



Standard Test Method for Evaluating Diesel Fuel Lubricity by an Injection Pump Rig¹

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INTRODUCTION

All diesel fuel injection equipment relies, to some extent, on diesel fuel as a lubricant. Shortened life of diesel fuel injection pumps and injectors from wear caused by excessive friction has sometimes been ascribed to lack of lubricity in the fuel. This test assesses the lubricity of a fuel by operation of the fuel in a typical fuel injection system comprised of injection pump, high pressure pipes, and injectors on a pump test rig bench. The test models an actual commercial application of such equipment. The pump performance is evaluated on a test bench meeting SAE J1668 requirements.

1. Scope

1.1 This test method covers evaluating the lubricity of diesel fuels using a pump rig test and Stanadyne Model DB4427-4782 pumps.

NOTE 1—Other pumps may be used if a correlation between pump performance factors and fuel lubricity has been developed.

1.2 This test method is applicable to any fuel used in diesel engines, including those which may contain a lubricity enhancing additive.

1.3 The values stated in SI units are to be regarded as standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* Specific hazard statements are given in Section 7.

2. Referenced Documents

2.1 ASTM Standards:

D 329 Specification for Acetone²

D 362 Specification for Industrial Grade Toluene³

D 4057 Practice for Manual Sampling of Petroleum and Petroleum Products⁴

D 4177 Practice for Automatic Sampling of Petroleum and Petroleum Products⁴

D 4306 Practice for Aviation Fuel Sample Containers for

Tests Affected by Trace Contamination⁴

D 6078 Test Method for Evaluating Lubricity of Diesel Fuels by the Scuffing Load Ball-on-Cylinder Lubricity Evaluator (SLBOCLE)⁵

D 6079 Test Method for Evaluating Lubricity of Diesel Fuels by the High-Frequency Reciprocating Rig (HFRR)⁵

2.2 SAE Standards:⁶

SAE J967 Calibration Fluid for Diesel Injection Equipment
SAE J968/1 Diesel Injection Pump Testing—Part 1: Calibrating Nozzles and Holder Assemblies

SAE J1418 Fuel Injection Pumps—High Pressure Pipes (Tubing) for Testing

SAE J1668 Diesel Engines—Fuel Injection Pump Testing

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *boundary lubrication, n*—a condition in which the friction and wear between two surfaces in relative motion are determined by the properties of the surfaces and the properties of the contacting fluid, other than bulk viscosity.

3.1.1.1 *Discussion*—Metal to metal contact occurs and the chemistry of the system is involved. Physically adsorbed or chemically reacted soft films (usually very thin) support contact loads. Consequently, some wear is inevitable.

3.1.2 *lubricity, n*—a qualitative term describing the ability of a fluid to affect friction between, and wear to, surfaces in relative motion under load.

3.1.2.1 *Discussion*—In this test method, the lubricity of a fluid is evaluated by comparing critical pump component dimensions, fuel flow rate and transfer pump pressures before and after testing under defined and controlled conditions. A computed value known as pump lubricity value (PLV) results.

¹ This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.E0 on Burner, Diesel, Non-Aviation Gas Turbine, and Marine Fuels.

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² *Annual Book of ASTM Standards*, Vol 06.04.

³ Discontinued. See 1991 *Annual Book of ASTM Standards*, Vol 06.04.

⁴ *Annual Book of ASTM Standards*, Vol 05.02.

⁵ *Annual Book of ASTM Standards*, Vol 05.03.

⁶ Available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001.