B07 Volatility Surveillance Panel Updates

Amy Ross 20231101

Valvoline™ Global

Minutes 20231101

- Antitrust Statement
- Members List Review
- Minutes 20230607 Review
  - Incorrect minutes presented; correct minutes sent via email after meeting with a motion to approve by Denny Gaal and a second by Shawn Dubecky
- Overview of D6417 and D5800 Executive Summary (high level)
- Discussion of interim monitoring of D5800 procedures
  - Multiple comments and discussion regarding practical significance of differences between procedures B and D
  - No significant change in fail rate, even with an influx of new and returning labs/rigs in the most recent period
  - Severity adjustments are confirmed and adjusted dynamically to accommodate variability (Zi, not Yi adj)
  - Panel has decided not to take any actions regarding targets or further adjustments at this time
    - TMC engineering judgement to determine significant change in pass/fail rate as actionable
    - AR to research how CEC is approaching variability/differences in procedure
    - Continuous annual and interim monitoring by AR
- Other topics?
  - No D5800 updates at this time; GF-7 limits established for Noack

Overview

- Antitrust Statement
- Members List Review
- Minutes 20221028 Review
- Overview of D6417 and D5800 Executive Summary (high level)
- Discussion of interim monitoring of D5800 procedures
- Other topics?
- Adjourn

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Minutes 20230607

- Antitrust Statement (Reviewed)
- Members List Review
  - updated 20230607 and is inserted at the end of the slides
- Minutes Approval from last meeting
  - Motion by Greg Miiller, Second by Robert Stockwell
- Reference Oil Checks
  - Reviewed by panel; no comments
- Stats Review
  - Presented by Ricard Affinito; virtually no change in standard deviation as confirmed by ANOVA from data up to 06/05/2023 (MSE = 0.0462); untransformed reference oil data shows unequal variances across range of mean values which reaffirms the natural log transformation of Noack data; overall fail rate remains low but observed slight deviation for the period upcoming which can be attributed to one rig (BD4 with an individual fail rate of 54%); no recommended changes at this time
  - Comment from Alfis Babajide (Shell) regarding the VOLD18 daily QC fluid as tested on NCK25G rigs
    - panel discussed troubleshooting options for a rig which is unable to pass daily reference checks, including pump calibrations, temperature probe calibration, firmware updates, proper filter maintenance, cup/lid pairing
    - AB asked for any panel members to comment if they had issues passing the VOLD18 fluid to which there was no response; it was noted that a rig cannot submit for calibration or perform testing with the intent of licensing without passing the daily QC check with VOLD18; other reference oils are suitable for use with Noack but the VOLD18 is a requirement for calibration and licensing data acquisition; Observing consistent lab/rig participation and relatively infrequent occurrence of recalled tests, it can be assumed that passing the VODL18 daily QC is not prohibitive of participation at this time
- B07 Semi-Annual report (slides included)

01

Executive Summary Overview

D6417 & D5800

Executive Summary Overview – D6417

- Labs -1, Stands -1
- Fail Rate 0%
- Pooled s lower than target (0.34 vs. 0.39)
- Performance on target (-0.02 md/s)
- Calibration Fluids:
  - Oil 52: On target for mean, sd, and performance (-0.35)
  - Oil 55: On target for mean, sd, and performance (-0.39)
  - Oil 58: On target for mean, sd, and very slight severe performance (0.58)

D6417: Estimation of Engine Oil Volatility by Capillary GC

Period Precision and Severity Estimates

Area % Volatized @ 371°C	n	df	Pooled s	Mean Δ/s
Initial Selected Oils from RR	54	51	0.39	-----
10/1/19 through 3/31/20	17	14	0.30	0.09
4/1/20 through 9/30/20*	16	13	0.41	-0.34
4/1/20 through 9/30/20*	14	11	0.31	0.01
10/1/20 through 3/31/21*	21	18	0.47	-0.81
10/1/20 through 3/31/21*	19	16	0.37	-0.43
4/1/21 through 9/30/21	17	14	0.39	-0.28
10/1/21 through 3/31/22	20	17	0.51	0.13
4/1/22 through 9/30/22	19	16	0.48	-0.67
10/1/22 through 3/31/23	18	15	0.43	0.41
4/1/23 through 9/30/23	16	13	0.34	-0.02

*Period statistics with two mild results from rigs D5/D6 included and excluded (operational problem suspected but lab never confirmed)

