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## Rejuvenating Hydronic Systems Without Chemicals: Mission Possible or Impossible?

Two historical buildings in Saint-Eustache, Quebec, the Globensky Manor and the Police Headquarters, were equipped with an old hot-water heating system when the City of Saint-Eustache acquired them.

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(Éditorial en page 5)

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Par M<sup>e</sup> Jean-Pierre St-Amour — En page 7

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d'enrobé bitumineux contenant  
du bardeau d'asphalte recyclé** (En page 12)



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# Rejuvenating Hydronic Systems Without Chemicals:

## Mission Possible or Impossible?

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Two historical buildings in Saint-Eustache, Quebec, the Globensky Manor and the Police Headquarters, were equipped with an old hot-water heating system when the City of Saint-Eustache acquired them. Each radiator had its original control valve, a faucet-type unit allowing the user to increase or decrease hot water flow depending on the desired room temperature.

Because adjusting these control valves proved a "hit and miss" affair and caused a lot of user discomfort, they were replaced with manually-controlled or electrical-signal thermostatic water valves in both buildings concerned.

However, these new valves included a sophisticated water flow adjustment system. This flow control device was often obstructed by lime scale deposits forming permanently in the mechanism and making the valve irredeemably inoperable.

A quick corrective solution consisted in replacing any valve as soon as it became non-functional, which proved expensive (nowadays, it costs about \$400 to replace a single thermostatic water valve). Ensuingly, the City evaluated the feasibility of cleaning the heating system's piping networks.

### Chemical Cleaning of The Piping

Chemically cleaning the piping normally follows a two-step process. First of all, chemicals are injected into the piping. These additives dissolve the various deposits so as to suspend them in the water, then are drained away. Secondly, a stabilizing solution is added to counteract the first injected product's cleaning effect. Finally, the network is filled with water.

This process was discarded because its results would only produce a temporary effect, given that more deposits would form again during subsequent years. In addition, we deemed this technique a risky one on account of our networks' age. The danger of multiple leaks in the walls and ceilings was very real due to the following potential situations: the injected active product can thin out inner pipe walls in certain spots, and non-neutralized active residues lodged in the piping's joint threadings can carry on their dissolving effect.

### Catalytic Water Treatment

Around 1994, the City received some advertising on Evolu-Tech Ltd.'s Mag-O-Pure system, which demonstrated bold new ways of solving the above issue. It then called Evolu-Tech, which responded by organizing a visit of the Oka Cistercian Abbey in order to show City of Saint-Eustache officials the high degree of satisfaction which the Trappist Monks have been enjoying with the implementation of Evolu-Tech Ltd.'s Mag-O-Pure system on their hot-water heating system. The visit having proved conclusive, the City decided to install a Mag-O-Pure system on the Globensky Manor's hot-water heating system on a trial basis.

## **System Description**

Evolu-Tech Ltd.'s Mag-O-Pure system, on the market since 1987, had already proved it could delime even in extreme conditions, as demonstrated in an appraisal conducted by the Quebec Industrial Research Center (*CRIQ*) in 1992. But what particularly convinced City administrators is all the successful applications of the Mag-O-Pure catalytic water treatment in hydronic heating circuits since 1988.

The two systems installed at the City of Saint-Eustache include a loop that pulls water out of the boiler to catalyze it, then filters it before sending it back into the boiler.

The Mag-O-Pure system's underlying principle consists in using the drinking or natural water's existing mineral potential to the utmost, catalyzing the water to make sure that lime precipitation formed as a result of water heating remains in colloidal suspension, then filtering this precipitation as it is formed in order to prevent its depositing on pipe walls and valves, an often inevitable process in water supply systems.

A light warning is activated upon a low flow signal in order to prevent the pump from overheating and warn that the water filter is due for a change.

The Mag-O-Pure system's work was analyzed and demonstrated through research at Sherbrooke University in 1988. This project found out that calcite, the crystalline form usually encountered in lime deposits, is preferably catalyzed into aragonite whose morphological dimensions allow its mechanical filtration.

Because the water treated in this fashion always remains at the hardness's saturation point, its natural alkalinity increases proportionally to its temperature. This water's pH is always neutral, and varies according to operating temperature. This phenomenon is observed in all applications of Evolu-Tech Ltd.'s Mag-O-Pure system and contributes to preventing corrosion.

### **Installation at The Globensky Manor**

This manor, built in 1861, was house to the lord, but burned down in 1901, then was re-built from 1902 to 1903. In the Thirties, a hot-water heating system with an oil-heated cast iron boiler was installed. In 1962, the municipality acquired the Manor. At the beginning of the Eighties, it had manually-controlled thermostatic valves installed on all radiators. Each valve has a graduation scale from 1 to 5, allowing the user to better control ambient heat.

In 1995, Evolu-Tech Ltd.'s Mag-O-Pure system was installed, and has provided excellent results. Since then, the thermostatic valves have never needed replacement, maintenance has been facilitated, and filters require only occasional replacement.

### **Installation at The Police Headquarters**

On the strength of the dramatic improvement that has steadily maintained itself in the Globensky Manor's heating system ever since the initial 1995 implementation, the City decided in 2000 to install a second Evolu-Tech Mag-O-Pure system in another municipal building dated 1958, which formerly housed the Post Office, but has been home to the Police Headquarters since 1986. This other building then still retained the original hot-water heating system with an oil-heated cast iron boiler. Shortly after the Police offices moved in, electrically-controlled thermostatic valves were installed and connected to the wall thermostat units. In 1988, the original boiler, in dire need of major repairs, was replaced by a natural gas boiler.

Evolu-Tech Ltd.'s Mag-O-Pure system again performed convincingly: the control valves no longer need any replacement, and the filters foul only after long periods of operation.

## Energy Savings

Catalytic treatment is not only effective in rejuvenating hydronic systems, but also an environmental friendly process and an extremely important energy-saving tool, as purports Evlu-Tech Ltd. An energy consumption analysis was conducted on the Police Headquarters installation, and revealed that it more than just met initial objectives: it also provided unexpected energy savings.

As the City of Saint-Eustache lies in between the Mirabel Airport and Dorval Airport weather conditions zones, a degree-days average for both weather stations was used to standardize natural gas consumption measured during the heating periods immediately preceding, and immediately following, the August, 2000 installation of the Mag-O-Pure system at the Saint-Eustache Police Station. Results show a 20 to 25% reduction in natural gas consumption per degree-day, despite an increase in degree-days and slightly shortened sunshine time.

## Other Savings Considerations

One of the benefits of catalytic water treatment is difficult to evaluate on a short-term basis: its contribution to cutting the costs of maintaining and replacing equipment that contacts with catalyzed water. These savings in operating costs add to energy savings, the latter normally accounting for between 66 and 75% of total savings, according to Evlu-Tech Ltd.

Evolu-Tech Ltd.'s Mag-O-Pure system has stood the test in various municipal applications:

Humidification, reverse osmosis pre-treatment, cooling systems, arena ice and vapor generation are only a few of the applications in which savings have been obtained in cities other than Saint-Eustache.

