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SIGNIFICANT WATER CONSERVATION THROUGH INDUSTRIAL, COMMERCIAL AND INSTITUTIONALLY SUPPORTED MUNICIPAL WATER LOSS MANAGEMENT

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ABSTRACT

Industrial, commercial and institutional (ICI) facilities are mainstays in small Canadian communities providing an economic backbone upon which community growth is supported. Many ICI facilities rely on local raw materials and resources in order to operate. In order to minimize their demand on these resources, facility managers are continuously seeking ways to improve their operating efficiency through innovative technology, streamlining production and internal education. The cost of water is a significant variable cost for business with huge potential for increased value in the near future. Aside from the financial incentive to become more efficient, ICI demand for water resources can often contribute to situations of scarcity for the community sharing the local water source. Growth of the industrial group and the survival of the local community are determined by the availability of that resource. Regardless of the economic reliance of the community on that facility, eventually ICI facilities will be called to minimize use to allow the community to remain sustainable for the long term. This concern is what has stimulated a recent interest on behalf of ICI operators to strive to become 'water neutral'.

If a facility is to be considered 'water neutral' then local source water capacity should remain at the same level while the company is in operation as it would be before the operation existed. This definition is often interpreted as unrealistic since it has previously been accepted that most industry requires the use of water for processing, cooling and perhaps even as a raw material for the products they manufacture. To completely eliminate this resource from such activities would be utterly crippling for any business.

Instead of limiting ICI access to water and prohibiting that company's prosperous growth, a resource management model similar to the Carbon Credit market structure should be proposed. That industrial, commercial and institutional demand for water should be offset by financially supporting water loss recovery projects in the community surrounding the facility. By preventing water from being lost to leaks, the resource capacity of the local source is quantifiably increased by the volume of water recovered. By repairing an equivalent volume of leakage to that of the ICI facility's daily operational demand, the consumption from that operating day is effectively negated by the recovered capacity.

The value of water conservation and the need for more innovative water management strategies has never been more apparent. This literal capacity increase, sponsored by locally operating ICI facilities will ultimately prove to be the only true 'Green' water credit source as it is a direct replacement of otherwise wasted water that would not be possible without the direct funding mechanism proposed. .

Considering the resource recovery potential, private efforts to offset unavoidable daily use may become the missing link in the supply of funding towards effective local water loss management in small communities, proving to be one of the most significant opportunities for water conservation on the planet.

INTRODUCTION

Significant municipal water loss will continue to rise over the coming years. Blame that on aging infrastructure, with some of the country's water distribution systems, pipes and fittings nearly a century old. Over the coming decade, an estimated $90 billion will be needed to manage Canada's decrepit water systems. The necessary leak detection, training and manpower are tremendously expensive for municipalities at a time when government resources are scarce. If small municipalities are expected to shoulder the immense cost of this maintenance themselves, billing rates would need to increase dramatically, especially in rural areas, and ratepayer discontent will grow accordingly.

The value of water conservation and the need for more conscientious water management strategies has never been more apparent. A new system is slowly emerging which will provide the means to work directly with small municipalities and with local industry to educate on the best management practices available to tackle this issue and to facilitate a dramatic, measurable decrease in the daily volume of water lost to leakage. This document will highlight the value of enlisting the services of industry leaders like HETEK Solutions Inc and associated not for profit organizations like the Water Loss Initiative in order to learn more about the best methods to reduce private industry's operational demands and how to recover a significant, quantified volume of water loss with the District Meter area method. The financial model described for supporting this opportunity will prove to be the most sustainable and efficient mechanism for protecting our limited water resources, spreading public awareness of the issue's severity and for helping to control the public costs associated with water loss.

A Brief Review of Water Loss in Canada

With 24 million people reliant on municipal infrastructure to supply their homes with water, and with each of those individuals consuming 335 litres of water every day we are left with an average daily demand of 8.04 billion litres on this country's water resources.

Add to that the estimated 18% demand for the industrial, commercial and institutional sector within these municipalities we are facing an average daily demand for water of 9.8 billion litres. It is astounding to consider that of that 9.8 billion litres a conservative estimate of 10%, or 980 million litres, is poured directly back into the ground each day due to the presence of leakage in our underground infrastructure. Couple that significant volume of water loss with the related waste of energy from treatment and pumping and add the ecological concern over the continuous release of chlorine used to treat our water being dumped into our streams and water resources every day. The benefits of tackling this issue have become clear.

The actual question is no longer whether or not tackling water loss across our country has merit but instead the question becomes how small municipalities with limited manpower, training and budgetary resources will manage to prevent the dramatic losses from occurring within their areas operation.

The solution to this problem can be found within the community.

Conservation through Industrial, Commercial and Institutionally Supported Water Loss Management

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There are two areas of activity required within the ICI supported water loss management model. Those areas are ICI facility water efficiency and targeted water loss management within the community.

ICI Facility Water Efficiency

More and more companies are finding themselves embroiled in highly public and emotionally charged disputes over a resource considered by many to be a human right resulting in community and regulatory pressure.

To achieve improved water efficiency it is important for an ICI facility to complete an internal water use audit. The focus of a water use audit exercise is to provide a clear picture of the water use patterns within the site, to assist in preparing a plan for reducing consumption and then clearly identifying the remaining volume of unavoidable daily use. A water consumption assessment for ICI facilities is completed with the expectation of preparing a recommendations document outlining the benefit/cost of any potential retrofit/refurbishment. Beyond the improved efficiency of the facility, the critical goal is to accurately measure and quantify the facility's volume of unavoidable daily use on an average litres per day basis. This information is the ultimate factor for determining your water loss recovery target and is the base upon which the pricing and schedule for support of a water loss recovery program within the local community is established.

