

MEETING MINUTES: ROBO SURVEILLANCE PANEL

Meeting: ROBO SP Meeting

Date: April 11, 2019

Location: Skype meeting

Minutes by: Justin Mills – SP Chair

Actions:

1. Tom Schofield will organize shipment of 3-4 samples of 434-3 to Evonik, Intertek, SwRI, and Lubrizol.
2. Justin Mills and Tom Schofield to track the number of 438-2 runs. Once there are >20 runs, the limits will be recalculated are shared with the SP.
3. Justin Mills to write a short research report detailing the development of the dilute NO2 alternative
4. Justin Mills and Matt Schlaff to draft procedure for introducing dilute NO2
5. SP members are encouraged to review method and bring forward any changes that may be necessary.
6. Justin Mills to schedule next SP meeting for Thursday, May 30th.

Membership and Attendance:

Ace Glass	Dave Lawrence
Afton	*Shelia Thompson, Jeff Yang, *Todd Dvorak
ASTM TMC	*Tom Schofield
BASF	Mary Dery, Bridgett Rakestraw
Chevron Oronite	Man Hon Tsang, Robert Stockwell
ExxonMobil	*Dennis Gaal
Infineum	Andy Richie, Sapna Eticala
Intertek	*Joe Franklin, *Matt Schlaff,
Lubrizol	*Mike Faile, *Aimee Shinhearl, Rick Hartman
PetroChina	Li Shaohui , Sun Ruihua, Peng Wang, Xiaogang Li, Xu Li
Evonik Oil Additives	*Justin Mills, *Bruce Zweitzig, Joan Souchik, *John Maxwell, *Justin Kontra
Vanderbilt Chemicals	Al Filho, Ron Hiza
SwRI	Becky Grinfield, Joe De La Cruz, *Mike Birke, Young-Li McFarland
Valvoline	Amol Savant, Kevin Figgatt, Steve Lazzara
Koehler Instruments	Raj Shah, Vincent Colantuini
Tannas/Savant	Greg Miller, Ted Selby
General Interest	*Alan Flamberg

* Denotes attendance

MEETING MINUTES: ROBO SURVEILLANCE PANEL

Summary:

- Meeting convened at 10:03EST on April 11, 2019
- Agenda accepted by SP without any modifications
- ASTM Antitrust and Recording Policy reviewed
- Membership review and update – no changes to report.
- Meeting minutes from February 21st SP meeting were accepted
 - Motion made by Bruce Zweitzig and seconded by Mike Faile
- Actions from the February 21st meeting were reviewed
 - SP members were encouraged to review ASTM D7528-17a and bring forward any changes that may be necessary in the next revision.
- ROBO industry statistics
 - The 2019APR semester (10/1/18 – 3/31/19) ended without a severity bias (Average $Y_i=0.0352$); however the precision is slightly worse than target (Pooled $s = 0.2738$)
 - Unclear how or why the test is running more severe at the moment, as there was no concerted effort to make the test more severe.
- Stats Group update
 - Stats group is very busy supporting Sequence tests and BOI/VGRA for upcoming ILSAC GF-6 category – will likely have more time to address ROBO afterward – likely Q3 2019
- Reference Oil 438-2
 - At the last SP meeting we agreed to track # of 438-2 runs in ROBO LTMS. Once >20 runs are reached, new limits will be calculated and proposed to SP
 - As of 4/9/19, there were no additional data points for 438-2 since our last meeting. Tom Schofield commented that most labs do not have 438-2 yet because they are still using existing inventory of 438.
 - Justin and Tom will continue to monitor # of runs. Once >20 runs on 438-2 are recorded, Justin will re-evaluate 438-2 limits.
- Reference Oil 434-2
 - 434-2 inventory has become critically low. Despite TMC's electronic inventory showing 14 gallons of 434-2 remaining a physical audit revealed there are approximately 7.5 gallons remaining. Based on current consumption rates, this will last about 9-10 months.
 - Tom Schofield offered 434-3 and 436 as replacements.
 - Based on Sequence IIIH data the 434-3 is more severe than 434-2. Todd Dvorak commented he helped with statistical analysis of 434-3 in Sequence IIIH and suggested that we may not see the same severity issue in ROBO.
 - Based on Evonik's limited experience with 436, this reference oil may be too mild to be a suitable alternative to 434-2.
 - The next step will be to conduct a mini round-robin on 434-3. Evonik, Intertek, SwRI, and Lubrizol volunteered to donate 2-3 runs each. Tom Schofield will organize shipment of 434-3 to volunteer labs. We hope to have results by next SP meeting.
- Update on dilute nitrogen dioxide
 - Path forward for implementation of dilute NO₂ will be:
 - Demonstrate equivalence to the SP – Results from Evonik and Intertek were shared. When comparing MRV vs. PVIS, dilute NO₂ shows same trend as concentrated NO₂. The SP was satisfied with the results and no objections were brought forward. As a next step, Justin Mills agreed to write a short research report detailing the development of the dilute NO₂ alternative. In addition, Mike Faile asked if we could calculate statistics on the limited dataset.
 - Develop a procedure for dilute NO₂ – Matt Schlaff and Justin Mills to develop
 - Approve by SP – Will likely vote at next SP meeting.
 - Once approved by SP, an information letter allowing use of dilute NO₂ as an alternative will be issued.
 - The final step will be to ballot the changes at ASTM
 - Tom Schofield suggested that we track standard vs. dilute NO₂ in TMC data file by adding an additional field to data dictionary.
- Concentrated nitrogen dioxide

