

**Report of Meeting**  
**L-37-1 Surveillance Panel Conference Call**  
**January 25<sup>th</sup>, 2021**

**Attendees:**

SwRI -	<b>Warden</b> , Koston
Lubrizol -	Venhoff, <b>Slocum</b> , Drjla, Manouchehri
Afton -	<b>Sangpeal</b> , Hayden
Intertek -	<b>Lange</b> , Smith
TMC -	<b>Beck</b> , Clark
ExxonMobil -	<b>Banas</b>
BASF -	
Dana -	<b>Zyski</b>
Meritor -	<b>LaBond</b>
Army -	
AAM -	<b>Muransky</b>
Linamar -	

Voting Members in **BOLD**

**1.0 LTMS Acceptance Criteria Discussion**

- Rebecca and Travis present statistical bands in LTMS vs whole number ratings for L37-1
- What is the appropriate way to determine above/below when the rating falls within discrete values?
- Concern is Non-normality of distributions
- Wes- Question around setting targets on minimal data points (i.e. 6). How many "N" size would justify a different target approach
- Travis best approach set initially with small data sets then make adjustments as more data points are gathered
- Kevin M. - how confident are we are this data set. Bias based on trimming probability of failure to ~5%
- Troy/Amy some concern on possible lab/rater bias on either end of limits with limited data on those ends
- Will put on LRI 200 L37-1 Agenda for further discussion

Respectfully submitted,

Robert Slocum  
L-37-1 Surveillance Panel Chairman

# L37-I Targets

## Non-Lubricated Only

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# Data Set

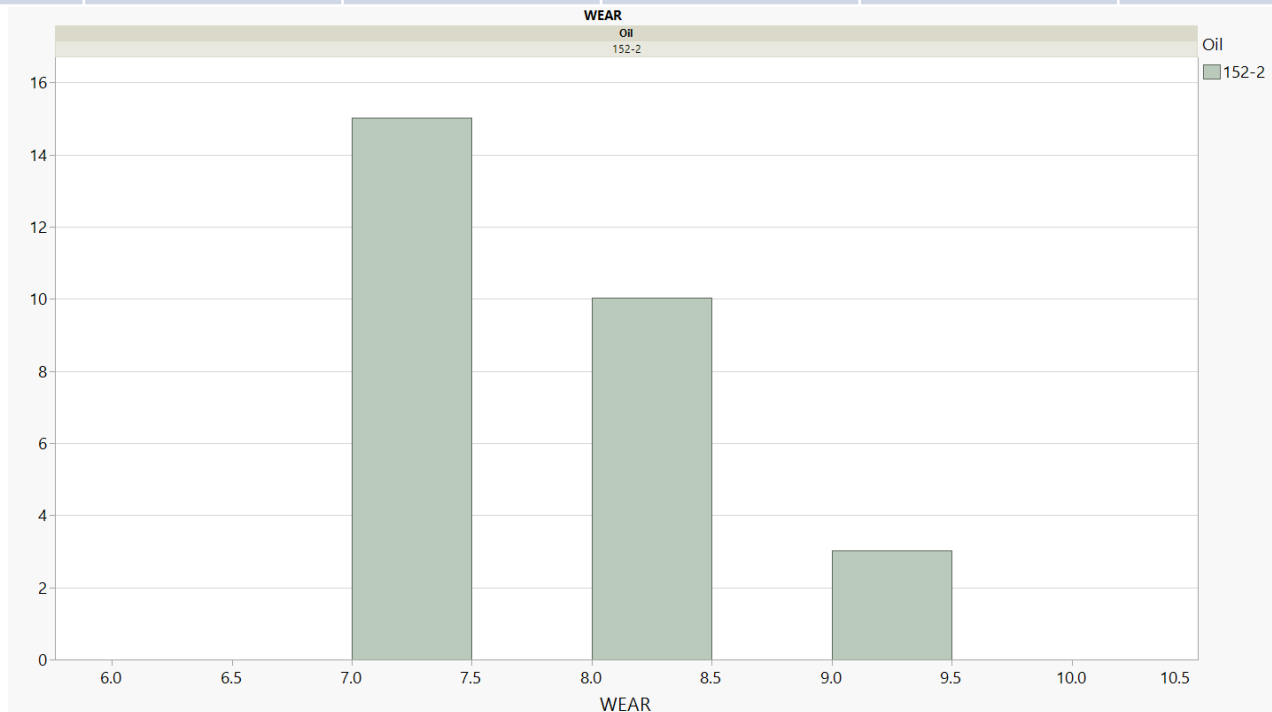
“L37-I Target Setting Data for TMC Memo 20-027” was used in the following slides.