The ICI facility water audit will help ICI facilities to reduce operating costs through the identification of more efficient ways to use the existing water supply.

Facility managers should be aware that accurate water meters are essential for a valid water audit. The main City water meters indicate the amount of water supplied to the site. Sub meters indicate water used for specific processes and individual buildings on the site.

Sub-metering is an excellent way to accurately account for large water uses in specific processing equipment for departments within the plant. Sub-metering helps personnel become familiar with water use for all operations and indicate whether equipment is using water when it is not needed.

Following the commissioning of any water metering technology, the next step is to conduct a walkthrough survey with knowledgeable facility personnel who are most familiar with how water is used in each area of the facility. Use direct observation and measurements to identify and record all pieces of equipment that use water.

Once a potential measure has been identified as a likely candidate for retrofit or refurbishment, it is then necessary to conduct 7-day period flow monitoring. The purpose is to obtain hard data and to identify realistic values representing consumption levels for identified processes within the facility and to convert that flow data into a benefit/cost analysis. The most effective way of doing this is to monitor flow trends in the area of study over the period of 7 days when consumption in the area of study is typical. Once a demand trend has been identified the facility manager will provide the flow data to the designated mechanical engineering specialist for this project, who will proceed to establish the potential for savings related to a possible retrofit/refurbishment.

With the walkthrough completed, it is important to represent the acquired facility demand data in a concise format that displays all the water using components together summarizing the daily demand for each item. Contrasting the uses with the available sources allows for the manager of the audit to establish a water balance, providing a system to verify that all uses are accounted for against the recorded volume of supply. Aside from the ability to reassure the user of the thorough inventory of water uses, a properly completed balance essentially provides the manager with a 'roadmap' for planning which retrofit opportunities demand the most immediate attention when contrasted against the demands of other items within the facility.

As discussed, the goal of becoming water neutral is achieved by first reducing internal water consumption, to maximize operating efficiency, but then to proceed with establishing targets for water offset credit by accurately assessing the volume of unavoidable daily water use on an average litres per day basis.

When assessing the volume of unavoidable daily use it is critical that the manager responsible has considered all corporate plans for production increases, revenue growth goals and local legislation regulating your company.

The Benefits of Conducting ICI Audits

A completed ICI auditing program in conjunction with an effective retrofit and replacement program will provide the facility with improved operating awareness and efficiency, reduced operating costs, significantly reduced resource demand and as a result, improved public image. This diminished water demand will help to minimize the cost of the remaining offset water credit.

Community Water Loss Management

The critical component in reliably offsetting the now defined ICI facility's desired volume of unavoidable daily water use is to accurately quantify the volume of water loss within the local community and to precisely pinpoint the location of those losses out in the system in order to facilitate their repair. The reliable measurement of the located leak volume is absolutely necessary in order to ensure that the volume recovered is verifiably recovered for future use. This leakage quantification and repair exercise completes the foundation of the water offset credit by becoming the measured volume of recovered water credit to balance against the recently determined ICI facility's volume of unavoidable daily use.

The District Meter Area (DMA) method of leak detection is primarily a flow based technique to quantify the level of leakage, or real water losses, in a water distribution system. This approach is the most cost effective and reliable method for achieving the quantification, repair and offset goals described above.

The first stage when conducting a DMA study is to obtain hard data and identify realistic levels of real losses within the water distribution system. The most effective way of doing this is to isolate the system into smaller districts, and monitor flow trends in these districts. Typically each district will have the district flow monitored for a period of 7 days. During the course of this exercise, carefully monitor any pressure fluctuations using data loggers, spread throughout the respective districts. Any major consumers, or critical consumers such as dialysis patients, are carefully considered prior to any testing of this nature.

Once a demand trend has been identified, the minimum night flows will be compared to the theoretically estimated legitimate usage. The minimum night flow, less any legitimate usage, will give an indication of the volume of real loss of water in any particular DMA.

Areas designated for further investigation are subjected to a number of techniques to find the general area of the leak. These techniques can include noise logging, step testing, or

correlator surveys. The decision on which technique to use, is made based on the characteristics of each individual DMA. Step testing is most common.

Step testing consists of isolating sections of main from the supply by a number of controlled valve closures against the district flow meter, which is set to record flow against time. Step testing can be particularly beneficial when testing sections of main which are traditionally hard to test with sonic equipment, such as PVC, where leak noise levels are not transmitted for long distances. The step test is undertaken during the minimum night flow period, and any valve closures which cause a large reduction in the night line are recorded for further investigation. Crews noticing a large reduction in flow at a particular step will continue to follow through with leak pinpointing. This method of testing ensures that an operator does not miss a leak, since he knows that a high flow is occurring in the area of distribution system and the volume associated with that loss.

The Benefits of Supporting a Local District Meter Area Study

The sponsoring facility has directly contributed the reduction of an existing national daily water loss volume and more importantly to a direct increase in locally available water capacity. In addition to preventing water loss the local region benefits from no longer needing to generate a significant amount of energy to supply and treat that water, previously lost to waste. The sponsored, temporary provision of technology resources and manpower during the project delivery phase allows municipal staff to develop new skills through exposure to industry best management practices and on-site training. This private sponsorship of local water loss recovery facilitates better long term management of the community's valuable water resources.