MEETING MINUTES: ROBO SURVEILLANCE PANEL

- No issues to report. All labs are using SpecGas or Electronic Fluorocarbons for concentrated NO₂ supply.
- Method housekeeping
 - All SP members were encouraged to review the ASTM D7528-17a and recommend any additional changes that may be necessary.
 - Method housekeeping will remain an agenda item for the next SP meeting.
- Next meeting is tentatively scheduled for May 30, 2019.
- Meeting adjourned

ROBO Surveillance Panel Meeting

April 11, 2019

Justin Mills

Agenda

- Welcome, ASTM statement
- Review membership of SP
- Review and approve minutes from previous meetings (see attachment)
- Review and follow-up on actions from February 21st meeting
- Statistics update – Current statistics for ROBO and Stats group update
- TMC 438-2 update
- TMC 434-2 – supply running low and need a replacement
- Dilute nitrogen dioxide – share data and next steps
- Additional topics, if any
- Set next meeting

ASTM Antitrust and Recording Policy

ASTM International is a not-for-profit organization and developer of voluntary consensus standards. ASTM's leadership in international standards development is driven by the contributions of its members: more than 30,000 technical experts and business professionals representing 135 countries.

The purpose of antitrust laws is to preserve economic competition in the marketplace by prohibiting, among other things, unreasonable restraints of trade. In ASTM activities, it is important to recognize that participants often represent competitive interests. Antitrust laws require that all competition be open and unrestricted.

It is ASTM's policy, and the policy of each of its committees and subcommittees, to conduct all business and activity in full compliance with international, federal and state antitrust and competition laws. The ASTM Board of Directors has adopted an antitrust policy which is found in Section 19 of ASTM Regulations Governing Technical Committees. All members need to be aware of and compliant with this policy. The Regulations are accessible on the ASTM website (<http://www.astm.org/COMMIT/Regs.pdf>).

Electronic recording of ASTM meetings is prohibited.

Membership – Updated 2/21/19

Ace Glass	Dave Lawrence
Afton	Shelia Thompson, Jeff Yang, Todd Dvorak
ASTM TMC	Tom Schofield
BASF	Mary Dery, Bridgett Rakestraw
Chevron Oronite	Man Hon Tsang, Robert Stockwell
ExxonMobil	Dennis Gaal
Infineum	Andy Richie, Sapna Eticala
Intertek	Joe Franklin, Matt Schlaff
Lubrizol	Mike Faile, Aimee Shinhearl, Rick Hartman
PetroChina	Li Shaohui , Sun Ruihua, Peng Wang, Xiaogang Li, Xu Li
Evonik Oil Additives	Justin Mills, Bruce Zweitzig, Joan Souchik, John Maxwell, Justin Kontra
Vanderbilt Chemicals	Al Filho, Ron Hiza
SwRI	Becky Grinfield, Joe De La Cruz, Mike Birke, Yong-Li McFarland
Valvoline	Amol Savant, Kevin Figgatt, Steve Lazzara
Koehler Instruments	Raj Shah, Vincent Colantuini
Tannas/Savant	Greg Miller, Ted Selby
General Interest	Alan Flamberg

Summary of changes:

- Justin Kontra added to Evonik roster.

