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HM 56

Continuous On-line Measurement of Water Content in Petroleum (Crude Oil and Condensate)

First Edition, October 2010

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Foreword

This publication was prepared jointly by the American Petroleum Institute Committee on Petroleum Measurement and the Energy Institute Hydrocarbon Management Committee.

The American Petroleum Institute Committee on Petroleum Measurement (COPM) and the Energy Institute's Hydrocarbon Management Committee (HMC) are responsible for the production and maintenance of standards and guides covering various aspects of static and dynamic measurement of petroleum. The API/EI Joint Committee on Hydrocarbon Management (JCHM), its sub-committees and work groups consist of technical specialists representing oil companies, equipment manufacturers, service companies, terminal and ship owners and operators. The API/EI JCHM encourages international participation and when producing publications its aim is to represent the best consensus of international technical expertise and good practice. This is the main reason behind the production of joint publications involving cooperation with experts from both the API and EI.

This technical report (TR) is intended to provide a performance basis for the use of on-line measurement of water content in petroleum (crude oil and condensate) in real-time using an On-line Water measurement Device (OWD) and to collect consistent data. However, it is not intended to preclude the use or development of any other technologies or methods. To gain a better understanding of the methods described in this standard, the reader should review in detail the latest editions of the publications, standards, and documents referenced herein.

SI units are used throughout this publication as the primary units of measurement since this system is commonly used in measurement and sampling. However, U.S. Customary (USC) units continue to be used in some applications. Therefore, both SI and USC units are shown (with USC in parentheses).

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Shall: As used in a TR denotes a minimum requirement in order to conform to the requirement.

Should: As used in a TR, denotes a recommendation or that which is advised but not required in order to conform to the requirement.

This publication was produced following API/EI standardisation procedures that ensure appropriate notification and participation in the developmental process and is designated as an API/EI standard.

Questions concerning the interpretation of the content of this publication or comments and questions concerning the procedures under which this publication was developed should be directed in writing to the Director of Standards, American Petroleum Institute, 1220 L Street, NW, Washington, D.C. 20005, USA, or the Technical Department, Energy Institute, 61 New Cavendish Street, London, W1G 7AR, UK.

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Introduction

The purpose of this technical report is to provide guidance for the installation and operation of an On-line Water measurement Device (OWD) for on-line measurement of water content in petroleum (crude oil and condensate) in real-time. Guidance is also provided for the collection of consistent data to allow for long term performance assessment. Applications for the OWD include pipeline and marine applications, use as an operational tool for allocation of production, or other forms of non-custody transfer process management.

OWDs can be used in conjunction with other methods of water determination or as a stand-alone method. However, automatic sampling may be essential for determining other petroleum fluid properties and when the retention of samples is required for audit.

The OWD should be tested for acceptance as described in this technical report, and go through an on-going verification program as described in this technical report. Operation with different crude oils and different conditions may require additional testing and verification. This technology should be viewed as one of several methods to determine the water in petroleum and petroleum products. The method for measuring water in petroleum should be selected with consideration given to installation, application, and properties of the product(s) being measured.

Continuous On-line Measurement of Water in Petroleum (Crude Oil and Condensate)

1 Scope

This technical report will provide guidance for the application, installation, operation, verification, and proving of OWDs for use in the non-custody transfer measurement of water in crude oil and condensate.

2 References

API *Manual of Petroleum Measurement Standards*

API *MPMS*, Chapter 5, Metering

API *MPMS*, Chapter 7, Temperature Determination

API *MPMS*, Chapter 8, Sampling (all sections)

API *MPMS*, Chapter 9, Density Determination

API *MPMS*, Chapter 10, Sediment and Water

API *MPMS*, Chapter 13, Statistical Aspects of Measuring and Sampling

API *MPMS*, Chapter 20.1, Allocation Measurement

API *MPMS*, Chapter 21.2, Flow Measurement Using Electronic Metering Systems

API Recommended Practice 87, *Recommended Practice for Sampling and Analysis for Crude Oil Streams Containing from 2 % to 50 % Water by Volume*

ISO Guide 98 [1], *Uncertainty of Measurement*—Part 3: Guide to the Expression of Uncertainty in Measurement (GUM: 1995)

ISO 3171*, Petroleum Liquids – Automatic Pipeline Sampling*

NFOGM [2], *Handbook of Water Fraction Metering*

NFOGM, *Handbook of Uncertainty Calculations—Fiscal Metering Stations*

3 Definitions

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

3.1
dissolved water
Water in solution in petroleum and petroleum products.

[1] International Organization for Standardization, 1, ch. de la Voie-Creuse, Case postale 56, CH-1211, Geneva 20, Switzerland, www.iso.org.
[2] Norwegian Society for Oil and Gas Measurement, P.O. Box 252, 1326 Lysaker, Norway, www.nfogm.no.