



## **GM Vehicle Fuel Economy Test Monitoring System**

### **Introduction**

The GM vehicle fuel economy test procedure (GMVFE)<sup>1</sup> measures an oil's ability to improve fuel economy relative to a baseline oil during vehicle operation. The GM vehicle fuel economy test is a part of GM's dexos<sup>TM</sup> 1 engine oil specification.

### **Definitions**

Day – Monday through Friday, excluding federal holidays, company holidays, or scheduled facility shutdown periods.

Qualification – the process whereby a vehicle installed on a chassis dynamometer demonstrates the capability to correctly evaluate reference oils for fuel economy.

TMC – ASTM Test Monitoring Center

### **Reference Oils**

One reference oil and one baseline oil will be provided by GM and stored at TMC. These oils will be labeled GMVFEHR01 and GMVFEBL02, respectively. TMC will dispense reference and baseline oil to the laboratory as needed.

### **Test Measurement Parameters**

The critical test measurement parameter is percent fuel economy improvement relative to baseline oil.

### **Vehicle Qualification Criteria**

Multiple vehicles at two laboratories have been approved to run the GM fuel economy test. If a new vehicle is obtained, the laboratory will need to prove that the vehicle can correctly evaluate the reference oil for fuel economy.

#### **A. Qualifying a New Vehicle**

1. The laboratory must consult GM before purchasing a new vehicle. GM must approve the new vehicle specifications before the lab is permitted to purchase the vehicle and begin qualification testing.

<sup>1</sup>ISP T0384-2015

2. Once a new vehicle is ready for testing, the laboratory must provide written notification to TMC of the new vehicle. TMC will assign the baseline and reference oils within 2 days of receipt of the notification.
3. The laboratory will run a set of tests on the following oils in the sequence shown below:

GMVFEBL02  
GMVFEHR01  
GMVFEBL02  
GMVFEHR01  
GMVFEBL02

- (a) A set consists of 4 operationally valid tests on each oil. If the variance as defined by the test method for the set is equal to or greater than 0.80%, a fifth test must be run. Eliminate the result with the highest deviation from the mean, and recalculate the variance. If the variance is still equal to or greater than 0.80%, the laboratory, TMC, and GM will confer to determine next steps.
  - (b) The laboratory must report all test results along with operational parameters within 2 days of test completion to TMC, who will perform all calculations necessary for the qualification process.
  - (c) An operationally invalid test will not count toward the test count. The number of operationally invalid tests will be used by TMC and GM as a factor in determining whether a vehicle can be qualified.
4. A test is operationally valid if:
    - (a) The test is run in accordance with the test procedure and is not terminated before its designed conclusion.
    - (b) Every controlled engine operating parameter meets its target value.
  5. TMC will determine pass/fail for the reference oil as follows:
    - (a) The averages of the first and second GMVFEBL02 sets will be combined into an overall baseline average, BL\_AVG1.

- (b) The averages of the second and third GMVFEBL02 sets will be combined into an overall baseline average, BL\_AVG2.
  - (c) The average of the first GMVFEHR01 set and BL\_AVG1 will be used to calculate percent fuel economy improvement, FEI\_HR1.
  - (d) The average of the second GMVFEHR01 set and BL\_AVG2 will be used to calculate percent fuel economy improvement, FEI\_HR2.
  - (e) If both FEI\_HR1 and FEI\_HR2 are at or above 0.8%, the vehicle passes qualification.
  - (f) If both FEI\_HR1 and FEI\_HR2 are less than 0.8%, the vehicle fails qualification.
  - (g) If one of the percent fuel economy improvement results, FEI\_HR1 or FEI\_HR2, is less than 0.8%, TMC will instruct the laboratory to rerun the oils in the sequence GMVFEHR01 followed by GMVFEBL02.
    - i. The averages of the third and fourth GMVFEBL02 sets will be combined into an overall baseline average, BL\_AVG3.
    - ii. The average of the third GMVFEHR01 set and BL\_AVG3 will be used to calculate percent fuel economy improvement, FEI\_HR3.
    - iii. If FEI\_HR3 is at or above 0.8%, the vehicle passes qualification.
    - iv. If FEI\_HR3 is less than 0.8%, the vehicle fails qualification.
6. If the event that a vehicle fails qualification, the laboratory, TMC and GM will investigate the cause and develop an action plan. Once the laboratory submits an attestation to TMC that the action plan has been implemented, TMC will within 2 days of receipt of the notification instruct the laboratory to resume qualification starting at A.3.
7. After receipt of all reference oil results, TMC will provide written confirmation to the laboratory within 2 days whether the vehicle is qualified. The laboratory is permitted to start candidate oil testing immediately upon receipt of an affirmative confirmation.

