Report of Meeting
L-37-1 Surveillance Panel Conference Call
February 10th, 2021

Attendees:

SwRI -	**Warden,** Kostan
Lubrizol -	Venhoff, **Slocum,** Drjla, Bealko, Manouchehri
Afton -	**Sangpeal,** Bell, Henderson, Hayden
Intertek -	**Lange**, Smith, Chadwick
TMC -	**Beck,** Clark
ExxonMobil -	**Banas,** Kanga
BASF -	**Goyal,** Mosher
Dana -	**Zyski**
Meritor -	**LaBond,** Carter
Army -	**Comfort**, Sattler
AAM -	**Muransky**
Oronite –	Martinez
	Dvorak

Voting Members in **BOLD**

1.0 Membership Review

Motion #1 → W. Venhoff 1st /2nd A. Zyski to approve Jason Carter to replace Jessica LaBond as the voting member for Meritor. Motion passed unanimously, 11-0-0 (Yes-No-Abstain).

2.0 Meeting minutes Approval

- November 10th, 2020 (LRI# 199)
- January 25th, 2021 Conf Call

Motion #2 → A. Zyski 1st /2nd W. Venhoff to approve the meeting minutes from the November 10th, 2020 (LRI# 199) and January 25th, 2021 Conf Call. Motion passed unanimously, 11-0-0 (Yes-No-Abstain).

3.0 L-37-1 LTMS Acceptance Criteria Follow-up

- Travis Kostan presented to panel and industry statisticians on LTMS acceptance criteria
- Recommended manually determine limits and try and get a type 1 5% error of probability
- Martin Chadwick - what is the upper and lower rating bound? (0-10)
    - Did Travis try and find a transform? Didn't work with existing data.
    - Not opposed to Travis's proposed solution
    - Look into possible Zi or EWMA
- Todd Dvorak what has changed test has been around? Rebecca overtime things are falling outside of reference bands. Used to be acceptance bands but currently LTMS.
- Statisticians will need to further look at the data
- But acceptance band approach may be appropriate in the time being
- Do we want to possibly go back to acceptance bands vs. LTMS??
- **SP Task Force group** look more at the data etc.
    - Travis to head up organizing
        - 1st stats group
        - Surveillance panel task force to get involved after 1st is finished

4.0 TMC155-2 qualification matrix (L and NL)

- A question (A. Lange) to industry statisticians around 155-2 reblend and LTMS Appendix F criteria
  - (5) runs are suggested on initial blends but on reblend may depend on what risk willing to take
  - But 4 a good first step to see if there is an issue. Prefer 5 to 6-8. More the better.
- Question if 3 references oils are still necessary?
- Are the different sensitivities still necessary?
- Dale Smith - 134 fail, 155 strong pass, the 152 oils was brought in for Canadian reference. Was used historically as batch approvals and gained traction into referencing
- Rebecca- should we consider going from 3 to 2 reference oils?
  - 152 more sensitive than 155 could we drop 155??
  - Wes made comment 134 that can have a wide variety of results
- **Further discussion – Conf Call????**
- **2 vs. 3 Ref oils**
- **Action - R. Slocum to arrange conference call in next couple weeks to discuss**

5.0 L-37-1 axle build procedure

- **Action – R. Slocum to take a first go at cleaning up current document and LZ work instructions.**
  - Will distribute to Labs for there input
- Need to Include Strange build
- Document to reside on TMC website

6.0 Next Gleason Batch Quantities

- SwRI – 300
  - Should support 2-3yrs
- Afton – prefer greater number than last time? 400-500
- Intertek -~100
- LZ - ~250
- **Action – R. Slocum to discuss with Gleason and look into getting quotes out to the labs.**

7.0 Adjourn

Motion #3 → W. Venhoff 1st /2nd A. Goyal to adjourn. Motion passed unanimously, 11-0-0 (Yes-No-Abstain).

Respectfully submitted,

Robert Slocum
L-37-1 Surveillance Panel Chairman

D02.B0.03

L-37-1 Surveillance Panel Meeting

02/10/2021
2:45 pm – 4:15 pm
Robert Slocum

Agenda

- Call to Order/Agenda review
- Membership review
- Meeting Minute Approvals
  - November 10th, 2020 (LRI# 199)
  - January 25th, 2021 Conf Call
- L-37-1 LTMS Acceptance Criteria Follow-up
- TMC155-2 qualification matrix (L and NL)
- L-37-1 axle build procedure
- Next Gleason Batch Quantities
- New business
- Adjournment

Membership Review

Rob Banas	ExxonMobil
Allen Comfort	US Army
Troy Muransky	AAM
Matt Sangpeal	Afton
Arjun Goyal	BASF
Amy Zyski	Dana
Dylan Beck	TMC
Jessica LaBond	Meritor
Anthony Lange	Intertek
Robert Slocum	Lubrizol
Rebecca Warden	SwRI
Kaled Zreik	GM
Mike Cabaj	Linamar

Total Voting Members = 13

Meeting Minutes Approval

- November 10th, 2020 (LRI# 199)
- January 25th, 2021 Conf Call

L-37-1 LTMS Acceptance Criteria Follow-up

TMC155-2 qualification matrix (L and NL)

- Further discussion – Conf Call????
  - 2 vs . 3 Ref oils
  - Next couple of weeks ???

L-37-1 axle build procedure

8.2.1 ….
Include strange
LZ to take first stab and clean up with current WI
Favor reside in TMC

Next Gleason Batch Quantities

- Last order was 1100/4= 275

- SwRI – 300
  - Should support 2-3yrs
- Afton – prefer greater number than last time? 400-500
- Intertek - ? ~100
- LZ - ? ~250

New Business

- ?

