Water Transmission & Sewer Force Main Renewal – 16” through 60”

SWAGELINING™

LIFE EXTENDING TECHNOLOGY
FOR NEW AND EXISTING PIPELINES

North American Operations

1973 S 91st Street

Milwaukee WI 53227

4700 N Pearl Street

Jacksonville FL 32206

office 414.321.2247 • fax 414.321.2297

www.swagelining.com

MPC Murphy Pipeline Contractors, Inc.

Our History

- Millions of feet of static pipe bursting & Swagelining™ experience world wide
- North America's most diverse and experienced trenchless technology management team
- Granted sole partnership for Swagelining™ in North America
- 2003 Trenchless Project of the Year Nominee
- 2005 Trenchless Project of the Year Nominee
- 2008 CSX Rail Performance & Safety Awards
- 2009 APWA Environmental Project of the Year
- 2010 UCTA Most Valuable Professional – Andy Mayer
- Lead instructor and advisor to the AWWA, EPA, state regulatory agencies and trenchless equipment manufactures

MPC Murphy Pipeline Contractors, Inc.

Our Services

- Trenchless Design
  - Design Build
  - Feasibility study
  - Cost analysis
  - Evaluation of replacement / refurbishment alternatives
  - Engineering
- Trenchless Construction
  - Swagelining™
  - Slip lining
  - Pipe bursting
  - Pre-chlorinated Pipe bursting
  - Pipe splitting

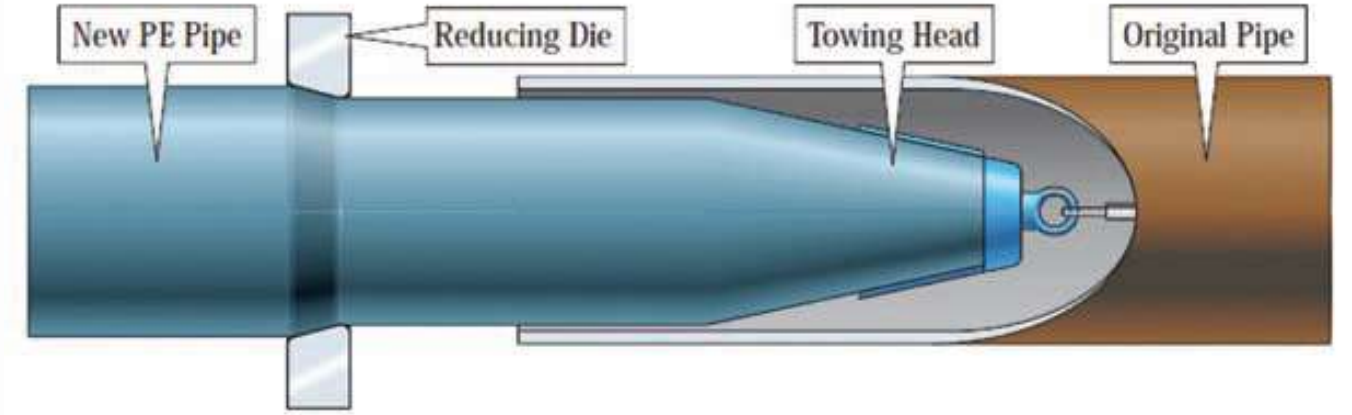
United Kingdom – British Gas

Development of Swagelining™ & Pipe bursting in 1970's

Swagelining™ History

- History
  - Method developed by British Gas (1970's) and patented for gas distribution
  - Success led to potable water crossover
  - Swagelining™ over 17,300,000 feet installed in the past 28 years
- Today
  - Currently used to renew water, force main, gas, oil, mining, slurry, chemical, industrial, salt water and off-shore pipelines world wide

Swagelining™ Process



Swagelining™ Engineering Overview

- Follows path of the existing utility
  - Reduces 3rd party utility damage
  - Reduces infrastructure congestion
  - Engineering design hours reduced
- Maintains or possibly increases flow capacity
  - C-factor of 150 for life of HDPE
  - No grouting required due to ‘tight’ fit of HDPE
- HDPE
  - Long term design life
  - Corrosion protection
  - Increased operating efficiency
  - Unmatched Fatigue Resistance
  - Resistance to RCP

