HYDROMAX USA
Advanced Water, Wastewater and Gas Data Collection

CASE STUDY

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

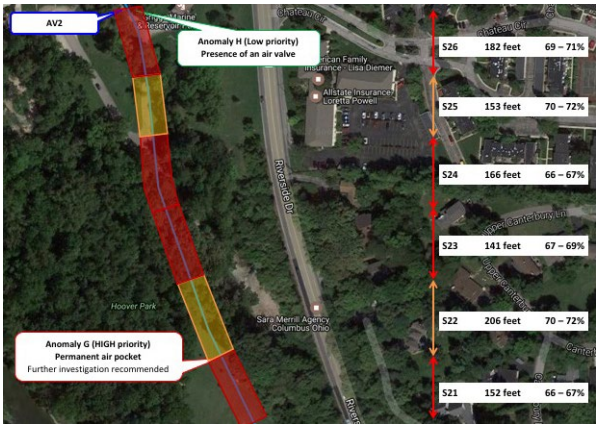
Working with Brown and Caldwell and the City of Columbus, Ohio, Hydromax USA collected all available data on the two pipelines including as-builts, GIS, pressure data, and repair history. Hydromax team performed a detailed analysis and feasibility review to ensure p-CAT was a proper fit for the proposed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

From that review it was determined the pipeline was an ideal candidates 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.

Section Identifier	Approx. Chainage (ft)		Sub-section Location on Pipeline	Assumed Pipe	Approx Length (ft)	Theoretical Thickness (inch)		Remaining Total Equivalent Wall Thickness [A] (Difference between metal wall or cement mortar lining from the nominal theoretical value)						Sub-Sectional Average Wave Speed (ft/s)
								Assumed Internal Corrosion [C]			Assumed External Corrosion [C]			
	Start	End				Wall	Lining	Wall (in)	Lining (in)	% remaining [D]	Wall (in)	Lining (in)	% remaining [D]	
S1	7230	7359	AV1 as found on site to the pipe material/size transition (anomaly B)	Unknown	130	Unable to provide pipe wall condition as the pipe specification is unknown								4178
S2	7359	7545	Starts at the transition (anomaly B)	12" DICL	186	0.34	0.06	0.25 (-0.08)	0.00 (-0.06)	73%	0.24 (-0.1)	0.06 (0.00)	71%	3943
S3	7545	7701	as per chainage	12" DICL	156	0.34	0.06	0.26 (-0.08)	0.00 (-0.06)	74%	0.24 (-0.1)	0.06 (0.00)	72%	3953
S4	7701	7896	as per chainage	12" DICL	195	0.34	0.06	0.25 (-0.09)	0.00 (-0.06)	73%	0.24 (-0.1)	0.06 (0.00)	71%	3940
S5	7896	7992	as per chainage	12" DICL	96	0.34	0.06	0.27 (-0.07)	0.00 (-0.06)	77%	0.25 (-0.08)	0.06 (0.00)	76%	3983
S6	7992	8111	as per chainage	12" DICL	119	0.34	0.06	0.27 (-0.07)	0.00 (-0.06)	76%	0.25 (-0.09)	0.06 (0.00)	75%	3973
S7	8111	8282	as per chainage	12" DICL	171	0.34	0.06	0.27 (-0.07)	0.00 (-0.06)	77%	0.25 (-0.09)	0.06 (0.00)	75%	3980
S8	8282	8425	as per chainage	12" DICL	143	0.34	0.06	0.27 (-0.07)	0.00 (-0.06)	77%	0.25 (-0.09)	0.06 (0.00)	75%	3976
S9	8425	8624	Ends at Anomaly C	12" DICL	199	0.34	0.06	0.25 (-0.09)	0.00 (-0.06)	73%	0.24 (-0.1)	0.06 (0.00)	71%	3940
S10	8624	8953	Starts at Anomaly C	12" DICL	328	0.34	0.06	0.24 (-0.09)	0.00 (-0.06)	70%	0.23 (-0.11)	0.06 (0.00)	68%	3913
S11	8953	9102	Ends at Anomaly D	12" DICL	149	0.34	0.06	0.24 (-0.1)	0.00 (-0.06)	68%	0.22 (-0.12)	0.06 (0.00)	66%	3891
S12	9102	9234	Starts at Anomaly D	12" DICL	131	0.34	0.06	0.24 (-0.1)	0.00 (-0.06)	70%	0.23 (-0.11)	0.06 (0.00)	68%	3911
S13	9234	9476	as per chainage	12" DICL	243	0.34	0.06	0.23 (-0.1)	0.00 (-0.06)	68%	0.22 (-0.12)	0.06 (0.00)	66%	3885
S14	9476	9579	as per chainage	12" DICL	102	0.34	0.06	0.25 (-0.09)	0.00 (-0.06)	72%	0.24 (-0.1)	0.06 (0.00)	70%	3934
S15	9579	9724	as per chainage	12" DICL	146	0.34	0.06	0.23 (-0.1)	0.00 (-0.06)	68%	0.22 (-0.12)	0.06 (0.00)	66%	3885
S16	9724	9857	Ends at Anomaly E	12" DICL	133	0.34	0.06	0.24 (-0.09)	0.00 (-0.06)	70%	0.23 (-0.11)	0.06 (0.00)	69%	3914
S17	9857	10017	Between Anomaly E and F	12" DICL	162	0.34	0.06	0.24 (-0.1)	0.00 (-0.06)	69%	0.22 (-0.11)	0.06 (0.00)	67%	3898

Sample Sub-Sectional Analysis Report



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.

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