



# Standard Practice for Calculation of Permanent Shear Stability Index<sup>1</sup>

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## 1. Scope

1.1 This practice specifies the procedure for the calculation of Permanent Shear Stability Index (PSSI) of an additive using viscosities before and after a shearing procedure.

1.2 PSSI is calculated for a single blend component and can then be used to estimate the effects of that component on finished lubricant blends.

1.3 This practice is applicable to many products and may use data from many different test methods. The calculation is presented in its most general form in order not to restrict its use.

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

- D2603 Test Method for Sonic Shear Stability of Polymer-Containing Oils
- D4485 Specification for Performance of Active API Service Category Engine Oils
- D5119 Test Method for Evaluation of Automotive Engine Oils in the CRC L-38 Spark-Ignition Engine (Withdrawn 2003)<sup>3</sup>
- D5275 Test Method for Fuel Injector Shear Stability Test (FISST) for Polymer Containing Fluids
- D5621 Test Method for Sonic Shear Stability of Hydraulic Fluids
- D6278 Test Method for Shear Stability of Polymer Containing Fluids Using a European Diesel Injector Apparatus
- D7109 Test Method for Shear Stability of Polymer Containing Fluids Using a European Diesel Injector Apparatus at 30 and 90 Cycles

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.07 on Flow Properties.

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<sup>2</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.

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

### 2.2 CEC Standards:<sup>4</sup>

- CEC L14A 93 Evaluation of the Mechanical Shear Stability of Lubricating Oils Containing Polymers
- CEC L37 T 85 Shear Stability of Polymer-Containing Oils (FZG)
- CEC L45 T 93 Viscosity Shear Stability of Transmission Lubricants (KRL)

## 3. Terminology

### 3.1 Definitions:

3.1.1 *degree of thickening (DT), n*—the ratio of an oil's viscosity with an additive to that oil's viscosity without the additive. A measure of the amount by which an additive increases the base fluid viscosity.

3.1.2 *permanent shear stability index (PSSI), n*—a measure of the irreversible decrease, resulting from shear, in an oil's viscosity contributed by an additive.

3.1.2.1 *Discussion*—PSSI is a property calculated for a single component. Viscosity Loss (*q.v.*) is a property measured for a finished oil.

3.1.3 *shear, adj*—a relative movement of molecules or molecular aggregates that occurs in flowing liquids. A shear flow is one in which the spatial velocity gradient is perpendicular to the direction of flow.

3.1.3.1 *Discussion*—Not all flow geometries meet this definition.

3.1.4 *shear, v*—to subject a liquid to a shear flow.

3.1.4.1 *Discussion*—Shearing an oil can sometimes cause scission of certain molecular species, resulting in a decrease in viscosity. Not all oils exhibit this response. Common ways of shearing oils to elicit this effect include injection through a small orifice and flow through gears or bearings. Irradiation with sonic energy can also decrease the viscosity of some oils.

3.1.5 *Viscosity Loss (VL), n*—a measure of the decrease in an oil's viscosity.

3.1.5.1 *Discussion*—Viscosity Loss is a property measured for a finished oil. Permanent Shear Stability Index (*q.v.*) is a property calculated for a single component. Some test methods report VL as a relative change, which is dimensionless (for example, Test Methods D2603, D5275, D6278, and D7109).

<sup>4</sup> Available from Organization for Economic Cooperation and Development, Madou Plaza, Place Madou 1, B-1030 Brussels, Belgium.