Motion to accept February 21, 2019 meeting minutes

MEETING MINUTES: ROBO SURVEILLANCE PANEL

Meeting: ROBO SP Meeting
Date: February 21, 2019
Location: Skype meeting
Minutes by: Justin Mills – SP Chair

Actions:

- Tom Schofield to implement new 438-2 limits.
- Justin Mills and Tom Schofield to track the number of 438-2 runs. Once there are >20 runs, the limits will be recalculated and shared with the SP.
- Justin Mills to add D7528 housekeeping as topic for next SP meeting.
 - SP members are encouraged to review method and bring forward any changes that may be necessary.
- Justin Mills to schedule next SP meeting for Thursday, April 11th – date is tentative. It will be postponed if there is not enough dilute NO₂ data available to vote on and there is <20 runs on 438-2.

Membership and Attendance:

Ace Glass	Dave Lawrence
Afton	*Shelia Thompson, Jeff Yang, Todd Dvorak
ASTM TMC	*Tom Schofield
BASF	Mary Dery, Bridgett Rakestraw
Chevron Oronite	Man Hon Tsang, Robert Stockwell
ExxonMobil	Dennis Gaal
Infinium	Andy Richie, Sapna Eticala
Intertek	Joe Franklin, *Matt Schliaff,
Lubrizol	*Mike Faile, *Aimee Shinheard, Rick Hartman
PetroChina	Li Shaohui, Sun Ruihua, Peng Wang, Xiaogang Li, Xu Li
Evonik Oil Additives	*Justin Mills, Bruce Zwieltzig, *Joan Souchik, John Maxwell, Justin Kontra
Vanderbilt Chemicals	Al Filho, Ron Hiza
SwRI	Becky Grinfield, Joe De La Cruz, *Mike Birke, Young-Li McFarland
Valvoline	Amol Savant, Kevin Figgatt, *Steve Lazzara
Koehler Instruments	*Raj Shah, *Vincent Colantuini
Tannas/Savant	Greg Miller, Ted Selby
General Interest	*Alan Flamberg
Guests	None

* Denotes attendance

ASTM D7528 ROBO SP Meeting February 21, 2019

MEETING MINUTES: ROBO SURVEILLANCE PANEL

Summary:

