NIST Training Seminar

Augusta Maine

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Loading Rack Meters

Loading Rack Meters

- EPO No. 25
  - Safety
  - Pretest Determinations
  - Inspection
  - Test Notes
  - Test Procedure

Safety

Safety

- Clothing
  - non-Synthetic
- Electrical Hazards
  - Exposed wiring
  - Sources of Ignition (heat or spark)
- Emergency Procedures
  - Phone Numbers for Emergency Services
  - Basic First Aid Training
- Eye Protection
  - Goggles or Safety Glasses
  - Eye Wash

Safety Cont.

- Fire Extinguisher
  - Portable (20 lb or larger)
  - Dry Chemical
- First Aid Kit
  - Basic Supplies
- Grounding
  - Grounding Cable and lugs
  - Skully System

Safety Cont.

- Ignition Sources
  - Open wiring
  - Exposed Lights
  - Improper Extension Cords
  - Portable Heaters
- Lifting
  - Proper Lifting Techniques
  - Weight Limitations
- Location
  - Condition (wet/slick)
  - Obstructions, Overhead Hazards
  - Petroleum Products, Hazardous Materials of Chemicals (MSDS's)

Safety Cont.

- Material Data Sheets
- Nature of Product
- Personal Protection Equipment
  - Safety Shoes
  - Protective Clothing, Gloves, Eye Wear, Respirator, Barrier Cream
  - Hard Hat
- Safety Cones/Warning Signs
- Static Discharge
  - Grounding
  - Clothing

Safety Cont.

- Support for Prover
  - Proper Leveling Jacks
  - Wheel Chocks
- Switch Loading
  - Diesel Fuel First
- Traffic
- Transportation of Equipment

Pretest Determinations

Pretest Determinations

- Prover
  - Must have a current calibration certificate
  - Seals must be in place
  - Design compatible with system (top/bottom loading
  - Capacity sufficient to hold one minute flow at max rate and not less than 200 L (50 gal) N.3.5.
  - Condition - no dents, rust, water, or foreign material , sight glass clean and not leaking
  - For top loading prover inlet lower than meter outlet
- Thermometers
  - Range 0 ^{0}F to 120 ^{0}F , 0.5 ^{0}F increments, 0.2 ^{0}F accuracy

Pretest Determinations Cont.

- Test Fluid N.1.1.
  - Same characteristics as that measured commercially
- Applicable Requirements G-T, T.1.
  - Basic Tolerances T.2.3.3.
    - Normal tests
      - Acceptance tolerance 0.2 %
      - Maintenance tolerance 0.3 %
    - Special tests
      - Acceptance tolerance and Maintenance tolerance 0.5 %

Inspection

Inspection

- Indicating and recording elements
  - Design
    - Must have indicating element, may have recording element S.1.1.
    - Units in liters or gallons or binary-submultiples or decimal subdivisions S1.2., S.1.2.3.
  - Readability
    - Indicating and recording elements clear, definite, and easily read G-S.5., S.1.4., S.1.5.
    - Required markings distinct, easily readable and permanent G-S.6., G-S.7.

Inspection

- Indicating and recording elements cont.
  - Value of intervals
    - Uniform throughout series G-S.5.3.
    - If designed to indicate more than one unit - value must be appropriately identified G-S.5.3.1.
  - Advancement and return to zero
    - Elements may only be advanced if S.1.3.
      - Cannot be stopped until zero is reached or
      - Indications are automatically obscured until zero is reached

Inspection

- Indicating and recording elements cont.
  - Provision for sealing
    - Provision must be made for sealing electronic adjustable components G-S.8.
    - A security seal must be affixed to any adjustment mechanism designed to be sealed G-UR.4.5.

Inspection

- Measuring elements
  - Effective vapor elimination system S.2.1.
    - Vent lines suitably rigid
  - Means provided for determination of product temperature S.2.6.
  - Provision for applying security seals to meter and automatic temperature compensating system
    - All security seals intact G-UR.4.5., S.2.2., S2.7.3.

Inspection

- Installation
  - Readily accessible for testing G-UR.2.3., G-UR.4.4.
    - Assistance provided if required
  - Liquid cannot be diverted from measuring chamber or discharge line and directional flow valve are automatic S.2.3., S.3.1.
  - No leaks on meter outlet side G-UR.4.1., S.3.1.
    - Leaks on inlet side noted and called to users attention

Inspection

- Installation cont.
  - System and associated equipment installation, and construction do not facilitate fraud G-S.2.
  - Installation is proper and does not adversely affect system performance G-UR2.1., UR.2.1.
  - Actual maximum discharge rate does not exceed manufacturer's specification UR.2.2.

Inspection

- Selection and use
  - Device suitable for application G-UR.1.1., G-UR.1.2.
    - Design
    - Flow rate
    - Computing capability
    - Indicating and recording elements
    - Value of smallest unit and unit price
    - Environment

Inspection

- Selection and use cont.
  - Device and associated equipment operated in manner intended by manufacturer G-UR.3.1., G-UR.4.1.
  - If equipped with mechanical ATCS UR.3.6.1.1.
    - Connected and operable
    - In use at all times

Inspection

- Marking
  - Make, model, and serial number G-S.1.
  - Switches, lights, displays, pushbuttons, controls, and features clearly identified G-S.6.
  - Limitations of use clearly and permanently marked S.4.1.
  - Minimum and maximum discharge rate clearly marked S.4.3.1.
    - Minimum cannot exceed 20 % of maximum

Inspection

- Devices equipped with ATCS
  - Provision to deactivate S.2.7.2.
  - Thermometer well provided for determination of product temperature S.2.7.4.
  - Primary indicating and recording elements marked to show delivered volume has been adjusted to 60 ^{0}F S.4.3.2.

