API MPMS Chapter 14.10 Flare Measurement, what is it, and the benefits to and for the industry

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Flare Gas Flow Measurement

API 14.10 describes the measurement as “…distinctly different from traditional flow measurement…”

The most challenging of flow applications  FLARE GAS

> Variable flow rates with wide dynamic velocity range
  – Low flow = normal flare
  – Moderate flow = inadvertent flare
  – High flow = emergency flare

> Variable Composition
  – Range of hydrocarbons
  – H₂ to C₆+ (typical)

> Corrosive Environment
  – H₂S, HF etc.
  – Liquid dropout

> Low Pressure
  – Atmospheric (slightly negative to slightly positive)

> Wide Temperature Range
  – From –150°C to 280°C overall
Why measure flare gas flow

ACCOUNTABILITY
> Flare Base Load
  – Typically unknown
> Mass Balance
  – Complete balance
  – Drive flaring reduction

STEAM CONTROL
  – Steam Injection
    • Complete burning
    • Smokeless operation
  – Steam Consumption
    • Expensive
    • Flow rate controlled
    • Molecular weight
    – proportion steam
Flare Gas Flow Measurement
API 14.10 describes the measurement technologies available and provides guidelines for use:

**Meter Type**
- Differential Pressure
  - Venturi
  - Orifice Plate
  - Pitot tube
- Thermal
- Optical
  - Scintillation
  - Laser 2-focus
- Vortex Shedding
- Ultrasonic

**Some Guidelines for Flare Gas**
- “not typically used” – pressure loss
- “typically not suitable” – pressure loss
- DP too low for low flow, high flow ok
- Sensitive to gas variations
- Careful alignment, optical surfaces
- Uses particles in flowstream
- Pressure loss, fouling
- Alignment, fouling
Flare Gas Flow Measurement

Environmental Regulation and Legislation are increasingly being applied to flare gas.

The regulations require flare gas flow measurement, and documentation of meter performance.

API 14.10 provides a basis for this performance so manufacturers can supply industry users with the documentation needed for Regulatory Compliance.

This includes:

- **New Flare Gas Application Evaluation**
  - Meter meets accuracy?
  - Pipe layout acceptable?
- **Re-Evaluation Existing Flare Gas Meter**
  - New Regulations-New Meter?
- **Commissioning Procedure**
- **Periodic Field Verification**
  - Meet Regulations on Yearly Verification
  - Report for Users for Compliance
Flare Gas Flow Measurement
Calibration and Uncertainty of Flare gas Flow Measurement

API 14.10 benefits the user of flare gas flow meters by recognizing the difficulty of calibration for this application:

- Very large pipes
- Very High Flow Rates
- Very Low Flow rates
- Low pressure
- Wide Composition Variability

Few facilities can calibrate the full range. Calibration is a challenge whether for type or for individual meters, and varies with meter technology.

A portion of the range of a Flare Gas flow meter may be calibrated to the 5% accuracy and at 30, 60 and 90% of meter range that API 14.10 identifies.

This can be at a third party facility or at the manufactures facility.
Flare Gas Flow meters may be Inline type or Insertion type

In many cases a flare Gas Flow meter is tapped into existing pipe. Performance testing can be done on sensors and electronics, but not on the actual pipe works.

API 14.10 provides a detailed guide for uncertainty calculation which will serve as the evaluation of a flare gas meter.

Performance Testing
• API is developing a test protocol, API MPMS Ch. 22.3, which addresses this subject
Measurement of Flow to Flares
API MPMS 14.10