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

First Edition, October 2010

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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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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.