Test Notes

Test Notes

- Level Prover
  - Level indicators working properly
- Connect safety interlock, ground cable and vapor recovery hose if applicable
- Verify all valves closed and pumping mechanism functioning
- Record totalizer reading
  - Before and after each draft

Test Notes

- Minimize temperature differences between meter and prover N.2.
- Minimize splashing in top loading provers and maintain fill spout in consistent position
- Examine printed tickets and invoices
  - Print after every draft G.S.5.6.
  - Computing type
    - Check computations S.1.7.2.
    - Total volume and unit price must accompany total price either printed or handscript UR.3.4.

Test Notes

- Examine printed tickets and invoices cont.
  - Check indicated and recorded values for comparability G-S.5.2.2.
  - With ATCS check invoices for UR.3.6.1.2. a & b
    - Notice that volume has been adjusted to 60 ^{0}F
    - For electronic systems, listing of API gravity, specific gravity, or coefficient of expansion, product temperature, and gross meter reading
  - Without ATCS UR.3.6.2.1., UR.3.6.2.2.
    - If adjusted, notice that volume has been adjusted to 60 ^{0}F
    - Temperature of product used to make adjustment

Test Notes

- Reading meniscus
  - Bottom for transparent liquids
  - Top for opaque liquids
- Draining prover
  - Lower sight glass
    - Close drain valve before liquid reaches zero, wait 30 seconds, open small zero drain valve till zero
      - do not readjust
  - No lower sight glass
    - When drips start wait 30 seconds, close drain

Test Notes

- Temperature readings
  - Read to nearest 0.5 ^{0}F
    - Use matching thermometers
  - Read prover temperature immediately after each accuracy test run
    - Average readings if prover has multiple wells
  - Read meter temperature
    - Thermometer well in measuring chamber or immediately adjacent
    - Read at 1/3 and 2/3 of prover capacity

Test Notes

- Automatic stop mechanism (preset) must stop within one-half the minimum indicated interval G-UR.4.1.

Test Procedure

Test Procedure

- Wet prover
- Empty prover using 30 second drain
- Insert ticket & set preset to prover volume
- Zero meter
- Start pump then open delivery valve
- At end of each run read prover & determine meter error
  - Repeat run if test result is near or out of tolerance

Test Procedure

- Notes for Repair Personnel
  - At least two runs at same flow rate to determine repeatability
    - Individual runs within applicable tolerance
    - Difference not to exceed 40 % of applied tolerance
  - Adjust meter if out of tolerance
    - Deactivate ATCS if necessary
    - Check performance of temperature sensor

Test Procedure

- Accuracy tests - *no ATCS* N.5.
  - Normal test - full flow N.4.1., N.4.1.1., T.2.3.
    - Flow rate within meter rating G-UR.3.1., G-UR.2.2.
  - Special test - slow flow N.4.2., N.4.2.4., T.2.3.
    - Fill prover at minimum flow rate marked on meter
- Read temperature at meter and prover make corrections for meter and prover readings

Test Procedure

- Accuracy tests - *no ATCS* N.5.
  - Normal test - full flow N.4.1., N.4.1.1., T.2.3.
    - Flow rate within meter rating G-UR.3.1., G-UR.2.2.
    - Average product temperature at meter - read at 1/3 & 2/3 of prover capacity
    - Product temperature in prover
- Correct prover, product in prover, & meter readings for temperature difference from 60 ^{0}F

Test Procedure

- Accuracy tests - *no ATCS* N.5.
  - Special test - slow flow N.4.2., N.4.2.4., T.2.3.
    - Fill prover at minimum flow rate marked on meter
    - Average product temperature at meter - read at 1/3 & 2/3 of prover capacity
    - Product temperature in prover
- Correct prover, product in prover, & meter readings for temperature difference from 60 ^{0}F

Test Procedure

- Accuracy tests of temperature compensated meter - indication in “net” gallons
  - Normal full flow test - *With ATCS activated*
    - Average product temperature at meter - read at 1/3 & 2/3 of prover capacity
      - Only to note large variation
    - Product temperature in prover
  - Correct prover reading & product in prover for temperature difference from 60 ^{0}F

Test Procedure

- Accuracy tests of temperature compensated meter - *ATCS deactivated*
  - Normal full flow test
    - Average product temperature at meter - read at 1/3 & 2/3 of prover capacity
    - Product temperature in prover
  - Correct prover, product in prover, & meter readings for temperature difference from 60 ^{0}F

Test Procedure

- Accuracy tests of temperature compensated meter
  - Special test slow flow - *ATCS deactivated*
    - Average product temperature at meter - read at 1/3 & 2/3 of prover capacity
    - Product temperature in prover
  - Correct prover, product in prover, & meter readings for temperature difference from 60 ^{0}F

Test Procedure

- Accuracy tests - For meters that display both “net” and “gross” deliveries
  - For “gross” delivery indication use correction procedure for meter without temperature compensation for normal & special tests
  - For “net” delivery indication use procedure for meter with ATCS for normal & special tests

Test Procedure

- For system with ATCS
  - Difference in meter error with ATCS activated and ATCS deactivated shall not exceed
    - –0.2 % for mechanical ATCS and
    - –0.1% for electronic ATCS T.2.3.3.

Test Procedure

- Security seal
  - Provision for security seals S.2.2.
  - Seals in place & intact G-UR.4.5.
- Wet-hose system S.3.9.
  - Check effectiveness of anti-drain valve
- Dry-hose system S.3.6.
  - Check for complete drainage of hose

Test Procedure

- RFI/EMI
  - Test with associated equipment only
    - Test only if a problem is suspected
    - G-N.2., G-UR.1.2., G-UR.3.2., G.UR.4.2.