TRAINING TOPICS

CHART RECORDERS

Summary

As used in our industry, chart recorders are generally associated with natural gas measurement and record the static pressure, differential pressure and temperature of a flowing stream over time. Depending on the chart rotation speed, the time covered by a chart might range from one (1) hour to thirty-one (31) days. This SOP covers the installation, maintenance and calibration of chart recorders, troubleshooting guidance, operating principles and other information.

References

- Barton DPU Piping and Startup Practices Version 01C05d, 3/2001
- A.G.A Gas Measurement Manual Part No. 3

EGM CALIBRATION

Summary

As used in our industry, EGM devices are generally associated with natural gas measurement and record the static pressure, differential pressure and temperature of a flowing stream over time. This training covers the installation, maintenance and calibration of EGM devices, troubleshooting guidance, operating principles and other information.

References

- Standard Industry Practice
- A.G.A Gas Measurement Manual Part No. 3, 7, 8, 9, etc.
- API 14.1, 21.1, 21.2
- ABB Operation Manual
- ThermoFlow Operation Manual

ORIFICE PLATE INSPECTIONS

Summary

Orifice plate inspection is a critical part of the measurement process. It is essential to verify the size and condition of the orifice plate and seal ring when inspecting metering stations. As used in our industry, orifice fittings are generally classified as Senior, Junior, Simplex or Flange. This training covers the removal, inspection and installation of orifice plates. Extra material is devoted to the Daniel Senior Fitting since the other fittings require depressurization to remove the plate.

References

- API Chapter 14.3, Part 2
- AGA Report No. 3

MEASUREMENT STATION WITNESSING

Summary

To determine the overall acceptability of a third-party measurement system, equipment and measurement procedures and to fully document the results.

References

- A.G.A Gas Measurement Manual Part No. 3, 7, 8, 9, etc.
- API 14.1, 21.1, 21.2
- GPA
- ASTM
- ISO (for international work)

NATURAL GAS PROCUREMENT

Summary

This training is intended to describe systems and procedures necessary to perform spot, composite or continuous sampling of natural gas streams.

References

- API Chapter 14.1
- GPA Standard 2166

LACT MEASUREMENT

Summary

This training has been prepared as a guide for the design, installation, calibration and operation of a lease automatic custody transfer (LACT) system. LACT equipment includes a meter, a means of proving, devices for determining temperature and pressure, means for sample procurement, flow control, and a way to determine non-merchantable product.

References

- API MPMS Chapter 4, API MPMS Chapter 5, API MPMS Chapter 6, API MPMS Chapter 8
- FMC Smith Meter Inc. Technical Bulletin TP0A013 "LIQUID MEASUREMENT STATION DESIGN," Mr. James C. Fielder
- FMC Smith Meter Inc. Technical Bulletin TP01001 "IMPROVING CUSTODY TRANSFER MEASUREMENT ACCURACY," Mr. Phillip D. Baker

PIPE PROVERS

Summary

This training has been prepared as a guide for the calibration and operation of conventional pipe provers. Pipe provers include bidirectional provers, unidirectional provers, and small-volume piston provers.

References

- API MPMS Chapter 4, API MPMS Chapter 5, API MPMS Chapter 6, API MPMS Chapter 8
- FMC Smith Meter Inc. Technical Bulletin TP0A013 "LIQUID MEASUREMENT STATION DESIGN," Mr. James C. Fielder
- FMC Smith Meter Inc. Technical Bulletin TP01001 "IMPROVING CUSTODY TRANSFER MEASUREMENT ACCURACY," Mr. Phillip D. Baker

Corporate Headquarters
8850 Interchange Drive
Houston, TX 77054

LIQUID PD METERS

Summary

This training covers the unique performance characteristics of displacement meters in liquid hydrocarbon service. A displacement meter is a volume-measuring device that separates a flowing liquid stream into discrete volumes and counts the separated volumes. The meter carries through its measuring element a theoretical swept volume of liquid, plus the slippage for each stroke, revolution or cycle of the moving parts. The indicated volume of the displacement meter must be compared with a known volume that has been determined by proving, as discussed in MPMS Chapter 4.

References

- API Chapter 4 – Proving Systems
- API Chapter 5.2 – Positive Displacement Meters
- API Chapter 12.2 – Calculation Methods
- API Chapter 21.2 – Electronic Liquid Measurement

PROVERS

Summary

The learning objective of this training session will be to state the purpose of meter proving while identifying the main components of provers. We will also look at the operating sequence of provers, along with the know-how of leak testing on a four-way valve and a small-volume prover.

WATER DRAW

Summary

The learning objective of this training will be to state the purpose of calibrating a liquid meter prover. We will review the three types of liquid meter provers used in the industry while describing the major components used in performing a water draw. Accuracy and importance of a water draw will also be reviewed.

MASTER METER PROVING

Summary

This training is intended to describe proving of allocation meters using the master meter method. It will cover displacement, turbine and coriolis meters as master meters. The field of application for this session and technology is any division of the petroleum industry where dynamic flow measurement of applicable fluids is desired. This training is intended for single-phase liquid hydrocarbons.

