

METHOD 13

REF: Regs. 8-1-206 8- 5-101
 8-6-206 8-18-111
 10-9-301 10- 9-302

DETERMINATION OF THE REID VAPOR PRESSURE OF PETROLEUM PRODUCTS

1) PRINCIPLE

The method provides for air partial saturation of petroleum products with a Reid vapor pressure below 26 lb using a Reid Vapor Pressure Bomb. The gasoline chamber portion of the vapor pressure apparatus is filled with a chilled sample and connected to the air chamber. The apparatus is immersed in a constant temperature bath ($100 \pm 0.2^{\circ}\text{F}$) and shaken periodically, until equilibrium is reached.

2) APPARATUS

2.1 Refrigerator or Freezer

2.2 Reid Vapor Pressure Bomb. This unit is equipped with a 4 in., 0 to 15 psig gauge (Fig. III-6).

2.3 Constant Temperature Water Bath ($100 \pm 0.2^{\circ}\text{F}$)

3) ANALYTICAL PROCEDURE

3.1 Handling of Sample.

3.1.1 The size of the sample container used in taking the sample shall not be less than 1 quart nor more than 1 gallon. The container shall be a solvent can, with a 1-3/4 in. lid opening, and filled to approximately 90% capacity.

3.1.2 In all cases after a sample has been taken, the container shall not be opened unless it has been cooled to $< 32^{\circ}\text{F}$.

3.1.3 Samples shall be put in ice as soon as taken, and transferred to the laboratory for immediate storage in the refrigerator, and stored there until the tests have been completed. Samples in leaky containers shall not be considered for tests but shall be discarded and new samples taken.

3.2 Preparation for Test.

3.2.1 Air Saturation of Sample in Sample Container. Remove the sample container from the refrigerator, unseal it examine it for its liquid content, which shall be approximately 90 percent of the container capacity. After the liquid content has been assured, reseal the container, shake vigorously and return it to the refrigerator.

3.2.2 Preparation of the Gasoline Chamber. Place the open gasoline chamber and the sample transfer connection into the refrigerator for sufficient time to allow the chamber and connection to reach temperature **(32°F to 40°F)**.

3.2.3 Preparation of Air Chamber (100°F Procedure). After rinsing and purging the air chamber, connect the gauge to the air chamber. Immerse the air chamber to at least 1 in. above its top in the water bath maintained at $100 \pm 0.2^\circ\text{F}$ for not less than 10 minutes just before coupling it to the gasoline chamber. Do not remove the air chamber from the bath until the gasoline chamber has been filled as described in Section **3.3**.

3.3 Sample Transfer. With all in readiness, remove the chilled sample from the refrigerator, uncap it and insert the chilled transfer connection and air tube **(Fig. III-5)**. Then place the empty chilled gasoline chamber over the sample delivery tube of the transfer connection. Invert the entire system rapidly so that the gasoline chamber is finally in an upright position with the delivery tube extending to within 1/4" of the bottom of the gasoline chamber. Fill the gasoline chamber to overflowing. Lightly tap the gasoline chamber against the work bench to insure that the sample is free of air bubbles. If any sample is displaced, refill the chamber to overflowing.

3.3.1 Assembly of Apparatus. Without delay and as quickly as possible, attach the air chamber to the gasoline chamber.

3.3.2 Introduction of Apparatus to Bath. Turn the assembled vapor pressure apparatus upside down to allow the sample in the gasoline chamber to run into the air chamber and shake vigorously in a direction parallel to the length of the apparatus. Immerse the assembled apparatus into the bath, maintained at $100 \pm 0.2^\circ\text{F}$, in an inclined position so that the connection of the gasoline and air chamber is below the water level and may be observed closely for leaks. If no

leaks are observed, immerse the apparatus to at least 1" above the top of the air chamber. Observe the apparatus for leaks throughout the test. If a leak is detected, discard the test.

3.3.3 Measurement of Vapor Pressure. After the assembled vapor pressure apparatus has been immersed in the bath for 5 minutes, tap the pressure gauge lightly and record the reading. Withdraw the apparatus from the bath, invert it, shake it vigorously and immediately place back in the bath. At intervals of about 10 minutes, repeat this agitation and gauge observation at least five times, until the last two gauge readings are constant. These operations normally require 60 to 90 minutes. Read the final gauge pressure to the nearest 0.05 psig for gauges with intermediate graduations of 0.1 psig and to the nearest 0.1 psig for gauges with graduation of 0.2 to 0.5 psig. The value obtained is the Reid Vapor Pressure of the sample under test.

3.3.4 A nomograph (**Figs. III-7 and III-8**) is used to convert Reid Vapor Pressure to true vapor pressure (**See Ref. 4.2**).

4) REFERENCE

- 4.1** Vapor Pressure of Petroleum Products (**Reid Method**) ASTM designation D-323-72, Book 23 ASTM Petroleum Products (**1977**).
- 4.2** Nomograph of Petroleum Products Vapor Pressure. Air Pollution Engineering Manual, **2nd** Ed., AP40, 635-636.