St-Eustache Police Station case study

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Subject : Evaluation of the St-Eustache Police Station case

A post office was built at St-Eustache (QC) in 1958, with a hydric (hot water) heating system. Town of St-Eustache took over this old office in 1986 to convert it into a police station.

Heating system revamping, construction, insulation and newer fenestration works were completed at summer 1997. Among the work performed, the existing water heater was changed by a gas heater. In that building, natural gas is strictly dedicated to water heating, using the former hydric system made of old original piping and room radiators.

The Evolu-Tech catalytic water treatment was installed on that system in august 2000. Early at the beginning of winter 2000-2001, a comfort improvement was noticed in the police office and the breathing valves on the radiators showed an important reduction of calcareous scaling, leading to lesser plumber calls.

Why was a catalytic treatment chosen? :

A chemical descaling with an acid was excluded due to the risk of jeopardizing the whole heating circuit by causing mid-term corrosion against which the chemical treatment providers couldn't provide a warranty.

At that time, Evolu-Tech Ltd was treating since five (5) years another hydric circuit installed in the early nineteen's at the Manoir Globensky owned by Town of St-Eustache. Evolu-Tech was also giving warranties on his catalytic treatment process supported by documented researches.

The descaling tendency results, the comfort improvement at Manoir Globensky and the warranties given by Evolu-Tech were interesting and they all contributed to the choice of a catalytic treatment for this renovated police station which was at that time indicating an increasing scaling of its hydric circuit.

An ideal case to the check savings due to descaling :

In 1998, renovations of the police station (added insulation, new controls and new thermostatic valves) are completed but scaling problems are still remaining. A catalytic treatment was installed in august 2000 at the police station that became an ideal opportunity for an energetic reduction study due to the treatment descaling, since that treatment installation was the only change on the circuit since 1998, the gas consumption is totally used for heating, and up and above, all gas billing is also available since December 1998.

It's not common that natural gas installations are only and totally used for heating. Also, since the revamping work was completed two years ago, a complete year prior to the catalytic treatment system installation could be used to specifically evaluate the impact of the treatment. Most of the building energy simulations are not considering a heating circuit cleaning as an energy saving. Most of the time it cannot be evaluated and only some parts of a hydric circuit is cleaned. Generally, each two years or as required, only the water heater of a circuit can be descaled with an acid wash. That frequency of acid washing is a good indication of continuous scaling of the system and its radiators without knowing their status of scaling with time. It's where the police station case becomes important to enable a global evaluation of all these parameters.

The herein energy savings evaluation is based on the GazMetro billing of the police station since December 1998 and they will be normalized using the monthly Meteorological Summaries issued by Environment Canada. When the cost analysis of the police station heating was decided, the gas consumption bills prior to December 1998 have been included in immobilization expenses reports of Town of St-Eustache and were not available anymore.

Measurements and conditions :

The data used for comparison should be as much as possible without interferences and be available for the same periods of time with the same measurements basis.

The GazMetro bills are giving the volume of gas consumed and the gas cost for each period. Since the price of gas is fluctuating, it could not be considered part of the energy savings evaluated. Savings were therefore expressed as gas units of volume. The gas price of the year preceding the installation of our treatment and the four (4) years following it presented by itself a mean increase of +40%.

The energy request is also linked with climate conditions, control measures and to the thermal insulation integrity of the building. The building thermal insulation has been revamped two years ago and wasn't touched during all the evaluation period. The heater has only two years old when the treatment is installed. The hydric system is 55 years old and the thermostatic valves are also two years old at that time. Normally, everyone is always acting to improve its comfort when it's not fulfilling it. So, if the treatment is efficient, it will reduce the need for control and therefore reduce also the human intervention. Its why that part was not considered for many years. Anyway, the control setups didn't practically changed. The climate measurements remained the main parameter permitting normalization of the gas consumption for the evaluation period. The heating degree-day will enable to compare winter periods if the thermal insulation remains constant. Cooling degree-days are also indicated and available. Hence these billing periods with cooling degree-days indicated on Environment Canada summaries should be excluded of the study. It happens during spring and autumn days that cooling is necessary during the day period and that heating is needed at night. This situation can lead to as many cooling degree-days as heating degree-days generation during 24 hours. Since it presents a risk of distortion for the real gas consumption, these days should be taken out of the study. These constraints limited the usable periods to about 150 days generally between October 20 and Marsh 20.

Résults :

In Appendix you will find several analysis tables. Since the basis of comparison are the volume of gas consumption and the heating degree-days, the energy fluctuating index used will be, for each period, the gas m3 per degree-day. This should give a real heating system efficiency improvement if there is.

You can go through a table in appendix where the data used, the periods compared and the change in noticed efficiency are summarized. Graphics are also available to visualize the comparisons and the effects of the catalytic treatment on the hydric system.

Degree-days reported by Environment Canada :

The Environment Canada reports are providing for each day the minimum, maximum and mean temperatures expressed as Celsius degrees.

The different degree-day are given following the calculation:

Heating degree-day = 18 C – mean temperature
Cooling degree-day = mean temperature – 18 C

During autumn and spring, the same month can have heating and cooling days based on that calculation. Since the degree-days have to be positives, each day presents one or another condition.

For heating degree-day, when the outdoor temperature is colder, the degree-day should be higher.

In the case of Town of St-Eustache, we consider that its area is colder than the temperatures measured by the Dorval meteorological station, but less coldly than those from the Mirabel station. Its why for the police station we will use the mean temperature measurement between Dorval and Mirabel for the present savings study.

The billing periods used are when Environment Canada doesn't show cooling degree-days for both meteorological station, and when there is only consecutive heating degree-days shown.

Conclusions :

Table 1 and Graphic 1 are showing the basic data used to evaluate if the Evolu-Tech catalytic treatment is descaling the hydric circuit and if it can maintain it descaled afterword, contrary to chemical treatments.

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The natural gas consumption before the catalytic treatment installation was 2.963 m3/d-d on average for 1999-2000 winter while an average consumption of 2.406 m3/d-d was obtained for the next four winters, presenting consumption reduction of 18.8% overall (graphic 2). The study is supporting the Evolu-Tech saying that at least a 10% saving can be realized with a catalytic treatment and that they are maintained as long as the treatment is under control and used (graphic 4)

2002-2003 winter was the coldest one with a gas consumption similar to the reference period giving savings of 14% realized in m3/d-d. Winter 2001-2002 was the hottest with 20.8% savings in m3/d-d.

The catalytic treatment can then be considered as a mean of long lasting descaling for hydric circuits maintaining them clean without acid washing, without sequestering agents, without phosphates, without chemical descaling, without softeners or deionizer which contribute greatly to circuits elements corrosion. The catalytic treatment can be applied to old and new installations. It is efficient in reducing and controlling scaling of the whole water circuit globally.

Consequently, circuit pieces of equipment require less maintenance and can double their life cycle. It's true for the heater, the radiators, piping, valves, controls, etc. These savings haven't been evaluated in the study.

From the results noticed for that treatment case we can say that it'll contribute to a reduction of at least 10% of greenhouse effect gases, a reduction of 90% of the chemicals rejection above the realized maintenance and mentioned energy savings. The mean price of m3 of gas, which was not considered in the study, had raised by an average of 40% over the four (4) years following the catalytic treatment installation (graphic 3). Therefore, savings in money are 26% over four (4) years.

If you need information or if you have questions you can contact us,

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