- Meeting convened at 10:04EST on February 21, 2019
 - Agenda accepted by SP without any modifications
 - ASTM Antitrust and Recording Policy reviewed
 - Membership review and update
 - Justin Kontra added to Evonik membership. Justin Kontra replaced Lizzy Wagoner / Alan Flamberg.
 - Meeting minutes from January 10th SP meeting were accepted
 - Motion made by Mike Birke and seconded by Mike Faile
 - Actions from the January 10th meeting were reviewed
 - One outstanding action is for SP members to review ASTM D7528-17a and bring forward any changes that may be necessary in the next revision.
 - ROBO industry statistics
 - For the first time in recent history the ROBO test is not running mild (mean $\Delta/s = 0.15$); however the precision is slightly worse than target (Pooled $s = 0.2750$)
 - Unclear how or why the test is running more severe at the moment, as there was no concerted effort to make the test more severe.
 - Stats Group update
 - Stats group is very busy supporting Sequence tests and BOI/VGRA – will likely have more time to address ROBO afterward. Justin will continue to follow up with Stats Group.
 - Reference oil 438-2
 - To date, 11 runs were donated, but only 10 were operationally valid. SP agreed this was a sufficient amount of data to set temporary limits.
 - The following limits were shared:
- | TMC 438-2 | n | Natural Log Transformed Mean (ln) | Mean in Original Units | s.d. (ln) | 95% band in mPPM, min | 95% band in mPPM, max | 95% band (ln), min | 95% band (ln), max | |
|-----------|--|-----------------------------------|------------------------|-----------|-----------------------|-----------------------|--------------------|--------------------|---------|
| Option #1 | No bias correction | 10.4017 | 34.951 | | 22.172 | 55.094 | 10.0000 | 10.9108 | |
| Option #2 | Average Y1 from TMC statistics (N = 0.1098) | 10.4421 | 34.273 | 0.2322 | 21.742 | 54.025 | 9.9870 | 10.8972 | |
| Option #3 | Average Y1 from participating labs/units only (N = 0.3436) | 10.3967 | 32.850 | | 20.839 | 52.266 | 9.9440 | 10.8548 | |
| | Current Limits for TMC 438 | 14 | 10.2676 | 26.785 | 0.2037 | 19.308 | 42.912 | 9.8693 | 10.6969 |
- After some discussion, the surveillance panel agreed that Option #2 was the preferred option. Option #2 included a bias correction – the same procedure was used when we set 434-2 limits. As shown in the above table, the severity adjustment had little impact on the 95% bands, but nevertheless we agreed that it was important to set limits in the same manner as 434-2.
 - Alan Flamberg made a motion to accept Option #2 and it was seconded by Matt Schliaff. A vote was taken – all were in favor and no objections were raised. The motion passed.
 - SP agreed to re-evaluate the limits once >20 runs on 438-2 are conducted.
 - Justin Mills and Tom Schofield will track # of 438-2 runs in ROBO LTMS. Once >20 runs are reached, new limits will be calculated and proposed to SP.
- Update on dilute nitrogen dioxide
 - The dataset for dilute NO₂ needs to be further developed before we can proceed to Surveillance Panel vote.
 - Method housekeeping
 - Section 9 of the method needs to be updated. Footnote #11 is no longer valid because calibration requirements for ROBO will no longer be a standalone document and will instead be included in TMC's LTMS document. <http://www.astmtmc.cmu.edu/ftp/docs/ltms/ltms.pdf>
 - In addition it was suggested that we remove the requirements in Section 9 and just reference the LTMS instead for calibration requirements. Otherwise we run the risk of misaligning the calibration requirements in the LTMS and method.
 - All SP members were encouraged to review the ASTM D7528-17a and recommend any additional changes that may be necessary.
 - Method housekeeping will remain an agenda item for the next SP meeting.
 - ROBO workshop

ASTM D7528 ROBO SP Meeting February 21, 2019

MEETING MINUTES: ROBO SURVEILLANCE PANEL

- The idea of hosting another ROBO workshop was briefly discussed. The last workshop was held in October 2015. The overall value of a workshop is unclear. At that workshop there were no significant changes or actions identified to improve ROBO; however there was value in people meeting face to face and sharing best practices. There was no clear consensus on whether or not the effort is justified.
- Next meeting to be scheduled for April 11, 2019. Meeting may be postponed if there is not sufficient data for dilute NO₂ to take a vote or if there are not >20 runs to set final limits for 438-2.
- Meeting adjourned

ASTM D7528 ROBO SP Meeting February 21, 2019

Actions from February 21st meeting

- Tom Schofield to implement new 438-2 limits.
- Justin Mills and Tom Schofield to track the number of 438-2 runs. Once there are >20 runs, the limits will be recalculated and shared with the SP.
- Justin Mills to add D7528 housekeeping as topic for next SP meeting.
 - SP members are encouraged to review method and bring forward any changes that may be necessary.
- Justin Mills to schedule next SP meeting for Thursday, April 11th – date is tentative. It will be postponed if there is not enough dilute NO₂ data available to vote on and there is <20 runs on 438-2.