# Wear

# Wear Distribution of Oil 152-2

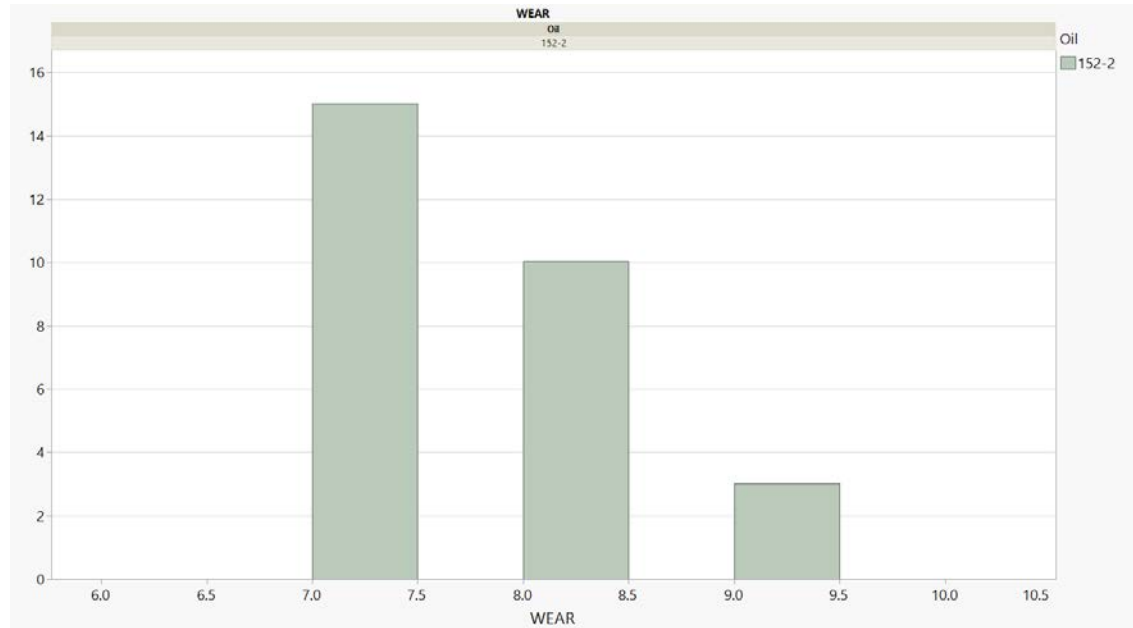
Below is a plot of the target setting data for 152-2. Non-normality is an issue here, but the distribution of 134 appears reasonably normal, so a transformation may not be an appropriate fix. However, 11% of the data from target setting which rated a 9 is a fail using the current approach. Typically,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