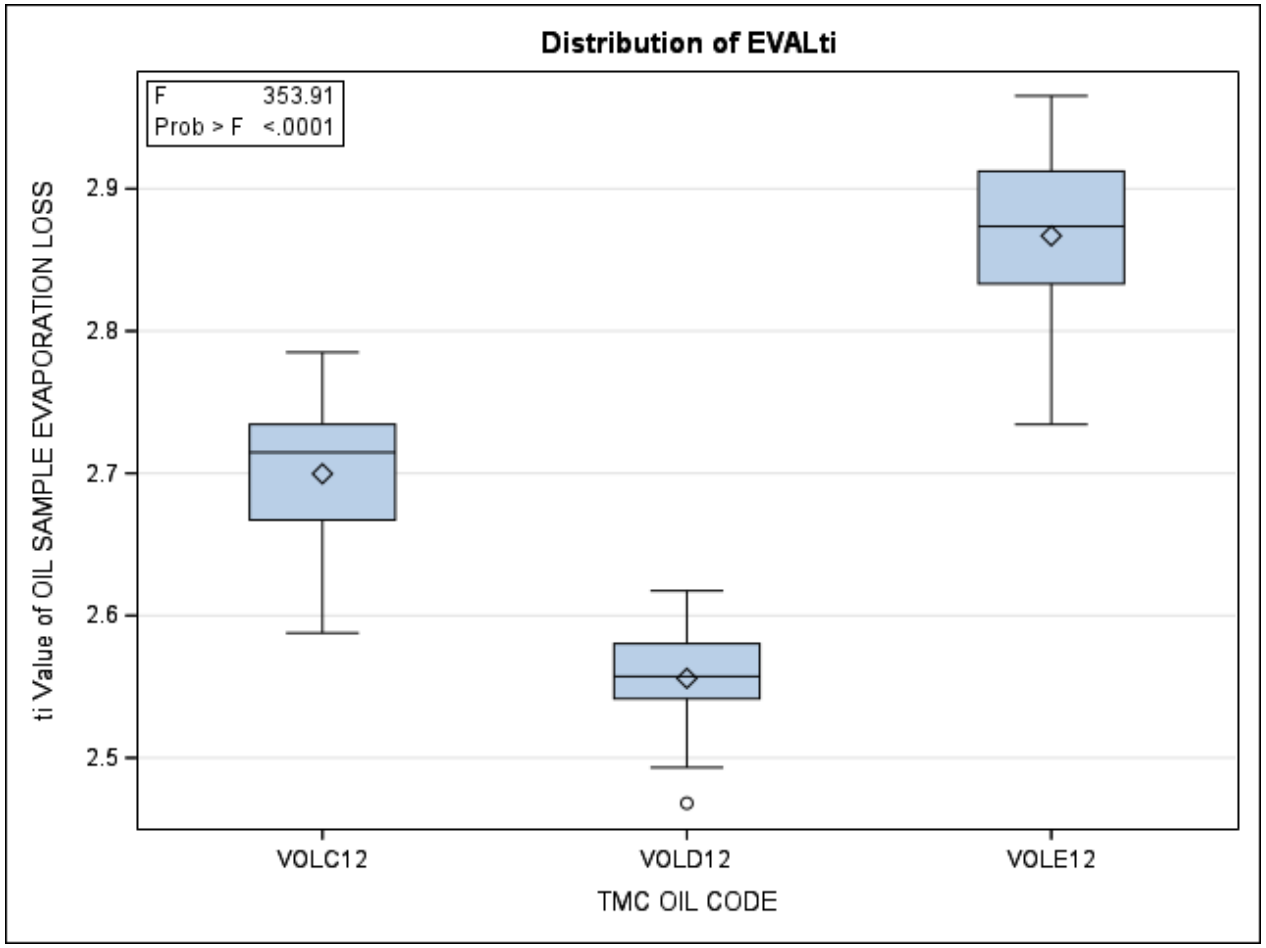
Executive Summary Overview – D5800

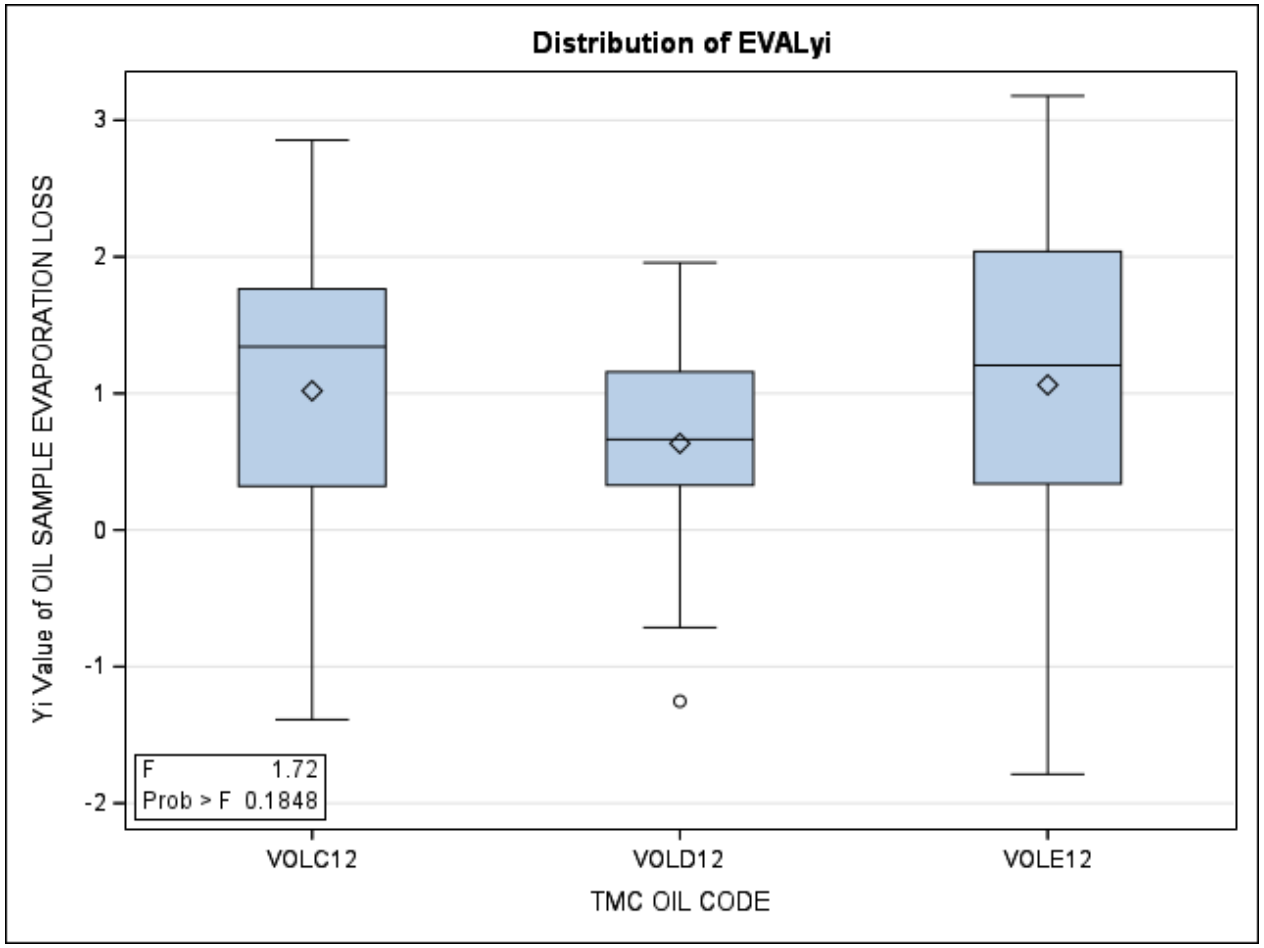
- Labs +3, Stands +11
- Fail Rate 10.65%
  - 7/18 level 3
  - 14/18 severe
  - 7/18 OC due to imprecision; ProcB=5, ProcD=2
  - Rig BD4 contributed 7/18 OC, level 2 severe; rig has been removed from LTMS
- Pooled s much higher than target (0.0586 vs. 0.0465; 0.0565 without BD4)
- Performance shift (back to severe and worse than last; 0.33)
- Calibration Fluids:
  - VOLC12: above mean target, much worse than target precision
  - VOLD12: above mean target, better than target precision
  - VOLE12: above mean target, much worse than target precision

Executive Summary Overview – D5800

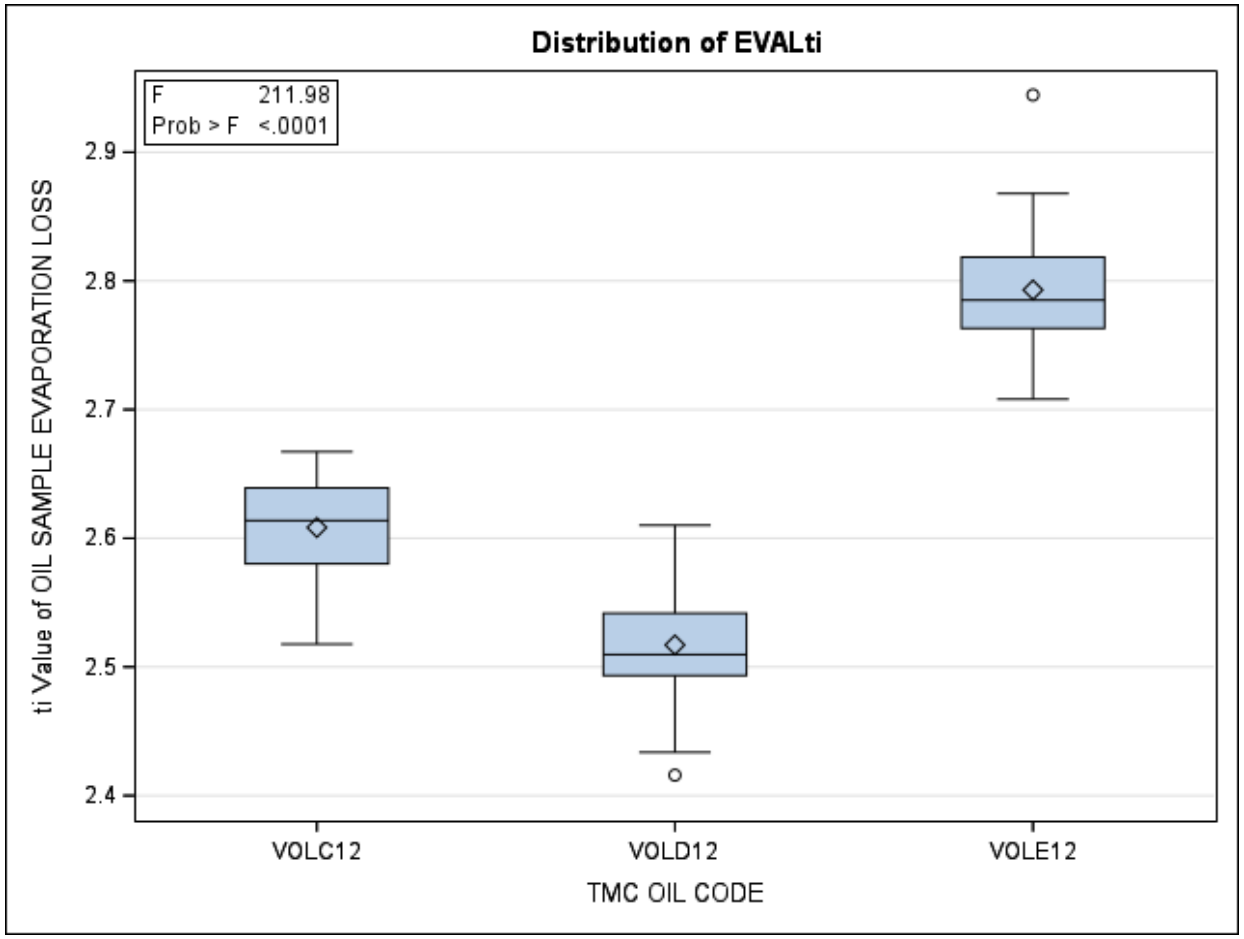
- Procedures
  - Procedure B Performance severe and slightly above target; +7 new rigs in population
  - Procedure D performance mild and comparable to target; +4 new rigs in population
  - Procedure B fail rate 12.7%, Procedure D fail rate 7.5%

