



Designation: D5621 – 07 (Reapproved 2013)

## Standard Test Method for Sonic Shear Stability of Hydraulic Fluids<sup>1</sup>

This standard is issued under the fixed designation D5621; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This test method covers the evaluation of the shear stability of hydraulic fluids in terms of the final viscosity that results from irradiating a sample of the hydraulic fluid in a sonic oscillator.

1.2 Evidence has been presented that a good correlation exists between the shear degradation that results from sonic oscillation and that obtained in a vane pump test procedure.<sup>2</sup>

1.3 This test method uses millimetres squared per second ( $\text{mm}^2/\text{s}$ ), an SI unit, as the unit of viscosity. For information, the equivalent unit, cSt, is shown in parentheses.

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.*

### 2. Referenced Documents

2.1 *ASTM Standards:*<sup>3</sup>

D445 Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity)

D2603 Test Method for Sonic Shear Stability of Polymer-Containing Oils

D6022 Practice for Calculation of Permanent Shear Stability Index

### 3. Summary of Test Method

3.1 A convenient volume of hydraulic fluid is irradiated in a sonic oscillator for a period of time and the viscosities before

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<sup>2</sup> Stambaugh, R. L., Kopko, R. J., and Roland, T. F., "Hydraulic Pump Performance—A Basis for Fluid Viscosity Classification", SAE Paper No. 901633. Available from Society of Automotive Engineers, 400 Commonwealth Dr., Warrendale, PA 15096.

<sup>3</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

and after irradiation are determined by Test Method D445. A standard reference fluid containing a readily sheared polymer is run frequently to ensure that the equipment imparts a controlled amount of sonic energy to the sample.

3.2 The conditions to obtain the data for the precision statement were: 30 mL sample, 12.5 min calibration, and 40 min sample irradiation at 0°C jacket temperature.

### 4. Significance and Use

4.1 This test method was developed using Test Method D2603–91.

4.2 This test method permits the evaluation of shear stability with minimum interference from thermal and oxidative factors that may be present in some applications. It has been found applicable to fluids containing both readily sheared and shear-resistant polymers. Correlation with performance in the case of hydraulic applications has been established.

### 5. Apparatus

5.1 *Sonic Shear Unit*, fixed frequency oscillator and sonic horn.

5.2 *Auxiliary Equipment*—To facilitate uniform performance, the following auxiliary equipment is recommended:

5.2.1 *Cooling Bath or Ice Bath*, to maintain a jacket temperature of 0°C.

5.2.2 *Griffin 50-mL Beaker*, borosilicate glass.

5.2.3 *Sonic-Insulated Box*, to enclose the sonic horn to reduce the ambient noise level produced by the sonic shear unit.

5.3 *Viscometer*, any viscometer and bath meeting the requirements of Test Method D445.

### 6. Reference Fluids

6.1 The reference fluid is ASTM Reference Fluid B,<sup>4</sup> a petroleum oil containing a polymer capable of being broken down by turbulence at high rates of shear. This oil has a

<sup>4</sup> The sole source of supply of the fluid known to the committee at this time is Evonik Oil Additives USA, 723 Electronic Drive, Horsham, PA 19044–2228. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,<sup>1</sup> which you may attend.