ADDENDUM K1

TEMPLATE CHECKLIST

Purpose

The Checklist for Comparing Tests to the Template is used to assess progress in new engine test development against the Code Acceptance Criteria and Action Plans. The checklist is updated periodically during the course of test development and is provided to, and discussed with, the appropriate ASTM test development task force.

The rating scale for comparing test development to the Template is as follows:
A - Completed
B - In Progress
C - Planned
D - No Action

Summary: Precision Matrix has been completed and data has been analyzed and discussed in industry groups. The test shows oil discrimination and good precision.

A. **Precision and Discrimination** – PM analysis complete, need d_p from MAD Survey
B. **Severity and Precision Control Charting** – Will be included in the next TMC LTMS update.
C. **Interpretation of Multiple Tests** – SP agreed to use MTAC
D1. **Reference Oils –** 1010-1, 542-2, and 543 were chosen as matrix oils and reference oils.
D2. **Test Parts** - Engines are the critical parts. The plan is to supply ____ complete engines and have them preserved and stored by the end of ____.
D3. **Test Fuel** - SEQ VI-E W/ DCA (HF2003) will be used and supplied by Haltermann. There are no special fuel requirements.
D4. **Test Procedure** –
D5. **Rating and Reporting Results** – FEI1, FEI2, and FEISUM are pass/fail parameters.
D. D6. **Calibration, Monitoring and Surveillance –** Will be included in the next TMC LTMS update.

Test Name Sequence VIF Assessment Date February 23, 2017

Appendix K - Template for Acceptance of New Tests

Checklist for Comparing Tests to the Template

A. Precision and Discrimination

A.1 Precision

$E_p = d_p/Spp$, $E_p \geq 1.0$ for all pass/fail parameters
d_p = Smallest difference of practical importance
Spp = Pooled standard deviation at target level of performance

Parameter	dp	Spp	Ep	Ep≥1.0
FEI1		0.22		
FEI2		0.30		

Comments:

A.2 Discrimination

Oil 542-2 has a higher FEI1 than 1011.
Oil 542-2 has a higher FEI1 than 543.
Oil 543 has a higher FEI1 than 1011.

Oil 543 has a higher FEI2 than 542-2.
Oil 543 has a higher FEI2 than 1011.

Parameter: FEI1

			p-value for t-test of equal means (Tukey)		
Oil	Least-Square Mean	95% Confidence Interval for Mean	Vs 1011	Vs 542-2	vs 543
1011	1.45	1.20 to 1.69		0.00	0.04
542-2	2.23	2.01 to 2.44	0.00		0.05
543	1.88	1.68 to 2.09	0.04	0.05	

Parameter: FEI2

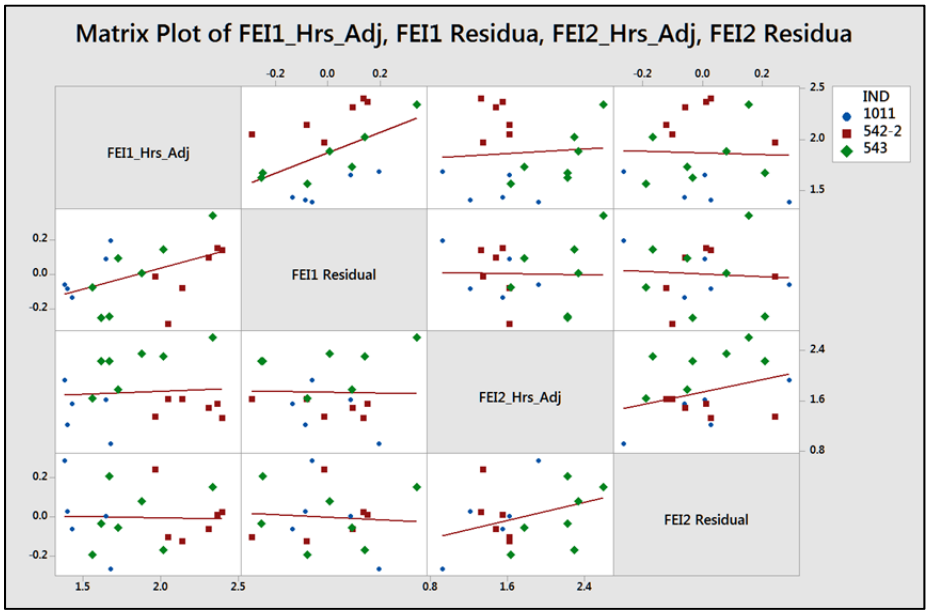
			p-value for t-test of equal means (Tukey)		
Oil	Least-Square Mean	95% Confidence Interval for Mean	Vs 1011	Vs 542-2	vs 543
1011	1.41	1.20 to 1.63		0.70	0.00
542-2	1.52	1.33 to 1.71	0. 70		0.00
543	2.25	2.07 to 2.43	0.00	0.00	

Comments:

A.3 Parameter Redundancy

Parameter redundancy is concluded if a correlation coefficient is 0.85 or greater; and, none of the below listed parameters meet the 0.85 threshold.

