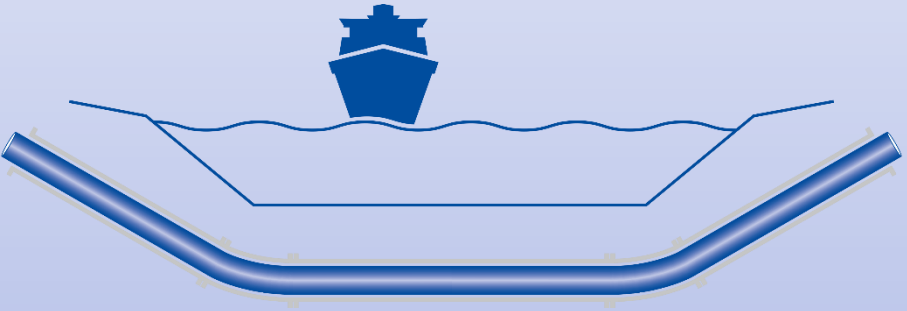
# Navagating Bends in Pressure Pipe Rehabilitation



John Moody
Director of Sales USA
Primus Line Inc.

PRIMUS LINE
The prime solution for pipes.

# Can you line a Bend?

- The answer is complex. Every bend is unique relative to its location and operating conditions. That's why a manufacturer will ask you for the information to be placed on their DATA COLLECTION SHEET.
- Work with your contractor or manufacturer to do the up front engineering to ensure the correct design is being utilized for the application.
- Every application has it's own set of challenges, allow the manufacturer to guide you through the process of product applicability.

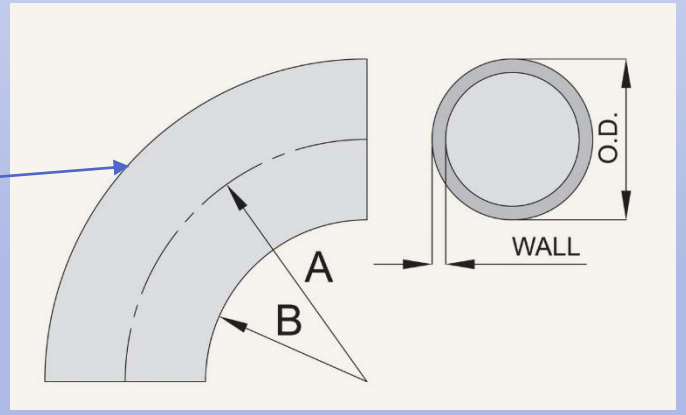
## 1.0 Basic Pipeline Criteria:

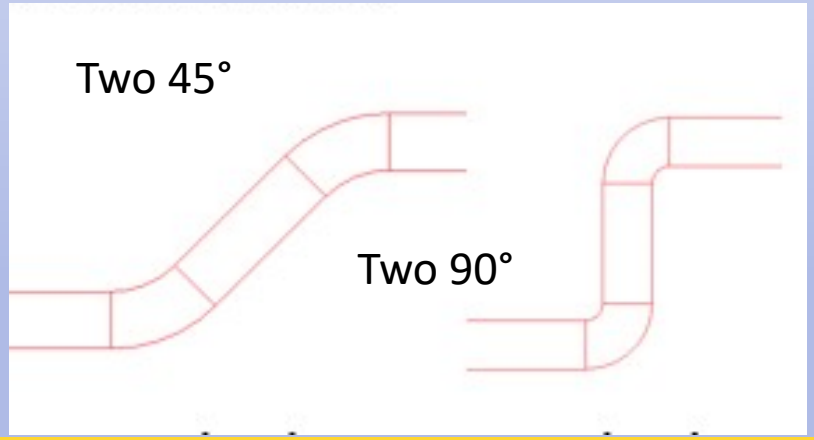
| | |
|---|---|
| Where is the Pipeline located (Address / Map / Line of the pipe given to the map colored line) | |
| Ground view (scaled plan) | |
| Longitudinal view (scaled plan) | |
| Service Medium (chemical analysis) | |
| Host Pipe Material | |
| Pipeline Outer Diameter (OD) | inch |
| Pipeline Inner Diameter (ID) | inch |
| Pipeline Wall Thickness (WT) | inch |
| Connection to the host pipe | |
| Host Pipe Condition | |
| Reason for renovation | |
| Pipeline length | feet |
| Bends / radius of the bend as a multiple of the pipe diameter | 1. Degrees: Radius: Position:<br>2. Degrees: Radius: Position:<br>3. Degrees: Radius: Position:<br>4. Degrees: Radius: Position:<br>(Please add additional bends if necessary) |
| Existing fittings, pipeline crossings that need to be taken into consideration (valves, hydrants, service connections); | |
| Hydro-test Pressure after installation of the Primus Line System | psi |
| Are there existing manholes, concrete chambers along the Line; if part of the renovation ask for ground and longitudinal view and cross sections | |

# Anatomy of the Bend and why it's a challenge

- The greatest challenge is to make sure that the liner material on the outside radius of the bend located on  the 45° of the 90° can with stand the pressures exerted onto it. This is a result of the Material compression on the inside of the bend and being under tension on the outside

Outside radius



# Clean and preparation of host pipe.

- Level of cleaning will be dictated by the type of solution selected.
- Slip line- Level of Cleaning: generally cleaned with scrapper pigs to remove tuberculation, when done no debris in pipe some water is likely ok.
- CIPP- Level of cleaning: no debris and not too much water.
- Spray on epoxy / polyurea – Perfectly clean and perfectly dry. No standing water during application .
- Cement Mortar lining –Perfectly clean and relatively dry

