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Sequence X Information Letter 24-2
Sequence Number 11
July , 2024

TO: Sequence X Surveillance Panel

SUBJECT: Alternate Fuel Supplier.

As a result of the June 4, 2024 Sequence X Surveillance Panel Conference call and subsequent Email ballot, the panel agreed to allow for alternate fuel suppliers for the fuel used for Sequence X tests. As a result, a new Annex A11, which delineates the testing requirements for a fuel to be considered as a candidate for an alternate.

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:https://www.astmtmc.org/ftp/docs/gas/sequencex/procedure_and_ils/il24-2-x.pdf

Distribution: Email

Revises D8279-24

A11 Alternate Fuel Approval Requirements

A11.1 For an alternate fuel to be approved for Sequence X test, 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 X fuel specification, as well as conducting a prove-out program.

A11.2 *Prove-out Program*—Complete the prove-out program using the Sequence X test, which is to be performed on a minimum two test stands from different test laboratories. Test stands chosen must have an active calibration status. Fuel approval tests are to be run on the same critical parts batches and reference oil blends as the most recent reference on each stand. Reference oil 270 (or subsequent approved re-blends) will be used. The test matrix is shown in Table A11.1. Please note that the testing lab(s) must ensure that the tanks for the alternate fuel program are to be cleaned and have none of the previous fuel blend in them.

Table A11.1 Testing Matrix

Stand #1	Stand #2
270	270
270	270
270	270

In addition, the fuel will be required to show that it can discriminate, using reference oil 271. The results in both stands must meet the requirements given in the LTMS document for showing discrimination with reference oil 271. The supplier can have the discrimination test run at any time in the matrix, i.e., beginning, after run 1, etc.

A11.3 A member of the Subcommittee B statisticians group will conduct the analysis of the results of the test matrix. The list of members can be found using the link "Data Analyst List" found on the TMC homepage. The parameter used in the analysis will be End of Test Chain Wear Percent Elongation (CHST). For this parameter, determine the current exponential weighted moving average, or Zi, for each test stand immediately prior to beginning the prove-out program. Each test stand will have its own unique Zi value. The Zi value calculated for each stand 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 Yi and the previously determined Z_{cal} value. This difference is the prediction error, or Ei value. That is, Ei = Yi – Z_{cal} . Note that because of the use of Z_{cal} instead of Z_{i-1}, this is slightly different than the definition of Ei in the LTMS document. Here Y_i is defined as:

$$Y_i = \frac{R_i - M}{S}$$

where:
Y_i = standardized test result at test order *i*
R_i = actual reference oil test result, expressed as Ln units for CHST
M = reference oil target mean from LTMS, and
S = reference oil target standard deviation from LTMS.

The results of the prove-out testing must meet the following criteria:

A11.3.1 The average of the six Ei results for each parameter shall be less than 0.60.

A11.3.2 A 95% confidence interval on the mean of the Ei results for each parameter shall have no part of the interval beyond +/- 1.5. The interval will be formed as

Sample Mean +/- 1.05 * Sample Standard Deviation

1.05 is derived from a t-distribution multiplier of 2.571 based on the 5% significance level with 5 degrees of freedom divided by the square root of 6 results.

A 11.3.3 If a single test has an Ei value beyond this limit of ±2.066, all data from this test can be discarded and can be replaced with another test on the same test stand and reference oil. Only one replacement can occur.

11.3.4 For the discrimination test, the Zi used for Ei calculation will be the average of the Stand Yi values from the three reference oil 270 results.

A11.4 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.

A11.5 *Implementation of a new fuel* - Each laboratory can choose which approved fuel to use for individual stands, provided all candidate 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 X 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.