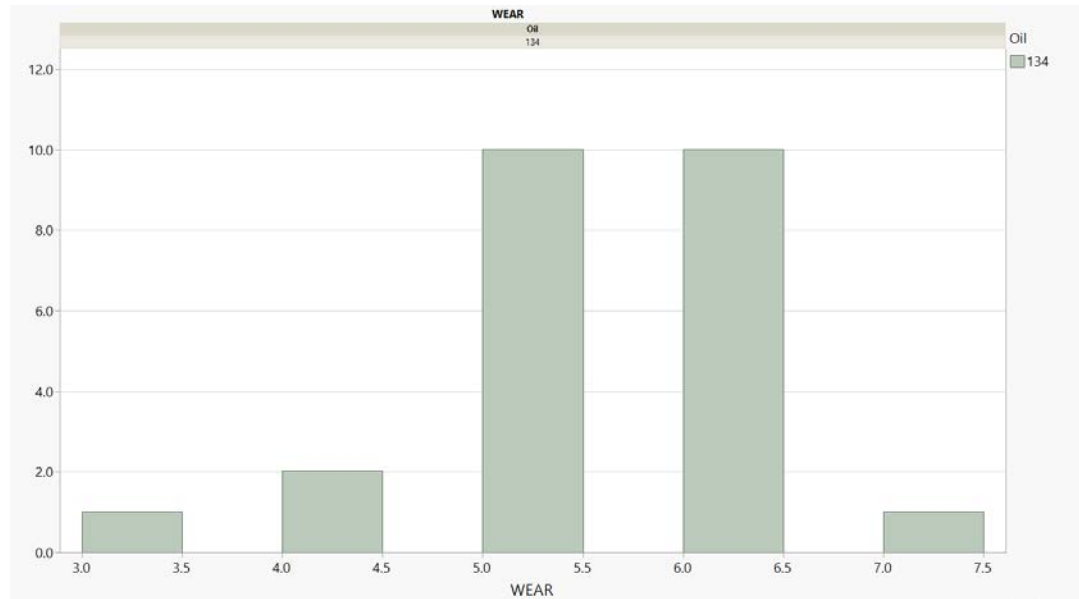
Best estimate of "current"

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

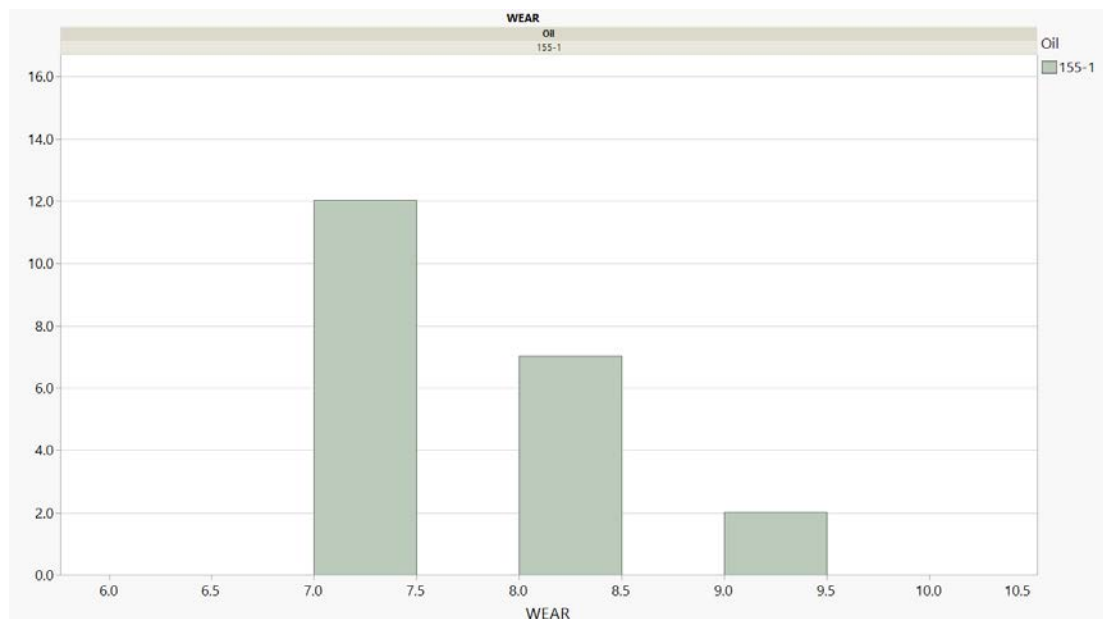
Best estimate of "current"