ROBO Industry Statistics

Period	N-size	Degrees of Freedom	Pooled s	Mean Δ/s	Comments
Current Targets	49	46	0.1945	-----	
10/1/15 through 3/31/16*	92	89	0.4115	-0.10	Period statistics with and without one extreme result included
10/1/15 through 3/31/16*	91	88	0.3661	-0.20	
4/1/16 through 9/30/16	74	71	0.3152	-0.53	
10/1/16 through 3/31/17	78	75	0.2771	-0.91	
4/1/17 through 9/30/17	99	95	0.2220	-0.76	
10/1/17 through 3/31/18**	90	86	0.2376	-0.91	Period statistics with and without seven suspect results from two rigs
10/1/17 through 3/31/18**	83	79	0.2076	-0.74	
4/1/18 through 9/30/18	126	122	0.2184	-0.49	Period statistics with and without one extreme result included
4/1/18 through 9/30/18	125	121	0.1958	-0.53	
10/1/18 through 3/31/19	100	96	0.2738	0.04	

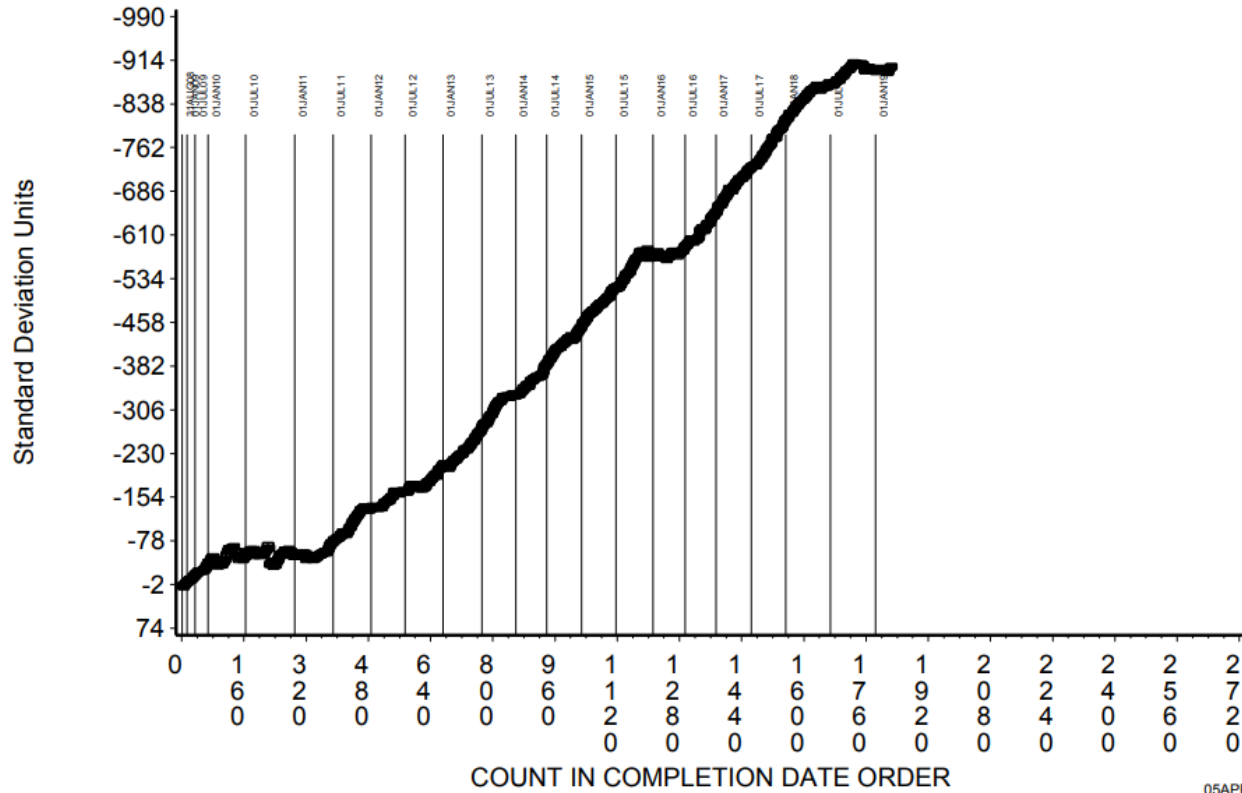
Updated 4/19/19

CUSUM severity analysis

ROBO TEST INDUSTRY OPERATIONALLY VALID DATA
 AGED OIL MRV APPARENT VISCOSITY



CUSUM Severity Analysis



05APR19:16:15

ASTM Stats Group Support Update

- Stats group is very busy supporting Sequence tests and BOI/VGRA – will likely have more time to address ROBO afterward.
 - Support may be available in Q3

