

Composite Wrap

Lessons Learned

from Natural Gas STAR



**NiSource and
EPA's Natural Gas STAR Program**

June 3, 2003

Composite Wrap



Source: Armor Plate

**Permanent On-Line
Pipeline Repair
Technology**



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- Use of 30 wrap repairs versus line replacements could save 70,000 Mcf/yr netting almost \$130,000 in savings
- Repairs with pipeline in service average 2 days versus 5-7 days for typical cut & weld pipe replacements

**A QUICK & SAFE WAY
to improve profitability &
AVOID VENTING
METHANE!**



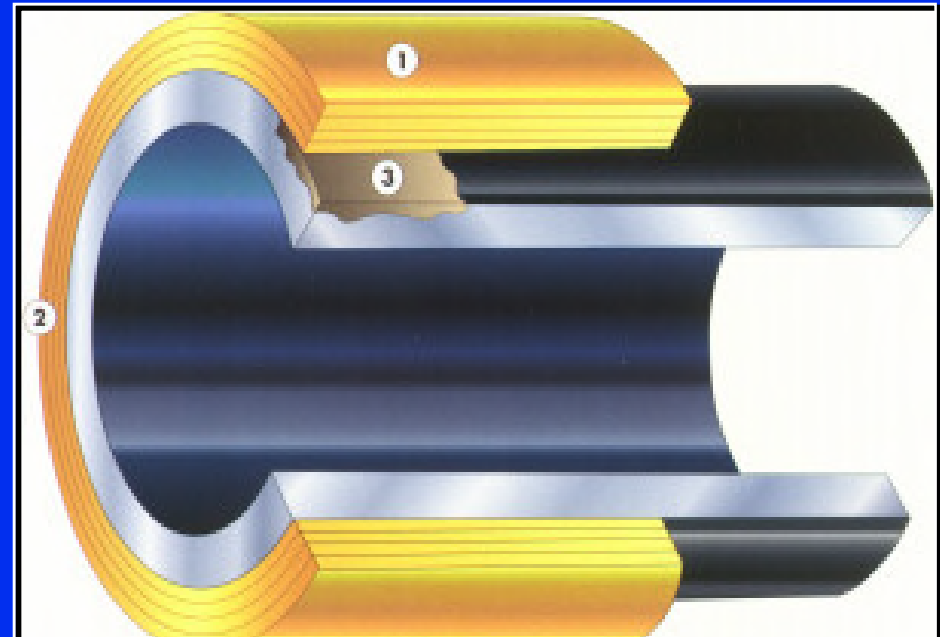
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- **Before January 13th, 2000** repair methods were restricted to replacement, or use of full encirclement steel sleeves welded in place
- **And now** the steel sleeve requirement is amended to allow composite wrap sleeves



Composite Wrap What Are They?

1. A high strength glass fiber composite or laminate
2. An adhesive or resin bonding system
3. A high-compressive-strength load transfer filler compound



Source: Clock Spring® Company L. P.



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Composite Wrap Software

- **Software will determine:**
 - ◆ if a repair is needed
 - ◆ if a composite wrap is suitable
 - ◆ or if a pipe replacement is required

- **Defects up to 80% loss wall thickness can be repaired with composite wrap**

- **There may be pressure and temperature restrictions on composite wrap**



Composite Wrap Installation

- **After excavation and pipe preparation**
 - ◆ External defects are filled with filler
 - ◆ Composite wrap wound around pipe with adhesive or laminating agents
 - ◆ Typically 2" of wrap must extend beyond damage
 - ◆ After mandated drying or curing time, excavation site refilled
- **While lines can be repaired at full pressure, reducing pressure improves quality of repair**



Source: Armor Plate



Composite Wrap Decision Process

1. Determine suitability of composite wrap technique for repair option
2. Calculate cost for composite wrap and consider other benefits of on-line repair
3. Estimate methane savings
4. Calculate avoided costs of line replacement
5. Evaluate economics



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Step1: Determine Suitable Application

- ❑ Evaluate nature of defect and causal factors
- ❑ Evaluate operational needs and job site factors
- ❑ Follow industry standards, such as ASME, and your company engineering policies and procedures



