Paper Title

Multi-Sensor Condition Assessment Tool Features Low Voltage Conductivity Technology To Find And Measure Water Losses

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Where & When to Attend?

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Abstract

We all know the limitations of using acoustic sensors, data loggers, and correlators to look for water leaks. Frequent false-positive readings, poor data repeatability, reliance on third party data interpretation, ambient noise from road traffic, changing water table heights, pipe diameter, leak size, and inability to assess PVC, PE, and HDPE pipes, represent just some of the drawbacks.

The water industry has already seen what happens in building optimization strategies based on faulty assessment data. Since the *wrong* repair may often cost ten times the cost of doing the *right* repair -- i.e. ongoing cost of undetected leaks, misapplied CAPEX, increased operating costs, risk of customer interruptions, etc. -- the need to continuously improve and better understand the condition of its buried assets, reduce the risk of pipeline failure, and extend the useful life of underground infrastructure, has never been greater.

With drought conditions expected to continue despite favorable El Niño conditions, water losses of 10-30% occurring before reaching customer's meter are no longer acceptable. To assist water utilities better identify and manage their water losses, a new technology has emerged that is capable of locating (within .04in or 2cm) and measuring (in gpm or lps with ±20% accuracy) water losses at specifically identified pipe defects.

Using low voltage conductivity -- a geophysical principle that allows electrical current to pass through leaks, defective service connections, bad joints, and other openings to ground -- a focused array automatically assesses the 360-degree circumference of a pressurized pipe wall to measure each leak's size and leakage rate, without operator interpretation.

This paper introduces low voltage conductivity and examines its development milestones, including German water trials in the 1990s, an ASTM standard established for sewers in 2006, field benchmarks by the USEPA in 2011, and recent potable water trials for both pressurized and gravity water mains in the United States and England.

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Using a multi-sensor probe that enters through a fire hydrant, valve, flow meter, or hot tap -- while a water main is still in service -- pipes may be evaluated up to 1,000ft in either direction from a single access point.

Recent case studies will be presented describing field set-up, operation, safety, and resulting data from each sensor, including: (1) Low Voltage Conductivity, to identify leak size and location; (2) High-Definition Camera, for in-pipe navigation through hydrant, valves, main line and documenting surrounding conditions at the leak; (3) Pressure Sensor, to help measure pressure at leak location; and, (4) Acoustic Hydrophone, to compare and contrast legacy anomalies with low voltage findings.

This paper describes how findings from detailed low voltage inspections can be applied to water networks to influence and refine pipe risk assessments and capital expenditure plans, in contrast to generalized age, pipe material, and diameter assessments.

About the Authors

Chuck Hansen
Hansen is a visionary responsible for transforming major policies and practices in the global water and sewer industry. As co-founder with his father and brother of Hansen Information Technologies in 1983, Hansen is responsible for building multi-generational asset management systems supporting the life cycle management of the water, sewer, transportation, and transit markets. Developing the first national standards for the closed-circuit television market, Hansen systems grew to encompass a 360-degree citizen-centric application portfolio to include Asset Valuation, Building Permit, Customer Information Management, Property Tax, Utility Billing, and Work Management. After selling his company for $100 million in 2007, Hansen worked with a number of high technology, entertainment, and social media start-ups. In 2011, after extensive research in pipe condition assessment, Hansen founded Electro Scan Inc., to consolidate intellectual property of low voltage conductivity, a game-changing technology able to precisely locate and measure defects and leakage rates in water, sewer, and gas pipelines. Today, Hansen lives with his family in Sacramento, California, holder of multiple patents and patents pending, investment advisor to a an instrumented-rated pilot, and studio musician. Hansen earned his BS at the University of California, Berkeley, and MBA from UCLA.

Mark Grabowski
Grabowski is a pioneer in the fields of electrical and mechanical design, fabrication, testing, and deployment of pipeline inspection technologies. After working for a number of large diversified contracting firms developing interchangeable parts & equipment for field-ready pipeline services, he joined Electro Scan Inc. in June 2012. Grabowski was responsible for reengineering multiple manufacturer's closed-circuit television (CCTV) equipment to allow for dual usage of low voltage technology and CCTV for field inspection. A co-patent holder, Grabowski has successfully adapted the low voltage technology that he co-developed for the wastewater industry for the market of pressurized water and sewer pipe condition assessment, this time adding a high resolution camera, pressure sensor, and acoustic hydrophone. Grabowski was also responsible for securing tandem technologies for deployment and retrieval of smart probes into pressurized lines, without service disruption. Today, Grabowski lives with his family in Milwaukee, Wisconsin. Grabowski earned his BS in Mechanical Engineering from the University of Central Florida and has a certificate in Water Technology from the University of Wisconsin-Milwaukee. Additionally, he is a licensed Pipeline Rehabilitation Contractor in South Florida.