Production Chemistry Networking Event
Custody Transfer and Allocation Metering
Guidelines and Standards

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Topics

- What is Custody Transfer and Allocation metering?
- Who regulates this metering?
- Who writes the standards used in the regulations?
- Metering standards – crude oil metering system
- Metering standards – natural gas metering system
- Key points to take away
Custody Transfer and Allocation Metering

Terminology

- **Custody Transfer Metering**
  - Custody transfer occurs at any metering system where the ownership of the fluid is being transferred from one party to another
  - Measurement uncertainty for these systems is typically $\pm 1\%$ for gas systems and $\pm 0.25\%$ for liquid
  - Fluid volume (or mass) and fluid composition information both essential for a fair and equitable transaction
  - Following the regulations and standards is a good way of achieving and maintaining these low uncertainties
Custody Transfer and Allocation Metering

**Terminology**

- **Allocation**
  - Several offshore operators all putting hydrocarbons into a shared pipeline to a single on-shore reception terminal
  - Terminal operator will have metering, sampling, and analysis at the terminal to measure the total amount and quality of fluid entering the terminal
  - Offshore operators will (or should!) have metering, sampling and analysis on each installation to determine their pipeline input
  - Metering, sampling and analysis that is used for helping figure out who gets what is known as allocation metering
  - Sometimes allocation metering gets quite complex…
UK North Sea Forties Pipeline

St. Fergus Terminals
Who Regulates Custody Transfer and Allocation Metering?

The regulatory framework for North Sea Operators

- For custody transfer and allocation metering in the UK the Oil & Gas Authority (OGA) is responsible for licensing and regulation
- The Guidance Notes for Petroleum Measurement is the “go-to” document
- In Norway regulation is by the Norwegian Petroleum Directorate (NPD)
- Functional and technical requirements are defined in NORSOK I-106
What are the guidelines based on?

The references used by the regulators…..

- Both the OGA and NPD reference standards from many international bodies
  - International Standards Organisation (ISO)
  - British Standards Institute (BSI)
  - Energy Institute (EI)
  - American Petroleum Institute (API)
  - American Gas Association (AGA)
  - Norwegian Society for Oil and Gas Flow Measurement (NFOGM)
  - The European Gas Research Group (GERG)
  - North Sea Flow Measurement Workshop Papers
One Metering System – Many Standards!

- Countless standards for a typical oil or gas metering system
- Majority not measurement or analysis related, but essential
- **Skid**
  - Pipe and valve selection
  - Welding quality
  - Cable trays
  - Lights
  - Junction boxes
  - Bolts......
- **Control System and Panel**
  - Barriers and isolation
  - Power supplies
  - Cabling......
Primary Flow Element - Liquid Ultrasonic meter

**Liquid Ultrasonic Meter**
ISO 12242:2012 Measurement of fluid flow in closed conduits — Ultrasonic transit-time meters for liquid

Each standard references other standards

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*
One Metering Skid – Many Metering Standards!

Meter proving – turbine master meter

Turbine Master Metering Stream
API MPMS, Chap. 4.5, Master meter provers
API MPMS, Chap. 5.1, Metering – General considerations
API MPMS, Chap. 5.3, Measurement of Liquid Hydrocarbons by Turbine Meters

ISO 7278-1:1987
Liquid hydrocarbons — Dynamic measurement — Proving systems for volumetric meters — Part 1: General principles
One Metering Skid – Many Metering Standards!

Meter Proving – Piston Prover

Compact Prover
API MPMS:
Chapter 4.2 Displacement Provers
Chapter 4.6 Pulse Interpolation
Chapter 4.8 Operation of Proving Systems
Chapter 12.2 Calculation of Petroleum Quantities
Chapter 13 Statistical Aspects of Measuring and Sampling

ISO 7278-1:1987
Liquid hydrocarbons — Dynamic measurement
— Proving systems for volumetric meters —
Part 1: General principles
One Metering Skid – Many Metering Standards!

Fluid mixing and sampling

ISO 3171:1988
Petroleum liquids — Automatic pipeline sampling

Powered Mixer and Automatic Sampling System
API MPMS Chapter 8 Sampling
Section 2-Standard Practice for Automatic Sampling of Liquid Petroleum and Petroleum Products
Another Metering Skid – Many More Metering Standards!

Natural gas custody transfer metering skid – Orifice metering

Orifice Plate Metering Stream
ISO 5167-1:2003
Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full — Part 1: General principles and requirements

ISO 5167-2:2003
Part 2: Orifice plates
Another Metering Skid – Many More Metering Standards!

Natural gas custody transfer metering skid – gas sampling and analysis

Gas Sampling and Analysis system
ISO 6976 Natural gas — Calculation of calorific values, density, relative density and Wobbe indices from composition

ISO 10715:1997 Natural gas — Sampling guidelines

AGA Report No. 8, Part 1, Thermodynamic Properties of Natural Gas and Related Gases, DETAIL and GROSS Equations of State
Summary

Key points to take away

- Custody transfer and allocation metering transactions are very high value
- Mistakes in design and operation can generate significant financial exposures for operators and treasuries
- It is a very heavily regulated segment of the oil and gas industry
- Failure to adhere to the regulations is always painful for the operator
  - Kicked out of pipeline sharing agreement
  - Fines up to £1,000,000 (OGA)
  - Removal of production license.

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What questions do you have for me?