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

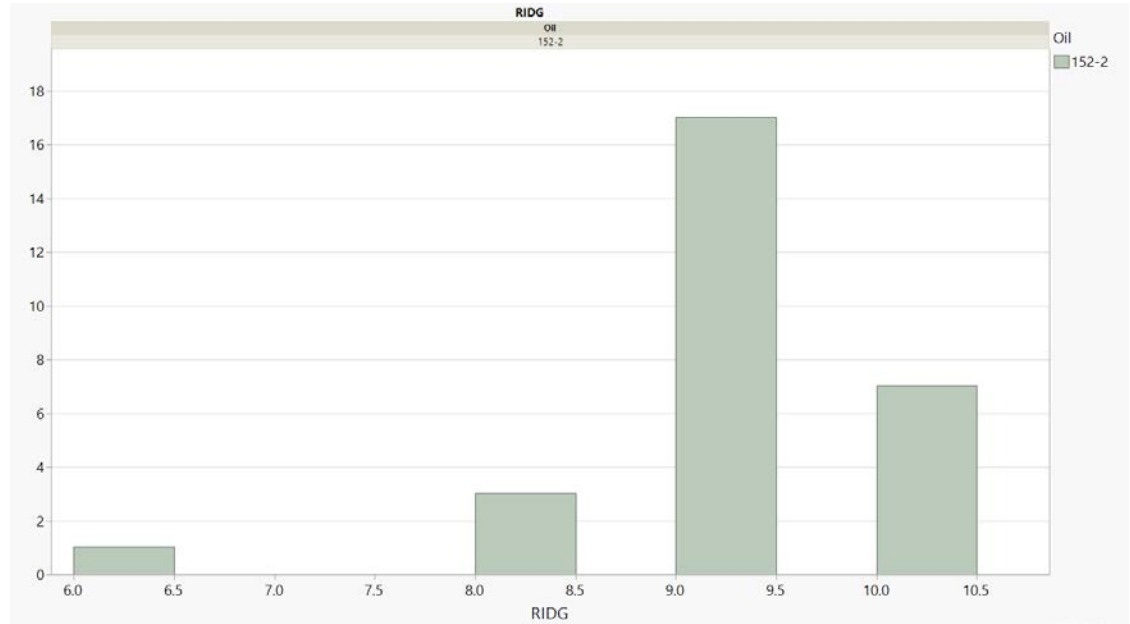
Mean	SD	Lower (Effective)	Upper (Effective)	P<Lower	P>Upper	P(Fail)
7.5	0.7	6.5 (7)	8.5 (8)	7.7%	7.7%	15.3%
7.5	0.7	6.5 (7)	9.5 (9)	7.7%	0.2%	7.9%
7.5	0.7	5.5 (6)	9.5 (9)	0.2%	0.2%	0.4%



# 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

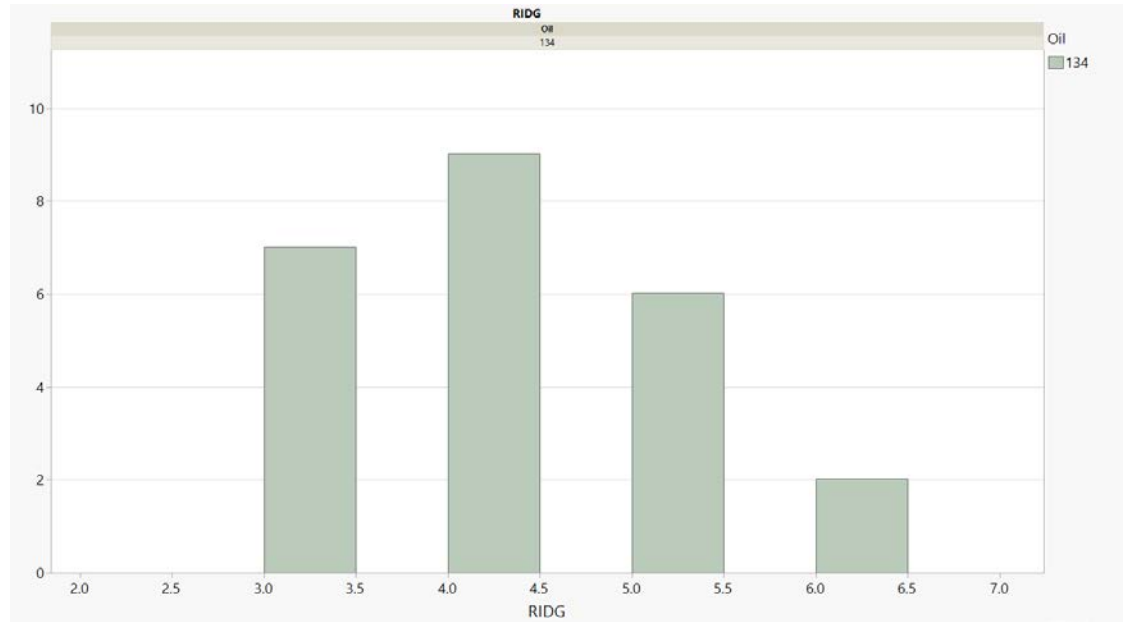
Best estimate of "current"

