

Leak Detection Program: The City of Mount Pearl

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Introduction

The limited supply of fresh water requires careful management. Many communities are faced with significant water supply challenges and recognize the importance and need to conserve. As a result, water suppliers are under increasing pressure to reduce leakage rates and provide a consistent, high integrity water supply. Resource development is expensive and reductions in Non Revenue Water (NRW) are an attractive and economically viable means of increasing the headroom between supply and demand. Leak detection is a component of a comprehensive Best Management Practices, water management strategy. New techniques in leak detection are emerging to help water suppliers achieve their objectives.

For the past several years, the City of Mount Pearl, Newfoundland, had been receiving increasing pressure from the water supplier to decrease water consumption rates, which were approximately 30% too high. Mount Pearl Council was also pressuring the engineering department to investigate why the City's water demand was so high and to develop a plan to reduce costs. Through modelling and field pressure testing, it was determined that the water distribution system had many leaks. The City asked BAE-Newplan Group (BNG) to assemble an economically viable process that could accurately locate leaks. BNG and Hetek Solutions Inc. proposed a leakage reduction program involving Palmer Environmental's Permalog leak localization system. This system allowed testing without disruption to the water supply, and provided accurate results in 24 hours, with minimal operation time and cost.

The City of Mount Pearl is the second largest city in Newfoundland, located alongside St. Johns, with a population of over 25,500 residents. The City's water distribution system consists of cast iron and ductile iron water mains totalling 94 Kms, ranging in age from relatively new to 50 years old and ranging in diameter from 150 to 450 mm. The City is served by two separate networks each of which has a number of pressure zones. In addition to this, the City has a water pressure boosting station required to supply water to development above the 190 m contour line, which is the maximum elevation to which water can be supplied by gravity from the regional water tanks.

Prior to conducting the water leakage reduction study, the City of Mount Pearl had a total system input volume of 7.5 million M3 per year, with a total authorised consumption of 3.63 million M3 of water per year and total water losses of 4.38 million M3 per year. This resulted in an Infrastructure Leakage Index (ILI) of 18.3, this is recognised to be high compared to the IWA/AWWA Best Management Practice target.

Leakage Reduction Methods

BNG and Hetek Solutions proposed a process involving Palmer Environmental's Permalog leak localization system. This system allowed testing without disruption to the water supply. It provided accurate results in 24 hours, with minimal operation time and cost.

Permalog units were deployed throughout the distribution system to provide continuous surveying of leakage. These loggers were used to focus the leakage surveys in specific areas of the network. Easily installed on mainline and hydrant valves, they were retained in place by a strong magnet and are battery-powered for at least 10 years. Each unit adapts itself automatically to its environment. If no leak is present, a signal is transmitted to indicate normal background conditions. However, as soon as a possible leak is detected, the Permalog unit enters an alarm state and transmits leak data.



Figure 1.0

Deployed loggers send signals indicating the areas of leakage

Once a specific area is identified as containing a leak, MicroCorr Digital Correlators were used to pinpoint the exact leak location. Similar to the loggers, a strong magnet attaches to main line valves, hydrants, and curb stops. The correlators use sound travel to listen along pipe walls and send the information to the base unit. A graphical screen on the base unit allows you to enter key information, such as pipe size, material and length and then view a graph, which shows the location of leak by giving a distance from a correlator. As an extra precaution, geophones were also used to confirm the leak location calculated by the correlators.



Correlating a leak from a valve

Leakage Results and \$ Savings

The noise logging survey was completed indicating 87 recorded leak areas throughout the City. In the same month the first leak was located, excavated and repaired. During the course of the program 9 leak areas were added totalling 96 possible leak locations. Of the 96 leak areas, 60 leaks were located with 54 repaired. Un-repaired leaks were for reasons such as, leaky toilets and curb stops that could not be located. Approximately 60% of the leaks were on service lines and a quarter of these leaks were abandon services. Of the 40% main line breaks most were circumferential splits with only two leaks on fire hydrant leads.

Since the introduction of the leakage reduction program, monthly water consumption rates have dropped considerably and in one year 1 million cubic meters of non-revenue water was saved, resulting in a yearly savings of \$150,000.00.

Implementation of the Water Leak Reduction Program in 2003, water consumption has decreased considerably. A second IWA balance was completed after the first year of the leakage program was completed and indicated a reduction of 13.2% of the total system input volume and a total real loss of 25.6% from the previous IWA balance. The Infrastructure Leakage Index (ILI) has also reduced from 18.3 down to 13.5 with more leakage to be found.

The Next Step

While continuing with the noise logging and correlation process, the introduction of District Meter Areas (DMA's) as well as utilizing pressure control systems, are being considered. By the introduction of DMAs, the City will be divided into individual zones, and in each zone the night flows will be compared to the estimated legitimate usage and background losses. This will help to focus on the DMAs with potential leakage, and further work will be completed to find the general area of the leaks, and ultimately pinpoint each leak.

This process will ensure that the economic level of leakage is achieved in each DMA, and can be used as a basis for ongoing leakage control, and flow modulation to reduce background leakage.

The City of Mount Pearl continues to utilize BNG for pro-active and re-active leak detection. As in most distribution systems there are a number of annual breaks expected and having a state of the art leak detection team at your fingertips saves water and money.