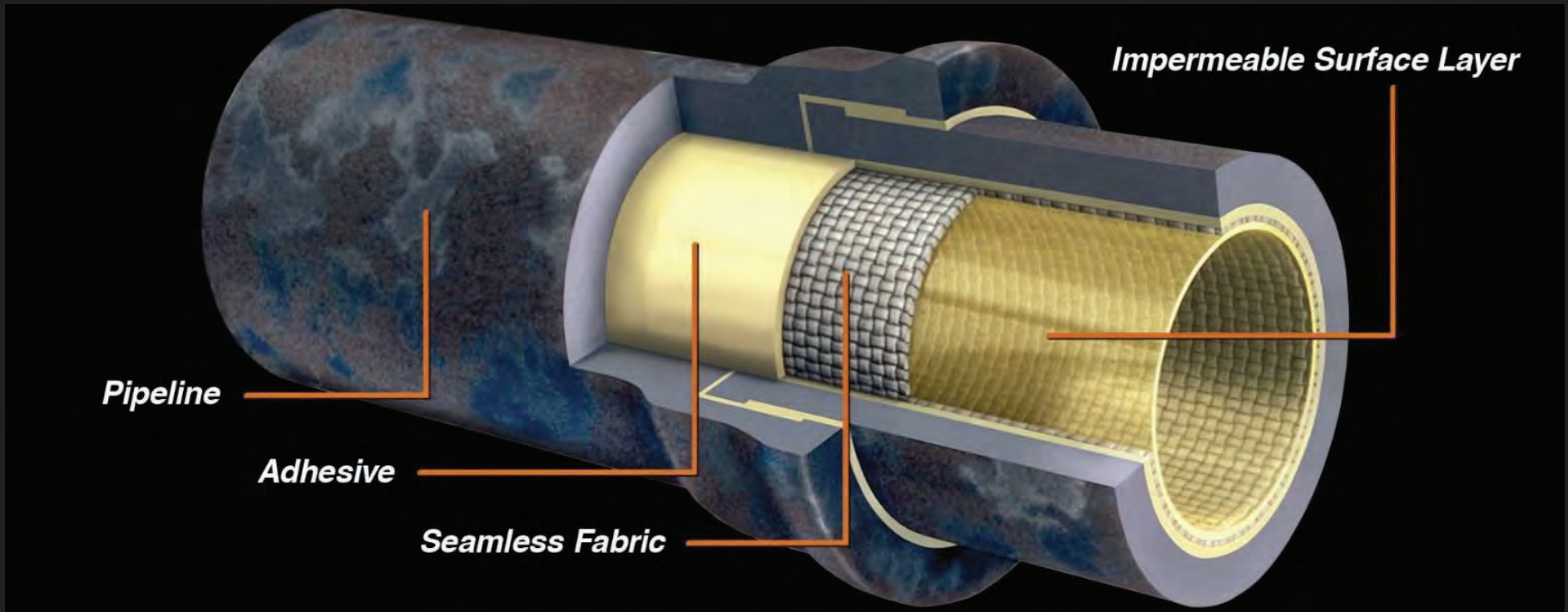


Trenchless Reconditioning of Natural Gas Pipelines via Cured-In-Place-Lining (CIPL)



Your Presenter



Casey Giambrone

Vice President of Engineering

Progressive Pipeline Management

CFG@progressivepipe.com

Cell: (631) 339-3075



Casey is an MBA and Industrial Engineer who has the ability to balance sharp technical understanding with a business mindset. Before joining the PPM family in 2020, his career included twenty years with National Grid. Casey led and managed a group of thirteen engineers within the Public Works department. He was responsible for National Grid's New York City and Long Island City State Construction practice and helped create the NYC Public Works Tracking System. Casey leads cured-in-place-lining projects across the U.S. with a present focus in New Jersey, Baltimore, Chicago, and New England. He is spearheading the launch of PPM's Broadband Electromagnetic Probe (BEM) main ferrous assessment tool. The patented technology is effective for investigating cast iron, ductile iron and steel pipelines of all diameters.

A Compelling Need for Trenchless



Wall St, NYC - 1917

A Compelling Need for Trenchless

The Cured-In-Place (CIPL) lining application is a trenchless technology designed to recondition and renew existing metallic gas and pressure pipelines.