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

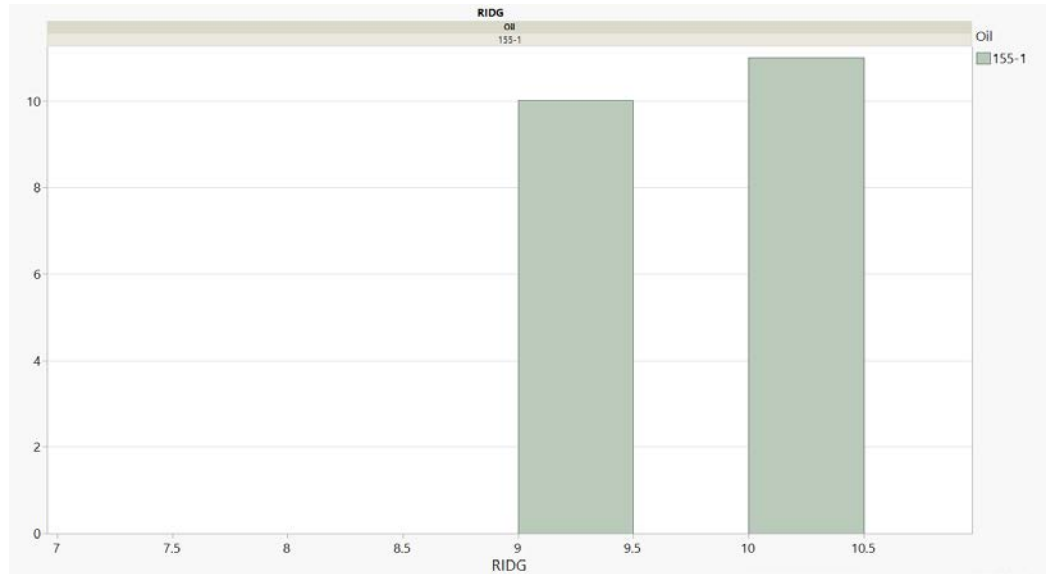
Best estimate of "current"

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”