Swagelining™ Engineering Overview

- Install HDPE pipe wall thickness that is Solution to the Problem (DR 11 through DR 51)
  - Fully structural HDPE
  - Interactive HDPE
  - Thin walled HDPE

Swagelining™ Construction Overview

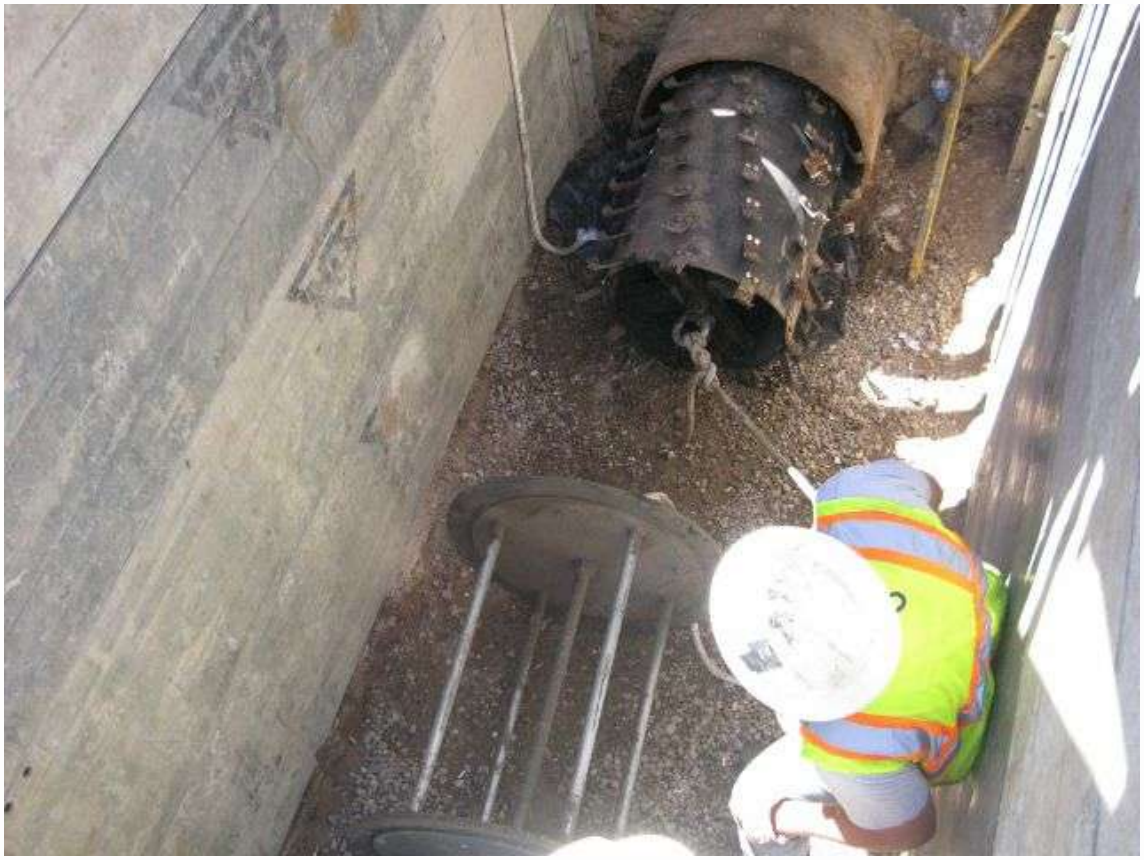
- Insertion lengths up to 5,000 feet
- Pipe sizes of 4” through 60”
  - Oil, Gas & Mining Pipelines most suitable 4” through 16”
  - Water Transmission & Sewer Force Mains most suitable 16” through 60”
- Negotiates field bends
- Surgical excavations
- Environmentally sensitive
- Undertake projects year round
- Social costs reduced

Integrated Lining System

- Polymer Materials Specification
- Liner System Design
- Insertion Technology
- Specialized Connectors