Correlation Coefficients	FEI1_HRS_ADJ	FEI1_Residual	FEI2_HRS_ADJ	FEI2_Residual
FEI1_HRS_ADJ	1.00	0.49	0.08	-0.03
FEI1_Residual	0.49	1.00	-0.02	-0.07
FEI2_HRS_ADJ	0.08	-0.02	1.00	0.34
FEI2_Residual	-0.03	-0.07	0.34	1.00



B. Severity and Precision Control Charting

Requirements

B.1 Is an LTMS for reference oil tests in place which is consistent with the ACC Code Appendix A? __A___

B.2 Are appropriate data transforms applied to test results? __A___

Comments:

C. Interpretation of Multiple Tests

Requirements

C.1 Is a suitable system in place to handle repeat tests on a candidate oil? __A___

Type: MTAC Tiered Limits Other

C.2 Has a method for the determination and handling of outlier results been defined? __A___

A. **Comments:** SP agreed to use MTAC

RATING SCALE: A - Completed; B - In Progress; C - Planned; D - No Action

D.Action Plan

D.1 Reference Oils

Do the majority of reference oils represent current technology? __A___

Are the majority of reference oils of passing or borderline pass/fail performance? __B___

Recommended Approaches

D.1.1 Is reference oil supply and distribution handled through an independent organization? __A___

D.1.2 Is a quality control plan defined and in place? __A___

D.1.3 Is a turnover plan defined/in place to ensure uninterrupted supply of reference oil and an orderly transition to reblends? __A___

D.1.4 Is a process for introducing replacement reference oils defined and in place? __A___

D.1.5 Are oils blended in a homogeneous quantity to last 5 years? __A___

Comments: 1011, 543, 542-2 were chosen as matrix oils and reference oils. TMC and Seq VI SP handle all of the above.

D.2 Test Parts

Are all critical parts identified? __A___

Is a system defined/in place to maintain uniform hardware? __A___

Is there a system for engineering support and test parts supply? __A___

Recommended Approaches

D.2.1 Are critical parts distributed through a Central Parts Distributor (CPD)? __A___

D.2.2 Are critical parts serialized, and their use documented in test report? __A___

D.2.3 Are all parts used on a first in/first out basis? __A___

D.2.4 Are all rejected critical parts accounted for and returned to the CPD? __A___

RATING SCALE: A - Completed; B - In Progress; C - Planned; D - No Action

D.2.5 Does the CPD make status reports to the test surveillance body at least semi-annually? __A___

D.2.6 Is there a quality control and turnover plan in place for critical test parts, including identification and measurement of key part attributes, a system for parts quality accountability, a turnover plan in place for simultaneous industry-wide use of new parts or supply sources? __B___

D.2.7 Is the CPD active in industry surveillance panel/group, and in industry sponsored test matrices? __A___

D.3 Test Fuel

Recommended Approaches

D.3.1 Is the fuel specified and the supplier(s) identified? __A___

Is a process in place to monitor fuel stability over time? __A___

Are approval guidelines in place for fuel certification? __D___

D.3.2 If the test fuel is treated as a critical part of the test procedure: Is an approval plan and severity monitoring plan for each fuel batch in place? __D___

Is a quality control plan defined and in place to assure long term quality of the fuel? __A___

Is a turnover plan defined, in place and demonstrated to ensure uninterrupted supply of fuel? __A___

Comments: SEQ VI-E W/ DCA (HF2003) will be used and supplied by Haltermann.

RATING SCALE: A - Completed; B - In Progress; C - Planned; D - No Action

D.4 Test Procedure

Recommended Approaches

D.4.1 Is a technical report published documenting, per ASTM Flow Plan:

Test precision for reference oils?	__B__
Field correlation?	__D___
Test development history? To be completed after test acceptance.	__B*___

D.4.2 Are test preparation and operation clearly documented in a standard format, e.g., ASTM, CEC? __B___

D.4.3 Are test stand configuration requirements documented and standardized? __B___

D.4.4 Are milestones for precision improvements established? __A___

D.4.5 Are routine engine builder workshops planned/conducted? __D___

D.5 Rating and Reporting of Results

Recommended Approaches

D.5.1 Are the reported ratings from single raters (i.e. not averages from various raters)? __D___

D.5.2 Is a suitable severity adjustment system in place? __A___

D.5.3 Is each pass/fail parameter unique and have a significant purpose for judging engine oil performance? __A___

D.5.4 Do all rate and report parameters judge operational validity, help in test interpretation or judge engine oil performance? __D___

D.5.5 Are routine rater workshops conducted/planned? __D___

RATING SCALE: A - Completed; B - In Progress; C - Planned; D - No Action

D.6 Calibration, Monitoring and Surveillance

Recommended Approaches

D.6.1 Is a process in place for independent monitoring of severity and precision with an action plan for maintaining calibration of all laboratories? __A___

D.6.2 Are stand, lab, and industry reference oil control charts of all pass/fail criteria parameters used to judge calibration status? __A___

D.6.3 Does the specified calibration test interval allow no more than 15 non-reference oil tests between successful calibration tests? __A___

D.6.4 Is an industry surveillance panel in place? __A___

RATING SCALE: A - Completed; B - In Progress; C - Planned; D - No Action