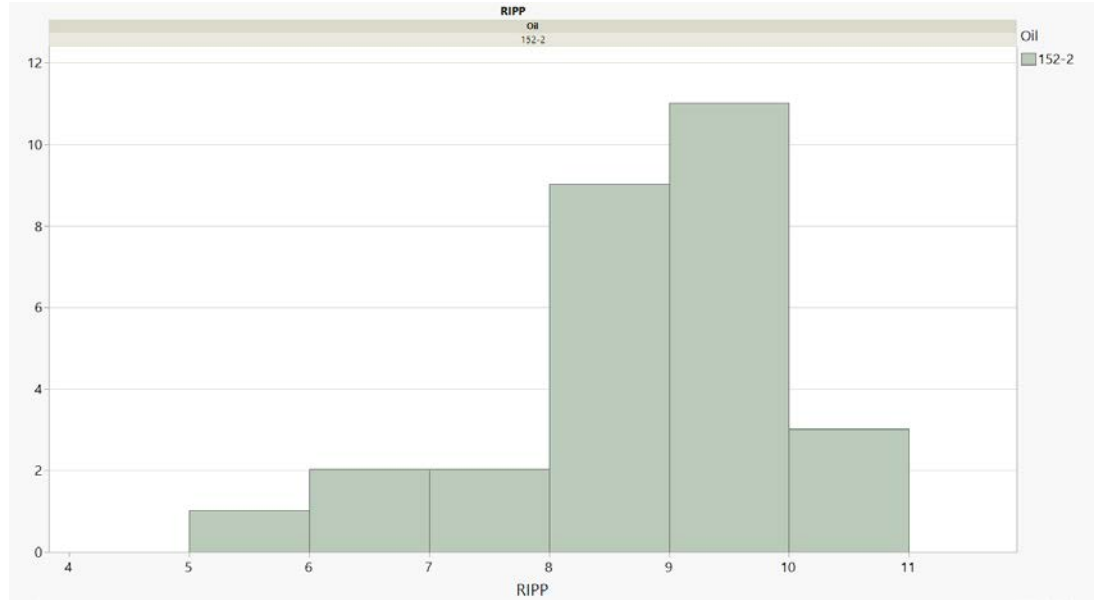
Alternative

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

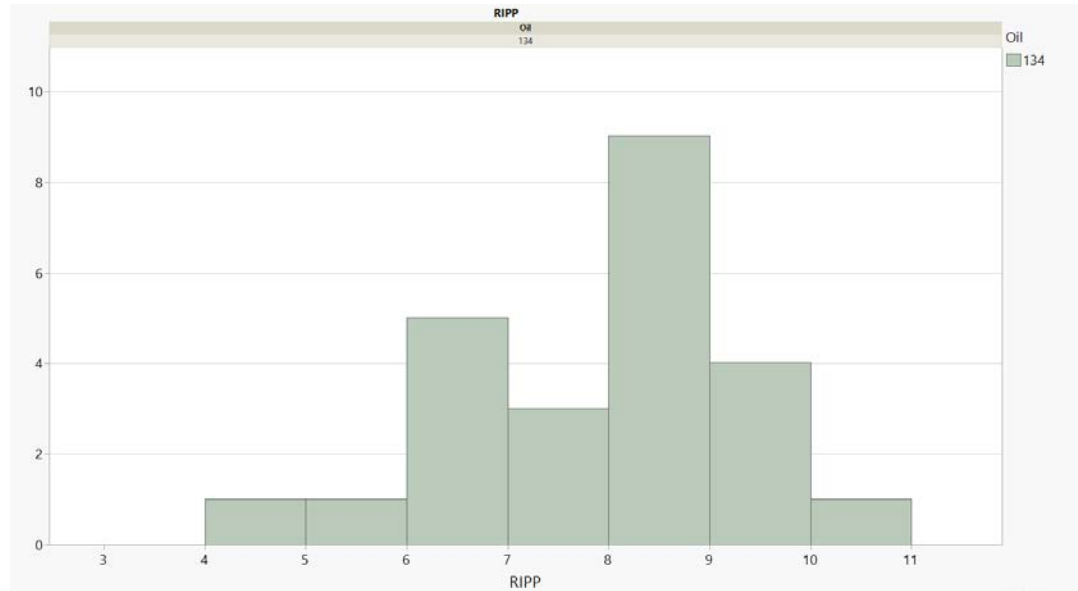
Best estimate of "current"