Adjourn

L37-1 Targets

Non-Lubrited Only

SOUTHWEST RESEARCH INSTITUTE®

Data Set

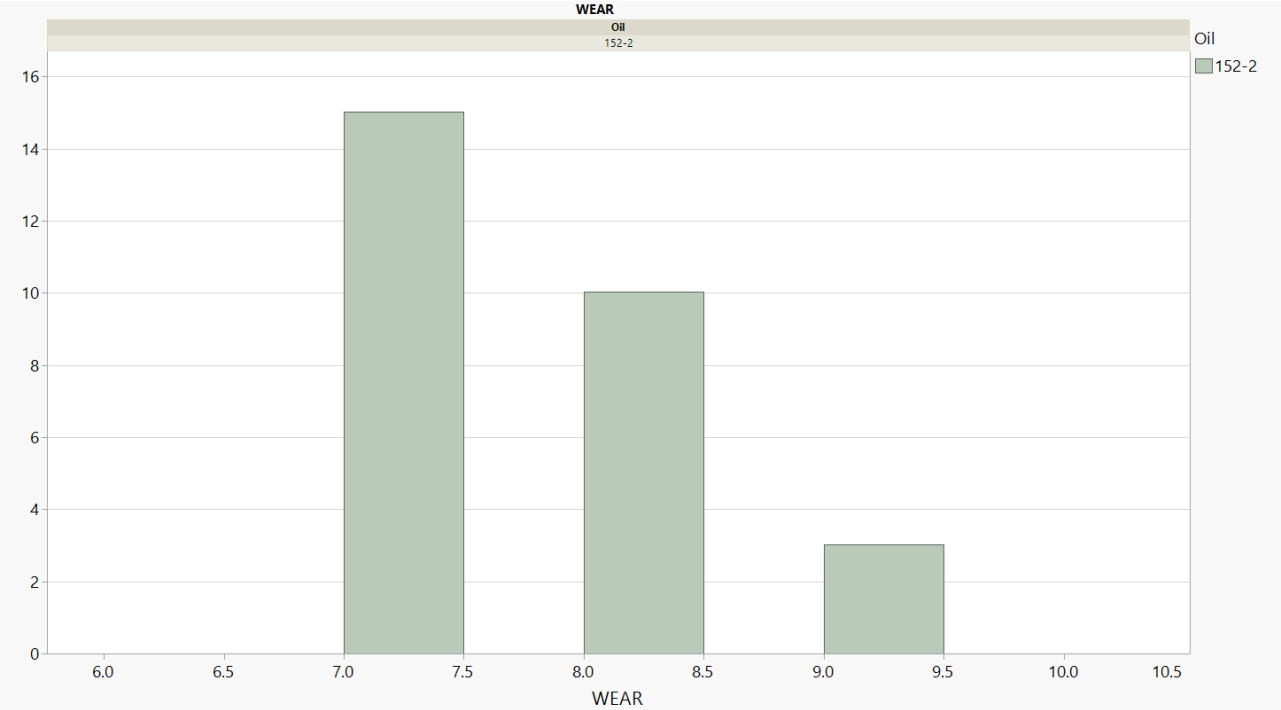
"L37-1 Target Setting Data for TMC Memo 20-027" was used in the following slides.

Wear

Wear Distribution of Oil 152-2

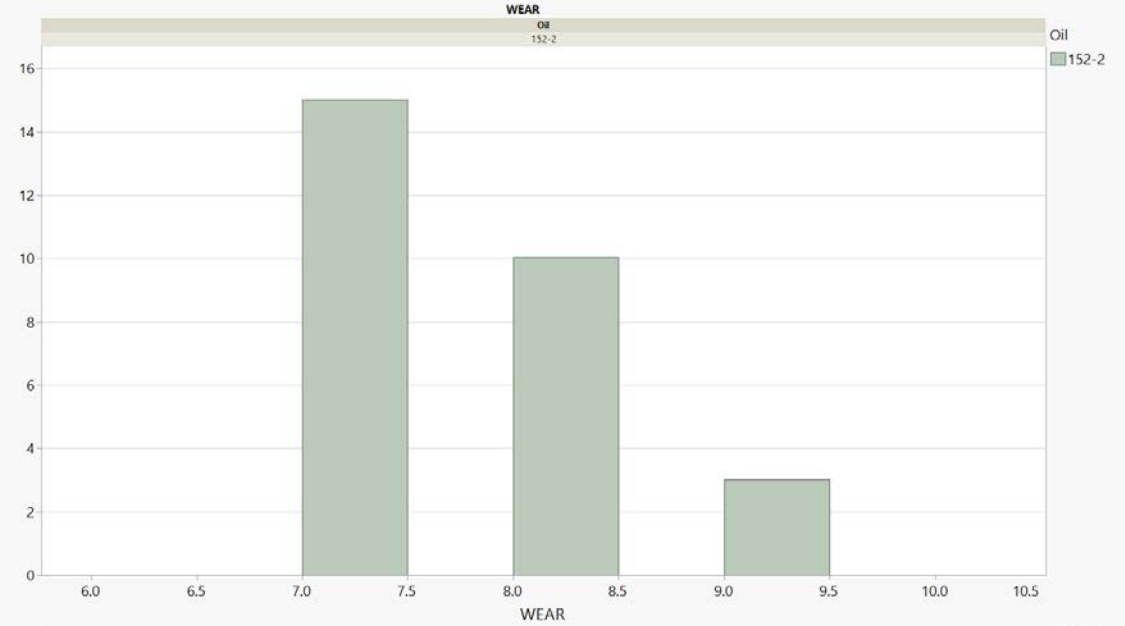
Below is a plot of the target setting data for 152-2. Non-normality is an issue here, but the distribution of 134 appears reasonably normal, so a transformation may not be an appropriate fix. However, 11% of the data from target setting which rated a 9 is a fail using the current approach. Typically, we aim for a type 1 error of only 5% (95% coverage).