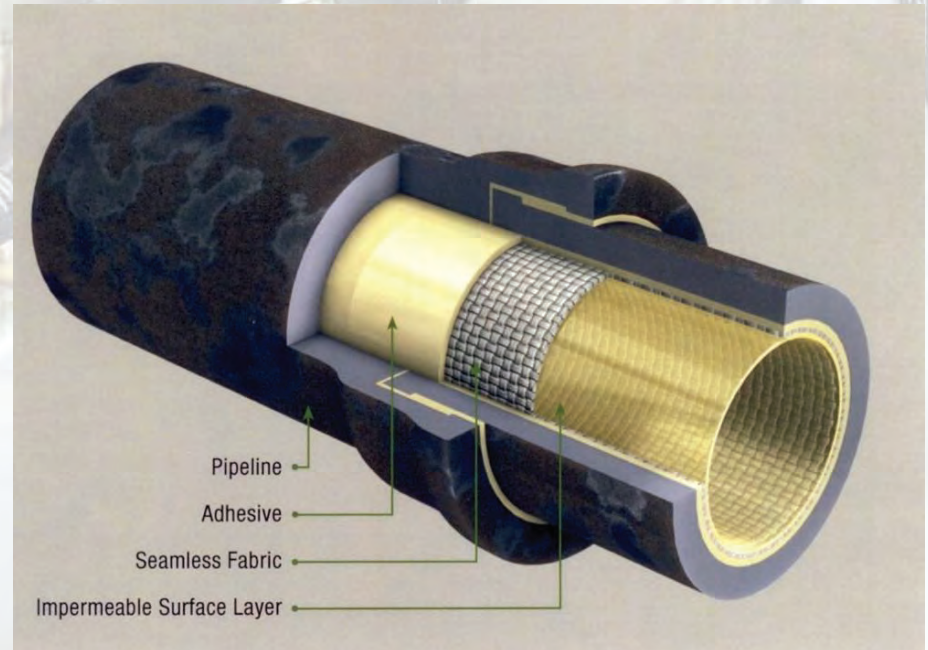
- Elimination of Methane Gas Emissions
- Pipe sections of up to 1,000 feet in length
- Metallic Natural Gas & Pressure Pipelines - 4" through 48" in pipe diameter
- Can Negotiate Multiple Bends, Open Valves, Tap Holes & Laterals
- Has been tested to withstand 100 years of service.
- The service life of a CIPL lined pipe is equal to that of a new pipe



What is CIPL?

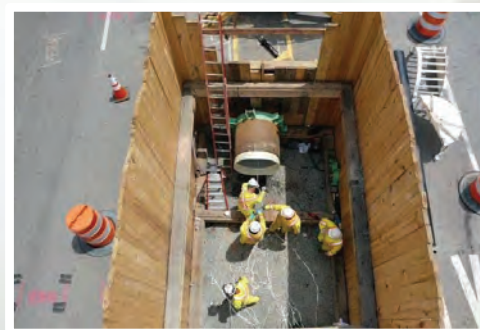
1. **Seamless Circular Woven fabric made of Polyester Yarns**
2. **Polyurethane Non- Permeable Inner Skin**
3. **Solvent Free 2-part Epoxy Adhesive**
4. **Host Pipe**
5. **Collectively a Composite Pipeline**

CIPL versus CIPP (Bonding is the Key!)



Benefits of CIPL

- ❑ Adds 100+ Years of NEW Service Life
- ❑ Seals ALL Leaks & Prevents Future Leaks
- ❑ Minimizes Excavations, Traffic Congestion & Restoration
- ❑ Eliminates Internal Corrosion
- ❑ **Green** Technology That Eliminates Methane Emissions



Lining Process

CCTV

PRE-CLEAN INSPECTION

- Determine amount of surface prep needed on interior of pipe segment.
- Confirm there are no unmarked obstacles or anomalies.
- Identification of service taps

POST-CLEAN INSPECTION

- Determine if cleaning operation passes inspection, and if additional cleaning is required
- Wheeled crawler with pan and tilt camera gives operator full 360° image.
- CCTV records video of all finds, and measurements are logged in a field report to be presented to client.