8. A laboratory must notify TMC of an invalid test within 2 days of occurrence. An operationally invalid test requires the laboratory to submit an action plan to TMC within 5 days after notification, identifying the problem, indicating the action to be taken, and providing a time line for implementation.
9. TMC will provide a written reply approving/disapproving the action plan within 5 days of receipt of the report.
  - (a) TMC may consult GM regarding approving/disapproving the action plan.
  - (b) If TMC approves the action plan, the laboratory must submit an attestation to TMC once the action plan has been implemented. Upon receipt of the attestation, TMC will within 2 days instruct the laboratory to resume qualification starting at A.3.
  - (c) If TMC disapproves the action plan, the laboratory must submit a second plan to TMC specifying the new action to be taken. This iterative process will continue until the action plan is satisfactory. If TMC approves the action plan, the laboratory must submit an attestation to TMC once the action plan has been implemented. Upon receipt of the attestation, TMC will within 2 days instruct the laboratory to resume qualification starting at A.3.
10. If a vehicle experiences two operationally invalid tests during the course of qualification that in the opinion of the laboratory or TMC represents a systemic problem or have no readily identifiable root cause, the laboratory, TMC, and GM will together develop an action plan. Once the laboratory submits an attestation to TMC that the action plan has been implemented, TMC will within 2 days of receipt of the notification instruct the laboratory to resume qualification starting at A.3.

B. Monitoring an Existing Vehicle

1. Each vehicle will be monitored by TMC through periodic reference oil testing.
2. A reference test consists of one operationally valid test set on GMVFEHR01.
3. A newly qualified or existing vehicle must begin a reference test:
  - (a) after no more than 15 candidate test starts or

- (b) no later than 180 days from receiving qualification confirmation from TMC  
or
  - (c) no later than 180 days from the last reference test,
- whichever occurs first.
4. All reference test results must be reported to TMC within 2 days of completion of test.
  5. TMC will determine pass/fail for the reference oil as follows:
    - (a) If the percent fuel economy improvement for GMVFEHR01 is at or above 0.8% relative to the baseline, GMVFEBL02, the vehicle passes the reference test and can continue with candidate testing.
    - (b) If the percent fuel economy improvement for GMVFEHR01 is less than 0.8% relative to the baseline, GMVFEBL02, the laboratory must run another operationally valid test set on GMVFEHR01.
      - i. If the average percent fuel economy improvement for the 2 test sets is at or above 0.8%, the vehicle passes the reference test and can continue with candidate testing.
      - ii. If the average percent fuel economy improvement for the 2 test sets is less than 0.8%, the vehicle fails the reference test and cannot continue with candidate testing.
    - (c) In the event of a failed reference test, the laboratory and TMC will together investigate the cause and develop an action plan. The laboratory or TMC may request the assistance of GM in the investigation and development of an action plan. Once the laboratory submits an attestation to TMC that the action plan has been implemented, TMC will assign the reference oil for testing. The laboratory must begin the reference test with 2 days of receipt of the assignment.
  6. A test is operationally valid if it meets the criteria listed in A.4. A laboratory must notify TMC of an invalid test within 2 days of occurrence. An operationally invalid test requires the laboratory to submit an action plan to TMC within 5 days after

notification, identifying the problem, indicating the action to be taken, and providing a time line for implementation.

7. TMC will provide a written reply approving/disapproving the action to be taken within 5 days of receipt of the report.
  - (a) TMC may consult GM regarding approving/disapproving the action plan.
  - (b) If TMC approves the action plan, the laboratory must submit an attestation to TMC once the action plan has been implemented. Upon receipt of the attestation, TMC will assign the reference oil for testing. The laboratory must begin the reference test with 2 days of receipt of the assignment.
  - (c) If TMC disapproves the action plan, the laboratory must submit a second plan to TMC specifying the new action to be taken. This iterative process will continue until the action plan is satisfactory. If TMC approves the action plan, the laboratory must submit an attestation to TMC once the action plan has been implemented. Upon receipt of the attestation, TMC will assign the reference oil for testing. The laboratory must begin the reference test with 2 days of receipt of the assignment.
8. The TMC, in consultation with General Motors, will review all invalid test declarations to determine if a reason for an invalid test represents a systemic pattern within a vehicle. Re-occurring evidence and the frequency of invalid tests by a laboratory will be a strong factor in determining the need to suspend the vehicle from candidate oil testing. A laboratory will be required to provide detailed explanations for the cause of an invalid test and the action taken to prevent the re-occurrence.

**Release and revision history**

Issue	Date	Description
1	March 2016	Initial release