TMC 438-2

Oil	n	Natural Log Transformed Mean (ln)	Mean in Original Units	s.d. (ln)	95% band in mPa·s Min ¹	95% band in mPa·s Max ¹	95% Bands Min (ln)	95% Bands Max (ln)
434-1	13	10.6599	42,612	0.1672	30,706	59,136	10.3322	10.9876
434-2	36	² 10.9284	² 55,737	0.1551	² 41,126	² 76,008	² 10.6244	² 11.2386
435	15	11.4895	97,685	0.2932	³ 60,000	173,546	³ 11.0021	12.0642
435-1	22	11.0416	62,420	0.20295	⁴ 44,570	92,910	⁴ 10.7048	11.4394
438	14	10.2676	28,785	0.2037	19,308	42,912	9.8683	10.6669
438-2	10	10.4421	34,273	0.2322	² 21,742	54,025	9.9870	10.8972

¹ 95% bands in mPa·s are listed for information purposes only, the transformed values will be used to judge acceptance in all cases.

² A correction factor (severity adjustment) has been applied to the mean of reference oil 434-2 to account for the mild bias observed during the period this dataset was generated. The 95% confidence range reflects the inclusion of the correction factor (severity adjustment).

³ The minimum value for Reference oil 435 is fixed at 60,000 (11.0021 in transformed units) and not a true 95% minimum as calculated from the statistics.

⁴ The minimum value for reference oil 435-1 is based on -1.66 standard deviations from the target mean (to match the range previously approved for oil 435 min), so is not actually a 95% confidence range. A 95% confidence range would use 1.96 standard deviations from target mean.

- At the last SP meeting we agreed to track # of 438-2 runs in ROBO LTMS. Once >20 runs are reached, new limits will be calculated and proposed to SP
 - No additional data points for 438-2 since our last meeting.
 - Will continue to monitor # of runs.
- LTMS has been updated to reflect new limits.
 - Please use <http://www.astmtmc.cmu.edu/ftp/docs/ltms/ltms.pdf> for latest version of LTMS.

TMC 434-2

Inventory is critically low

- Levels of 434-2 have become critically low
 - 7.5 gallons remaining = 9-10 months based on current consumption rate
- Replacement oil is needed
 - Reblend is available (434-3), but it may be more severe based on IIIH’s experience.
- Alternatively we could introduce TMC 436 as a replacement, but data from Evonik suggests that it may be more mild.

IND	APPARATS	PVIS	MRVTEMP	MRVYSEOT	MRV
436	AM3	71.5	-30	<35	25,900
436	AM4	70.7	-30	<35	28,200
436	AM4	92.1	-30	<35	26,200
436	AM3	95.1	-30	<35	16,000

- Next steps?

