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Natural Gas — Wet gas flow measurement in natural gas operations

Gaz naturel — Mesurage du débit de gaz humide dans les opérations de gaz naturel

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Foreword

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The committee responsible for this document is ISO/TC 193, *Natural Gas*, Subcommitte SC 3, *Upstream Area*.

Introduction

Oil and gas companies started developing Wet Gas Flow Meters (WGFMs) and Multiphase Flow Meters (MPFMs) through extensive R&D activities in the late 1980s. During this period, WGFMs and MPFMs were typically perceived as two distinct technologies for different applications: MPFMs were designed for liquid continuous flow conditions and WGFMs were designed for gas continuous flow conditions. In recent years, however, the operating range of these two technologies has increasingly overlapped, blurring the distinction between a WGFM and MPFM. As wet gas flow is presently considered a subset of multiphase flow, a WGFM is an MPFM that specializes in gas-dominant multiphase flow conditions. In this Technical Report, such technologies will be referred to as WGFMs.

There are many factors that contributed in the decision to replace a separator with a WGFM, with each application warranting careful consideration. A well-designed and maintained separator working within an appropriate flow condition range should produce accurate flow measurements. A primary concern for oil and gas companies was to reduce costs by replacing complex and bulky test separators, as well as to further simplify the upstream infrastructure, in particular for offshore and subsea projects. WGFMs typically require lower capital[1)] and operational[2)] expenditures than fully equipped test separators. More savings in CapEx may be achieved by omitting dedicated test lines in satellite developments. In addition, there is a significant benefit for offshore developments, in terms of weight and space conservation, by using the much smaller footprint of WGFMs.

Due to various operational problems, a conventional test separator does not continuously provide accurate and reliable well test data, giving only relevant information when the well is switched to the test separator. With the use of WGFMs testing well production more frequently or even continuously becomes possible. WGFM developments and extensive testing over the last two decades have resulted in WGFM technology that is a viable alternative to a test separator. Modern WGFMs now offer continuous well monitoring (per installation on individual wells).

WGFM technology is an attractive option for multiphase wet gas flow measurement. Over the last two decades, some WGFMs have been developed from prototypes into very mature, robust, advanced, and field-proven measurement devices, increasing their application scope. Although originally intended for use mainly in reservoir and well production allocations, WGFMs have evolved into a technology that spans even fiscal product allocation. In the latter case, the output of a WGFM is used to determine money transactions between operating companies or between an operating company and a host government.

This Technical Report focuses on the measurement of wet gas flow, i.e. terminology, models, and principles, and the design, implementation, testing, and operation of WGFMs.

1) Capital expenditure (CapEx) or costs for purchasing and installing a WGFM/MPFM includes all hardware to operate the WGFM (data transmission, verification facilities, sampling arrangements, etc.)

2) Operating expenditure (OpEx) or costs to operate a WGFM/MPFM (maintenance, verification processes, sampling for fluid properties, etc.)