Mean	SD	Mean-1.8*SD	Mean-1.8*SD	Effective Lower	Effective Upper
7.6	0.7	6.34	8.86	7	8



Wear Distribution of Oil 152-2

The table below shows the coverage probability for the current acceptance limits, plus 2 other alternatives. It is proposed to accept values of 7-9 to better match the target setting data and desired type 1 error probability.



Mean – 1.8*SD	Mean + 1.8*SD
6.34	8.86

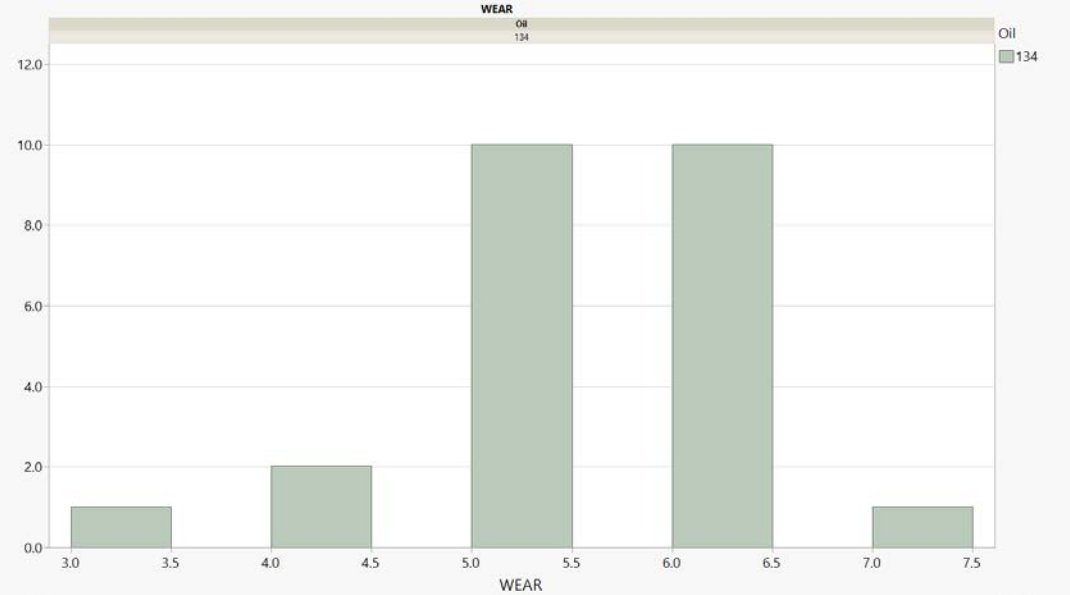
Best estimate of "current"

Proposed

Mean	SD	Lower (Effective)	Upper (Effective)	P<Lower	P>Upper	P(Fail)
7.6	0.7	6.5 (7)	8.5 (8)	5.8%	9.9%	15.7%
7.6	0.7	6.5 (7)	9.5 (9)	5.8%	0.3%	6.1%
7.6	0.7	5.5 (6)	9.5 (9)	0.1%	0.3%	0.5%

Wear Distribution of Oil 134

The table below shows the coverage probability for the current acceptance limits, plus 2 other alternatives. It is proposed to accept values of 4-7 to better match the target setting data and desired type 1 error probability.



