

# **Manual of Petroleum Measurement Standards Chapter 12—Calculation of Petroleum Quantities**

## **Section 2—Calculation of Petroleum Quantities Using Dynamic Measurement Methods and Volumetric Correction Factors**

### **Part 2—Measurement Tickets**

THIRD EDITION, JUNE 2003

REAFFIRMED, FEBRUARY 2016



AMERICAN PETROLEUM INSTITUTE



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## FOREWORD

This five-part publication consolidates and presents standard calculations for metering petroleum liquids using turbine or displacement meters. Units of measure in this publication are in International System (SI) and United States Customary (USC) units consistent with North American industry practices.

This standard has been developed through the cooperative efforts of many individuals from industry under the sponsorship of the American Petroleum Institute and the Gas Processors Association.

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# Chapter 12—Calculation of Petroleum Quantities

## Section 2—Calculation of Petroleum Quantities Using Dynamic Measurement Methods and Volumetric Correction Factors

### Part 2—Measurement Tickets

#### 1 Purpose

When most of the older standards were written, mechanical desk calculators were widely used for calculating measurement documentation, and tabulated values were used more widely than is the case today. Rules for rounding and the choice of how many figures to enter in each calculation step were often made on the spot. As a result, different operators obtained different results from the same data.

This five-part publication consolidates and standardizes calculations pertaining to metering petroleum liquids using turbine or displacement meters and clarifies terms and expressions by eliminating local variations of such terms. The purpose of standardizing calculations is to produce the same unbiased answer from the given data. So that different operators can obtain identical results from the same data, the rules for sequence, rounding, and discrimination of figures (or decimal places) have been defined.

#### 2 Scope

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

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

#### 3 Application of Part 2

The purpose of standardizing the terms and arithmetical procedures employed in calculating the amount of petroleum liquid on a measurement ticket is to avoid disagreement between the parties involved. The purpose of Part 2, “Measurement Tickets,” is to obtain the same unbiased answer from the same measurement data, regardless of who or what does the computing.

Calculations of correction factors and volumes may be done using continuous online integration techniques if agreed between the parties. The results of these calculations may not agree with the methods contained in this standard due to the variability in obtaining flowing parameters. However, the equations for computing correction factors and the rules for rounding, calculation sequence, and discrimination levels for any continuous online integration methods shall be identical to the specifications contained in this standard.

A measurement ticket is a written acknowledgment of a transfer of petroleum liquids and is the legal document of transfer. In addition, it serves as an agreement between the authorized representatives of the parties concerned as to the measured quantities and quality of the liquid. The measurement ticket shall contain all field data required to calculate the metered quantities.

Care must be taken to ensure that all copies of a measurement ticket are legible. Proper fiscal procedures forbid making corrections or erasures on a measurement ticket unless the interested parties agree to do so and initial the ticket to that effect. Should a mistake be made, the ticket should be marked “VOID” and a new ticket prepared. The voided ticket should be attached to the new one to support the validity of the corrected ticket.

#### 4 Organization of Standard

The standard is organized into five separate parts. Part 1 contains a general introduction for dynamic calculations. Part 2 focuses on the calculation of metered quantities for fiscal purposes or measurement tickets. Part 3 applies to meter proving calculations for field operations or proving reports. Parts 4 and 5 apply to the determination of base prover volumes (BPVs).

##### 4.1 PART 1—INTRODUCTION

The base (reference or standard) volumetric determination of metered quantities is discussed along with the general terms required for solution of the equations.

General rules for rounding of numbers, including field data, intermediate calculational numbers, and discrimination levels, are specified.

For the proper use of this standard, prediction of the density of the liquid in both flowing and base conditions is discussed.