Manual of Petroleum Measurement Standards Chapter 5.8

Measurement of Liquid Hydrocarbons by Ultrasonic Flow Meters

SECOND EDITION, NOVEMBER 2011

ERRATA, FEBRUARY 2014

REAFFIRMED, MAY 2017

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Introduction

This document describes methods for the installation and operation of Ultrasonic Flow Meters (UFMs) when they are used to measure liquid hydrocarbons.

Ultrasonic meters are inferential meters that derive the liquid flow rate by measuring the transit times of high-frequency sound pulses. Transit times are measured from sound pulses traveling diagonally across the pipe, downstream with the flow and upstream against the liquid flow. The difference in these transit times is related to the average liquid flow velocity along multiple acoustic paths. Numerical calculation techniques are then used to compute the average axial liquid flow velocity and the liquid volume flow rate at line conditions through the meter. See Annex A for additional details.

Measurement of Liquid Hydrocarbons by Ultrasonic Flow Meters

1 Scope

1.1 General

This document defines the application criteria for UFMs and addresses the appropriate considerations regarding the liquids to be measured. This document addresses the installation, operation, and maintenance of UFMs in liquid hydrocarbon service.

1.2 Field of Application

The field of application of this standard is the dynamic measurement of liquid hydrocarbons. While this document is specifically written for custody transfer measurement, other acceptable applications may include allocation measurement, check meter measurement, and leak detection measurement. This document only pertains to spool type, multi-path ultrasonic flow meters with permanently affixed acoustic transducer assemblies.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

API *MPMS* Chapter 4.5, *Master-Meter Provers*

API *MPMS* Chapter 4.8, *Operation of Proving Systems*

API *MPMS* Chapter 6.1, *Lease Automatic Custody Transfer (LACT) Systems*

API *MPMS* Chapter 6.2, *Loading Rack Metering Systems*

API *MPMS* Chapter 6.4, *Metering Systems for Aviation Fueling Facilities*

API *MPMS* Chapter 6.5, *Metering Systems for Loading and Unloading Marine Bulk Carriers*

API *MPMS* Chapter 6.6, *Pipeline Metering Systems*

API *MPMS* Chapter 6.7, *Metering Viscous Hydrocarbons*

API *MPMS* Chapter 13.1-1985, *Statistical Concepts and Procedures in Measurement*

API *MPMS* Chapter 21.2, *Electronic Liquid Volume Measurement Using Positive Displacement and Turbine Meters*

3 Terms and Definitions

For the purposes of this document, the following definitions apply.

3.1
acoustic path
The path that the acoustic signals follow as they propagate through the measurement section between the acoustic transducer elements.