Dilute nitrogen dioxide

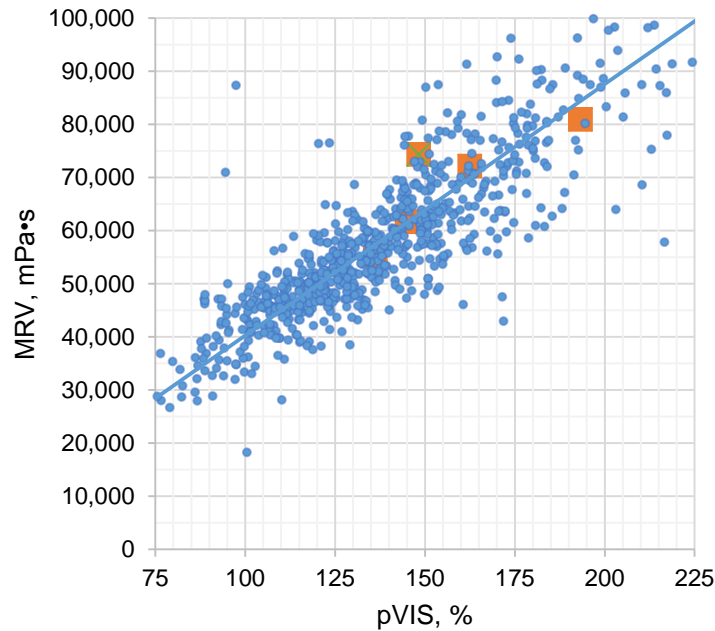
Path forward

- The likely path forward to implement dilute NO₂ as an alternative to pure NO₂ is the following:
 - Demonstrate equivalence to the SP – Thus far, 2+ runs on each reference oils have been conducted between Intertek and Evonik. Intertek has either completed (or will complete in near future) an additional set of runs on TMC reference oils. Evonik will also generate more data. At this point in time, no other lab is able to provide additional support.
 - Develop a procedure for dilute NO₂
 - Approve by SP – Vote at SP meeting
 - Issue information letter allowing use of dilute NO₂ as an alternative
 - Ballot the recommended changes at ASTM

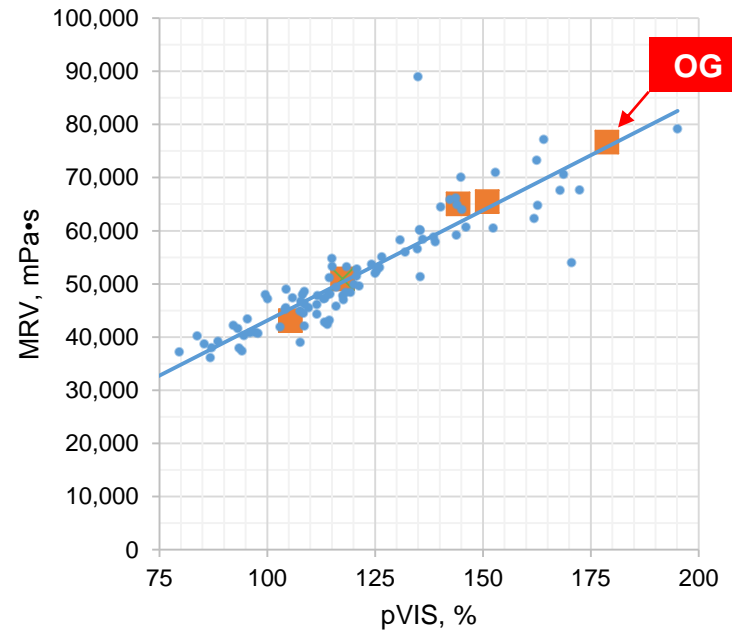
Dilute nitrogen dioxide

Comparison between concentrated and dilute

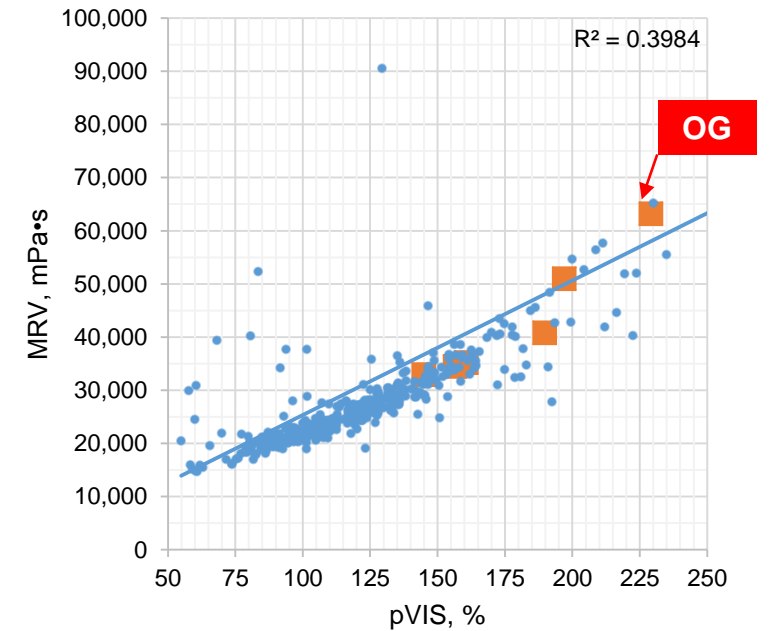
TMC 435-1



TMC 434-2



TMC 438



- All operationally valid data included for both concentrated and dilute NO₂.
- Dilute NO₂ shows same trend as concentrated NO₂.