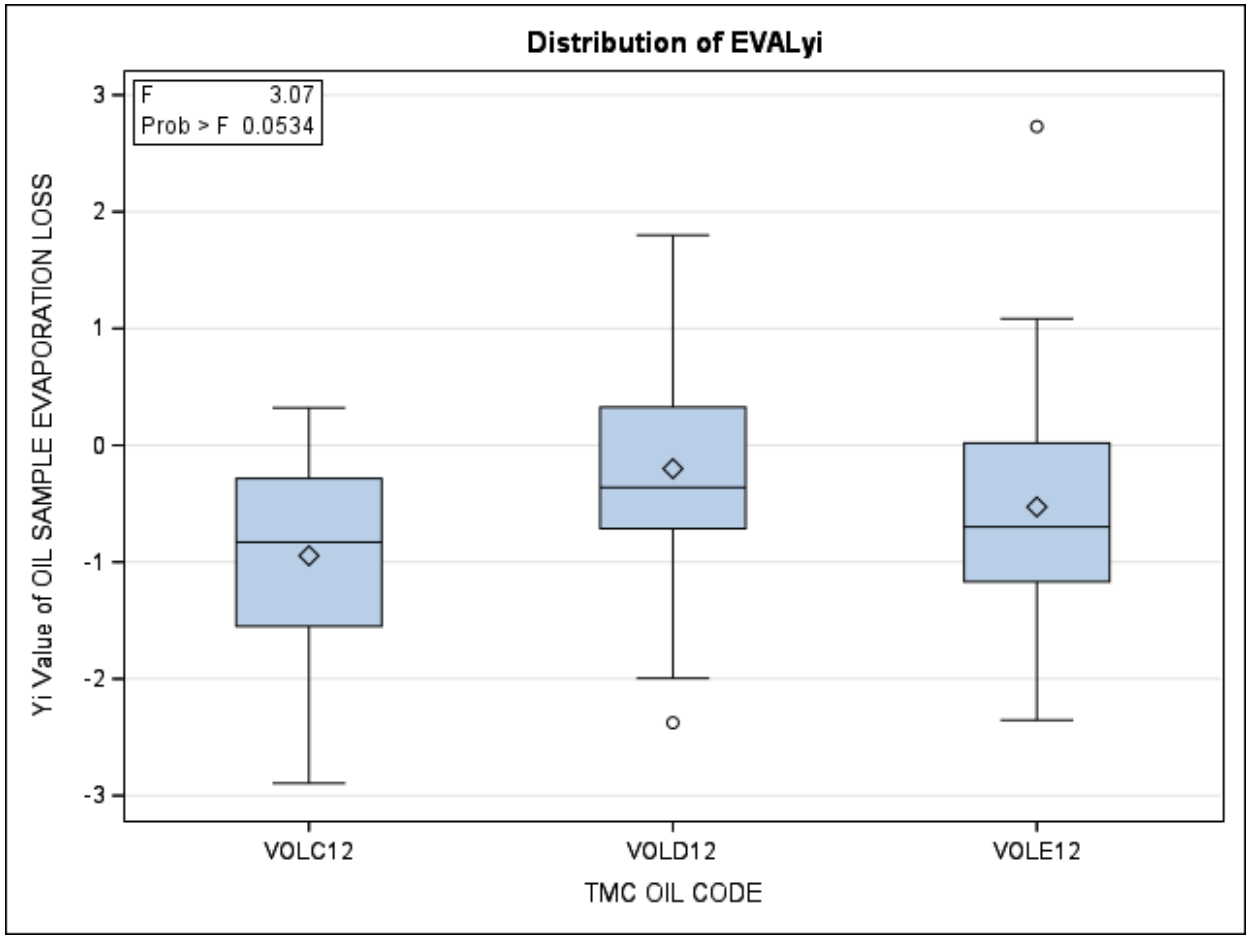
Procedure B: Apr23 - Sept23 Results





Procedure D (NS2): Apr23 - Sept23 Results





D5800: Evaporation Loss of Lubricating Oil by Noack Method: Semester Summary

Precision (Pooled s) moved slightly further from target this semester as former and new labs returned to monitoring and reported several failing calibration attempts.

Performance (Mean Δ/s) returned towards a severe path at +0.33 s after being mild (at −0.15 s) the previous semester.

- Procedure B rigs continue to trend severe (0.98 s) while Procedure D rigs continue to trend mild (−0.56 s).

CUSUM plot once again turned towards severe as has been the observed trend for many years (except last semester). This is due to severe test results from both Procedure B and D units in the last six months. The industry EWMA Control Chart had several Severe Warning Alarms last semester (and continues to have alarms this semester).

