



Reforming procurement practices for **underground water infrastructure**

Canada's underground infrastructure is at a crossroads. It is corroding at an alarming rate and purchasing managers have the opportunity to take an active role in reforming current procurement practices to ensure adoption of sustainable and cost-effective materials and solutions.

Upwards of \$100 billion will be spent on public infrastructure in the coming years, with a significant portion allocated to building and replacing water and sewage lines. More open procurement processes that include the life-cycle cost of underground infrastructure are critical to spending this money wisely.

According to McGill University's Professor Saeed Mirza, municipalities must consider the full cost and depreciation of infrastructure, as well as the operation and maintenance of assets over their service lives when making purchasing decisions.

Changing outdated procurement

Municipal purchasing managers can, and perhaps must, review procurement practices for underground water infrastructure to ensure that bidding is aligned with modern asset management standards that consider life-cycle costs and materials performance in all public projects.

Current procurement methods, however, are costly and prevent informed decisions because bids are often closed to qualified products. Opening them, according to experts, will save municipalities between 10 to 20 percent on all goods and services purchased.

The water and wastewater sector is a case in point. Pipe is the largest compo-

nent of a water utility's assets and seriously impacts operations and maintenance costs, which are spiralling out of control. So, the performance of a utility's pipe materials is critical to holding the line on costs.

Unfortunately, utility operators will often exclude widely used materials, saying they need to further "study" them, or rely on myths to avoid breaking old habits. Even products that are certified by every required international, national, state and provincial agency, and used by thousands of municipalities worldwide, can be excluded. This means less competition, resulting in higher prices for goods purchased by local governments. And higher front-end costs are only part of the story – tendering that is less competitive has costly cascading effects further down the line.

The corrosion eating away at our nation's underground infrastructure demands that all municipalities renew their practices in this area. And beginning this process will require fair bidding and openness to alternative and proven pipe materials.

The corrosion crisis: old technology versus sustainable options

According to the study, *Corrosion, not Age, is to Blame for Most Water Main Breaks*, corrosion is the leading cause of over 700 daily water main breaks

throughout North America (watermain-breakclock.com). A 2002 congressional study found that corrosion costs US water utilities over USD\$50.7 billion annually. For Canada, the yearly figure is over \$5 billion. Despite these huge expenses, however, many municipal utility operators have failed to consider the cost-benefits of using non-corroding pipe materials.

Today's corrosion crisis is due to materials used in North America's underground pipe networks over the last 100 years. At first, cast iron was used, with ductile iron gradually replacing it as the material of choice. Both now suffer from the ravages of corrosion. Moreover, the burden of old technology materials is not limited to the cost of repairing and replacing failed pipelines. It includes the cost of losing treated water from leaking systems – averaging between 20 and 50 percent in most water treatment systems.

Montreal is a case in point: about 40 percent of the water pumped through its underground network is lost to water main breaks and leaky pipes. And there is no end in sight to the waste: as our water distribution systems age, leak rates increase, while higher energy costs and even stricter water quality standards continue to drive water pumping and treatment costs even higher.

Sustainable and corrosion-proof

The solution to these problems begins with sustainability, durability and corrosion resistance and this is why municipalities must actively consider including alternative materials such as PVC in their bidding processes. Increased durability means fewer leaks, better water conservation and lower costs. Lower operating and life-cycle costs make good economic sense.

With over two million miles in service in North America, PVC has been celebrated by *Engineering News Record* as one of the top 20 engineering advancements of the last 125 years. A study by the American Water Works Association Research Foundation recently quantified the life expectancy of PVC pipe at more than 110 years – making it excellent for long-term asset management and sustainability. Another study presented at an international pipe symposium in Milan reported that vinyl pipe installed 70 years ago in Germany could easily see its 170th anniversary.

Additionally, PVC's ultra-smooth surface means that less energy is

WALKERTON, ONTARIO: from tragedy to triumph

Another advantage of PVC pipe is that its smooth, non-corrosive surface stays clean even after decades of use, unlike that of iron pipe, which suffers from tuberculation, a bio-film contamination. Tuberculation is internal sedimentation and corrosion which restricts the flow of water in iron pipe.

Iron pipe was used in Walkerton, Ontario where 2,500 people got sick and seven died. E-coli had infiltrated the water network and the town had great difficulty purging it from the system, since it had been exacerbated by tuberculation in the iron pipe. Only after repeated and costly flushing with super-chlorination was the piping system safe to use again.

Now part of the Municipality of Brockton, Walkerton is replacing its iron pipes with PVC. In fact, it's the only material the community now uses in its water system. Says Colin Saunders, Brockton's utilities manager, "With PVC pipe, I don't have concerns about corrosion, tuberculation or water main breaks, and this means lower maintenance costs and a longer lasting piping network."

required to pump water from source to tap. According to Dr. Bryan Karney, professor of civil engineering at the University of Toronto, a national program to replace older pipes with hydraulically efficient plastic pipes could reduce Canada's greenhouse gas emissions by up to five percent.

Furthermore, PVC pipe is more efficient to manufacture, taking four times less energy to make than concrete pressure pipe, and half that used for iron pipe. PVC's light weight reduces transportation and installation costs, yielding additional energy savings. It is also totally recyclable, though most of it has yet to enter the recycling stream given its great durability.

A municipal success story

A two-year study conducted in the 1990s by National Research Council of Canada showed that PVC pipe had the lowest break rate of pipe materials tested.

Municipalities which have adopted this technology have achieved dramatic results. In 1978, Calgary implemented


a more open procurement policy allowing PVC. As a result, half of its 4,000 kilometre water distribution system now consists of this material. Its water main break rate, at 0.2 per 100 kilometres, is the lowest in Canada.

Use of corrosion-proof piping materials is essential to the long-term financial management of water and wastewater systems. By making extensive use of PVC, Calgary and Edmonton save an estimated \$5 million a year in water main repair costs. But this is only part of the savings. The biggest financial benefit will come from lower replacement costs over the long term. If the Calgary approach were adopted nation-wide, hundreds of billions could be saved over the next century.

PVC pipe: the future of water distribution

While most municipalities in Canada allow PVC pipe in smaller diameters (up to 12 inches), some do not allow larger-sized PVC – especially in eastern Canada. Use of small diameter PVC pipe has helped water utilities keep the water main break problem from getting worse. Increasing its use in large diameters would help municipalities emulate Calgary's success.

For instance, the water main break rate per 100 hundred kilometres for several major Canadian cities is high: 8.7 for the Region of Durham, 10.9 for Peel Region and 26.9 for Toronto. These rates would be significantly reduced by increasing the use of longer-life, lower maintenance assets like PVC pipe.

Solving Canada's underground corrosion crisis will require openness to alternative, longer-lasting and more resilient pipe materials such as PVC. And purchasing agents and water utility officials should take the lead from Calgary and other communities by insisting that PVC pipe be part of their bidding processes. 

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