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

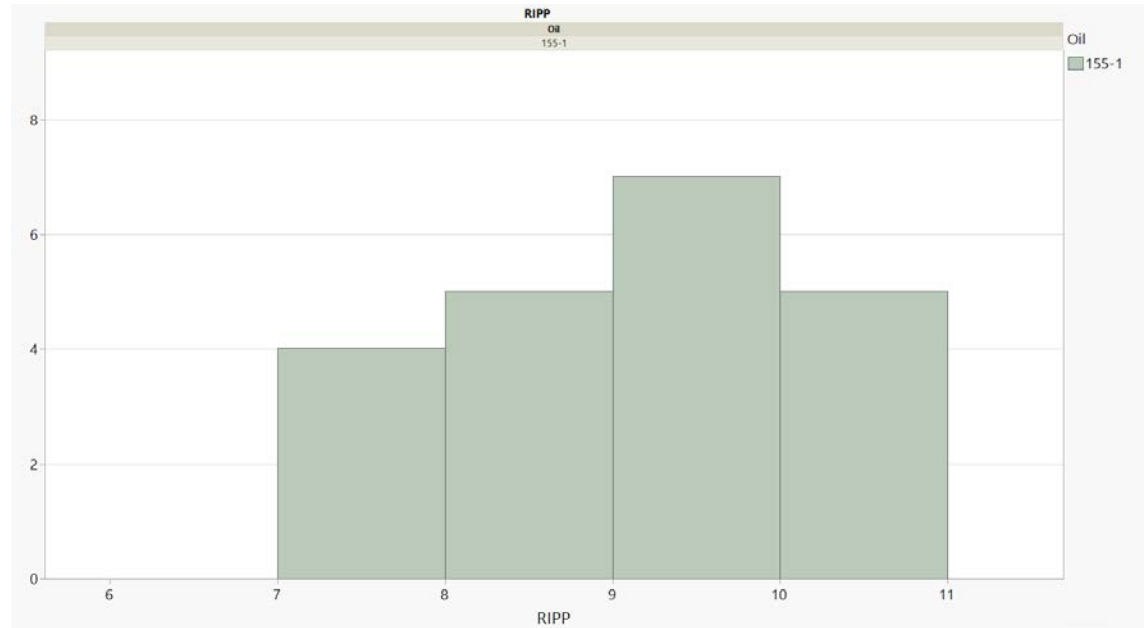


Mean	SD	Lower (Effective)	Upper (Effective)	P<Lower	P>Upper	P(Fail)
7.4	1.4	4.5 (5)	9.5 (9)	1.9%	6.7%	8.6%
7.4	1.4	4.5 (5)	10.5 (10)	1.9%	1.3%	3.3%
7.4	1.4	3.5 (4)	9.5 (9)	0.3%	6.7%	6.9%
7.4	1.4	3.5 (4)	10.5 (10)	0.3%	1.3%	1.6%



# Rippling Distribution of Oil 155-I

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%



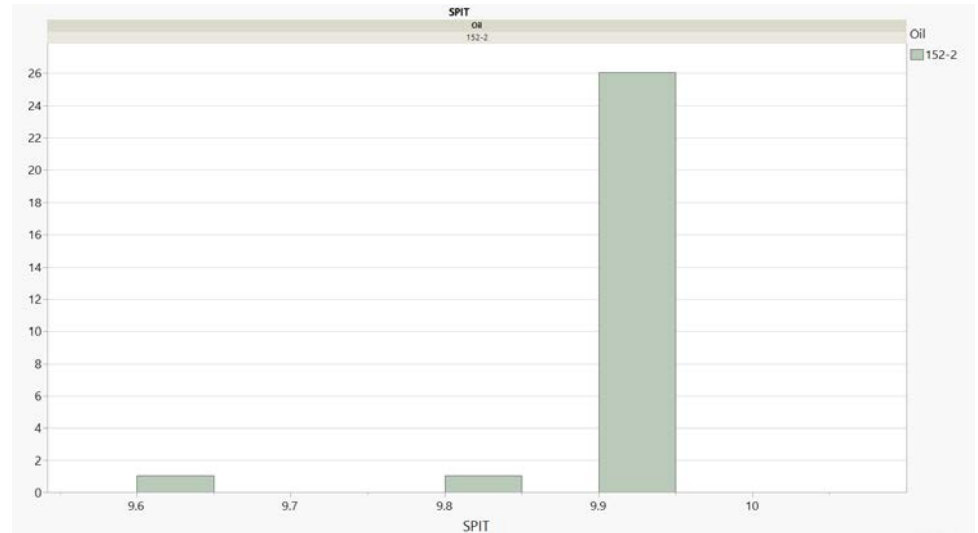
# Pitting/Spalling

# Non-Critical Parameters

In several other test-types, parameters that 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