# Pros and Cons of flexible Liner

| Benefits of Flexible Kevlar P.E. Coated liner | Considerations for installation |
|---|---|
| No onsite wet out or cure on site. Liner is inflated with air after install. | Pressure test must be done to insure proper installation. Installers must be certified |
| Very small foot print and minimal disruption to the environment, only requires a winch to pull in material. | Not a tight fit, annular space= reduction of inside diameter |
| Pipe does not have to be dry or perfectly clean. | CCTV inspection must be completed prior to installation to confirm suitability. Problem for long runs and multiple bends. |
| Extremely long runs(8,500LF) with multiple bends including 45 degree bends. High pressures are acceptable | Host pipe is only a conduit for the liner all internal pressure and forces are not conveyed to host. Host must be able to bare soil loads. |

# Flexible Kevlar Liner pulled through and operated in a 90 degree bend

**Primus Liner pulled through and operated in bends**

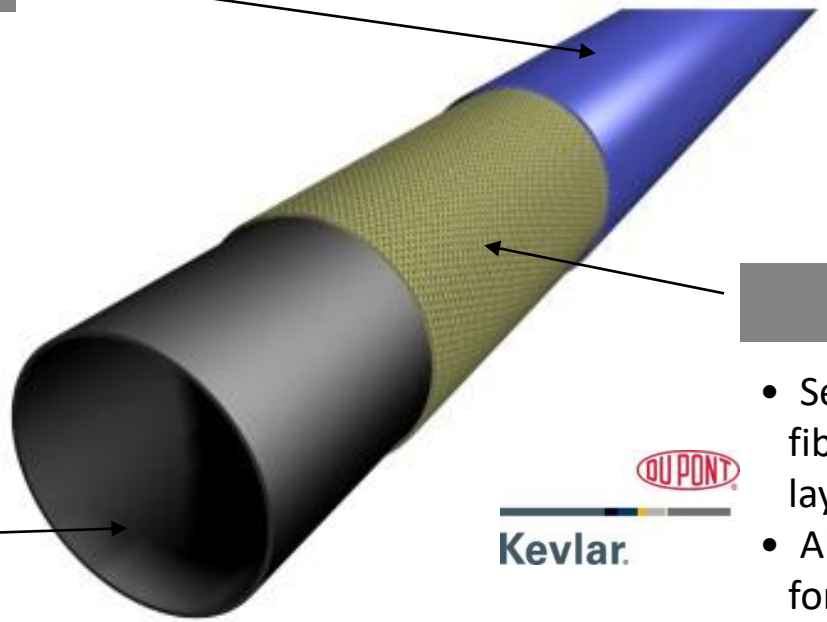
- - Flexible Kevlar Liner can be installed in a bends with 90 degree
- - especially for installing the liner in a 90 degree bend the technical department needs
- - ground view of the situation 90 degree bend
- - a longitudinal section of the situation 90 degree bend
- - a Primus Liner can be operated in a 90 degree bend, if
  - - the liner is installed as a loose-fit liner (annular space needed)
  - -the installation was finished “tension free”
  - - the installed length of the liner is concurrent to the length of the host
  - - the liner is inflated all along and therefore placed in the right position

Primus Line in a ***45° bend*** (r=1.5D)

# Composition of Primus Liner

## External Layer

- Abrasion-resistant PE sheath
- Protection of the fabric during insertion



## Kevlar®

- Seamless, woven aramid fibres (single or double-layered)
- Absorption of the tractive forces during insertion
- Accommodates the operating pressure

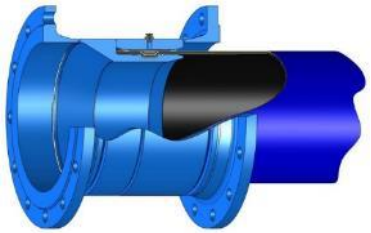
## Internal Layer

- Fluid specific
- Based on PE, TPU
- 15 potable water certifications (AS/NZS 4020:2005/NSF61)

## Liner system consists of ...

Flexible high-pressure composite pipe

…and patented end fittings




PRIMUS LINE

# Rehabilitation of Twin 12” industrial water lines for Paper Mill under a Highway.

Rand-Whitney Containerboard

Montville CT.

# Project Details

Year of rehabilitation – January /2017

**Technical Details:**

Host Pipe Material: Ductile iron

Transported Medium: Industrial water

Host Pipe Diameter: 12 inch

Operating Pressure: 160 psi

Raedlinger Primus Line® System: 12 inch Primus Liner with a nominal design pressure of 363 psi
4 x 12 inch low pressure connectors with double-sided 12 inch flanges

Total Length: 2 x 980 ft

Number of Construction Sections: 2 installation sections with 980 ft

Installation Time: 3 days for the installation of the Primus Liner and connectors

Line inflated

Coneectors installed

Conclusion

- Project was finished on schedule
- There where no issues during the installation
- Cleaning did take longer then anticipated
- One day for cleaning and prep
- One day for installation
- One day for fittings installed/pressure test
- State/ town officials all satisfied with results
- Pipe owner is planning more rehabilitation with this system
- Installer said it could have been completed in two days. He was being cautious as it was his first installation of this system.


End pit.
Small foot print

# Questions/Answers….MAYBE!

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