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A Program of ASTM International

Sequence IIIH Information Letter 20-5
Sequence Number 18
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ASTM consensus has not been obtained on this information letter. An appropriate ASTM ballot will be issued in order to achieve such consensus.

TO: Sequence III Surveillance Panel

SUBJECT: Alternate Fuel Approval Process

During the December 8, 2020 Sequence III Surveillance Panel Conference call, the panel agreed to allow for alternate fuel suppliers for the fuel used for Sequence IIIH tests. As a result, footnote 19 has been updated to refer to new Annex A14, which delineates the testing requirements for a fuel to be considered as a candidate for an alternate. Reference Documents have also been updated to include API 1525 as a reference.

These revised text and or section(s) have been highlighted in red and are effective with the issuance of this letter.

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Attachment

c: http://www.astmtmc.cmu.edu/ftp/docs/gas/sequenceIII/procedure_and_ils/IIIh/il20-5_IIIH.pdf
Distribution: Email

2.4 *Other Standards:*
MIL-PRF-2104 Performance Specification: Lubricating Oil, Internal Combustion Engine, Combat/Tactical Service[8]
API 1525 Bulk Oil Testing, Handling, and Storage Guidelines Documentation

[19]The sole source of supply of the fuel known to the committee at this time is Haltermann-Solutions. If you are aware of alternative suppliers, please provide the information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible committee,[1] which you may attend. Annex A14 provides testing and other requirements for being considered as an alternate by the Sequence III Surveillance Panel.

A14 Alternate Fuel Approval Requirements

A14.1 For an alternate fuel to be approved for Sequence III tests, the fuel supplier shall demonstrate, through chemical analyses and engine testing, that the fuel provides the same performance to the currently approved fuel. The supplier shall provide a Certificate of Analysis documenting that the fuel meets the current Sequence III fuel specification, as well as conducting a prove-out program.

A14.2 *Prove-out Program*— Complete the prove-out program using the Sequence IIIH test, which is to be performed on three test stands from a minimum of two test laboratories. Test stands chosen shall have completed a minimum of three successful calibration tests in the past 18 months prior to starting this prove-out program, with no failed calibration tests. During the time period spanning from two previous calibration tests through the completion of the prove-out program, there shall be no critical parts batch changes or reference oil re-blends. Use reference oils 434-3, 438-2, and 436 (or subsequent approved re-blends). The test matrix is shown in Table A14.1.

Table A14.1 Testing Order

Stand #1	Stand #2	Stand #3
434-3	438-2	436
436	434-3	438-2
438-2	436	434-3

A14.3 At the completion of testing on all stands conduct an analysis of the test results. The analysis is to be conducted by a recognized industry statistician. A list of industry statisticians is available from the TMC Website, www.astmtmc.org. Use the parameters Percent Viscosity Increase (PVIS), Weighted Piston Deposits (WPD), and Phosphorus Retention (PHOS) in the analysis. For each of these parameters, determine the current exponential weighted moving average, or Z_i, for each test stand immediately prior to beginning the prove-out program. Each test stand will have its own unique set of three Z_i values, one for each parameter. The Z_i value calculated for each stand-parameter combination will be referred to as Z_{cal} in the all subsequent calculations. For each test conducted on a stand, calculate the difference between the standardized test result Y_i and the previously determined Z_{cal} value for each parameter. This difference is the prediction error, or E_i value. That is, $E_i = Y_i - Z_{cal}$. Note that because of the use of Z_{cal} instead of Z_{i-1}, this is slightly different than the definition of E_i in the LTMS document, available from the TMC website, www.astmtmc.org.
Here Y_i is defined as:

$$Y_i = (R - M)/S \qquad\qquad (A14.1)$$

where:
Y_i = standardized test result at test order i,
R = actual reference oil test result expressed as Ln units for PVIS or original units for WPD and PHOS,
M = reference oil target mean from the LTMS and
S = reference oil target standard deviation from the LTMS.

In addition, determine the mean and standard deviation from the nine E_i results obtained on the three parameters with the alternate fuel and form a 95 % confidence interval around the mean E_i value for each parameter:

$$CI = \overline{X} \pm SD \times 0.77 \qquad\qquad (A14.2)$$

where:
CI = 95 % Confidence Interval formed from the nine E_i results,
$\overline{X}$ = mean obtained from the nine E_i results and
SD = standard deviation from the nine E_i results.

(NOTE: The value 0.77 is derived from a t-distribution multiplier of 2.31 based on the 5 % significance level with 8 degrees of freedom divided by the square root of 9 results, which is 3.)

For the proposed fuel to be qualified, the following shall be true of the model results for all three parameters:

A14.3.1 No more than one test with any absolute value $E_i > 2.066$. If a single test has one or more E_i values beyond this limit, discard all data from this test and replace with another test on the same test stand and reference oil. Recalculate $\overline{X}$ and CI using the replaced data point.

A14.3.2 The mean ($\overline{X}$) of the nine E_i results for each parameter shall be less than 0.62.

A14.3.3 The confidence interval (CI) on the mean of E_i results from the fuel being evaluated for each parameter shall have no part of the interval beyond ± 1.5.

A14.3.4 The Surveillance Panel will approve the fuel for use following confirmation of these results. If the supplier believes the fuel is providing equivalent performance to the current approved fuel without meeting the criteria listed above, they may petition the surveillance panel to conduct an additional review. At this point, the actions taken by the Surveillance Panel to accept or reject the fuel will vary depending on the results and judgement of the panel members.

A14.4 *Implementation of a New Fuel* - Each laboratory can choose which approved fuel to use for individual stands, provided all non-reference oil testing is conducted on the same fuel used to calibrate the stand. When switching from one supplier to another, a full Certificate of Analysis shall be conducted on a sample consisting of no more than 10 % of the current batch from the current supplier taken from the purchasing laboratory's tank and at least 90 % of the new batch from the new supplier. The Certificate of Analysis for this blended sample shall meet the current Sequence III fuel specifications. Once approved, a laboratory shall use this Certificate of Analysis only for a storage tank that consists of that same blend of current and new fuel.