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Step 2: Cost of Wrap Repair

GIVEN: 6" non-leaking defect in 24" line @ 350 psi

Estimate: 16 hours to repair

Cost of labor: Field Labor: 3 men @\$30/hr = \$1,440

Eng Mgmt: 25% of \$1,440 = \$ 360

Cost of Equipment: Wrap Kit = \$ 900

Backhoe & Sandblaster = \$ 750

Other: Permits/Inspection/Misc = \$1,650



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Step 3: Estimate Methane Savings

Methane Savings = Emissions avoided from line replacement

$$\begin{aligned}\text{Volume of methane(Mcf)} &= (D^2 * P * (L/1,000) * 0.372) / 1,000 \\ &= 24 * 24 * 350 (52,800 / 1,000) * 0.372 / 1,000 \\ &= 3,960 \text{ Mcf @ } \$3/\text{Mcf} \\ &= \$11,900\end{aligned}$$

Note: for 10 miles between block valves



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Step 4: Calculate Purge Gas Savings

Purge Gas saved = Purge Gas used during line replacement

$$\begin{aligned}\text{Volume of Purge Gas} &= [3.14 * D^2 * L / (4 * 144 * 1,000)] * 1.2 \\ &= [3.14 * 24 * 24 * 52,800 / (4 * 144 * 1,000)] * 1.2 \\ &= 200 \text{ Mcf @ } \$4/\text{Mcf of nitrogen} \\ &= \$800\end{aligned}$$

Note: for 10 miles between block valves, assuming 20% wastage



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Step 4(cont'd): Replacement Line Cost

GIVEN: 6" non-leaking defect in 24" line @ 350psi

Assume: replace 6' of line (3 times pipe diameter)

Estimate: 40 hours to repair

Cost of labor: Field labor: 4 men @\$30/hr = \$4,800
Eng Mgmt: 25% of \$4,800 = \$1,200

Cost of Equipment: 6' pipe @ \$50/ft = \$ 300
Backhoe, Welder & Crane = \$3,700

Other: Permits/Inspection/Misc = \$4,500



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Step 5: Evaluate the Economics

| 24" Line @ 350 psi | | |
|----------------------------------|---------------------|-----------------------|
| 6" Defect | | |
| 10 miles between shut off valves | | |
| | Composite Wrap - \$ | Line Replacement - \$ |
| Methane Savings | 11,900 | none |
| Purge Gas | 0 | 800 |
| Labor | 1,800 | 6,000 |
| Equipment & Materials | 1,650 | 4,000 |
| Other | 1,650 | 4,500 |
| Total Cost of Repairs | 5,100 | 15,300 |
| Pay Back | IMMEDIATE!! | |

INTANGIBLES:

- Safety
- Environmental impacts
- Site access
- Service interruption



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Composite Wrap Partner Experience

- 300+ wraps on 10” or greater lines since 1995
- Limits repairs to 4 butted wraps, then replaces
- 20” defect in line near creek bed: limited environmental exposure, wrapped in 2 hours; total repair 2 days start to finish



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Composite Wrap Lessons Learned

- ❑ Proven permanent repair for external defects
- ❑ Temporary repair for internal faults
- ❑ In-service pipeline repair methodology
- ❑ Ideal for urgent and quick repair
- ❑ Avoid service disruptions
- ❑ Cost effective versus alternatives
- ❑ Trained but not skilled crafts persons required
- ❑ Specialized welding and lifting equipment not required
- ❑ Minimizes access concerns
- ❑ No delays awaiting metal sleeve
- ❑ Cathodic protection remains functional



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Composite Wrap Contacts

- www.epa.gov/gasstar/
- EPA Natural Gas Star Managers
- Vendors of composite wrap kits
 - ◆ Armor Plate, Inc.
 - <http://www.armorplateonline.com>
 - ◆ The Clock Spring® Company L.P.
 - <http://www.clockspring.com>
 - ◆ The StrongBack Corporation
 - <http://www.strongbackcorp.com>
 - ◆ WrapMaster, Inc.
 - <http://www.wrapm.com>



Composite Wrap Discussion Questions

- Has anyone used composite wrap repairs?
- What are the barriers(technological, lack of information, regulatory, and etc.) that are preventing you from implementing this technology?
- Would anyone like to elaborate on the information provided in this presentation?