Dilute nitrogen dioxide

Available data

IND	TESTKEY	APPARATS	VAL	PVIS	MRVTEMP	MRVYSEOT	MRV	Current limits
435-1	116911-ROBO	AM3	NN	162.5	-30	<35	72,200	44,570 – 92,910
435-1	140615-ROBO	AM3	NN	145.0	-30	<35	61,700	
435-1	137372-ROBO	AM 3	NN	148.3	-30	<35	74,300	
435-1	135714-ROBO	G 8	AG	193.3	-30	<35	81,000	
435-1	138779-ROBO	G 8	AG	136.2	-30	<35	55,400	
435-1	138781-ROBO	G 8	LG	252	-30	<70	-223,100	
438	83467-ROBO	AM3	NN	197.0	-30	<35	51,000	19,308 – 42,912
438	119646-ROBO	AM3	NN	156.5	-30	<35	34,500	
438	137387-ROBO	AM 3	NN	144.9	-30	<35	32,900	
438	135716-ROBO	G 8	AG	189.7	-30	<35	40,800	
438	135717-ROBO	G 8	OG	229.1	-30	<35	63,200	
438	138795-ROBO	G 8	AG	160.7	-30	<35	35,200	
434-2	119643-ROBO	AM3	NN	144.3	-30	<35	65,100	41,126 – 76,008
434-2	113304-ROBO	AM3	NN	151.0	-30	<35	65,500	
434-2	142329-ROBO	AM 3	NN	117.5	-30	<35	50,900	
434-2	138766-ROBO	G 8	AG	105.4	-30	<35	43,100	
434-2	138767-ROBO	G 8	OG	178.7	-30	<35	76,700	
434-2	142038-ROBO	G 8	LG	146.1	-30	<35	-69,200	

Dilute nitrogen dioxide

Next steps

The likely path forward to implement dilute NO₂ as an alternative to pure NO₂ is the following:

- 1) **Demonstrate equivalence to the SP** → Based on the available data, do we feel confident that dilute NO₂ and concentrated NO₂ yield comparable results?
- 2) Develop a procedure for dilute NO₂ → Assuming SP is in agreement on equivalence, the next step will be to write a procedure. Any volunteers?
- 3) Approve by SP → Assuming procedure is written, seek approval at next meeting.
- 4) Issue information letter allowing use of dilute NO₂ as an alternative
- 5) Ballot the recommended changes at ASTM

Method housekeeping

- 9. New and Existing Test Stand Calibration needs to be updated.
 - ROBO no longer has stand-alone calibration requirements and is now included in LTMS. As such, the reference in the method is no longer valid
 - ¹¹ The ROBO TMC Calibration Requirements document is available at: http://www.astmtmc.cmu.edu/ftp/docs/bench/robo/procedure_and_ils/20170713_ROBO_TMC_Calibration_Requirements.pdf
 - Suggest we also update Section 9 calibration requirements and reference the LTMS for calibration requirements.

www.astmtmc.cmu.edu - /ftp/docs/ltms/

[\[To Parent Directory\]](#)

1/31/2019	4:07 PM	1436421	ltms.pdf
1/31/2019	4:09 PM	143	readme.txt
1/31/2019	4:14 PM	<dir>	ReplacementPages
1/31/2019	4:23 PM	<dir>	RevisionLetters

Method housekeeping

- At the February 21 meeting all SP members were encouraged to review the ASTM D7528-17a and recommend any additional changes that may be necessary.

- Any feedback?

Any Additional Topics?

Next Meeting

- Suggestions for next SP meeting?
 - **Thursday, May 30th?**