



## Standard Test Method for Relative Solvency of Petroleum Oils by the PKP Method<sup>1</sup>

This standard is issued under the fixed designation D 5661; 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 a procedure for determining the relative solvency of petroleum oils used in ink formulations by a pentaerythritol ester of resin acids (PKP)<sup>2</sup> titration.

1.2 This test method is applicable to petroleum oils that have an initial boiling point over 90°C and a dry point under 500°C as determined by Method D 86.

1.3 This test method, along with viscosity measurements as determined by Test Method D 445, is used to ensure the compositional consistency of petroleum oils. It can also differentiate between hydrotreated and non-hydrotreated oils that have the same viscosity.

1.4 This test method includes the use of a U.S. Occupational Safety and Health Administration (OSHA)—designated flammable chemical, pentane. Consult the suppliers' material safety data sheet for specific hazard information and guidance relative to use.

1.5 *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 1.3.

### 2. Referenced Documents

#### 2.1 ASTM Standards:

D 86 Test Method for Distillation of Petroleum Products at Atmospheric Pressure<sup>3</sup>

D 445 Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (the Calculation of Dynamic Viscosity)<sup>3</sup>

D 611 Test Methods for Aniline Point and Mixed Aniline Point of Petroleum Products and Hydrocarbon Solvents<sup>3</sup>

D 841 Specification for Nitration Grade Toluene<sup>4</sup>

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.37 on Ink Vehicles.

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<sup>2</sup> Pentalyne®K (PKP) is a pentaerythritol ester of dimeric resin acids and is available from Hercules Incorporated, Resins Group, Hercules Plaza, Wilmington, DE 19894.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 05.01.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 06.04.

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method<sup>5</sup>

### 3. Terminology

#### 3.1 Definitions:

3.1.1 *PKP value of a solvent*—the volume in millilitres, at  $25 \pm 2^\circ\text{C}$ , of pentane required to produce a defined degree of turbidity of a mixture containing 10 g of the test oil and 5 g of a standard solution of a pentaerythritol ester of resin acids in toluene.

### 4. Summary of Test Method

4.1 A 40 % solution by weight of PKP in toluene is standardized in two steps by mixing with toluene and titrating with pentane, and also by mixing with a toluene-heptane solution and titrating with pentane until a turbidity end point is reached.

4.2 The standardized PKP solution is mixed with the test oil and titrated with pentane. The test result is expressed as millilitres of pentane.

### 5. Significance and Use

5.1 PKP values indicate high aromatic or high naphthenic content, or both, which contributes to high relative solvency of the oil.

### 6. Apparatus

6.1 *Magnetic Stirrer*, with stir bar.

6.2 *Erlenmeyer Flask*, 1000-mL capacity.

6.3 *Glass Beaker*, 250-mL capacity.

6.4 *Burette*, 50-mL capacity.

6.5 *Print Specimen*, such as a 152 by 152 mm sheet of newspaper with 10-point type.

6.6 *Analytical Balance*, 100-g capacity, with reproducibility of 0.01 g.

6.7 *Sieve Screen*, 10 mesh.

### 7. Reagents

7.1 *Purity of Reagents*—Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that

<sup>5</sup> *Annual Book of ASTM Standards*, Vol 14.02.