

Case Study

Intelligent Pigging of 13.5 km Multi-diameter Pipeline (4", 6", 8" Pipeline)

Introduction

Intero's client asked Intero to inspect a multi-diameter pipeline, which the client removed from service four years earlier, and which currently only held a nitrogen blanket. The original pipeline owner constructed the pipeline 50 years prior, primarily with 8" pipe sections. In order to reduce installation expense, the owner installed two 6" pipeline sections (with Y-pieces), and 4" valve settings.

This ethylene transport pipeline follows the bank of the Schelde River for 13.6 km, in the harbor of Antwerp, Belgium.

The pipeline crosses from the north bank to the south bank through 6" sections, in a tunneling system, approximately 40 meters underneath the Schelde river.

Throughout the 50-year lifespan of this pipeline, the owners made various modifications and repairs using multiple nominal diameter steel pipe with various wall thicknesses, ranging from 6.3mm to a maximum of 18.2mm.

Pipeline Details

- Triple diameter ethylene pipeline: 4", 6", and 8"
- Varying wall thicknesses: from 6.3 mm to 18.2 mm
- Pipeline length: 13.5 km

The Intero Integrity scope of work consisted of:

- Feasibility study for inspection (including removal of 4" sections and Y-piece 6")
- Engineered pigging plan
- Dummy run
- Inline inspection (ILI)
- Pipeline mapping (XYZ)

The Challenge

Find a cost-effective solution to inspect the pipeline, remove the 4" sections, and commission it for the client's operations.



Challenging Pipe Characteristics

In addition to the multi-diameter complexity, this pipeline had additional challenging characteristics:

- Multiple heavy wall bends, which included an internal diameter of 132 mm
- 13.2 mm weld-penetrations in the 6" pipe sections



The internal obstructions combined with the multi-diameter complexity required a detailed engineering review to create a tailor made, flexible ILI solution to achieve the best possible results.

Feasibility and Engineering

The client hired Intero to help solve these challenges and create a feasible project plan. Intero quickly added a pipeline construction company to the project team, with their task to make the pipeline piggable.

Next, Intero engineered its standard unpiggable ILI tool to overcome the multiple complex challenges of the pipeline.



Inspection

Because of the complexity of this pipeline's configurations, Intero ran a dummy tool prior to the ILI tool. After the successful dummy run, Intero launched the inspection tool. Through the 8"-6"-8"-6" sections of the pipeline, the Intero field team noticed pressure variations on the gauges at the launcher. This indicated the inspection tool recorded sub-optimal results.

The significant weld penetrations in the older pipeline sections also provided data quality challenges. Intero and the client decided to improve the inspection results by recording a second data set on the last 5.5 km of the pipeline. Since Intero designed its tool to inspect bi-directionally, as soon as the ILI tool entered the receiver, Intero immediately reversed flow and launched the ILI tool in the opposite direction (from receiver to launcher). The ILI tool successfully recorded additional high-quality data for the last 5.5 km of the pipeline.



Advantages

- Early-stage involvement resulting in feasible project approach
- Over 40 years of experience in difficult to inspect pipelines
- Engineering review and multiple services provided to client
- Simple solutions for a complex situation
- Experienced personnel with multiple qualifications to optimize client's budget
- Flexible approach, designed to solve any unforeseen problem
- High-quality project procedures ensured good communication and smooth project execution