Lining Process

SURFACE PREPERATION "CLEANING"

- Proprietary "Abrasive Blast" cleaning process
- Simultaneous vacuum recovery of cleaning waste
- Post-cleaning CCTV Inspection



Lining Process

Surface Preparation "Cleaning"



NACE Industry Standard
 "National Association of Corrosion Engineers"

	Brush Off SSPC SP7 NACE No.4 ISO Sa 1	Industrial SSPC SP14 NACE No.8 ISO --	Commercial SSPC SP6 NACE No.3 ISO SA 2	Near White SSPC SP10 NACE No.2 ISO --	White Metal SSPC SP5 NACE No.1 ISO SA 3
Loose Material	None	None	None	None	None
Tight Material	100%	up to 10%	None	None	None
Stains, Shadows	100%	100%	up to 33%	up to 5%	None

Lining Process

VACUUM COLLECTING

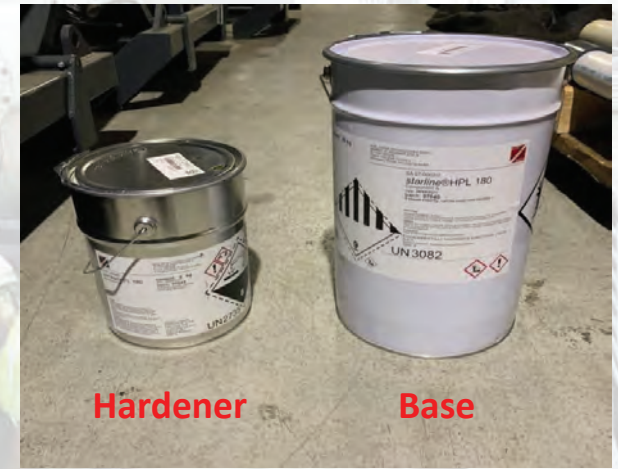
- Used to capture all debris within pipe while sandblasting
- 20,000 CFM, air velocity greater than 45 mph
- Anemometer measures velocity at mouth of pipe
- Smaller Footprint, Very Quiet, Easy Assembly



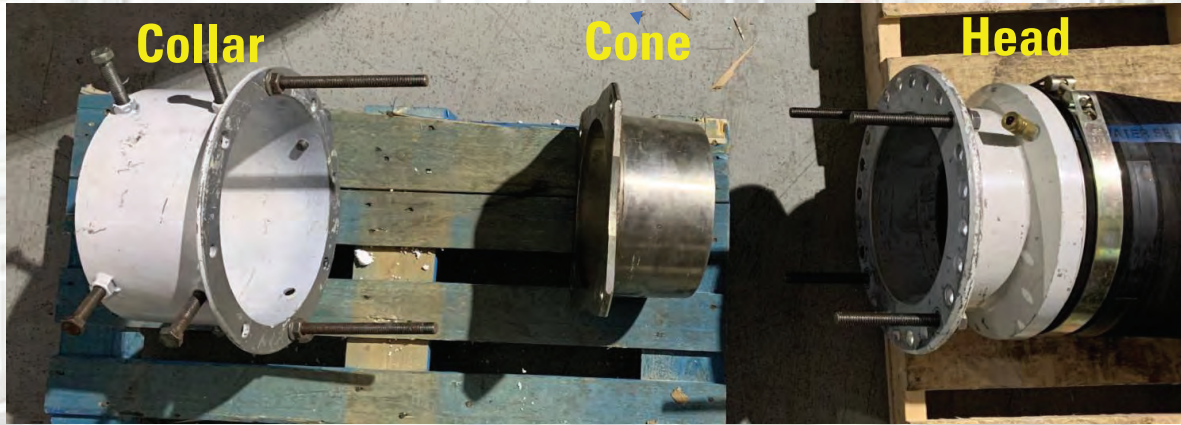
Lining Process

LINER "WET-OUT"

- Hand-mix 2 component Epoxy adhesive (Non-Haz)
- PPM's adhesive is not "glue."
 - epoxy that is moldable
 - fills any surface irregularities, gaps, holes, cracks or fissures.
- Add adhesive to liner (rollers ensure 100% saturation)
- Load liner into pressure drum



