

# **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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## Contents

|   | Page      |
|---|-----------|
| <b>1 Scope</b> .....  | <b>1</b>  |
| <b>1.1 General</b> .....  | <b>1</b>  |
| <b>1.2 Field of Application</b> .....   | <b>2</b>  |
| <b>2 Normative References</b> .....   | <b>1</b>  |
| <b>3 Terms and Definitions</b> .....  | <b>1</b>  |
| <b>4 Design Considerations</b> .....  | <b>2</b>  |
| <b>5 Bi-directional Flow</b> .....  | <b>4</b>  |
| <b>6 Selecting a Meter and Accessory Equipment</b> .....  | <b>4</b>  |
| <b>7 Installation</b> .....   | <b>5</b>  |
| <b>7.1 General</b> .....  | <b>5</b>  |
| <b>7.2 Flow Conditioning</b> .....  | <b>5</b>  |
| <b>7.3 Valves</b> .....   | <b>5</b>  |
| <b>7.4 Electronics</b> .....  | <b>6</b>  |
| <b>7.5 Electrical</b> .....   | <b>6</b>  |
| <b>8 Meter Performance</b> .....  | <b>6</b>  |
| <b>9 Proving Accuracy and Repeatability</b> .....   | <b>7</b>  |
| <b>10 Operation and Maintenance</b> .....   | <b>7</b>  |
| <b>10.1 System Setup</b> .....  | <b>7</b>  |
| <b>10.2 Hardware</b> .....  | <b>7</b>  |
| <b>10.3 Operation of Metering Systems</b> .....   | <b>7</b>  |
| <b>10.4 Setting the UFM Response Time</b> .....   | <b>7</b>  |
| <b>10.5 Pulse Scaling</b> .....   | <b>8</b>  |
| <b>10.6 Methods of Controlling Correction Factor</b> .....  | <b>8</b>  |
| <b>10.7 Zeroing the Meter</b> .....   | <b>9</b>  |
| <b>11 Auditing and Reporting Requirements</b> .....   | <b>9</b>  |
| <b>11.1 General</b> .....   | <b>9</b>  |
| <b>11.2 UFM Configuration Parameters and Settings</b> .....   | <b>9</b>  |
| <b>11.3 Alarm, Event Logs</b> .....   | <b>9</b>  |
| <b>12 Diagnostics</b> .....   | <b>9</b>  |
| <b>13 UFM Security and Access</b> .....   | <b>11</b> |
| <b>Annex A (informative) UFM Measurement Principle</b> .....  | <b>12</b> |
| <b>Annex B (informative) Verification and Validation of Meter Performance</b> .....                 | <b>14</b> |
| <b>Annex C (informative) Manufactured Flow Pulses and Their Impact on the Proving Process</b> ..... | <b>17</b> |
| <b>Annex D (informative) Reynolds Number Performance Curve</b> .....                                | <b>18</b> |
| <b>Bibliography</b> .....   | <b>23</b> |
| <b>Figures</b>  |           |
| <b>1 Typical Elements of a Single UFM Installation</b> .....  | <b>3</b>  |
| <b>2 UFM Main Components</b> .....  | <b>8</b>  |
| <b>A.1 UFM Transit Time Method</b> .....  | <b>13</b> |

## Contents

|   | Page |
|---|------|
| D.1 Flow Profile and Boundary Layer .....                                     | 19   |
| D.2 Increasing Boundary Layer Thickness with Decreasing Reynolds Number ..... | 19   |
| D.3 Constant Boundary Layer Thickness with Constant Reynolds Numbers .....    | 19   |
| D.4 Meter Factor vs Flowrate – 3 Oils .....                                   | 21   |
| D.5 Meter Factor vs Reynolds Number .....                                     | 21   |
| D.6 Meter Factor vs Reynolds Number – Characterized .....                     | 22   |
| <br>  |      |
| <b>Tables</b>   |      |
| B.1 Proving an Ultrasonic Flow Meter .....                                    | 15   |

## 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.