TABLE of CONTENTS

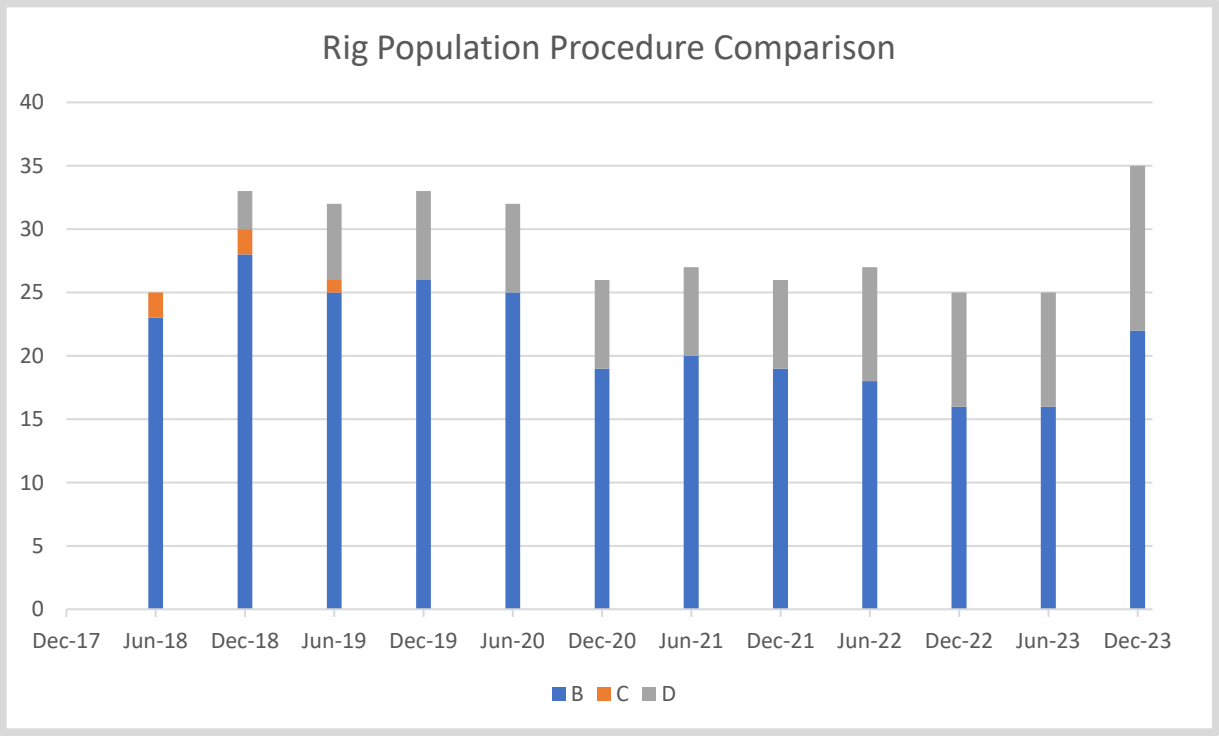
02

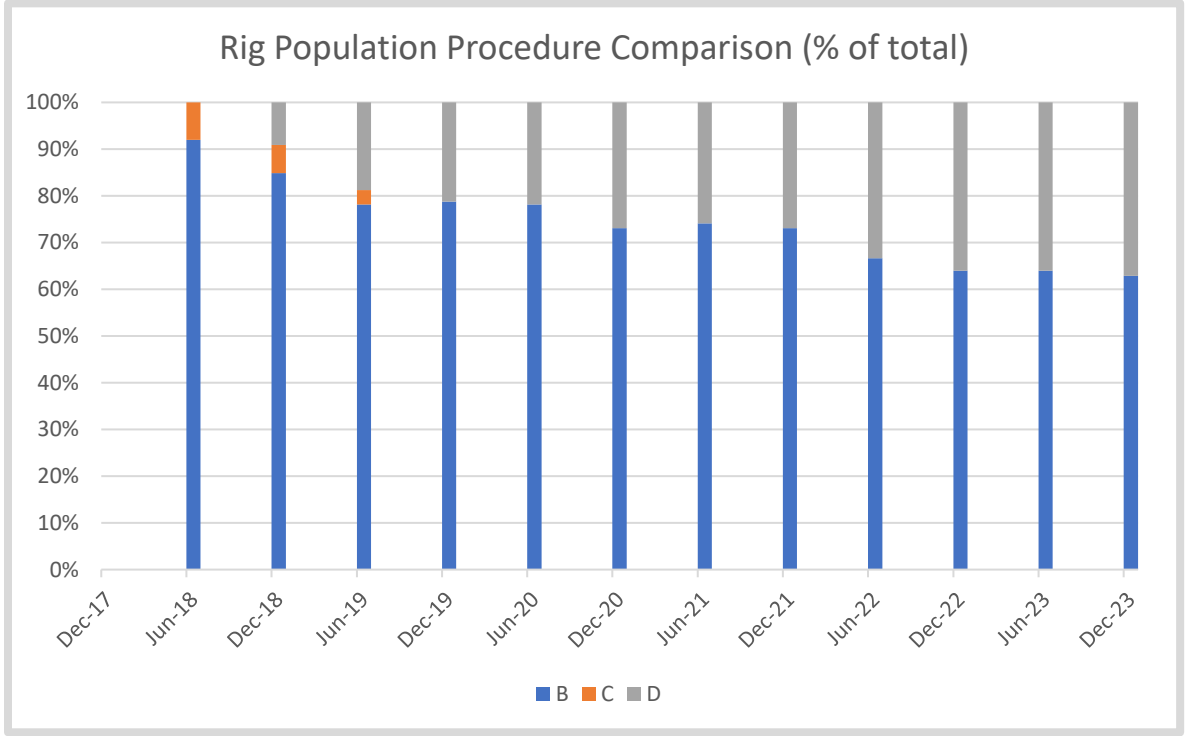
Interim Monitoring of Procedures

Recap of Stats Reviews for D5800

- LTMS monitoring
- PDSC analyses of stability of fluids
- TMC regular P&C monitoring
- Annual review of targets and standard deviation by statisticians
- Individual procedure reports in biannual executive summaries
- Daily QC fluid monitoring (VOLD18)
- Consistent pass/fail rates for calibrations
- Monitoring of rig population changes (specifically, NCK25G and NS2)
  - Proportion mostly stable over past three periods (next slide)

Recap of Stats Reviews for D5800





03

Statistical Review July 2023

Statistical Review July 2023

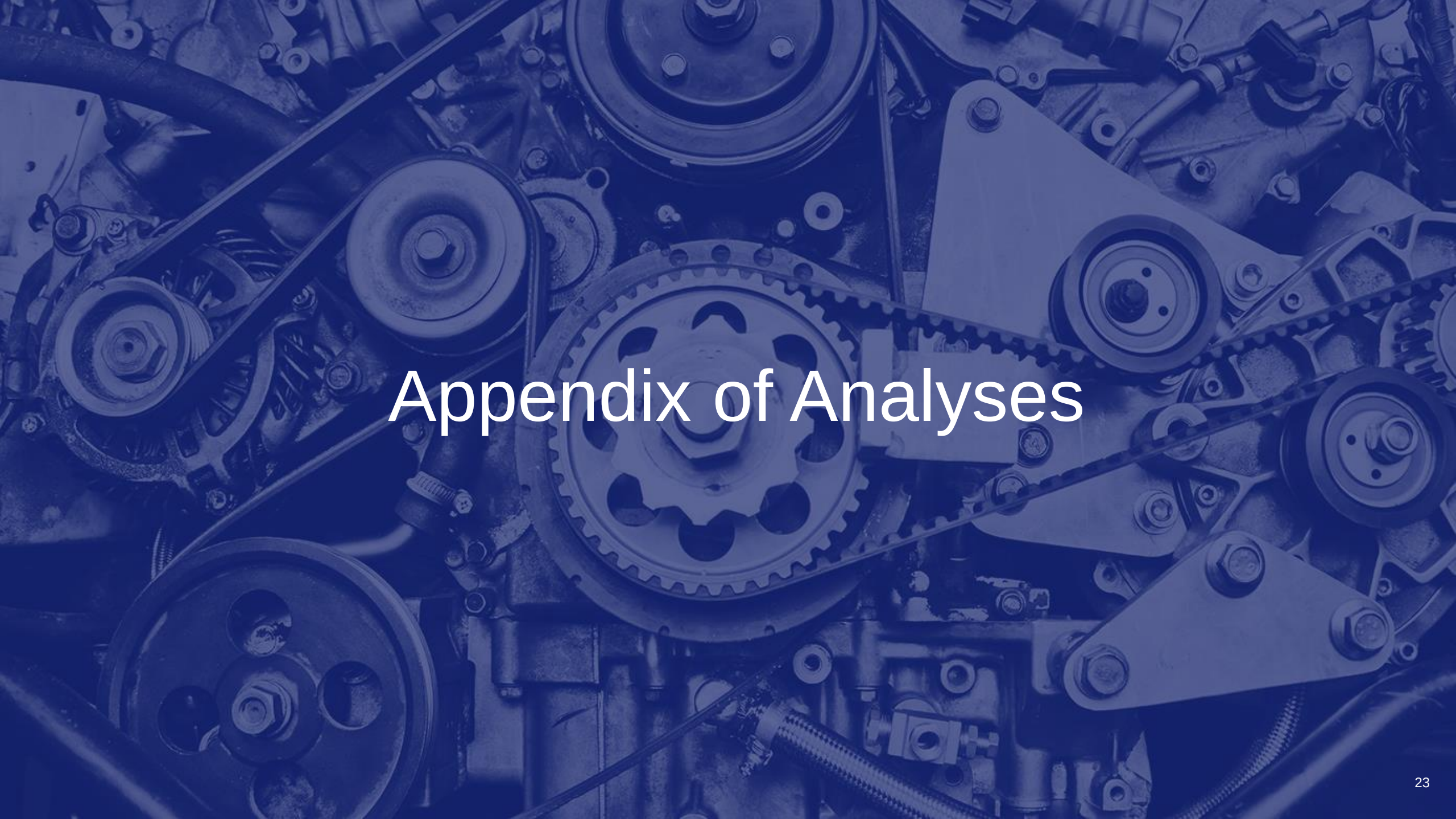
- ***The key objective of the analysis was to identify significant differences between Procedures B and D—scenario example, if we tested a sample twice, using each procedure, could we discern which one was used?***
  - Calibration data from 2019 and forward utilized, representing obsolescence of procedure C (January 2019) and introduction of Procedure D rigs (August 2018) in the TMC population
  - Data remained in natural log units; Only datapoints which were clear type-o's were removed
  - Descriptive stats provided estimated mean and variability details by oil and model
  - Data from calibration fluids were compared using GLM
  - Procedure, Lab, Apparatus were variables of interest
  - Residual analyses indicated mostly normal distributions for all oils; Ln scale is still appropriate
  - Tests for equal variances indicated differences between procedures B & D for VOLC12