Mean – 1.8*SD	Mean + 1.8*SD
3.68	6.92

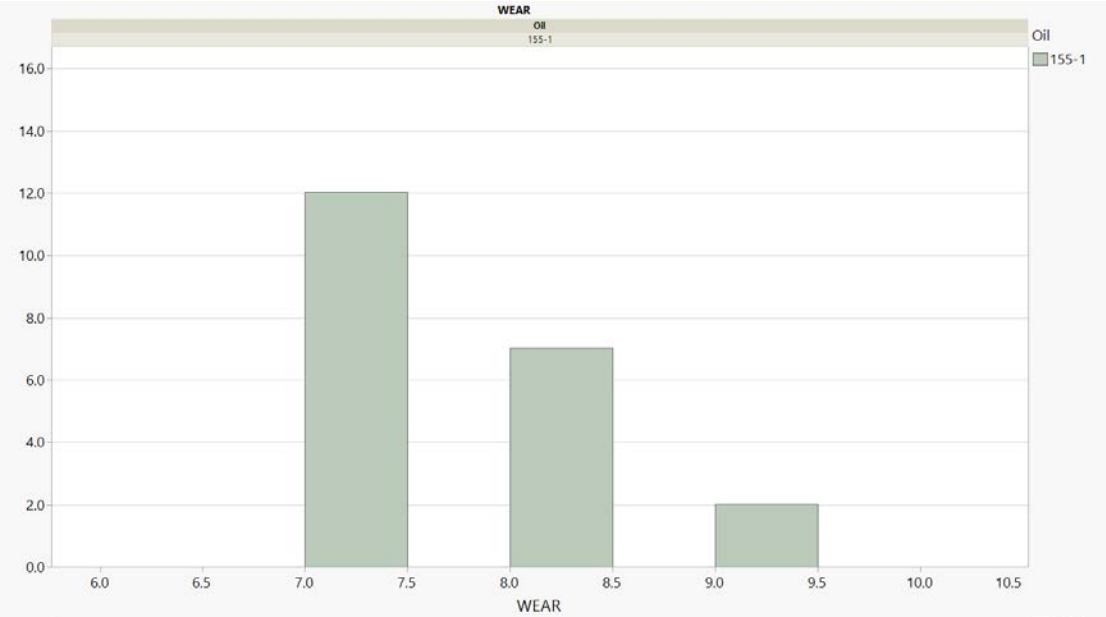
Best estimate of "current" →

Proposed →

Mean	SD	Lower (Effective)	Upper (Effective)	P<Lower	P>Upper	P(Fail)
5.3	0.9	3.5 (4)	6.5 (6)	2.3%	9.1%	11.4%
5.3	0.9	3.5 (4)	7.5 (7)	2.3%	0.7%	3.0%
5.3	0.9	2.5 (3)	7.5 (7)	0.1%	0.7%	0.8%

Wear Distribution of Oil 155-1

The table below shows the coverage probability for the current acceptance limits, plus 2 other alternatives. It is proposed to accept values of 7-9 to better match the target setting data and desired type 1 error probability.



Mean – 1.8*SD	Mean + 1.8*SD
6.24	8.76

Best estimate of "current"

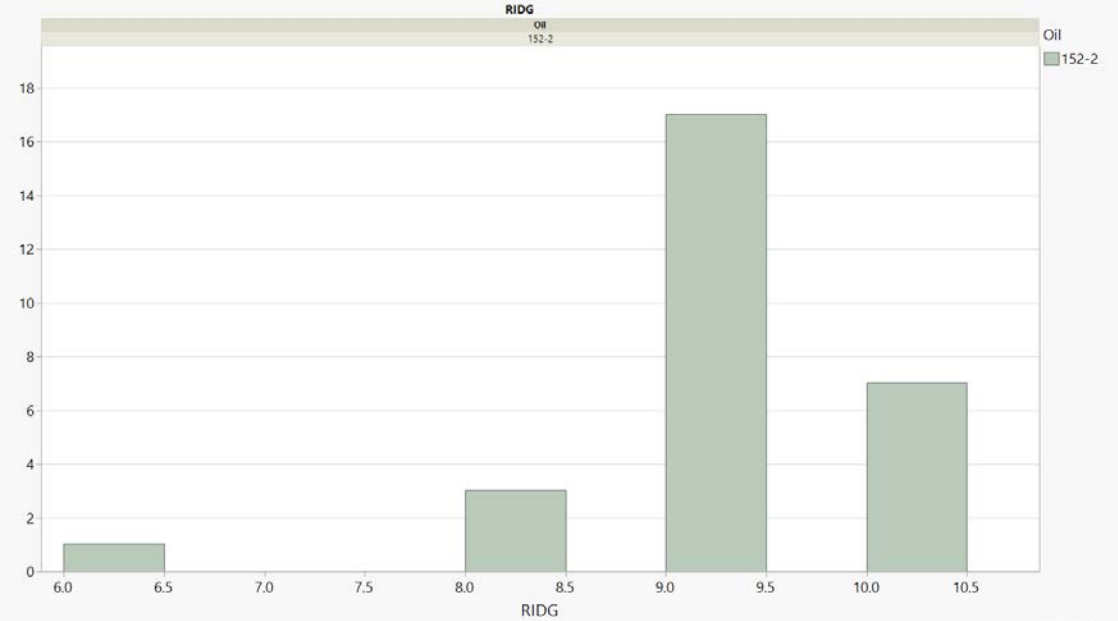
Proposed

Mean	SD	Lower (Effective)	Upper (Effective)	P<Lower	P>Upper	P(Fail)
7.5	0.7	6.5 (7)	8.5 (8)	7.7%	7.7%	15.3%
7.5	0.7	6.5 (7)	9.5 (9)	7.7%	0.2%	7.9%
7.5	0.7	5.5 (6)	9.5 (9)	0.2%	0.2%	0.4%

Ridging

Ridging Distribution of Oil 152-2

The table below shows the coverage probability for the current acceptance limits, plus 1 other alternative. The current acceptable values of 8-10 seem appropriate here.



Mean – 1.8*SD	Mean + 1.8*SD
7.56	10.44

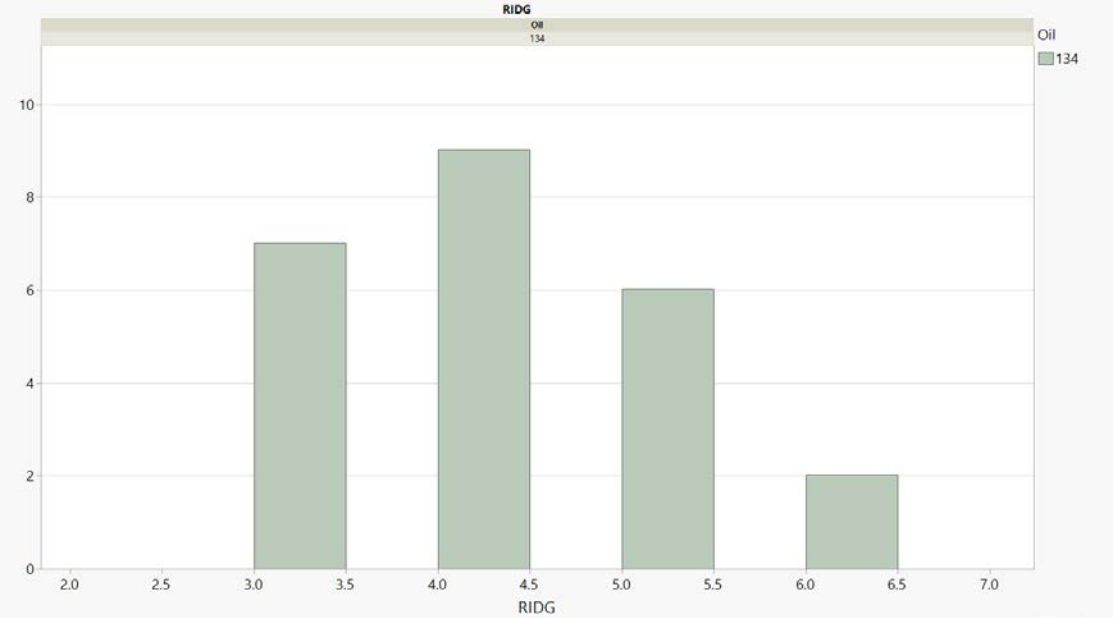
Best estimate of "current"

