Manual of Petroleum Measurement Standards Chapter 5.8

Measurement of Liquid Hydrocarbons by Ultrasonic Flow Meters

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Introduction

This standard is intended to describe methods to achieve custody transfer measurement requirements, including accuracy, when an ultrasonic meter is used to measure liquid hydrocarbons. Ultrasonic flow meters are inferential meters that derive the liquid flow rate by measuring the transit times of high-frequency sound pulses. Multipath ultrasonic meters have at least two independent pairs of measuring transducers (acoustic paths). Applications include, but are not limited to, the dynamic measurement of liquid hydrocarbons flow through production facilities, transmission pipelines, storage facilities, and distribution systems and by end-use customers.

The field of application of this standard is the dynamic measurement of single-phase 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 pertains only to spool-type, multipath ultrasonic flow meters with permanently affixed acoustic transducer assemblies.

It is recognized that meters other than the types described in this document are used to meter liquid hydrocarbons. This publication does not endorse or advocate the preferential use of an ultrasonic meter, nor does it intend to restrict the development of other types of meters. Those who use other types of meters may find sections of this publication useful.

Measurement of Liquid Hydrocarbons by Ultrasonic Flow Meters

1 Scope

This document describes the application, performance, and operation of ultrasonic flow meters (UFMs) in liquid hydrocarbon service.

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 *Manual of Petroleum Measurement Standards (MPMS)* Chapter 4.8, *Operation of Proving Systems*

API *MPMS* Chapter 21.2, *Section 2—Electronic Liquid Volume Measurement Using Positive Displacement and Turbine Meters*

3 Terms, Definitions, Acronyms, and Abbreviations

3.1 Terms and Definitions

For the purposes of this document, the following terms and definitions apply. Terms of more general use can be found in the API *MPMS* Ch. 1 *Terms and Definitions* online database.

3.1.1
accuracy
The closeness of agreement between a measured quantity value and a true quantity value of a measurand.

3.1.2
as-left verification
An as-left verification is performed at multiple flow rate points at the calibration laboratory after the meter has been repaired and/or adjusted, against the laboratory reference standard.

3.1.3
axial flow velocity
The component of liquid flow velocity at a point in the measurement section that is parallel to the measurement section’s axis and in the direction of the flow being measured.

3.1.4
calibration
A set of operations that establish, under specified conditions, the relationship between the values indicated by a measuring device and the corresponding known values indicated when using a suitable measuring standard.

3.1.5
calibration coefficients
Calibration coefficients, also known as calibration factors, are corrections applied in the meter electronics to obtain a meter output matching that of the reference standard.

3.1.6
flow conditioning element
A device for reducing swirl and velocity distortions.