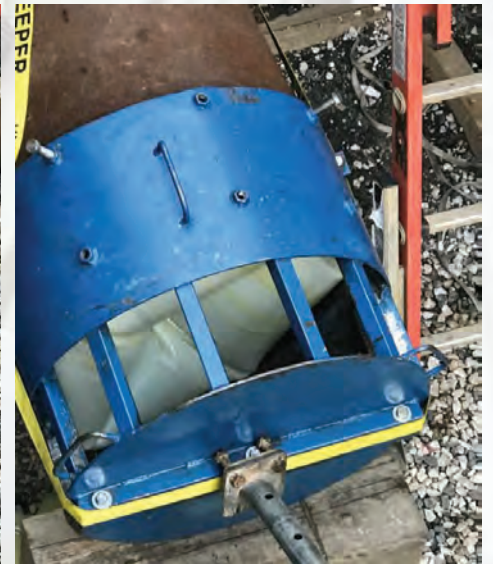
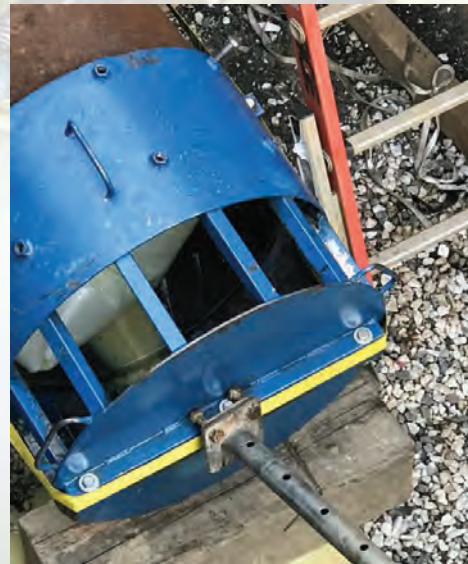
Lining Process



Lining Process

LINER INVERSION

- “Invert” liner into cleaned pipe with air pressure
- Compressed air inverts the liner “inside-out” into the host pipe where the adhesive-impregnated-fibers come into direct contact with the cleaned surfaces of the main.
- Begin curing process