Alternative

Mean	SD	Lower (Effective)	Upper (Effective)	P<Lower	P>Upper	P(Fail)
9	0.8	7.5 (8)	10.5 (10)	3.0%	0.0%	3.0%
9	0.8	6.5 (7)	10.5 (10)	0.1%	0.0%	0.1%

Ridging Distribution of Oil 134

The table below shows the coverage probability for the current acceptance limits, plus 2 other alternatives. It is proposed to accept values of 3-6 to better match the target setting data and desired type 1 error probability.



Mean – 1.8*SD	Mean + 1.8*SD
2.48	5.72

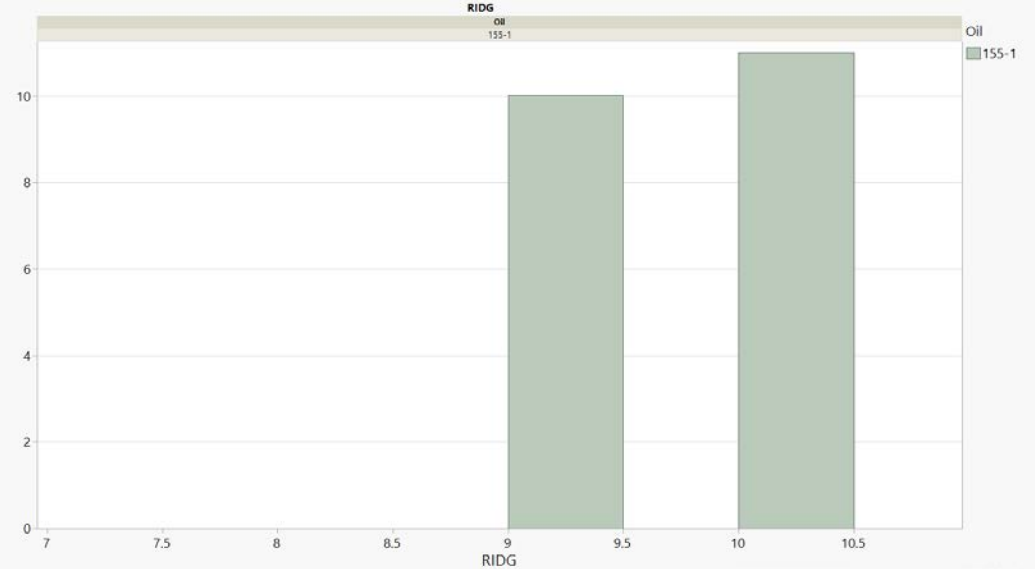
Best estimate of "current" →

Proposed →

Mean	SD	Lower (Effective)	Upper (Effective)	P<Lower	P>Upper	P(Fail)
4.1	0.9	2.5 (3)	5.5 (5)	3.8%	6.0%	9.8%
4.1	0.9	2.5 (3)	6.5 (6)	3.8%	0.4%	4.2%
4.1	0.9	1.5 (2)	6.5 (6)	0.2%	0.0%	0.2%

Ridging Distribution of Oil 155-1

The table below shows the coverage probability for the current acceptance limits, plus 2 other alternatives. The current acceptable values of 9-10 seem appropriate here.



Mean – 1.8*SD	Mean + 1.8*SD
8.6	10.4

Best estimate of "current"

