Manual of Petroleum Measurement Standards Chapter 5—Metering

Section 1—General Considerations for Measurement by Meters

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FOREWORD

Chapter 5 of the API *Manual of Petroleum Measurement Standards* (API *MPMS*) provides recommendations, based on best industry practice, for the custody transfer metering of liquid hydrocarbons. The various sections of this Chapter are intended to be used in conjunction with API *MPMS* Chapter 6 to provide design criteria for custody transfer metering encountered in most aircraft, marine, pipeline, and terminal applications. The information contained in this chapter may also be applied to non-custody transfer metering.

The chapter deals with the principal types of meters currently in use: displacement meters, turbine meters and Coriolis meters. If other types of meters gain wide acceptance for the measurement of liquid hydrocarbon custody transfers, they will be included in subsequent sections of this chapter.

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Manual of Petroleum Measurements Standards

Chapter 5—Metering

Section 1—General Considerations for Measurement by Meters

5.1.1 Introduction

API *MPMS* Chapter 5 covers the general installation and operation of meters and accessory equipment, without respect to the arrangements necessary to meet special problems. The guidelines are common to all metering systems, but appropriate precautions should be taken when they are used for specialized metering systems, as discussed in API *MPMS* Chapter 6, "Metering Assemblies," and for mass measurement, as discussed in API *MPMS* Chapter 14.8, "Liquefied Petroleum Gas Measurement."

Some of the advantages of metering are as follows:

a. Metering can increase the availability of tanks, since no tank needs to be isolated for the sole purpose of measurement.
b. Metering lends itself to the calculation, indication, and display of instantaneous flow rate and volume.
c. Metering can deliver a measured volume taken from several sources at the same time into a single receiver, or it can deliver a measured volume taken from a single source into several receivers.
d. Metering accuracy can be readily checked by the use of standard references.
e. Metering allows dynamic volume averaging of temperatures and samples to be applied to volumes.

This publication does not endorse or advocate the preferential use of any specific type of equipment or systems, nor is it intended to restrict future development of such equipment.

5.1.2 Scope

API *MPMS* Chapter 5 is intended to be a guide for the proper specification, installation, and operation of meter runs designed to dynamically measure liquid hydrocarbons so that acceptable accuracy, service life, safety, reliability, and quality control can be achieved. API *MPMS* Chapter 5 also includes information that will assist in troubleshooting and improving the performance of meters.

5.1.2.1 FIELD OF APPLICATION

The field of application of API *MPMS* Chapter 5 is the measurement of liquid hydrocarbons and chemicals by meter, at the temperature and pressure conditions that prevail inside a meter during flowing conditions. API *MPMS* Chapter 5 is also concerned with the metering of hydrocarbons that can, by heating, cooling, and/or compressing, be made and kept liquid by maintaining the proper temperature and pressure.

The chapter does not apply to the metering of two-phase fluids.

5.1.3 Referenced Publications

As stated in the foreword, this edition of API *MPMS* Chapter 5 contains six main sections; others may be added if the need arises. The current editions of the following API *MPMS* Standards contain information applicable to this chapter:

API *Manual of Petroleum Measurement Standards*

Chapter 1	"Vocabulary"
Chapter 4	"Proving Systems"
Chapter 6	"Metering Assemblies"
Chapter 7	"Temperature"
Chapter 8	"Sampling"
Chapter 9	"Density"
Chapter 11	"Physical Properties Data"
Chapter 12	"Statistical Aspects of Measuring and Sampling"
Chapter 13	"Application of Statistical Methods"
Chapter 14	"Natural Gas Fluids Measurement"
Chapter 20.1	"Allocation Measurement"
Chapter 21.2	"Flow Measurement Using Electronic Metering Systems"

5.1.4 Considerations for the Design of Meter Installations

The design of meter installations should take into account the following considerations:

a. The installation should be capable of satisfying the required performance characteristics for the application between the maximum and minimum flow rates, at the maximum operating pressure, and over the temperature range and liquid types to be measured. If necessary, the installation should include protective devices that keep the operation of the meter within design limits.
b. The installation should ensure a maximum, dependable operating life. Strainers, filters, air/vapor eliminators, or other protective devices may be provided upstream of the meter to remove solids and/or gases that could cause meter damage, premature meter wear and/or measurement error.
c. The installation should maintain adequate pressure on the liquid in the metering system at all temperatures to ensure