Gas System – Mains by Material

1987
4,114 Miles

- Unprot. Steel 45%
- Cast Iron 42%
- Protected Steel 6%
- Plastic 7%

2006
4,306 Miles

- Unprot. Steel 30%
- Cast Iron 32%
- Protected Steel 10%
- Plastic 28%
- 1,396 Miles
- 1,194 Miles
- 1,304 Miles
- 412 Miles
Estimated Emissions Reduction

• Emissions reduction of over 135 MMscf per year

• Savings of almost $1,000,000 per year

• Avoided maintenance costs
Leak Backlog

Year End Actual

Year End Goal

conEdison
Emission Reduction Methods

• Repair
• System Pressure Optimization
• Pipe Replacement / Rehabilitation
Cast Iron Mains (32%)

- Manufactured in 12 foot sections
- Joined using bell and spigot joints, subject to leaking
- Highly resistant to corrosion
- Extremely brittle, subject to cracking
Pressure Optimization

• Leaks on Cast Iron Pipe
  • 1396 miles x 5280 ft/mile = 7,370,880 ft
  • 1 joint every 12 ft = 614,240 joints on system

• Leakage on CI joints can be reduced by 50% if pressure is lowered from 11” wc to 6” wc.
Leak Migration vs. Pressure

- Migration at 10° w.c.
- Migration at 7° w.c.
Eliminating Leaks on Cast Iron

- Replacement
- Joint Repair
- Internal Lining
Replacement Methods

• Direct Bury
  • Costly
  • Upsize main in areas where increased pressure / flow required

• Insert
  • Reduced capacity

• Con Split
Con Split

- Minimize Excavation
- Upsize or same size installation
- Used in Cast Iron without sleeve
- Need to be away from other utilities
- Service lateral density will increase cost
Joint Repair

• Keyhole
  • Small Excavation
  • Not for High Temps

• CISBOT
  • Internal / Live
  • Seal 25 Joints from one Excavation
  • 6” – 12”
Internal Lining

- Cured in Place Liners
  - Starline
- Tight Fit Polyethylene
  - Rolldown
    - Size for Size Insertion
    - Reduction of Capacity
- Subline
  - Size for Size
  - Minimal Reduction of Capacity
Starline – Cured in Place Liner

Components of Liner
- Polyester woven liner
- Polyurethane coating
Starline Process

1. Surface preparation / Pipe cleaning
   - Grit-blasting method
   - Required to obtain the proper bonding strength
   - Abrasive is propelled through the blast hose at 100 psi
   - Recovery of the grit is obtained by a high capacity vacuum system
Starline Process

2. Adhesive Mixing

2-part Polyurethane adhesive mix

• Adhesive
• Hardener

3. Liner wet-out / Adhesive application

• Pour adhesive into liner
• Pull liner through calibrated rollers
Starline Process

4. Liner Inversion

1. Wound on reel of pressure drum
2. Bolted onto inversion cone
3. Attached to host pipe
4. Liner forced to invert inside host pipe
5. Liner ends at catch basket
Starline – Cured in Place Liner
Starline Process

5. Steam curing & pressure monitoring

Steam Boiler

Mixing Chamber

Temperature and Pressure Control

Liner

Air Compressor
Starline Process

6. Post-lining inspection
7. Service reinstatement (if necessary)
8. Final pipe construction and restoration
Rolldown

- Developed by Subterra UK.
- Concentric reduction and installation of close-fit PE pipe liners
- Uses standard PE-80/PE-100 pipe Uses thick-walled PE pipe
- Diameter reduction is typically 10%
- Reverted to a close fit by cold water pressurisation
Rolldown - Process

- Diameter range 4” - 20” SDR 11 - 33
- Bends up to 11¼° can be negotiated
- Typical lining lengths 1000 feet
- Long insertion trench required
- Excavations required to reconnect service connections/laterals etc
Rolldown - Process
Subline is a process for the cold folding and installation of close-fit, thin-wall PE pipe liners.

- Uses standard PE-80/PE-100 pipe.
- Subline was developed to allow lining of large diameter pipes & improve ability to negotiate bends.
- Liner insertion process is simple slip lining.
- Reverted to a close fit by cold water pressurisation.
Subline

- Available for PE diameters 3” – 59”
- SDR 26 - 80, depending on diameter
- Folded shape helps insertion, bends up to 22½° can be negotiated
- Lengths up to 1000 ft
- Long lead-in trenches for welded PE strings
- Local excavations to reconnect service connections/laterals etc
Subline - Process