

SOUTHWEST RESEARCH INSTITUTE®

Fuels and Lubricants Research Division

Sequence IX Engine Test (ASTM D8291)

Specifications

- ILSAC GF-6
- API SN+, SP

Objective

- Evaluates the ability of a motor oil to mitigate pre-ignition in the combustion chambers of gasoline, turbocharged, direct-injection (GTDI) engines under low-speed and high-load operating conditions.

Test Fixture

- Ford 2.0L EcoBoost inline four-cylinder engine as found in the 2012 Ford Explorer.

Test Parameters

- The test consists of 4 iterations. Each iteration is 175,000 ignition cycles from each cylinder with the first 170,000 valid cycles evaluated for the number of pre-ignition events.
- Unleaded Haltermann EEE test fuel is used.

Pre-ignition Event Definition

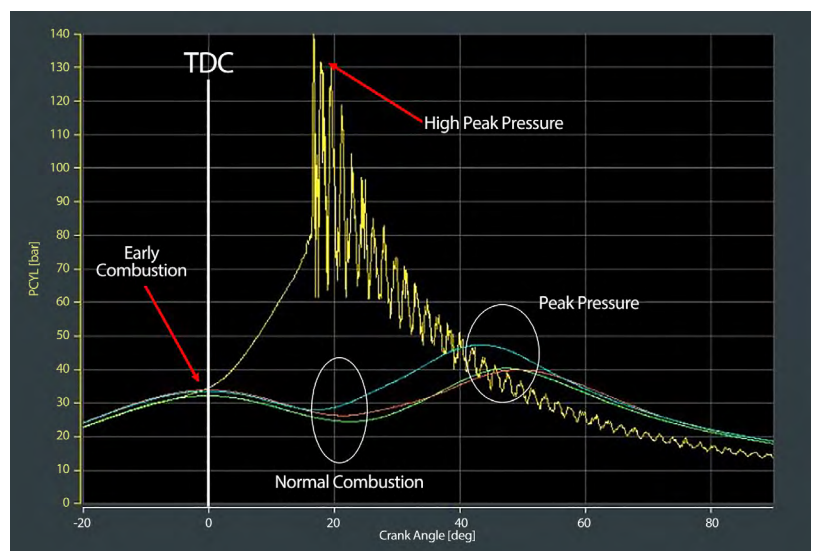
- In-cylinder pressure sensors are used to record the peak pressure of each cycle and the crank angle at which 2% of the mass fraction of fuel is burned (MFB2 calculated from pressure rise).
- A statistical method is applied to find peak pressure (very high) and MFB2 (very early) outliers, and when both conditions are met that is deemed an LSPI event.

Used Lubricant Analysis

- Viscosity @ 40 °C (ASTM D445)
- Viscosity @ 100 °C (ASTM D445)
- Fuel dilution (ASTM D3525)
- Wear metals (ASTM D5185)

Pass/Fail Criteria

	Parameter	Limit
API SN+, SP, GF-6	Average number of pre-ignition events per an iteration over 4 valid iterations (AVPIE)	5 maximum
SP, GF-6	Maximum number of events during any iteration (MAXPIE)	8 maximum





We welcome your inquiries.
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