Swagelining™ Process – Preparation of Host Pipe

- Camera inspection
- Cleaning



Swagelining™ Process – Preparation of Host Pipe

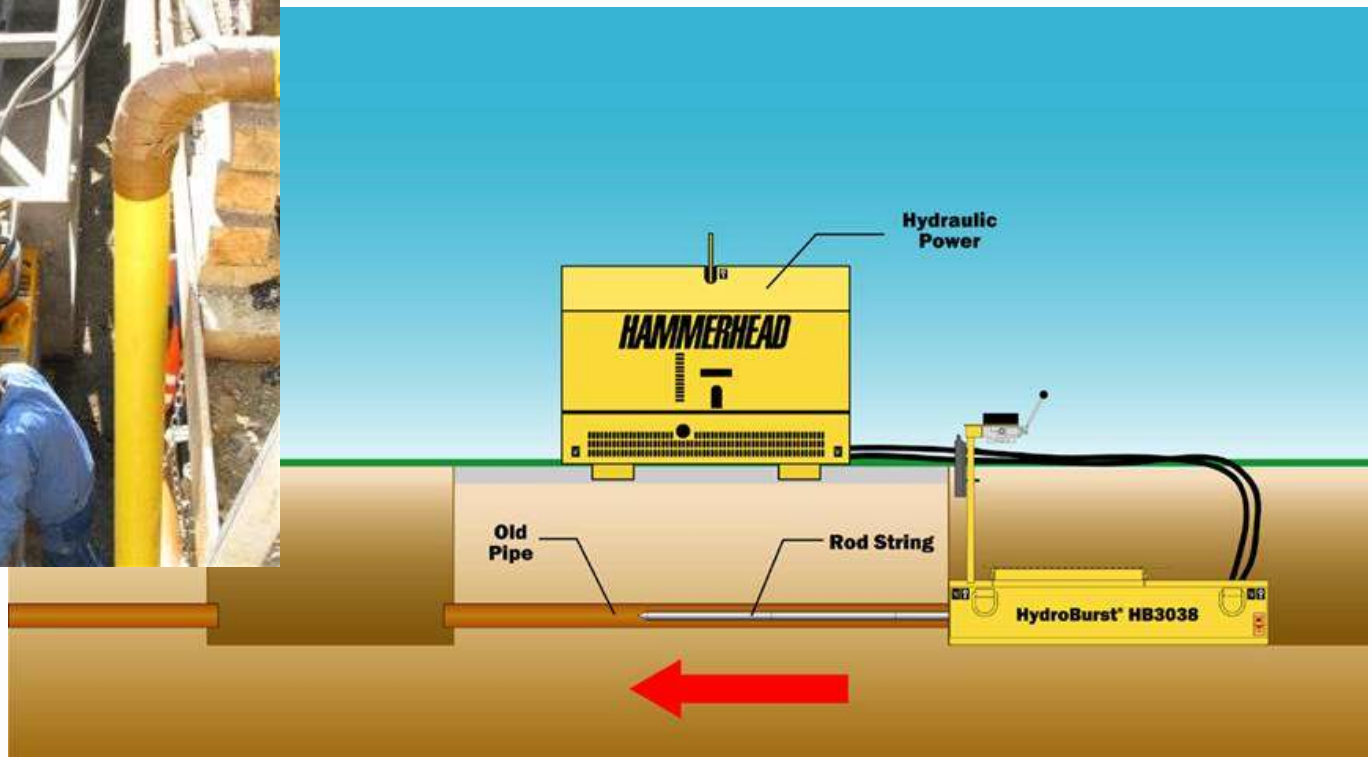
- Proving pig sent through host pipe to ensure free bore path