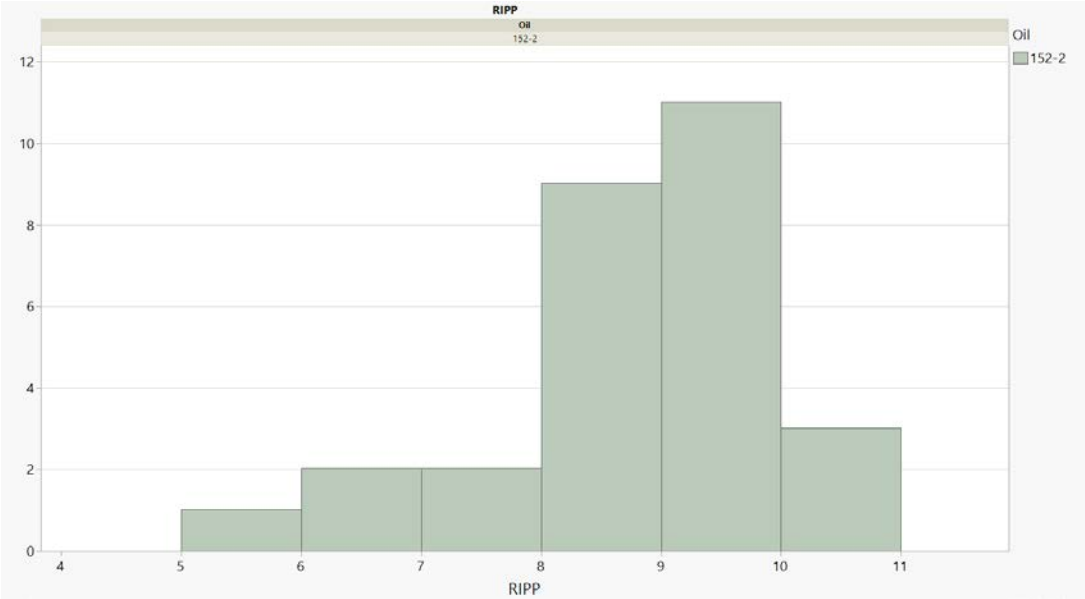
Alternative

Mean	SD	Lower (Effective)	Upper (Effective)	P<Lower	P>Upper	P(Fail)
9.5	0.5	8.5 (9)	10.5 (10)	2.3%	0.0%	2.3%
9.5	0.5	7.5 (8)	10.5 (10)	0.0%	0.0%	0.0%

Rippling

Rippling Distribution of Oil 152-2

The table below shows the coverage probability for the current acceptance limits, plus 2 other alternatives. It is proposed to accept values of 6-10 to better match the target setting data and desired type 1 error probability.



Mean – 1.8*SD	Mean + 1.8*SD
6.14	10.46

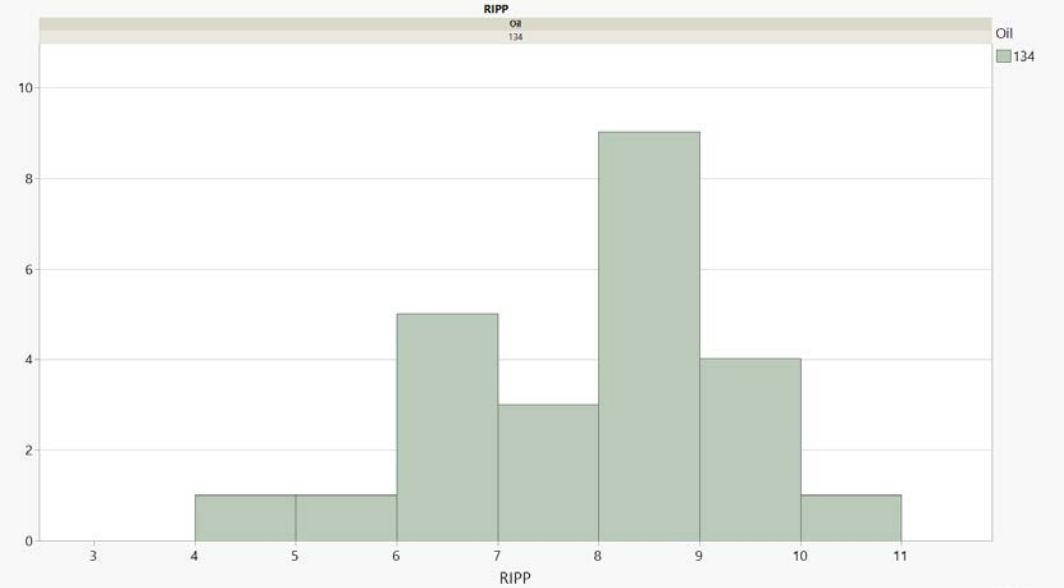
Best estimate of "current"

Proposed

Mean	SD	Lower (Effective)	Upper (Effective)	P<Lower	P>Upper	P(Fail)
8.3	1.2	6.5 (7)	10.5 (10)	6.7%	3.3%	10.0%
8.3	1.2	5.5 (6)	10.5 (10)	1.0%	3.3%	4.3%
8.3	1.2	4.5 (5)	10.5 (10)	0.1%	3.3%	3.4%

Rippling Distribution of Oil 134

The table below shows the coverage probability for the current acceptance limits, plus 3 other alternatives. It is proposed to accept values of 5-10 to better match the target setting data and desired type 1 error probability.



