Manual of Petroleum Measurement Standards Chapter 14—Natural Gas Fluid Measurement

Section 12—Measurement of Gas by Vortex Meters

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Contents

Contents

Introduction

This document describes the design, installation and operation of vortex shedding flowmeters for the measurement of hydrocarbon gases and steam flows.

Vortex shedding is a flow phenomenon that occurs when a bluff body is placed in flowing fluid and depending on the size and shape of a bluff body, under certain flowing conditions, alternating vortices are created on the downstream side of the body and detach periodically from either side of the body. The fluid flow past the object, often referred to a the vortex shedder, creates alternating low-pressure vortices on the downstream side of the object.

The vortex shedding frequency, with a few exceptions, is proportional to flow rate. Hence, by monitoring the shedding frequency and through numerical computational techniques, the fluid velocity and flow rate at the actual flowing conditions can be determined.

Chapter 14—Natural Gas Fluid Measurement
Section 12—Measurement of Gas by Vortex Meters

1 Scope

This Standard addresses the following:

a) provides generic information on full-bore vortex shedding flowmeters, including glossary, and sets of engineering equations useful in specifying performance;

b) describes vortex shedding flowmeters in which alternating vortices are shed from one or more bluff bodies installed in a closed conduit;

c) describes how the vortex shedding frequency is used to determine the velocity to infer the volume, mass, and/or energy flow rate and the total gas flow through the meter over a specific time interval;

d) applies only to single phase gas flows in closed conduit that are steady or vary slowly in time. For fiscal measurement, the output of the flow rate shall be within the acceptable limits of steady state flow rate;

e) describes the physical components of vortex shedding flowmeters and identifies need for inspection, certification, and material traceability;

f) addresses the effect of gas properties, installation, and process conditions that may affect the measurement uncertainty and describes guidelines for reducing or eliminating their influences;

g) defines the method for calculating uncertainty of the flow rate measurement;

h) defines the meter output requirements and necessary information pertaining to the meter output for the purpose of fiscal measurement of gas; and

i) provides calibration and/or performance verification guidance for the field application.

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*, 2011

API *MPMS* Chapter 4.2, *Displacement Provers*, Reaffirmed 2011

API *MPMS* Chapter 14.2, AGA Report No. 8/GPA 8185, *Compressibility Factors of Natural Gas and other Related Hydrocarbon Gases*, Reaffirmed 2012