Swagelining™ Process – Butt Fusion

- Sections of HDPE pipe are butt fused together
- External bead removed

Swagelining™ Process –
Job site aesthetics for Urban areas

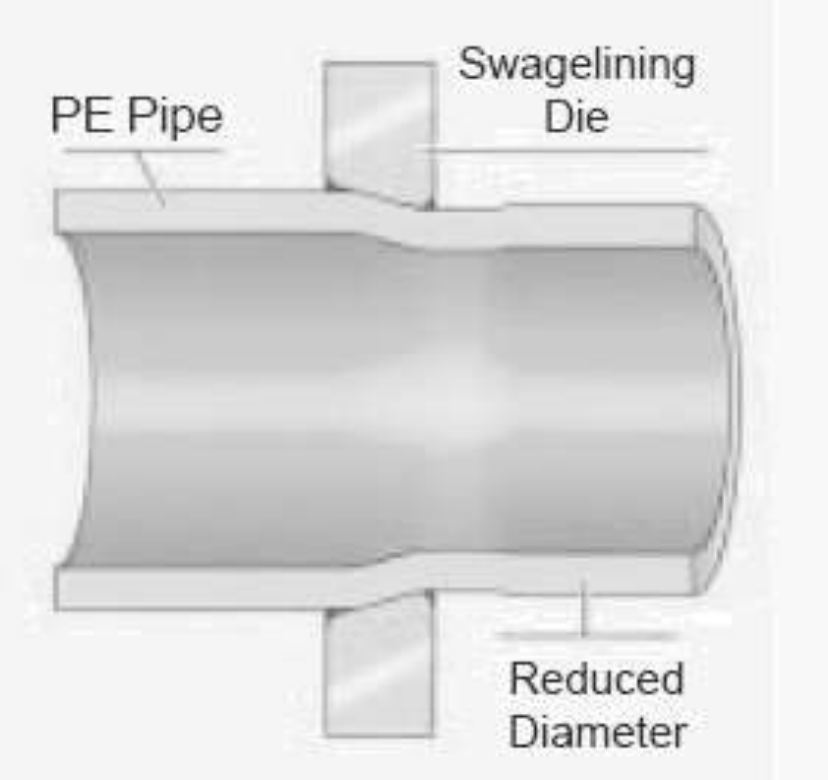
Swagelining™ Process -
Shuttle Rods through host pipe



Swagelining™ Process –
Attach pipe once rods reach entry pit

Swagelining™ Process – Reducing Die

- HDPE pipe has an OD slightly larger than the ID of the pipe to be renewed
- Pipe is pulled through a reduction die which temporarily reduces its diameter



Reducing Die

Swagelining™ Process – Rods recovered at exit pit

- Rods are removed from the exit pit as pipe is pulled into place
- For the next pull the exit pit becomes new entry pit

Swagelining™ Process – HDPE enters receiving pit

- Pulling force removed
- Natural relaxation of HDPE
- 90% of reversion occurs in 2 hours
- Remaining reversion occurs overnight

Swagelining™ Process – Results

- No gaps - all annular space is eliminated
- Fully structural pipe
- Interactive pipe
- Thin walled liner

Swagelining™ Process – Final Connections

Most Applicable

- 2” – 16” pipe bursting
- 16” – 60” Swagelining™

- Rapid installation
- Cost effective
- Solution to problem
- Long term design life
- Rural areas – environmentally friendly
- Urban areas – reduced social costs

General background information about large diameter Swagelining projects

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A summary of project references from the USA and around the world

Swagelining Selected Water Projects

Year	Application	Location	Diameter	Length
2013	Water Transmission	USA	24”-27”	18,500 feet
2012	Water Transmission	UK	40”	60,000 feet
2012	Water Injection	Norway	10”	37,800 feet
2012	Chilled Water Line	USA	18”-20”	6,400 feet
2011/2012	Water Transmission	USA	30”	5,300 feet
2010	Water Transmission	France	27”	4,600 feet
2010	Water Transmission	Australia	24”	7,250 feet
2009	Water Injection	Republic of Congo	24”	180,400 feet
2008	Water Transmission	Germany	54”	2,200 feet
2006	Water Injection	Norway	16”	31,200 feet
2005	Sewer Force Main	Germany	32”	3,280 feet
2004	Sewer Force Main	Singapore	18”	3,100 feet
2002	Water Irrigation	Abu Dhabi	20”	62,300 feet
1999	Sewer Force Main	Poland	16”	4,600 feet
1996-2001	Water Transmission/Sewer Force Main	USA	20”, 27”, 30”, 36”	45,700 feet
1992-1993	Water Transmission	UK	42”	4,850 feet

Swagelining Case Study
Amarillo, TX

Challenge

- Phase 1: 2,100 feet of 30” Cast Iron Water Transmission Main installed in 1927 – completed 2011
- Phase 2: 3,200 feet of 30” Cast iron Water Transmission Main installed in 1927 – completed 2012
- Leaking lead joints
- Tight easement, under homes and through busy roads
- Shut down limited to dry weather
- Flow capacity needed to be maintained

