

Non-Invasive Pipe Condition Assessment Technology Allows City of Columbus to Test Critical Pipeline While in Operation

PROJECT OVERVIEW

UTILITY:

City of Columbus, Ohio
partnering with Brown and Caldwell



PIPELINE FOR ASSESSMENT:

- 3.1 miles of 12-inch DICL lime slurry pipeline installed in 1973

PIPELINE SPECIFICATION:

- **Outside diameter: 13.2-inch**
(AWWA C-150-96)
- **Wall Thickness: 0.34-inch**
(AWWA C-150-96)
- **Cement Mortar Lining: 1/16-inch**
(AWWA C-104-95)

TECHNOLOGY USED:

p-CAT™ (pipe condition assessment technology)

p-CAT™ is a non-invasive and non-destructive technology suitable for pressurized metallic and asbestos cement pipelines and is applicable for potable water pipelines, raw water and waste water pipelines.



THE PROBLEM

Faced with a critical pipeline that has experienced multiple failures, The City of Columbus Ohio along with Brown and Caldwell set out to identify available technologies to perform pipe condition assessment and aid in the identification of potential problem sections.

As part of that effort, Brown and Caldwell along with the City of Columbus contracted Hydromax USA to deploy p-CAT technology.

THE SOLUTION

p-CAT™ is a non-invasive pipeline condition assessment tool that utilizes inverse transient pressure wave analysis to determine pipe wall degradation and identify anomalies. Developed over 10 years ago by Dr. Young-il Kim from the University of Adelaide Australia. p-CAT is designed to test long stretches of pipe efficiently and effectively while giving the utility detailed analysis capable of change detection down to 30 ft. sub-sections. In addition to wall degradation, p-CAT identifies anomalies which may include, pockets of air, pipe material changes, blockages and valve closure.

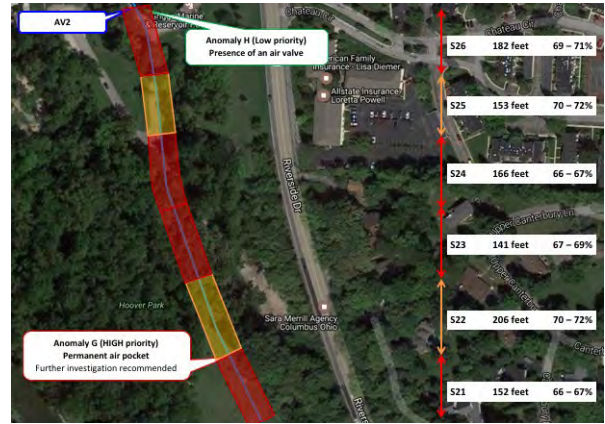
CASE STUDY

ASSESSMENT PERFORMED

Working with Brown and Caldwell and the City of Columbus, Ohio, Hydromax USA collected all available data on the two pipelines including as-builts, GIS, pressure data, and repair history. Hydromax team performed a detailed analysis and feasibility review to ensure p-CAT was a proper fit for the proposed pipeline.

From that review it was determined the pipeline was an ideal candidate for p-CAT. Hydromax team then performed a site visit to locate, identify and inspect available assets needed for a successful deployment of p-CAT. Further review and final test planning were taken on at the completion of the successful site visit. Field Teams returned to Columbus, Ohio and successfully performed p-CAT testing on the 3.1 miles of pipe in 2 day's time using the existing air release valves.

The data was sent to the analysis team for detailed review and report generation. Utilizing assumed originally installed pipeline schedule and class, the analysis team performed a sub-sectional analysis to identify problem areas down to 30 ft. resolution.



Sample Visual Summary of Sub-Section Analysis Report

RESULTS

- **101 separate section details** were provided – the smallest section being 35 feet.
- **33%** of pipeline tested: **65-69% total remaining wall thickness**, indicating **HIGHLY DETERIORATED** pipe.
- **67%** of pipeline tested: **70-81% total remaining wall thickness**, indicating **MODERATELY DETERIORATED** pipe.
- **3 HIGH PRIORITY** and **5 MEDIUM PRIORITY anomalies** were identified which included valves that were not fully sealed, pipe material change and entrapped air.

Section Identifier	Approx. Change(s) (ft)		Sub-section Location on Pipeline	Assumed Pipe	Approx. Length (ft)	Theoretical Thickness (in)		Remaining Total Equivalent Wall Thickness (%)						Sub-Sectional Average Wave Speed (ft/s)		
	Start	End				Wall		Assumed Internal Corrosion (1)			Assumed External Corrosion (2)					
						Wall (in)	Lining (in)	Wall (in)	Lining (in)	% Remaining (1)	Wall (in)	Lining (in)	% Remaining (2)			
S1	7230	7350	AVZ as found on file to the pipe material (See transition parameter 6)	Unknown	130	Unable to provide pipe wall condition as the pipe specification is unknown										4178
S2	7350	7545	Start of Anomaly B	12" DCL	195	0.34	0.06	0.25	0.00	73%	0.24	0.06	0.00	0.00	71%	3943
S3	7545	7705	in per change	12" DCL	160	0.34	0.06	0.36	0.00	74%	0.36	0.00	0.00	72%	3913	
S4	7705	7890	in per change	12" DCL	185	0.34	0.06	0.39	0.00	73%	0.31	0.00	0.00	71%	3860	
S5	7890	7990	in per change	12" DCL	96	0.34	0.06	0.37	0.00	77%	0.36	0.00	0.00	76%	3883	
S6	7990	8111	in per change	12" DCL	120	0.34	0.06	0.37	0.00	76%	0.36	0.00	0.00	75%	3873	
S7	8111	8282	in per change	12" DCL	171	0.34	0.06	0.37	0.00	77%	0.35	0.00	0.00	75%	3880	
S8	8282	8425	in per change	12" DCL	143	0.34	0.06	0.37	0.00	77%	0.35	0.00	0.00	75%	3876	
S9	8425	8624	End of Anomaly C	12" DCL	199	0.34	0.06	0.25	0.00	73%	0.24	0.06	0.00	71%	3840	
S10	8624	8953	Start of Anomaly C	12" DCL	329	0.34	0.06	0.34	0.00	76%	0.23	0.06	0.00	68%	3813	
S11	8953	9102	End of Anomaly C	12" DCL	149	0.34	0.06	0.34	0.00	68%	0.22	0.06	0.00	66%	3811	
S12	9102	9234	Start of Anomaly D	12" DCL	131	0.34	0.06	0.34	0.00	76%	0.23	0.06	0.00	68%	3811	
S13	9234	9476	in per change	12" DCL	242	0.34	0.06	0.34	0.00	68%	0.22	0.06	0.00	66%	3800	
S14	9476	9579	in per change	12" DCL	102	0.34	0.06	0.35	0.00	72%	0.34	0.00	0.00	70%	3814	
S15	9579	9724	in per change	12" DCL	146	0.34	0.06	0.35	0.00	68%	0.12	0.00	0.00	68%	3885	
S16	9724	9857	End of Anomaly E	12" DCL	133	0.34	0.06	0.34	0.00	76%	0.23	0.06	0.00	69%	3814	
S17	9857	10012	Between Anomaly E and	12" DCL	155	0.34	0.06	0.34	0.00	68%	0.22	0.06	0.00	67%	3808	

Sample Sub-Sectional Analysis Report

HYDROMAX USA
Advanced Water, Wastewater and Gas Data Collection

For more information on how Hydromax USA can help you with water assessment and leak detection contact us at 1-800-555-5555.