Statistical Review July 2023

- The variability contributions of the individual procedures were significant
  - Estimated difference between procedures is 0.068 (~1.5 standard deviations)
  - Is this of practical concern?
    - If so, what steps could we take to mitigate this effect, outside of changing targets?
    - Adjustments are already being issued on a rig-to-rig basis, do we factor in a bias offset between procedures?
    - Set a data threshold before enacting changes?
      - Set actionable limit on failure rate?
      - Monitor more closely during influx of data for category changes?

Other topics of discussion?.


Thank you for your time.



Appendix of Analyses

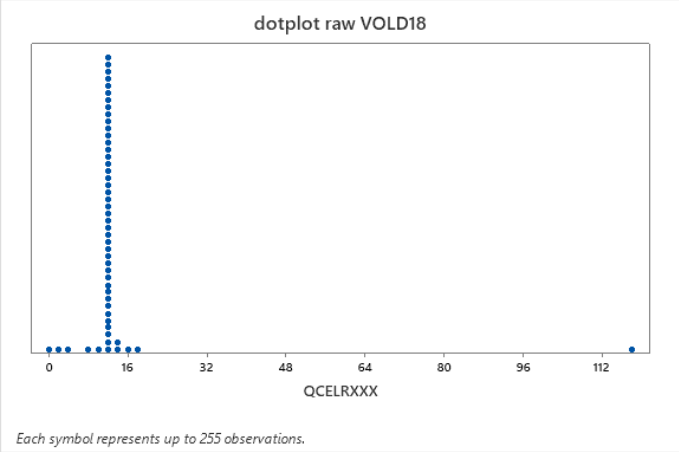
Current Targets

		Target Ln	SD Ln	Min Ln	Max Ln
TMC targets, Ln	VOLC12	2.6523	0.0465	2.6058	2.6988
	VOLD12	2.5264	0.0465	2.4799	2.5729
	VOLE12	2.8175	0.0465	2.771	2.864
		Target	SD Norm	Min	Max
TMC targets, norm	VOLC12	14.187	0.675	13.5	14.9
	VOLD12	12.508	0.595	11.9	13.1
	VOLE12	16.735	0.797	16	17.5
		Target	R/2.77	Rmin	Rmax
D5800 Precision	VOLC12	14.19	0.627	13.56	14.82
	VOLD12	12.51	0.571	11.94	13.08
	VOLE12	16.73	0.709	16.02	17.44

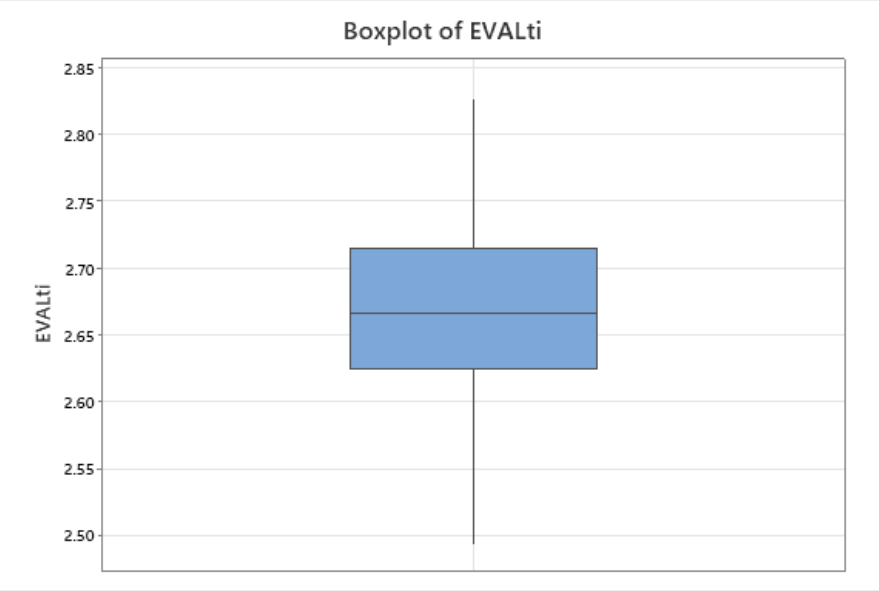
Dataset Overview

n	Procedure / Model		
	B	B	D
Oil	NCK2	NCK25G	NS2
VOLC12	17	308	136
VOLD12	19	295	141
VOLE12	18	317	140
VOLD18	7259	(pooled)	3833