Swagelining Case Study

Solution

- Several Methods Analyzed – with Swagelining selected to maximize flow capacity, limit excavation, follow the existing utility path and speed of installation
- Liner System Design
  - 32” Outside Diameter DR 32.5 HDPE DR 4710
  - 1,800 feet average pull distances to minimize connections

Swagelining Case Study

Impact

- Small footprint to reduce social and environmental costs
- 90% less excavation than open cut
- Rapid installation to complete project within dry weather shut down period
- ‘Tight’ fitting HDPE will provide
  - 100 year design life
  - Corrosion Protection barrier
  - Prevent future leaks

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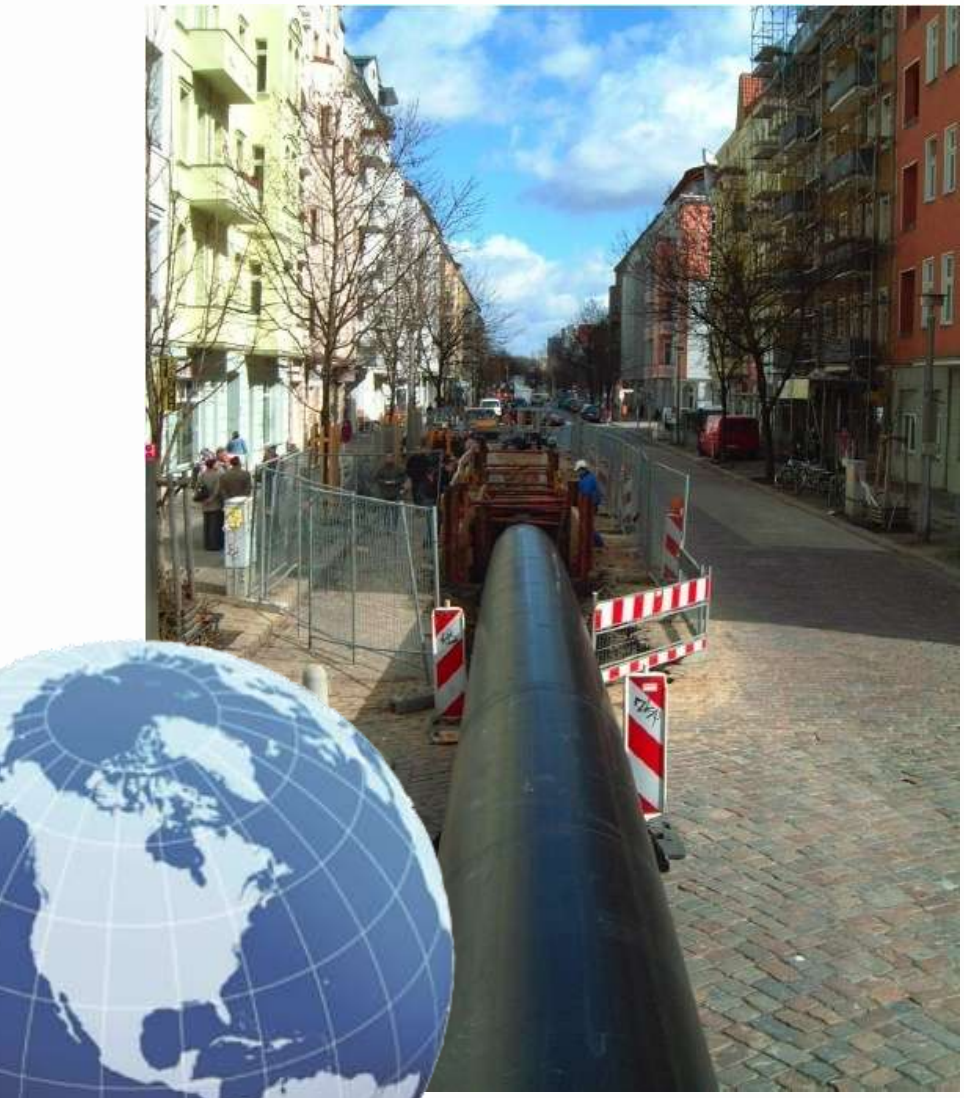

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