Manual of Petroleum Measurement Standards
Chapter 14.10

Natural Gas Fluids Measurement—Measurement of Flow to Flares

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Introduction

Measurement of flow to flares is important from accounting, mass balance, energy conservation, emissions reduction, and regulatory perspectives. However, measurement of flow to flares remains distinctly different from traditional fiscal measurement practices. Flares are safety-relief systems, which typically receive highly unpredictable rates of flow and varying compositions; for safety reasons, they do not often lend themselves to being taken out of service to accommodate measurement concerns, even for short periods. Therefore, some of the traditional paradigms applicable to fiscal measurement systems, such as reasonably predictable flow rates and composition, the use of in-line prover, capability to readily remove meters from the piping system, the use of by-pass connections, and the use of master meters, for example, have to be abandoned altogether or highly modified in flare measurement applications. Use of measurement systems with diagnostic and verification capability might be one solution to ensure the performance.

Natural Gas Fluids Measurement—Measurement of Flow to Flares

1 Scope

1.1 General

The standard addresses measurement of flow to flares, and includes:

— application considerations;

— selection criteria and other considerations for flare meters and related instrumentation;

— installation considerations;

— limitations of flare measurement technologies;

— calibration;

— operation;

— uncertainty and propagation of error;

— calculations.

The scope of this standard does not include analytical instrumentation.

1.2 Field of Application

For safety and other considerations, it is highly undesirable to directly flare multiphase mixtures of liquids and gases. Therefore, this standard is primarily concerned with flare flow measurement in the gas or vapor phase. However, considering that fouling substances such as liquid droplets and/or mist or other contaminants may be present even in well-designed flare systems, this standard provides appropriate cautionary detail as to the effects of such contaminants that may impact flare flow measurements.

Most flare header applications are designed to operate during non-upset conditions at near-atmospheric pressure and ambient temperature, where compressibility of the mixture is near unity. Extreme conditions have been noted to be between 97.925 kPa-a (14.196 psia) and 414 kPa-a (60 psia), and between –150 °C and 300 °C (–238 °F and 572 °F). Flare gas compositions are highly variable and can range from average molecular weights approaching that of hydrogen to that of iso-pentanes and heavier. The uncertainty in flare gas density associated with varying pressure, temperature, and composition is discussed in more detail in 10.4.

Most flare headers are designed to operate at maximum velocities of 91 m/s (300 ft/s), with extremes up to 183 m/s (600 ft/s). This standard does not exclude pressures, temperatures, and velocity ranges different than those suggested above, as long as all applicable requirements are met.

2 Normative References

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any addenda) applies.

API *Manual of Petroleum Measurement Standards* (*MPMS*) Chapter 21.1, *Flow Measurement Using Electronic Metering Systems—Electronic Gas Measurement*