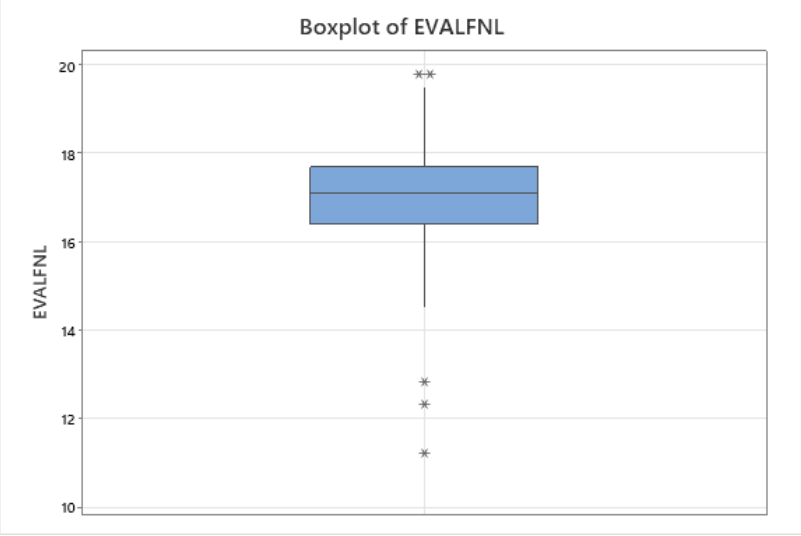
Dataset Overview



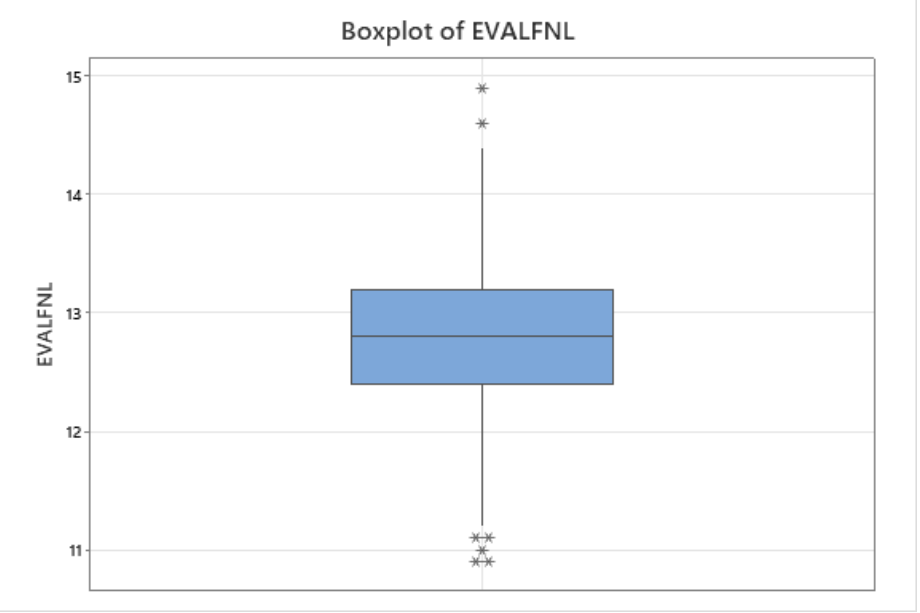
*VOLC12 without ProcC



*VOLD12



*VOLE12



Descriptive stats by Procedure and Model

VOLC12 no ProcC

Variable	MODEL	N	N*	Mean	SE Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Evati	NS2	136	0	2.6169	0.00360	0.0419	2.5096	2.5878	2.6174	2.6462	2.7473
Variable	**MODEL**	**N**	**N***	**Mean**	**SE Mean**	**StDev**	**Minimum**	**Q1**	**Median**	**Q3**	**Maximum**
EVALti	NCK2	17	0	2.6549	0.00696	0.0287	2.6174	2.6355	2.6462	2.6707	2.7344
	NCK25G	308	0	2.6928	0.00302	0.0529	2.4932	2.6603	2.6980	2.7344	2.8273

VOLD12

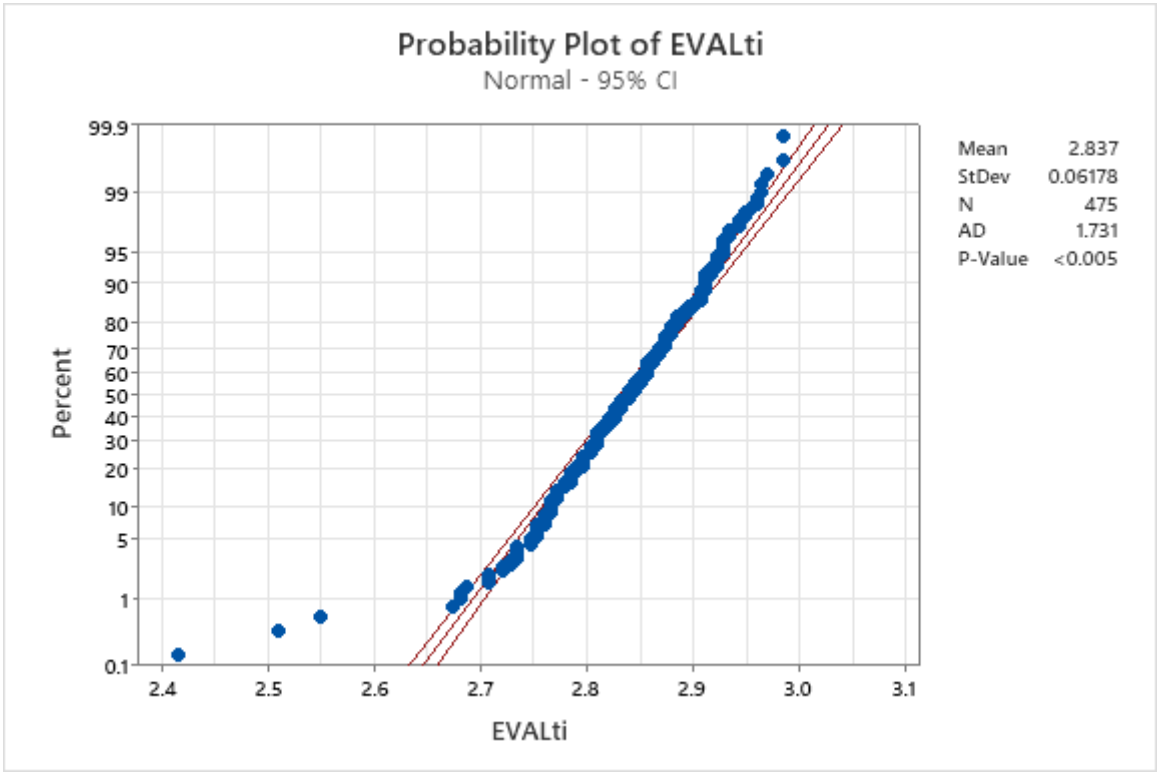
Variable	MODEL	N	N*	Mean	SE Mean	StDev	Minimum	Q1	Median	Q3	Maximum
EVALti	NS2	141	0	2.5318	0.00389	0.0461	2.3979	2.5055	2.5337	2.5649	2.6391
Variable	**MODEL**	**N**	**N***	**Mean**	**SE Mean**	**StDev**	**Minimum**	**Q1**	**Median**	**Q3**	**Maximum**
EVALti	NCK2	19	0	2.5280	0.00522	0.0227	2.4932	2.5096	2.5337	2.5416	2.5726
	NCK25G	295	2	2.5530	0.00291	0.0500	2.3888	2.5257	2.5572	2.5878	2.7014

