Manual of Petroleum Measurement Standards Chapter 12.4.1

Calculation of Petroleum Quantities—Base Prover Volume Determination—Waterdraw Volumetric Method

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Waterdraw Volumetric Method

1 Scope

This document provides standardized calculation methods for the quantification of liquids and the determination of base prover volumes (BPVs) under defined conditions by waterdraw method, regardless of the point of origin or destination or units of measure required by governmental organizations. The criteria contained in this document allows different individuals, using various computer languages on different computer hardware (or manual calculations), to arrive at identical results using the same standardized input data.

This publication rigorously specifies the equations for computing correction factors, rules for rounding, the sequence of the calculations, and the discrimination levels of all numbers to be used in these calculations. No deviations from these specifications are permitted since the intent of this document is to serve as a rigorous standard.

1.1 Application

1.1.1 General

The BPV of a prover (displacement or open tank) may be determined by one of three methods: waterdraw, master meter, or gravimetric.

This document specifies the equations, rules for rounding, the sequence of the calculations, and the discrimination levels for the waterdraw volumetric method.

The operational procedures and acceptance criteria employed to calibrate a prover by the waterdraw method are specified in API *MPMS* Ch. 4.9.2. See API *MPMS* Ch. 4.9.1 for additional information.

1.1.2 Applicable Liquids

The application of this standard shall be limited to potable water, which is assumed to be clean, air/gas free, and to properly implement the procedures to correct measured volumes at flowing temperatures and pressures to corresponding volumes at base (reference or standard) conditions. To accomplish this, the density correlations for water specified in API *MPMS* Ch. 11.4.1 are contained in this document.

1.1.3 Base Conditions

Historically, the measurement of some liquids for custody transfer and process control have been stated in volume units at base (reference or standard) conditions.

The base conditions for the measurement of liquids, such as crude petroleum and its liquid products, having a vapor pressure equal to or less than atmospheric pressure at the base temperature are as follows.

— International System (SI) of Units.

  — Pressure: 101.325 kPa (14.696 psia).

  — Temperature: 15.00 °C (59.0 °F).

— U.S. customary (USC) units.

  — Pressure: 14.696 psia (101.325 kPa).

  — Temperature: 60.0 °F (15.556 °C).