Mean – 1.8*SD	Mean + 1.8*SD
4.88	9.92

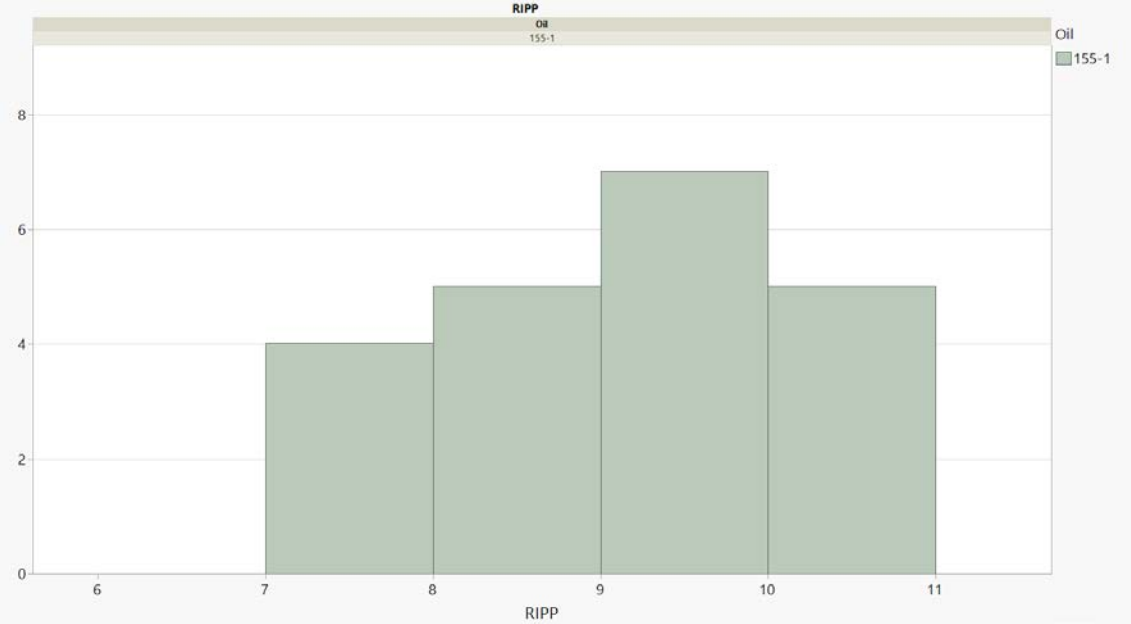
Best estimate of "current"

Proposed

Mean	SD	Lower (Effective)	Upper (Effective)	P<Lower	P>Upper	P(Fail)
7.4	1.4	4.5 (5)	9.5 (9)	1.9%	6.7%	8.6%
7.4	1.4	4.5 (5)	10.5 (10)	1.9%	1.3%	3.3%
7.4	1.4	3.5 (4)	9.5 (9)	0.3%	6.7%	6.9%
7.4	1.4	3.5 (4)	10.5 (10)	0.3%	1.3%	1.6%

Rippling Distribution of Oil 155-1

The table below shows the coverage probability for the current acceptance limits, plus 2 other alternatives. The current acceptable values of 7-10 seem appropriate here.



Mean – 1.8*SD	Mean + 1.8*SD
6.62	10.58

Best estimate of "current"

Alternative

Mean	SD	Lower (Effective)	Upper (Effective)	P<Lower	P>Upper	P(Fail)
8.6	1.1	6.5 (7)	10.5 (10)	2.8%	4.2%	7.0%
8.6	1.1	5.5 (6)	10.5 (10)	0.2%	4.2%	4.4%

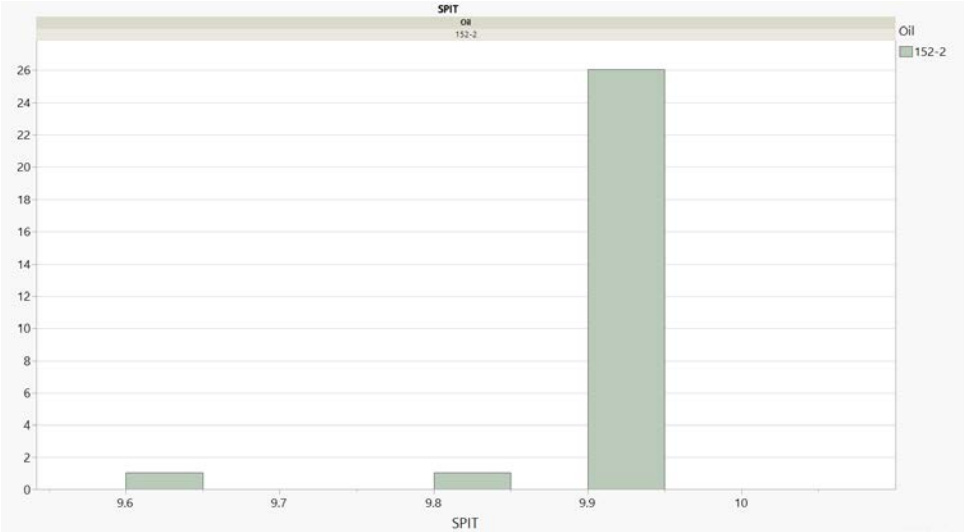
Pitting/Spalling

Non-Critical Parameters

In several other test-types, parameters the are not critical to the referencing process or that are not well controlled can be deemed "non-critical" or "report only" for reference tests. Based on the observed pitting/spalling data, this parameter may be a good candidate to be tagged as such.

Pitting/Spalling Distribution of Oil 152-2

The table below shows the coverage probability for the current acceptance limits, plus several other alternatives. It is recommended to use 2 decimal places for the standard deviation.



