Mack T-10

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

Test Name   Mack T10   Assessment Date   June 7, 2001

CMA Code of Practice
Appendix K - Template for Acceptance of New Tests
Checklist for Comparing Tests to the Template

Mack T10 Overall Summary

The Mack T10 test is a 300 hour test that generates approximately 5.5% - 6.0% fuel soot at end of test. The test cycle is very similar to the Mack T9 test, where the first 75 hours generates a certain amount of soot, then the remaining test hours are run at very rigorous conditions designed to stress the test oil.

Possible p/f parameters include ring weight loss, cylinder liner wear, Pb content in the used oil (or bearing weight loss), some IR measure of oil oxidation and possibly oil consumption.

The engine test matrix for Mack T-10 nears completion. Data on finished tests are available on TMC web site, however data analysis is on hold until all data from all the participating labs are compiled.

Changes:

D.4.5. Are routine engine builder workshops planned/conducted?   __**A**_
Comments: Builder workshop is planned for week of June 11 in San Antonio.

D.5.5   Are routine rater workshops conducted/planned?   __**A**__
Comments: Liner wear rating round robins are ongoing.

CMA Code of Practice
Appendix K - Template for Acceptance of New Tests
Checklist for Comparing Tests to the Template

A. Precision, Discrimination and Parameter Independence

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	≥1.0?
Ring Weight Loss, mg				
Cylinder Liner Wear, μm				
EOT Used Oil Pb Content, ppm				
Upper Bearing Average Weight Loss, mg				
? Oxidation (FT-IR) ?				
? Oil Consumption, l ?				

Comments: **Oxidation (FT-IR) and oil consumption are parameters which are still in discussion and will be decided upon all the data are compiled.**

A.2 Discrimination

For each test parameter in A.1, at least one of the oils used in proof-of-concept testing, matrix testing, or calibration testing must be statistically significantly different from at least one of the remaining oils. This difference must be in the correct direction, i.e., a poor oil should not test out as significantly better than a good oil. Significant difference may be declared with a p-value of 10% or less. Multiple comparison techniques (Tukey, Scheffe, Bonferroni, etc.) for the least-square means of the oils are preferred comparison techniques and should be stated in the analysis. Note that these least-squares means are not necessarily proposed LTMS targets. An example is provided below.

Parameter: AAAAA

Oil	Least-Square Mean	95% Confidence Interval for Mean	p-value for t-test of equal means (Tukey)		
			Vs 1	Vs 2	vs 3
1					
2					
3					

A.3. Parameter Independence

Each pass/fail parameter has a unique and significant purpose in terms of the engine oil performance standard. Parameter independence is concluded if a correlation coefficient is 0.85 or greater. An example is provided below.

	Correlation Coefficients			
	Parameter A	Parameter B	Parameter C	Parameter D
Parameter A				
Parameter B				
Parameter C				
Parameter D				

Comments:

B. Severity and Precision Control Charting

Requirements

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

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

Comments:
     It is not yet known if transforms will be needed to correct test data.

C. Interpretation of Multiple Tests

Requirements

C.1 Is a suitable system in place to handle repeat tests on a
     candidate oil?   __C__
     Type: MTAC   Tiered Limits   Other

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

Comments:

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?   __B__

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

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

Comments:
Reference oil technologies and base stocks have been agreed upon.

D.2 Test Parts

Are all critical parts identified?   __B__

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   __A__
Distributor (CPD)?

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

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

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

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

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 QC 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?

                                                                       __A~~B~~__

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

Comments:
Test parts are the same as used in the T9 test, so all appropriate protocols are
currently in place.

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?   __A__

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?   __A__

       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:
PC-9 test fuel has been agreed upon, and is currently in use at all labs.

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 FlowPlan:

      Test precision for reference oils?   __C__

      Field correlation?   __C__

      Test development history?   __C__

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

D.4.3 Are test stand configuration requirements documented and
Standardized?   __A__

D.4.4 Are milestones for precision improvements established   __B__

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

Comments: Builder workshop is planned for week of June 11 in San Antonio.

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)?   __A__

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

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

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

D.5.5 Are routine rater workshops conducted/planned?   **__A__**

Comments: Liner wear rating round robins are ongoing.

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

D.6 Calibration, Monitoring and Surveillance

Recommended Approaches

D.6. 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?   __C__

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

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

Comments:
The working group currently working on T10 development is a task force, but will be integrated into the Mack surveillance panel once the test is established.

D.7 Guidelines for Read Across

Recommended Approaches

D.7.1 Is a plan defined to establish data for development of   __A_
BOI and VGRA?

D.7.2 Has VGRA and BOI data been summarized and included in the technical report in D.4.1?   __C__

Comments:

Rating Scale: A - Completed; B - In Progress; C - Planned; D - No Action