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An American National Standard

Standard Test Method for Evaluation of Fluids for Effects on Friction and Wear of Wet Clutches¹

This standard is issued under the fixed designation D 5005; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method evaluates fluids for effects on friction retention, capacity, and traction clutches utilizing fluid wetted friction surfaces.

1.2 The values stated in SI (metric) units are to be regarded as the standard.

1.3 *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems 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. For specific hazard statements, see 7.4 and 8.3.*

2. Referenced Document

2.1 ASTM Standard:

D 235 Specification for Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvent)²

3. Terminology

3.1 Descriptions of Terms Specific to This Standard:

3.1.1 *apply pressure*—fluid pressure supplied to the hydraulic clutch actuating mechanism that causes clutch engagement.

3.1.2 *hold position*—a partially engaged condition where the clutch slips and does not transmit full engine r/min to the output shaft.

3.1.3 *stall test*—a procedure for determining the length of time required to stop an internal combustion engine after a clutch application is made with a fixed output shaft.

3.1.4 *stall time*—the time required for the tractor engine to stop when the power-take-off (PTO) clutch is engaged with a locked PTO shift.

3.1.5 *wear*—the loss of friction material during the test.

4. Summary of Test Method

4.1 A modified tractor is used in conducting this test method. The tractor's power-take-off (PTO) shaft is connected to a load fixture. While the engine is running at wide open throttle, the PTO clutch is engaged in two steps while monitoring engine speed, PTO clutch apply pressure, and PTO shaft output torque. Periodic stall tests are conducted to determine the fluid dynamic friction characteristics. After

2000 cycles, the PTO clutch is inspected and measured.

5. Significance and Use

5.1 This test method measures the friction retention, capacity, and effects on clutch wear of fluids used in traction clutches of on-off highway equipment.

5.2 This test method was developed for this purpose referring to John Deere Standard JDQ42.³

6. Apparatus

6.1 A John Deere (JD) 4250 tractor⁴ equipped with a quadrange transmission is required.

6.2 *External Fluid Cooling/Heating System*—External systems are required to maintain proper operating temperatures for both engine and transmission fluids. Do not use brass or copper in the system that will come in contact with the test fluid.

6.3 *Load Absorption Equipment*—The laboratory load fixture must be equipped as follows:

6.3.1 *Inertia Flywheel*, (14.90 kg·m²).

6.3.2 *Hydraulic Brake*, or equivalent, on the input shaft, (3.4 kN m torque capacity).

6.3.2.1 *Hydraulic Pump*, capable of 15 L/min at 9.0 MPa, to provide hydraulic brake operations (if required).

6.3.2.2 Manner of regulating fixture system pressure (if required).

6.3.2.3 *Electric Solenoid Valve* (normally open), connected to apply the brake pressure when de-energized and release the brake when energized (if required).

6.3.3 *Cooler*, of sufficient capacity to maintain the fixture fluid temperature below 65°C (if required).

6.3.4 *Driveline Torquemeter*, of 4000 N·m minimum capacity.

6.3.5 *Driveshaft*, for connecting the tractor PTO to the load absorption equipment.

6.4 *Cycle Controls*—A timer and mechanism to control the PTO clutch engagement.

6.5 *Recording Equipment*—A means of recording PTO shaft torque simultaneously with PTO clutch pressure and engine r/min.

6.6 *Measurement Equipment*—A device capable of measuring friction disk thickness to 0.01 mm.

7. Reagents and Materials

7.1 *Parts Listing*—A complete parts list is shown in

¹ This test method is under the jurisdiction of ASTM Committee D-2 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.B on Automotive Lubricants.

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² Annual Book of ASTM Standards, Vol 06.03.

³ Available from John Deere and Company, Corporate Standards, John Deere Road, Moline, IL 61265.

⁴ A product of John Deere and Company, John Deere Road, Moline, IL 61265.