References

- API Chapter 4.5 – Master Meter Proving
- API Chapter 5.2 – Positive Displacement Meters
- API Chapter 5.3 – Turbine Meters
- API Chapter 5.6 – Coriolis Meters
- API Chapter 11 – Volume Correction Factors
- API Chapter 12 Section 2 – Calculation Methods
- API Chapter 20.1 – Allocation Measurement

METER SWAP-OUT

Summary

This training has been prepared as a guide for the removal and installation of meters (swap out) at facilities where meter proving occurs off-site. The meters are then delivered to a location where the meter proving occurs.

References

- API Chapter 20.1

LIQUID SAMPLE PROCUREMENT

Summary

This training session establishes procedures for obtaining samples of the liquid phase from hydrocarbon sources. It does not address multi-phase sampling.

References

- GPA 2174
- API Chapter 8.1

LACT SAMPLING

Summary

This training has been prepared as a guide for the collection and handling of representative samples from a LACT system. The samples are subsequently analyzed for S&W, density and any other parameters required for custody transfer of the product.

References

- API MPMS Chapter 8.2
- API MPMS Chapter 8.3
- SPL SOP SPL-FLD-L-8.1

LIQUID SAMPLER MAINTENANCE

Summary

This training establishes procedures for installation, repair and maintenance of automatic sampling systems.

References

- Manufacturer's Manuals
- API Chapter 8.2

LIQUID TURBINE METERS

Summary

This training session covers the unique performance characteristics of turbine meters in liquid hydrocarbon service. This procedure is based on, and in compliance with, API MPMS Chapter 5.3.

References

- API Chapter 4 – Proving Systems
- API Chapter 5.3 – Turbine Meters
- API Chapter 12.2 – Calculation Methods
- API Chapter 21.2 – Electronic Liquid Measurement
- SPL SOP-FLD-L-4.2 – Pipe Provers
- SPL SOP-FLD-L-4.5 – Master Meters

Corporate Headquarters
8850 Interchange Drive
Houston, TX 77054

LIQUID CORIOLIS METERS

Summary

This training session covers the unique performance characteristics of Coriolis meters used to measure liquid hydrocarbons. Coriolis meters measure mass flow rate and density. This procedure is based on, and in compliance with, API MPMS Chapter 5.6.

References

- API Chapter 4 – Proving Systems
- API Chapter 5.6 – Coriolis Meters
- API Chapter 12.2 – Calculation Methods
- API Chapter 21.2 – Electronic Liquid Measurement
- SPL SOP-FLD-L-4.2 – Pipe Provers
- SPL SOP-FLD-L-4.5 – Master Meters

FIELD SHRINKAGE

Summary

This training is intended to demonstrate the proper technique for the determination of shrinkage factors in the field. Field shrinkages are sometimes used in allocation measurement.

References

- API MPMS Ch. 11 (Petroleum Measurement Tables)
- API MPMS Ch. 20.1

S&W

Summary

This test method covers the determination of water and sediment in crude oil by means of centrifuge. The amount of water detected using this method is always lower than the actual water content. When a highly accurate value of water is required, use SOP SPL/HE/HY-M39.01, ASTM D4006, Water in Crude Oil by Distillation. If a more accurate value for sediment is required, use SOP SPL/HE/HY-M20.01, ASTM D473, Sediment in Crude Oils and Fuel Oils by the Extraction Method.

References

- API Chapter 10.4 – Determination of Water and/or Sediment in Crude Oil by the Centrifuge Method (Field Procedure)
- ASTM D4007 – Standard Test Method for Water and Sediment in Crude Oil by the Centrifuge Method (Laboratory Procedure)

API GRAVITY

Summary

This test method covers the determination of API Gravity by Hydrometer. The API MPMS Chapters that cover this are API MPMS Chapter 9.1 for hydrometers and API MPMS Chapter 9.3 for thermohydrometers. This method is intended for atmospheric pressure petroleum products. The API Gravity is determined at the observed temperature and then converted to API Gravity at 60°F using the Petroleum Measurement Tables in API MPMS Chapter 11.1.

References

- API Chapter 11.1, Temperature and Pressure Volume Correction Factors for Generalized Crude Oils, Refined Products and Lubricating Oils
- ASTM D287, API Gravity of Crude Petroleum And Petroleum Products
- ASTM D1250, Guide for Use of the Petroleum Measurement Tables
- ASTM E1, Specifications for ASTM Liquid-in-Glass Thermometers

PHYSICAL PROPERTIES

References

- GPA Technical Standard 2145 "Table of Physical Properties for Hydrocarbons and Other Compounds of Interest to the Natural Gas Industry"
- GPA Technical Publication TP-17 "Table of Physical Properties Used In Extended Analyses"
- GPSA Engineering Databook – Section 23, "Physical Properties"
- GPA Technical Standard 2172 "Calculation of Gross Heating Value, Relative Density and Compressibility Factor for Natural Gas Mixtures from Compositional Analysis"

INTRO TO CHROMATOGRAPHY

Summary

Through the course of this training session we will review basic instrument design, carrier gases, pressure regulator, flow controllers, temperature control, injection ports and sample inlets. We will also review columns, detectors and data acquisition systems.

Additional Training Topics:

- Gas Chromatograph Maintenance
- Densitometers
- Specifications & Testing
- Moisture Determination
- H2s Determination
- Ultrasonic Gas Meters
- Gas Coriolis Meters
- Gas Meter Selection
- Pulsation
- Well Testing
- Separators
- Basic Electronics
- Gas Calculations
- Liquid Calculations
- Meter Proving