Mine Safety and Health Admin., Labor

§ 7.87

Test to determine the maximum fuel-air ratio.

(a) Test procedure. (1) Couple the diesel engine to the dynamometer and connect the sampling and measurement devices specified in §7.86.

(2) Prior to testing, zero and span the CO and NOX analyzers to the lowest analyzer range that will be used during this test.

(3) While running the engine, the following shall apply:

(i) The parameter for the laboratory atmospheric factor, \( f_a \), shall be:

\[ 0.98 \leq f_a \leq 1.02; \]

(A) The equation is \( f_a = (99/P_s)^{0.7} \times ((T_a+273)/298)^{0.7} \) for a naturally aspirated and mechanically supercharged engines; or

(B) The equation is \( f_a = (99/P_s)^{0.7} \times ((T_a+273)/298)^{1.5} \) for a turbocharged engine with or without cooling of the intake air.

Where:

\( P_s \) = dry atmospheric pressure (kPa)

\( T_a \) = intake air temperature (°C)

(ii) The air inlet restriction shall be set within ±10 percent of the recommended maximum air inlet restriction as specified by the engine manufacturer at the engine operating condition giving maximum air flow to determine the concentration of CO as specified in paragraph (a)(6) of this section.

(iii) The exhaust backpressure restriction shall be set within ±10 percent of the maximum exhaust backpressure as specified by the engine manufacturer at the engine operating condition giving maximum rated horsepower to determine the concentrations of CO and NOX as specified in paragraph (a)(6) of this section.

\[ (c)(18)(i) \text{ or } (c)(18)(iv) \text{ of this section, then all sample filters shall be discarded and the tests repeated.} \]

\[ (20) \text{ The analytical balance used to determine the weights of all filters shall have a precision (standard deviation) of 20 } \mu \text{g and resolution of 10 } \mu \text{g. For filters less than 70 mm diameter, the precision and resolution shall be 2 } \mu \text{g and 1 } \mu \text{g, respectively.} \]

\[ (21) \text{ All filters shall be neutralized to eliminate the effects of static electricity prior to weighing.} \]
§ 7.88 Test to determine the gaseous ventilation rate.

The test shall be performed in the order listed in Table E–2. The test for determination of the particulate index described in §7.89 may be done simultaneously with this test.

(a) Test procedure. (1) Couple the diesel engine to the dynamometer and attach the sampling and measurement devices specified in §7.86.

(2) A minimum time of 10 minutes is required for each test mode.

(3) CO, CO₂, NOₓ, and CH₄ analyzers shall be zeroed and spanned at the analyzer range to be used prior to testing.

(4) Run the engine.

(i) The parameter for fₚ shall be calculated in accordance with §7.87(a)(3).

(ii) The air inlet and exhaust backpressure restrictions on the engine shall be set as specified in §§7.87(a)(3)(iii) and (iv).

(5) The engine shall be at a steady-state condition before starting the test modes.

(i) The output from the gas analyzers shall be measured and recorded with exhaust gas flowing through the analyzers a minimum of the last three (3) minutes of each mode.

(ii) To evaluate the gaseous emissions, the last 60 seconds of each mode shall be averaged.

(iii) A 1.0 ±0.1 percent CH₄, by volume, shall be injected into the engine’s intake air for category A engines.

(iv) The engine speed and torque shall be measured and recorded at each test mode.

(v) The data required for use in the gaseous ventilation calculations specified in paragraph (a)(9) of this section shall be measured and recorded at each test mode.

(6) Operate the engine at each rated speed and horsepower rating requested by the applicant according to Table E–2 in order to measure the raw exhaust gas concentration, dry basis, of CO, CO₂, NO, and NO₂, and CH₄—exhaust (category A engines only).

(i) Test speeds shall be maintained within ±1 percent of rated speed or ±3 RPM, which ever is greater, except for low idle which shall be within the tolerances established by the manufacturer.

(ii) The specified torque shall be held so that the average over the period during which the measurements are taken is within ±2 percent of the maximum torque at the test speed.

(7) The concentration of CH₄ in the intake air shall be measured for category A engines.

TABLE E–2—GASEOUS TEST MODES

<table>
<thead>
<tr>
<th>Speed</th>
<th>Rated speed</th>
<th>Intermediate speed</th>
<th>Low-idle speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Torque</td>
<td>100</td>
<td>75</td>
<td>50</td>
</tr>
</tbody>
</table>

(8) After completion of the test modes, the following shall be done:

(i) Zero and span the analyzers at the ranges used during the test.

(ii) The gaseous emission test shall be acceptable if the difference in the zero and span results taken before the test and after the test are less than 2 percent.