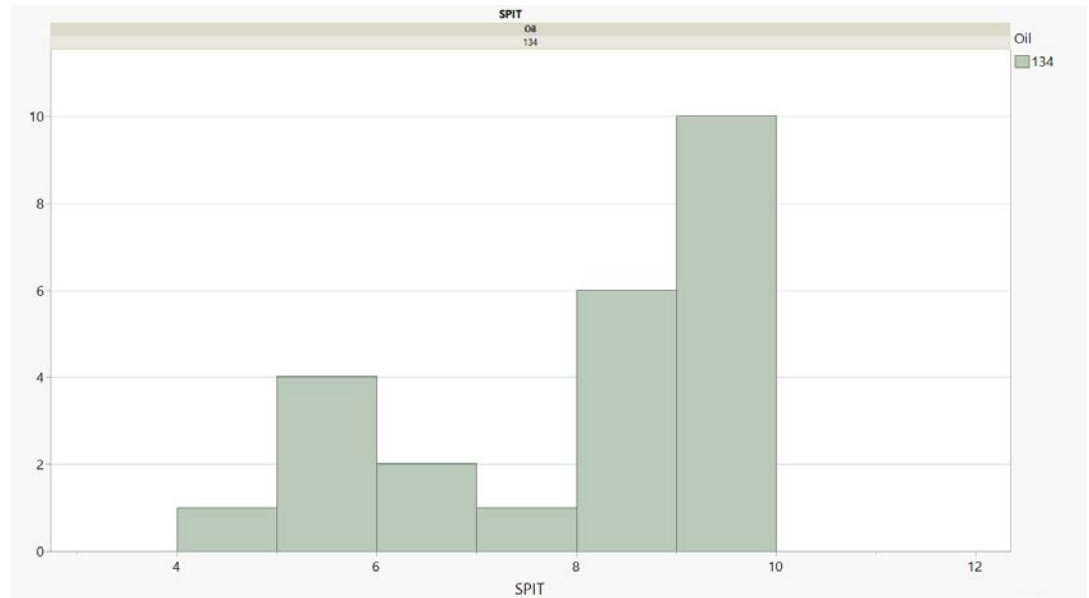
Mean - 1.8*SD	Mean + 1.8*SD
9.86	9.94

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.



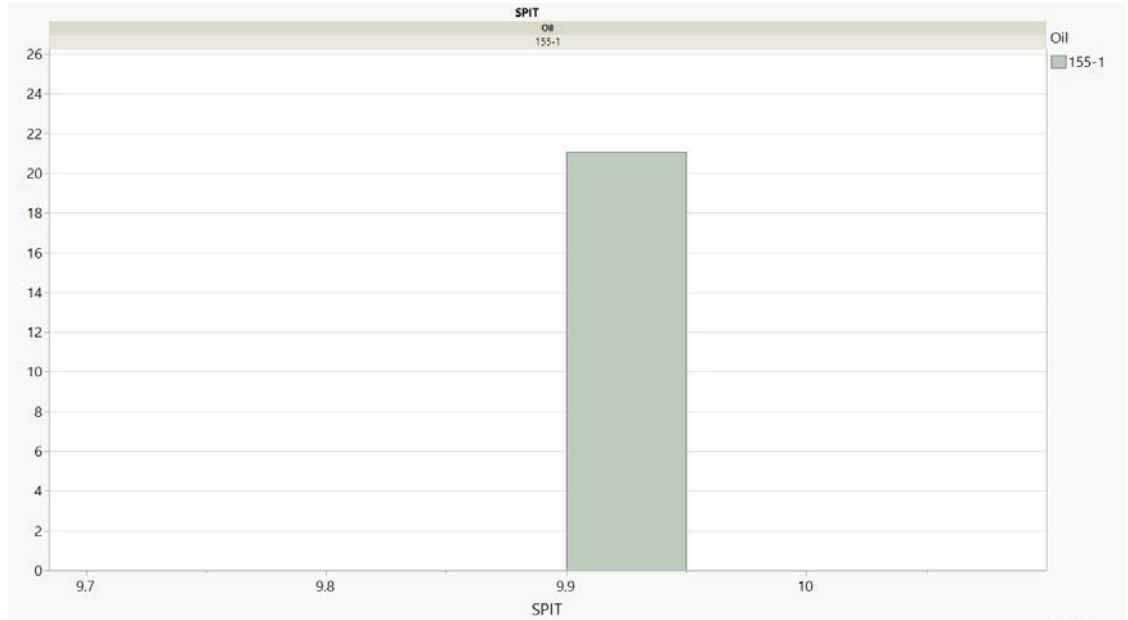
Mean - 1.8*SD	Mean + 1.8*SD
4.3	11.5

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

9.8

Mean + 1.8\*SD

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	?