           | Milner, Jeff   | NV             | Tienhe Chemical   | Phone: 804-252-6528<br>Fax:<br>E-mail: jmilner@tianhe-us.com          |
|           | Minke, Andreas | NV             | BASF  | Phone:<br>Fax:<br>E-mail: andreas.minke@basf.com                      |
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|           | Opperman, Rob  |                | Meritor<br>2135 W. Maple Road<br>Troy, MI 48237                               | Phone: 248-435-1544<br>Fax:<br>E-mail: robert.opperman@meritor.com    |

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*Feb* November 9, 2018

| Initials   | Name                     | Voting<br>V/NV | Company Name<br>Company Address   | Phone / Fax / E-Mail  |
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|   | Parke, Scott             | V              | TMC<br>6555 Penn Avenue<br>Pittsburgh, PA 15206                               | Phone: 412-365-1036<br>Fax:<br>E-mail: sdp@astmtmc.cmu.edu                    |
|  | Recinos, William         | NV             | Afton Chemical Corp<br>500 Spring Street<br>Richmond, Virginia 23218          | Phone: 804-788-<br>Fax: 804-788-<br>E-mail: william.recinos@aftonchemical.com |
|  | Rodriguez, Jesus (Jesse) | NV             | Intertek Automotive Research<br>5404 Bandera Road<br>San Antonio, Texas 78238 | Phone:<br>Fax:<br>E-mail: jesus.rodriguez@intertek.com                        |
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|  | Sattler, Eric            | NV             | US Army   | Phone: 586-282-2272<br>Fax:<br>E-mail: eric.r.sattler.civ@mail.mil            |
|  | Shank, Greg              | NV             | Mack Volvo<br>13302 Pennsylvania Ave.<br>Hagerstown, MD 21740                 | Phone: 301-573-5684<br>Fax:<br>E-mail: greg.shank@volvo.com                   |

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| Initials   | Name                         | Voting V/NV | Company Name<br>Company Address   | Phone / Fax / E-Mail   |
|------------|------------------------------|-------------|---|--|
| <i>RWS</i> | Slocum, Robert               | NV          | The Lubrizol Corporation<br>29400 Lakeland Boulevard<br>Wickliffe, Ohio 44092 | Phone: 440-347-5102<br>Fax:<br>Email: robert.slocum@lubrizol.com               |
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|            | Trader, Angela<br>(Chairman) | V           | Intertek Automotive Research<br>5404 Bandera Road<br>San Antonio, Texas 78238 | Phone: 210-706-1533<br>Fax: 210-684-6074<br>E-mail: angela.trader@intertek.com |
|            | Ved, Chintan                 | V           | Ford Transmission and Driveline<br>35500 Plymouth Rd<br>Livonia, MI, 48150    | Phone: 313-805-9495<br>Fax: 734-523-3960<br>E-mail: cved@ford.com              |
| <i>WV</i>  | Venhoff, Wes                 | NV          | The Lubrizol Corporation<br>29400 Lakeland Boulevard<br>Wickliffe, Ohio 44092 | Phone: 440-347-4879<br>Fax:<br>E-mail: wve@lubrizol.com                        |
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| Initials | Name          | Voting<br>V/NV | Company Name<br>Company Address | Phone / Fax / E-Mail                                       |
|----------|---------------|----------------|---------------------------------|--|
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|          |               |                |                                 | 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:                                  |
|          |               |                |                                 | Phone:<br>Fax:<br>E-mail:                                  |