VOLE12

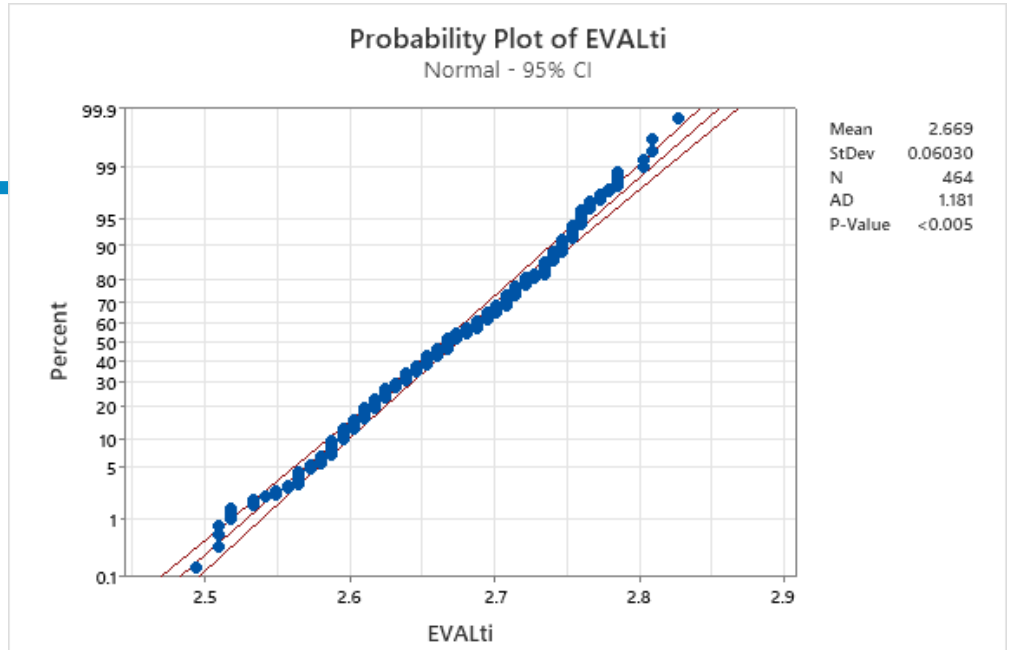
Variable	MODEL	N	N*	Mean	SE Mean	StDev	Minimum	Q1	Median	Q3	Maximum
EVALti	NS2	140	1	2.7916	0.00529	0.0626	2.4159	2.7663	2.7973	2.8214	2.9653
Variable	**MODEL**	**N**	**N***	**Mean**	**SE Mean**	**StDev**	**Minimum**	**Q1**	**Median**	**Q3**	**Maximum**
EVALti	NCK2	18	0	2.8401	0.00616	0.0261	2.7850	2.8273	2.8420	2.8565	2.8848
	NCK25G	317	1	2.8562	0.00291	0.0518	2.5494	2.8273	2.8565	2.8904	2.9857

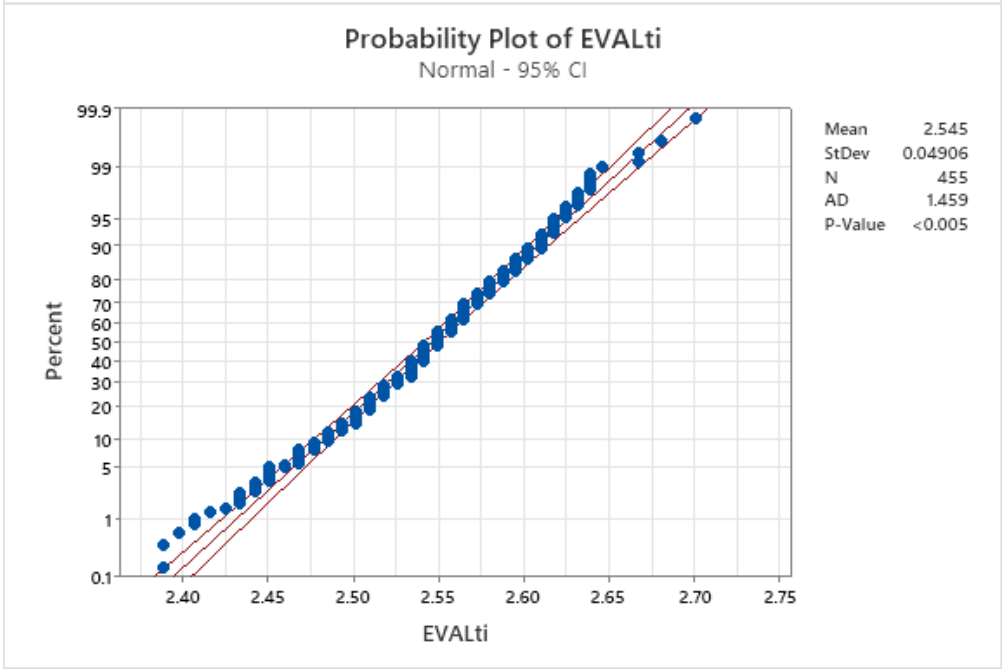
Probability Plots (Ln)