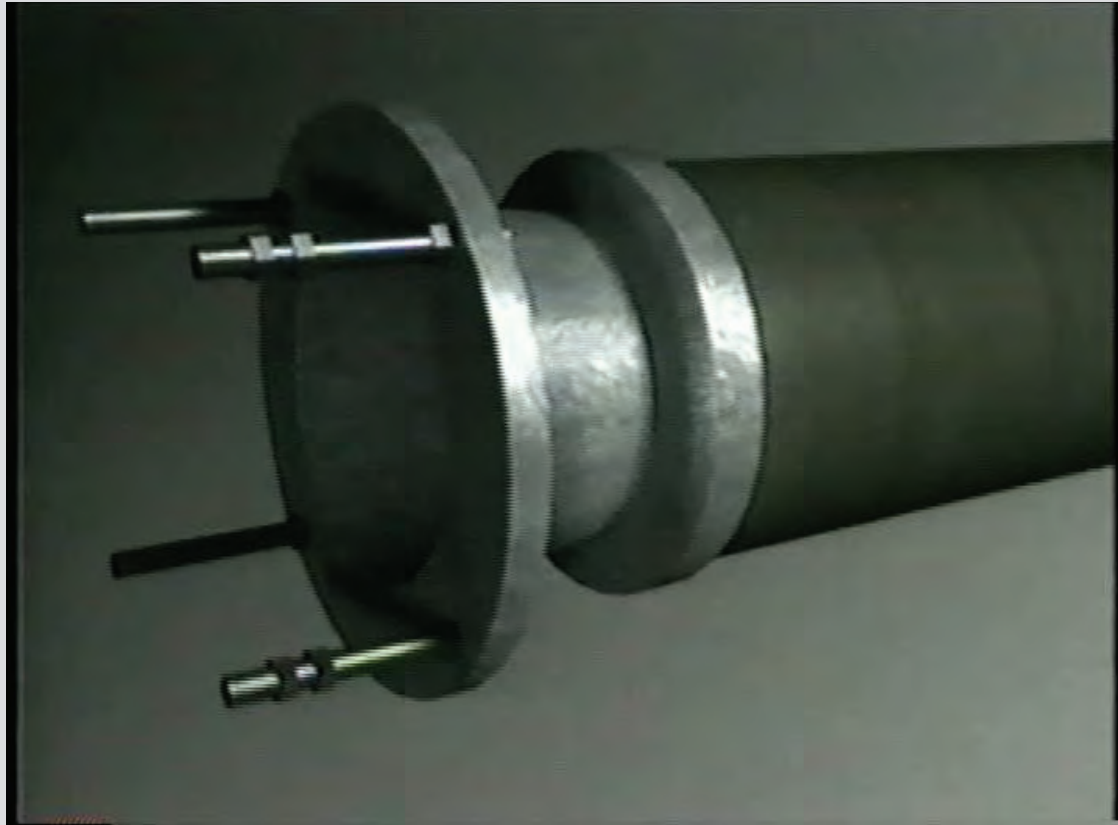


Cleaning Process Animation



[PIPELINE CLEANING VIDEO](#)

Lining Process Animation

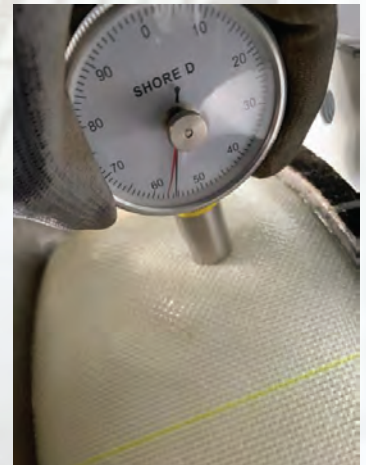


[CIPL INSERTION VIDEO](#)

Lining Process

LINER CURING

- The adhesive requires approximately 16 to 24 hours to fully cure in normal temperature ranges.
- A calibrated data recorder is used, to ensure consistency and monitor the internal pressure of the lined pipe.
- Nitrogen cannisters are attached to main to replace any drop in original pressure caused by ambient temperature.
- A hardness meter or Durometer is used to ensure liner is cured. A fully cured liner will have a hardness of 48 or above.



Lining Process

POST-LINE INSPECTION

- After liner has cured and utility's pressure test has passed, the main is depressurized and all hardware is removed.
- Ends of liner are trimmed flush.
- Laterals, tees, services, etc. are reinstated robotically with cutting tool.
- Post-line CCTV Inspection is performed.



Site Selection

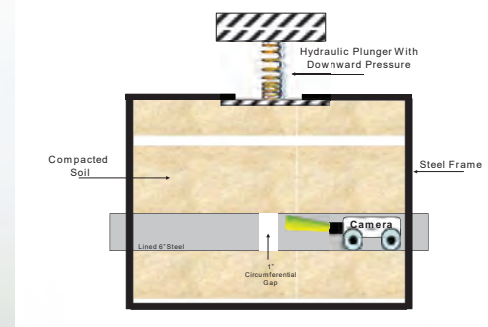
- **Crossings (Bridges, Railroads, Rivers, Highways, Intersections)**
- **Large Diameter Pipe Where Throughput Cannot be Reduced**
- **Urban Centers & Areas of High Concern (Schools, Churches, Hospitals)**
- **High \$ Restoration areas (Curb to Curb Paving, Stringent & Costly Stips)**
- **Leak Prone Or Areas Where Methane Emissions are detected**



CIPL Testing

- Over \$15 Million Invested in Testing Longevity & Performance
- 2002: ASTM Testing for F2207-02 and 2006 for F2207-06 to 300psi
- 2004: NYS Cast Iron Undermine Testing
- 2010: Worse Case Corrosion Testing for Bare Steel Pipelines
- 2017: DOT / PHMSA Longevity Testing at Cornell – “100 Year Test”

<https://www.youtube.com/watch?v=rwmX0yvUy9s>



CIPL Experience

- 2022 - 1,550,000 Feet RENEWED with CIPL (since founding of company)
- 2021 - 36" Cast Iron aka "The Mess" (NASTT Project of the Year Winner)
- 2019 - 600' of 42" Cast Iron with 6 Offsets – Largest Diameter Ever (at the time)
- 2018 - 1,500' of 36" Cast Iron (NASTT Project of the Year Winner)
- 2011 - Structural Reinforcement Sleeve (NASTT Project of the Year Winner)
- 2006 - 16" Citizens Tunnel (NASTT Project of the Year Runner Up)



Questions



PPM PROGRESSIVE
PIPELINE
MANAGEMENT
THE INFRASTRUCTURE RENEWAL SPECIALISTS

CASEY F. GIAMBRONE

Vice President of Engineering

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