Monitoring Cathodic Protection of Natural Gas Pipelines

Period #8

Basic Corrosion Course
2017
Introduction

Chapter Objective:

– Reasons to monitor
– What to monitor
– Regulatory Requirements
– Record Keeping
Reasons to Monitor

• The “U.S. Department of Transportation Regulations for Gas Pipelines”, gives specific requirements for monitoring cathodic protection systems.

  – D.O.T. regulations
    • 192 Subpart I
    • 195 Liquid

• Cathodic protection is necessary to enhance public safety.
Reasons to Monitor

• **Economics**
  – Repairs/leaks
    • Including cost of excavations
  – Lost Product
    • Lost revenue
  – Project Investment
    • Limited dollars
    • Need to spend money wisely
  – Cost of Monitoring
    • New technologies - “smart” test stations (RMU)
Reasons to Monitor

• **Rectifiers**
  - Depend On Constant Power
  - Cable Breaks
  - Anode Failures

• **Galvanic Anodes**
  - Calculated Life
  - Determine their Effectiveness
Reasons to Monitor

• New Construction
  – P/L Crossings
    • Shorted pipeline
    • Stray current
  – Damage to Structures
    • Coating damage
  – UST’S at Gas Stations
    • Foreign rectifier interference
  – Inform Personnel regarding C.P.
    • Additional training
    • Information sharing
Reasons to Monitor

• **Excellent Source for maintaining a sound cathodic protection system.**

  - NACE Standard Practice –SPO169-2013** (pipelines), SP0285-2011 (underground tanks), *Control of External Corrosion on Underground or Submerged Metallic piping System.*
What to Monitor

• **Pipe to Soil Potential:**
  – Once each calendar year, at intervals of no more than 15 months.
  – Separately protected sections not exceeding 100’ (10% each year)
  – First line of defense in maintaining good C.P.
  – Effectiveness of C.P.
  – Proper Instruments

– Readings:
  • Distribution
  • Transmission
  • UST’s
  • AST’s
What to Monitor

• **Test Stations**
  
  – **Condition**
    
    • Repair or replace broken or lost stations.
  
  – Connections to Pipe.
  
  – Service lines as test points for mains.

• **Current Flow**
  
  – On Pipelines
  
  – Anode Outputs
What to Monitor

• Rectifiers
  – 6X per year not to exceed 2 ½ mo.
  – Physical Inspection
    • Check cabinet for presence of voltage first
  – Outputs
  – Efficiency:
    Percent Efficiency = \( \frac{DC\ Power\ Out}{AC\ Power\ In} \times 100 \)
    DC power out (watts) = \( V_{dc} \times I_{dc} \)
    *If a watt-hour meter is used to determine input power, use the following formula:
    AC Input Power = \( \frac{3,600 \times K \times N}{T} \)
    *Where K= meter constant (shown on face of meter as kh), N= # of revolutions of the disk (60 sec. minimum), and T = time in seconds of observation
What to Monitor

• **Galvanic Anodes**
  - Current Output
    • Ammeter
    • Shunts
  - Life Calculations
  - Clamp on Ammeter

• **Critical Bonds**
  - 6X per year not to exceed 2 ½ mo.
  - Non-critical – 1X per year
  - Importance
What to Monitor

• **Unprotected Pipe**
  – Pipe w/o full C.P.
  – CFR 192.465
    • Re-evaluate every 3 years not to exceed 39 mo.
  – Hot Spot C.P.

• **Exposed Buried Pipe**
  – Bare or poorly coated (Gas)
  – All pipe (liquid)

• **Above Grade Pipe**
  – Atmospheric Corrosion
What to Monitor

• Isolation
  – Shorts
  – Methods
  – Repairs
  – Need to keep effective

– Section 192.467 of the DOT regulations covers the installation and testing of electrical isolation.
Record Keeping

• Required by D.O.T. regulation Section 192.491.
• Provides history of operation and maintenance of C.P.
• Provides a basis for scheduling repairs or maintenance.
• As built drawings
• Keep for the life of structure
If you don’t Monitor!

- Safety – Loss of life and or injuries
- Violations – Fines
- Malfunctions
- Losses
  - Product
  - Investments/Assets

Don’t bury It & Forget It! – C.P. needs Maintenance
Summary

– Discussed reasons to monitor
– Discussed what to monitor
– Identified Regulatory requirements
– Discussed the importance of Record Keeping
Question?

Comments

Thank you for Attending the Purdue Basic Session