

PROACTIVE RISK MANAGEMENT FOR WATER INFRASTRUCTURE

In 2019, CANN Forecast launched a Pan-Canadian research project to develop a model to better predict water main breaks. This model includes **water network structural characteristics, pipe break history**, as well as the **impact of pressure**.

The project was carried out in partnership with **McGill University, the Montreal Institute of Learning Algorithms, the National Research Council of Canada.**, and 9 innovative, forward-thinking Canadian municipalities; **Montreal, Windsor, London, Halifax, Thunder Bay, Laval, Rimouski, Gatineau, and Moncton.**

VALUE FORMUNICIPALITIES

4-10 times more accurate predictions of future breaks compared to the age-based models.

The tests were conducted based on the data from the past 5 years provided by each municipality.

Better understanding of the impact of pressure

According to previous research, the relationship between pipe burst frequency and static pressure vary according to: **$(P2-P0)/(P1-P0)^{N2}$** *

Machine Learning algorithms can be used to identify the pipe cohorts that behave differently in the network, increasing the accuracy of the computation of each (P0,N2) pair. When higher resolution pressure data is available, pressure variations can be used to significantly increase the accuracy of the predictions.

**Searching for N2: How does Pressure Reduction Reduce Burst Frequency?, Pearson & Al.



This project generated insights and takeaways that can be useful to all municipalities and water utilities.

The importance of using a Cohort-Based Approach

Machine Learning can identify which water main pipeline cohorts - pipes that share similar physical, environmental, and operational characteristics - are most at risk of failure with respect to factors such as aging, temperature, and pressure. Each cohort behaves - and should be modelled - differently.

Pressure Data can be leveraged in several ways

Hydraulic model outputs and hydrant inspection data are useful to better predict the short and long term likelihood of failure per pipe. Sensor data can feed real-time monitoring systems that alert operational teams of new breaks within the network.

The importance of Good Data Management Practices

Some of the best practices include (a) Recording the break type and cause of break as systematically as possible, (b) Keeping track of the historical breaks and abandoned pipes ids, and finally (c) Gathering more data on the highest risk cohorts.

THE PROBLEM AND THE NEED

Managing aging water infrastructure will put an enormous strain on municipalities and utilities budget in the upcoming years: **break rates increased by 27% in the period 2012 to 2018, and 82% of Cast Iron pipes are over 50 years old and are experiencing a 43% Increase in breakrates***.

Most municipalities have been gathering enough data to better prioritize which pipes to replace and rehabilitate. However, the teams we have been working with all face similar challenges: lack of time, lack of resources, and the lack of expertise in Artificial Intelligence.

By providing these 3 missing ingredients, CANN Forecast leveraged our clients existing data and assisted them in targeting the most at-risk pipes, thus doing more with less.

WHAT DOES THIS MEAN FOR THE FUTURE?

Cleaner Data for All Municipalities

Our Inteliflag software, developed in partnership with Quebec's Municipal Infrastructure Research Center (CERIU), can be used to detect the most common human errors within your data. Intelipipes is available for all municipalities. Interested? Contact us for more information.

Optimized, Smarter Proactive Maintenance & Monitoring

CANN's IntelIPipes solution is an end to end decision tool capable of helping your utility to maximize the short-term and long-term return on investment of the municipality's asset management program.

Better Data Management Practices

Our compiled best practices document for water data management is available upon request from municipal teams.

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