SD=0.1

Mean – 1.8*SD	Mean + 1.8*SD
9.72	10.08

SD=0.06

Mean – 1.8*SD	Mean + 1.8*SD
9.79	10.01

SD=0.02

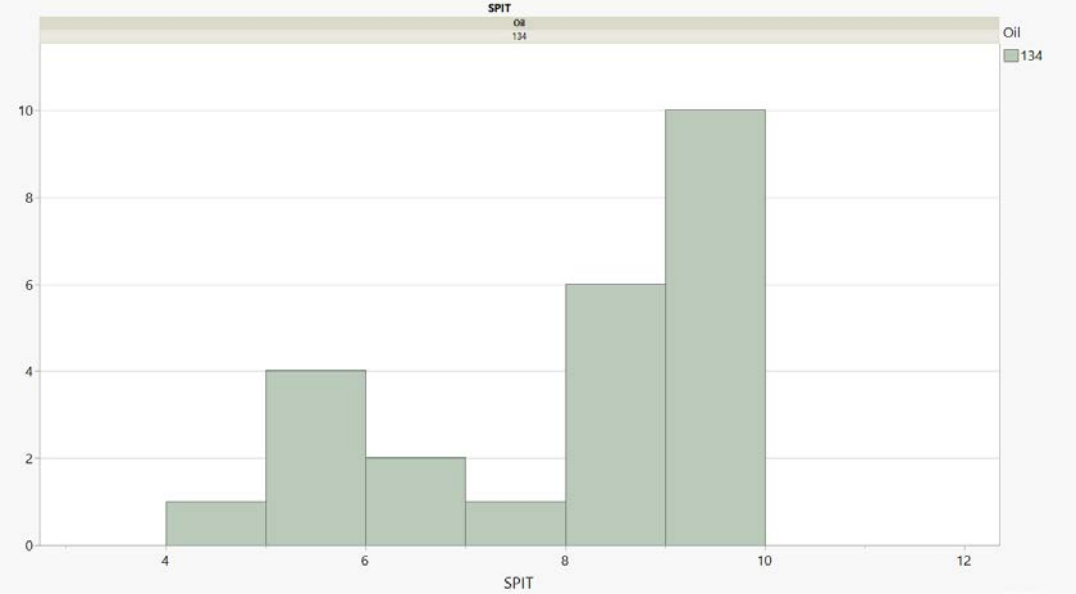
Mean – 1.8*SD	Mean + 1.8*SD
9.86	9.94

Best estimate of "current"

Mean	SD	Lower (Effective)	Upper (Effective)	P<Lower	P>Upper	P(Fail)
9.9	0.1	9.75 (9.8)	10.05 (10)	6.7%	0.0%	6.7%
9.9	0.06	9.75 (9.8)	10.05 (10)	0.6%	0.0%	0.6%
9.9	0.02	9.75 (9.8)	10.05 (10)	0.0%	0.0%	0.0%

Pitting/Spalling Distribution of Oil 134

In contrast to 152-2 and 155-1, this oil gives results which span almost the entire range, including 7/24 results 9.8 or greater.



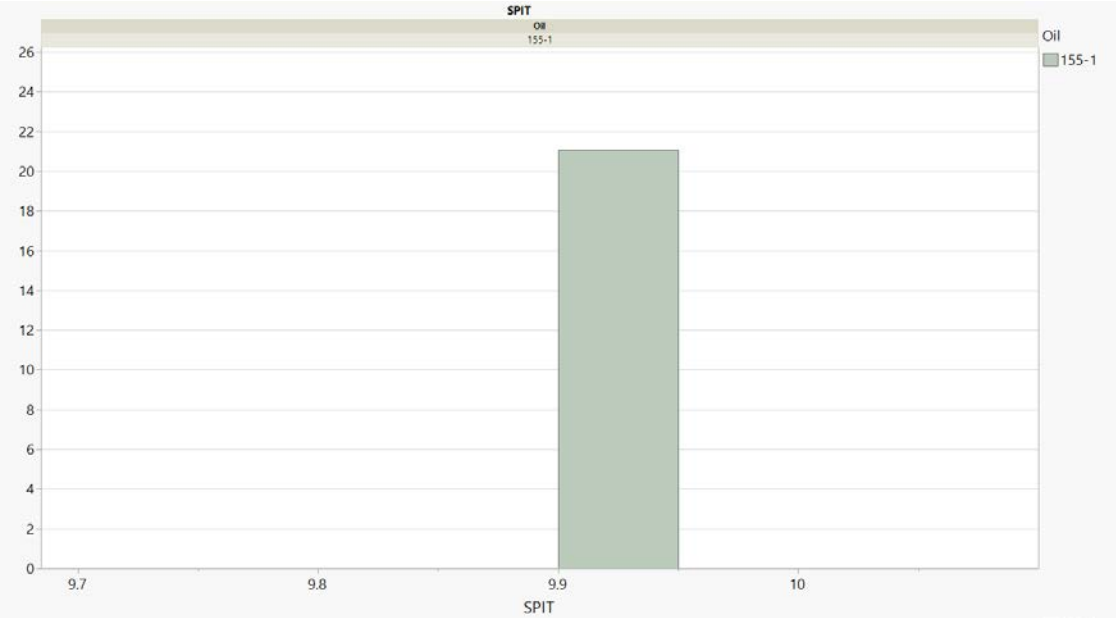
Mean – 1.8*SD	Mean + 1.8*SD
4.3	11.5

Best estimate of "current"

Mean	SD	Lower (Effective)	Upper (Effective)	P<Lower	P>Upper	P(Fail)
7.9	2	4.25 (4.3)	10.05(10)	3.4%	0.0%	3.4%

Pitting/Spalling Distribution of Oil 155-1

This oils lack of any deviation makes traditional target setting statistics useless.



Mean – 1.8*SD	Mean + 1.8*SD
9.8	9.8

Summary of Recommendations

Below is a summary of the recommended changes to the acceptable values for reference tests. It is also recommended to consider whether Pitting/Spalling is more appropriate as a critical or non-critical parameter for reference tests.

Wear

Oil	Current	Proposed
152-2	7-8	7-9
134	4-6	4-7
155-1	7-8	7-9

Ridging

Oil	Current	Proposed
152-2	8-10	No change
134	3-5	3-6
155-1	9-10	No Change

Rippling

Oil	Current	Proposed
152-2	7-10	6-10
134	5-9	5-10
155-1	7-10	No Change

Pitting/Spalling

Oil	Current	Proposed
152-2	9.8-10.0	?
134	4.3-10.0	?
155-1	9.9	?