



Cleaning and Preparation for Pressure Pipe Rehabilitation

Pressure Pipe Technical Track

Session 2



Cleaning

The removal
of all solids
from the
interior pipe
surface.

Cleaning progression.....



Tuberculation



Partial tuberculation
removal



Full tuberculation removal,
bitumen liner visible



Preparation

Cleaning
along with
profiling and
drying of the
interior pipe
surface.

Preparation progression.....



Bitumen liner being removed



Partial liner and graphitic corrosion removal



Fully prepared for liner bonding



Cleaning Methods and Results

- Water Jetting
- Pigs and Swabs
- Ice Pigging
- Air Driven Stone
- Chain Scraping / Reaming
- Drag Scraping
- Rack Feed Boring

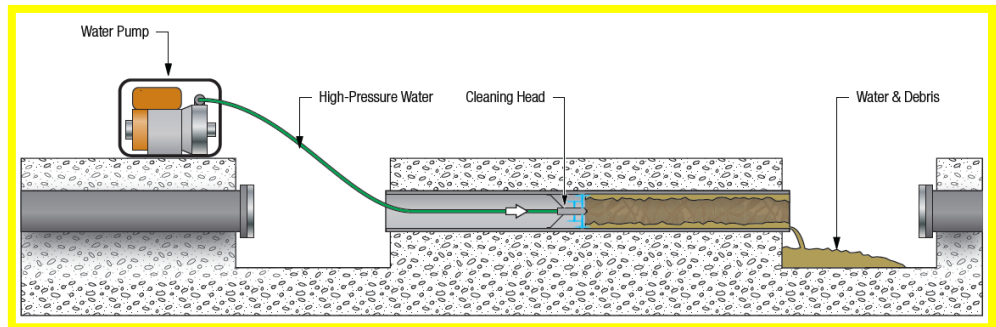


High Pressure Water Jetting

Process which uses a high-pressured flow of water to scour the interior surface of a pipe.

All diameters of pipe.

Scours surface and removes biofilm, loose scale and debris.





Pigs and Swabs

Abrasive or non-abrasive cylindrical or spherical device propelled through the pipeline by normal water flow.

2" and greater diameter.

Dependent upon device chosen, cleans and removes biofilm, pipe deposits, debris and standing water. Air blown swabs can also be employed to dry prepared pipe.





Ice Pigging

Ice slurry is pumped into the pipe and forced by pressure through the pipe.

2" to 24" diameter.

Removes biofilm, pipe deposits, debris.

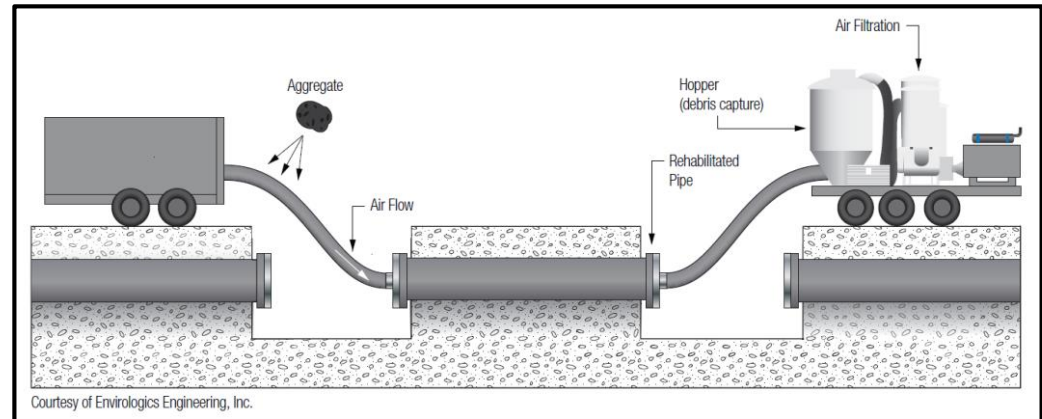


Air Driven Stone

Stone abrasives scrape the pipe surfaces propelled through the pipe with high-volume, low-pressure airstream.

4" to 12" diameter.

Removes biofilm, pipe deposits, debris, cleans, profiles and dries internal pipe surfaces.





Chain Scraping / Reaming

Combination hydraulic and mechanical process that incorporates the flailing of a rotating chain device against the interior of the pipe.

All diameters.

Removes pipe deposits and debris, accompanied by water stream that flushes particles from the pipe.



Enz USA Inc.



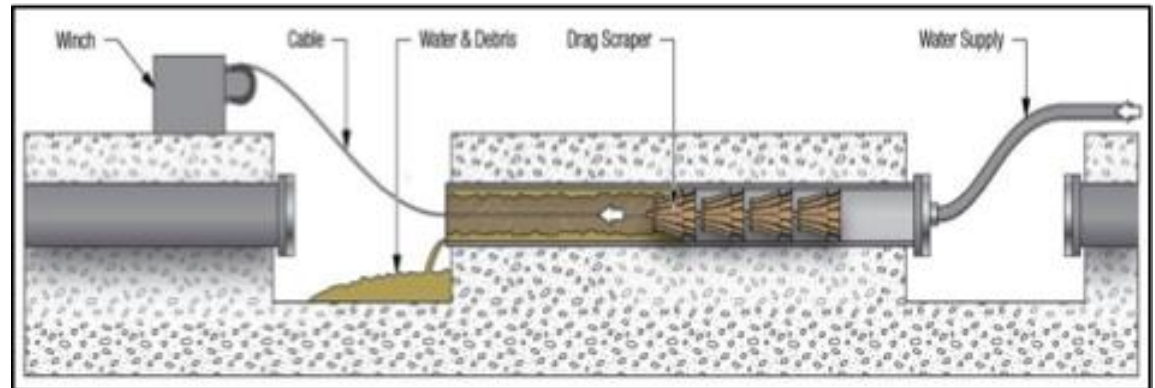
EHLE-HD

Drag Scraping

Mechanical process where device is pushed or pulled through pipeline.