*VOLE12



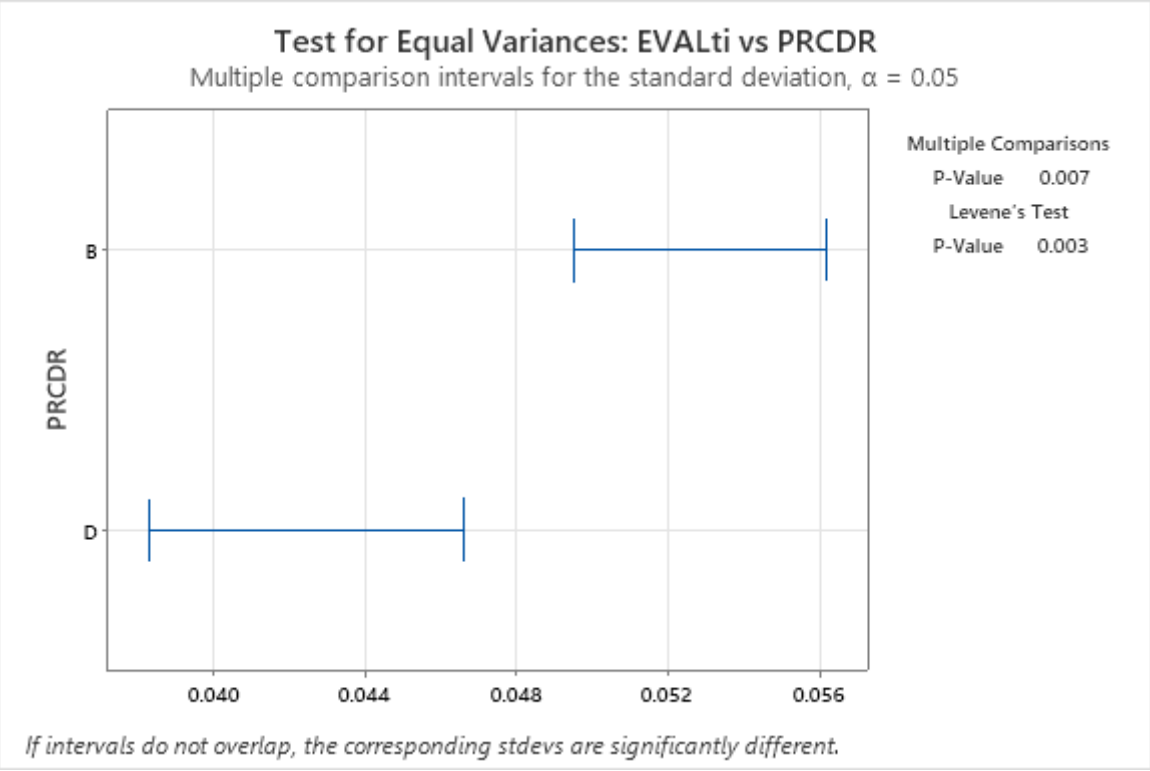
VOLC12 and VOLD12 - OKAY



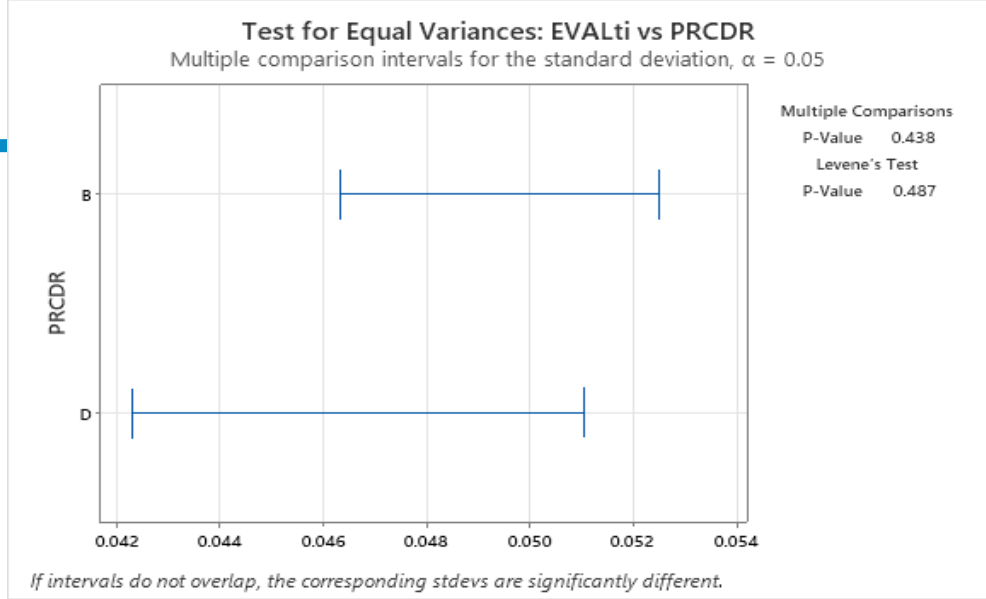


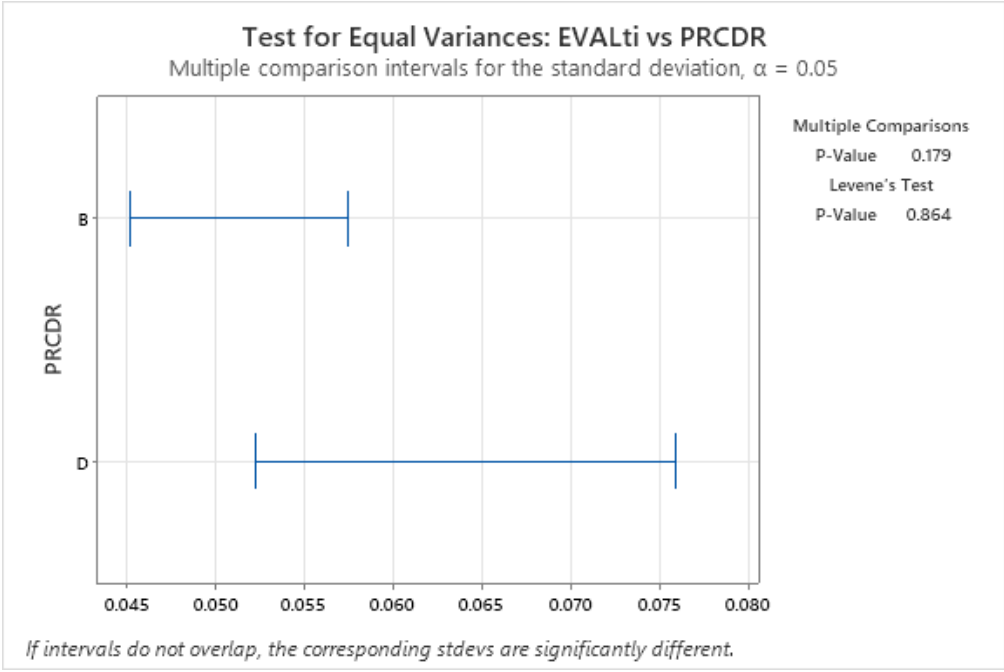
Tests for Equal Variances

*VOLC12



VOLD12 and VOLE12 - OK





t-tests for Targeted mean comparisons

Notes: All fluids showed differences, VOLE12 being the closest

COPY FROM 2019 FORWARD(IND = VOLC12 NO PROCC

One T VOLC12 no procC

N	Mean	StDev	SE Mean	95% CI for μ
461	2.66897	0.06004	0.00280	(2.66348, 2.67447)

Null hypothesis			H_o: μ = 2.6523
Alternative hypothesis			H_1: μ ≠ 2.6523
T-Value	**P-Value**		
5.96	0.000		

2019 FORWARD(IND = VOLD12)

One T VOLD12

N	Mean	StDev	SE Mean	95% CI for μ
455	2.54540	0.04906	0.00230	(2.54088, 2.54992)

Null hypothesis			H_o: μ = 2.5264
Alternative hypothesis			H_1: μ ≠ 2.5264
T-Value	**P-Value**		
8.26	0.000		

2019 FORWARD(IND = VOLE12)

One T VOLE12

N	Mean	StDev	SE Mean	95% CI for μ
475	2.83657	0.06178	0.00283	(2.83100, 2.84214)

Null hypothesis			H_o: μ = 2.8175
Alternative hypothesis			H_1: μ ≠ 2.8175
T-Value	**P-Value**		
6.73	0.000		

t-Tests for mean comparisons by Procedure

Note: All fluids, especially VOLC12 and VOLE12

VOLC12
COPY FROM 2019 FORWARD(IND = VOLC12 NO PROCC

Two-Sample T-Test and CI: EVALti, PRCDR

PRCDR	N	Mean	StDev	SE Mean
B	325	2.6908	0.0526	0.0029
D	136	2.6169	0.0419	0.0036

Difference	95% CI for Difference
0.07393	(0.06482, 0.08305)

T-Value	DF	P-Value
15.96	314	0.000

VOLE12
2019 FORWARD(IND = VOLE12)

Two-Sample T-Test and CI: EVALti, PRCDR

PRCDR	N	Mean	StDev	SE Mean
B	335	2.8554	0.0509	0.0028
D	140	2.7916	0.0626	0.0053

Difference	95% CI for Difference
0.06374	(0.05196, 0.07551)

T-Value	DF	P-Value		
10.67	219	0.000		

VOLD12
2019 FORWARD(IND = VOLD12)

Two-Sample T-Test and CI: EVALti, PRCDR

PRCDR	N	Mean	StDev	SE Mean
B	314	2.5515	0.0492	0.0028
D	141	2.5318	0.0461	0.0039

Difference	95% CI for Difference
0.01973	(0.01033, 0.02913)

T-Value	DF	P-Value
4.13	285	0.000

GLM Details

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
IND	2	19.5263	9.76313	4291.05	0.000
LTMSLAB	13	0.6317	0.04859	21.36	0.000
PRCDR	1	0.5013	0.50129	220.32	0.000
Error	1373	3.1239	0.00228		
Lack-of-Fit	35	0.3510	0.01003	4.84	0.000
Pure Error	1338	2.7729	0.00207		
Total	1389	24.4429			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0.0476994	87.22%	87.07%	86.93%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	2.67991	0.00314	853.95	0.000	
IND					
VOLC12	-0.01464	0.00181	-8.07	0.000	1.35
VOLD12	-0.13712	0.00182	-75.36	0.000	1.35
LTMSLAB					
A	0.01278	0.00489	2.61	0.009	2.15
AU	-0.01641	0.00713	-2.30	0.022	1.99
AY	0.02303	0.00990	2.33	0.020	2.75
AZ	0.02303	0.00690	3.34	0.001	1.95
B	-0.03452	0.00416	-8.31	0.000	1.97
BA	-0.00599	0.00540	-1.11	0.267	1.77
BD	0.03857	0.00814	4.74	0.000	2.21
D	0.00289	0.00573	0.50	0.615	2.79
E1	-0.03469	0.00438	-7.92	0.000	1.75
F	-0.0120	0.0314	-0.38	0.703	18.55
G	-0.01588	0.00413	-3.84	0.000	1.81
I	-0.03216	0.00647	-4.97	0.000	1.87
J	0.03766	0.00727	5.18	0.000	2.02
PRCDR					
B	0.03400	0.00229	14.84	0.000	2.69