

E. A. Hap Thompson  
404 Twin Oaks Lane  
St. Johns, FL 32259  
904-287-9596  
June 22, 2015

## **Sequence VI E**

Sufficient parts are available for matrix and subsequent testing

-Currently there are approximately 78 of the original 150 engines available.  
GM has stated they can supply additional engines; however,  
manufacturing timeline relative to original engines has not been established.

The test has been run at multiple labs

-Approximately 70 tests on reference oils have been completed across 4 of the 6  
labs participating in the precision matrix.

Discrimination has been shown

-Industry statisticians have shown that the prove out data ranks and  
discriminates the chosen reference oils in the same order as the Seq. VID

An estimate of the test precision based on the prove out data has been completed.

The test sponsor has requested additional test data regarding 0W-16 viscosity grade  
performance.

- Once completed, a vote for ready for precision matrix is expected by the  
surveillance panel.

As a result of completing the precision matrix, several procedural updates are expected  
including:

- Estimate of the test precision
- Updated engine hour correction factor
- Updated reference oil severity adjustments
- Number of passing reference oil tests required to calibrate new engine
- Number of candidate oil runs allowed within a reference period

## **Sequence IV B**

Test stand design is finalized; Golden Stand concept is being used; Test hardware is finalized; development testing has been conducted to identify, optimize and finalize the test hardware design; Test cycle (7 / 8 sec transient cycle) is finalized; development testing has been conducted to identify, optimize and finalize the test cycle and operational conditions; Test length (200 hours) is finalized; a 26 test Experimental Design Matrix has been conducted to evaluate, optimize and finalize the test length; Hardware evaluated for wear is not yet finalized; plan to evaluate intake and exhaust camshaft lobes and lifters through the conclusion of the precision matrix, but intake lifter wear is most promising to-date; Wear measurement method (for lifter wear) is not yet finalized; plan to evaluate PDI MicroAnalyzer 2000 w/ standardized fixture, and either laser etched or notched lifters, and Keyence VR3000 3D Macroscopic through the conclusion of the precision matrix; Prove-out testing has been completed at Intertek and SwRI and is currently running at Lubrizol; Test procedure is currently being drafted and reviewed; Development testing has been conducted to evaluate a very good performing oil (5W-20 version of REO3), a 0W-16 version of REO3 and the third IVB precision matrix oil (0W-16 version of Tech 1); Tie-back to IVA has been evaluated using ASTM REO 1006-2, ASTM REO 300 and REO3; Initial test repeatability and reproducibility has been evaluated; a 26 test Experimental Design Matrix has been conducted to evaluate test repeatability and reproducibility (statistically found no stand or lab differences).

Status of industry matrix stands: 5 stands at 3 labs (2 at SwRI, 2 at Intertek, 1 at Lubrizol) installed and operational; the 4 stands at the independent labs have all completed 1 or more prove-out and development tests; the 1 stand at the dependent lab is currently running a prove-out test.

Status of the Golden Stand replacement hardware on-hand for precision matrix + 1 reference period: 100% complete.

Status of the consumable test hardware on-hand for precision matrix + 1 reference period: 100% complete, with the exception of the lifter indexing.

Status of precision matrix: Expected start sometime in late June or early July of 2015.

## **MACK T-13**

The precision matrix was run at 5 labs on 7 stands. Targets were developed for the matrix oils and a reference oil was selected for the testing going forward. Stands have been granted calibration status and candidate testing has begun. Essentially the test development is completed and the test is nearly ready to move from the task force to the surveillance panel.

**I spent 30 hours working on the 3 documents over the past 6 months.**

Respectfully submitted,

*E. A. Hap Thompson*

E. A. Hap Thompson  
Facilitator