3" to 60" diameter.

Removes pipe deposits and debris by scraping pipe wall. Squeegees can be used to remove remaining debris and accumulated water after drag scraping.



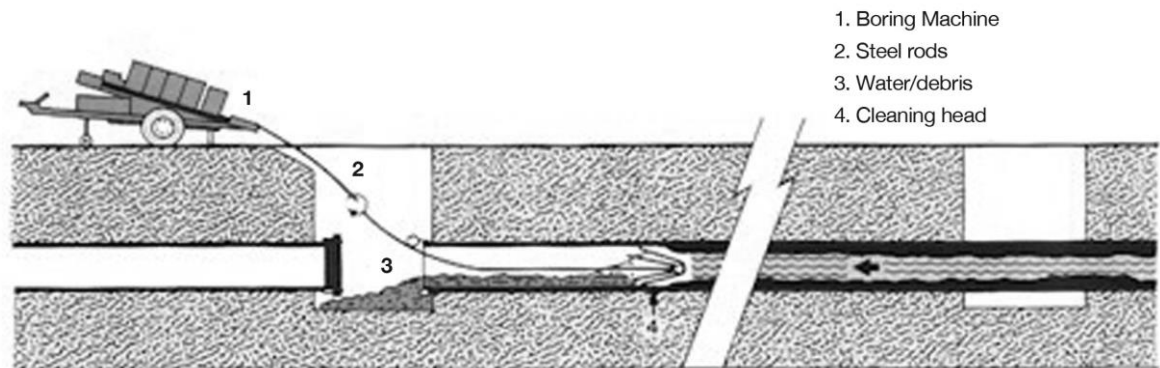


Rack Feed Boring

Mechanical process where hydraulically powered device operates a boring head with spring steel cutter blades or other tool which rotates through the pipe.

3" to 12" diameter.

Removes pipe deposits with rotating flail arms.





Rehabilitation Product Type

- Cement Mortar Lining
- Polymer Applied Lining
- Cured-in-Place Pipe Lining
- Sliplining



Match Need with Method

Structural Class	Product Type	Performance Standard
I	Cement Mortar Lining	The internal surfaces of pipe shall be cleaned to remove corrosion products; chemical or other deposits; loose and deteriorated remains of old lining materials; oil; grease; and accumulations of water, dirt, and debris.
I, II, III	Polymer Applied Lining	Internal pipe surfaces must be cleaned of all scale, deposits, and other debris or contaminants. The surfaces must be clean, free of standing water, profiled and dried in accordance with the product manufacturer's guidelines for the materials to be applied and bonded to the wall surface.
III, IV	Cured-in-Place Pipe Lining	The pipe shall be cleaned to remove mineral deposits, tuberculation, obstructions, dirt, rust and other debris that will interfere with the installation to the nominal host pipe diameter without altering the soundness of the host pipe. The surfaces must be clean, the pipe free of standing water and active leaks.
IV	Sliplining	The internal surfaces of the pipe shall be cleaned to remove mineral deposits, tuberculation, obstructions and debris that will interfere with the installation.



Method Selection

Condition	
Contaminants	FL+PS, WJ+PS, IP
Loose Debris/Sediment	FL+PS, WJ+PS, IP
Sediment, Moderate	WJ+PS, IP
Sediment, Heavy	DS+WJ/FL+PS, RF+WJ/FL+PS
Deposits/Tuberculation, Light	WJ+PS, IP, ADS
Deposits/Tuberculation, Moderate	PS+WJ, CS+WJ+PS, ADS, DS+WJ+PS
Deposits/Tuberculation, Heavy	ADS, RF+WJ+PS, DS+WJ+PS
Protrusions	DS+WJ+PS, RF+WJ+PS, ADS
Water Removal	PS, ADS
Profile	ADS
Drying	ADS, PS

Legend

ADS – Air Driven Stone CS – Chain Scraping DS – Drag Scraping FL – Flushing IP – Ice Pigging PS – Pigging/Swabbing
RF – Rack Fee Boring WJ – Water Jetting



Adhesion Requirements

- Class I, II, III Lining Systems
 - Interactive with host pipe
 - Require some degree of adhesion
 - Require removal of standing water
 - Require varying degree of “dry”
- Class IV Lining Systems
 - Independent from host pipe
 - Exception is seal around service connections and liner terminations



Potential Problems

- Poor adhesion to pipe surface
- Debris trapping
- Resin cure (set-up/strength affected by moisture)
- Leakage
- Annular voids
- Liner imperfections
- Stress concentrations
- Liner failure (buckling, leakage)



Summary

- Identify performance requirements for cleaning and preparation of the host pipe based upon lining product to be installed
- Determine best solution to attain performance requirements with all mitigating factors considered
 - Availability
 - Construction time
 - Cost
 - Environmental impact
 - Social impact