



Building Owners and Managers
Association of British Columbia

Unlocking Building Efficiency from Within

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PACE Chemicals specializes in water treatment for these HVAC systems. As sustainability manager at PACE I have had the opportunity to oversee hundreds of projects that have resulted in energy savings and ghg emissions reduction ranging from 5 – 30% of total building consumption just through water treatment. No major capital costs and no equipment required. In the next few minutes I will give you the top 3 things you can do to maximizing efficiency through water treatment.



39%

**Of all Greenhouse
Gas Emissions
are from Buildings**

According to stats Canada and US department of energy 39% of all greenhouse gas or GHG emissions come from buildings. GHG are considered the number 1 cause of global warming

50% of those building emissions come from the energy consumed to heating and cooling our buildings. For every 100 GJ of natural gas burned to heat a building, 6 tonnes of CO₂ emissions are released into the atmosphere

That means your heating and air-conditioning results in nearly 20% of global GHG emissions which is more than the emission from cars. Consider the length of your commute compared to the energy consumed to heat and cool your office and your home.



50%

**Of all buildings
in 2050 will have
been built before
2020**

Buildings last an average of 73 years which means over half of all buildings in your departments portfolio will still be here in 2050.

What are we doing now to improve energy efficiency and reduce emissions in existing buildings?

Major retrofits, like replacing boilers, changing windows, changing the building envelop for more insulation are extremely costly and have a payback period of 7 to 25 years.



Water-based Heating & Cooling

- Boilers
- Chillers
- Heat Pumps
- Cooling Towers
- Geothermal

Most buildings, other than single family residential, use water based heating and cooling systems to control interior temperatures.

Water is used because it can carry 3200 times more heat and transfers that heat 25 times faster than air. The HVAC industry and the Green Building community has focus on improving the energy efficiency of the system equipment. This costs hundreds of thousands and can take 7-20 years before the energy savings offsets the cost of the upgrade.

The water in the system is often overlooked.



Prevent Efficiency Loss

- **Corrosion**
- **Scale**
- **Fouling**

Step 1) Preventing corrosion is the first key to peak efficiency

Water is the heat transfers highway. To run at peak energy efficiency the water needs to be able to transfer heat to the building or exhaust heat for cooling. Anything that diminishes heat transfer will increase energy consumption. Dissolved gases like oxygen in the water promotes corrosion, dissolved minerals causes scale formation and suspended solids promote fouling.

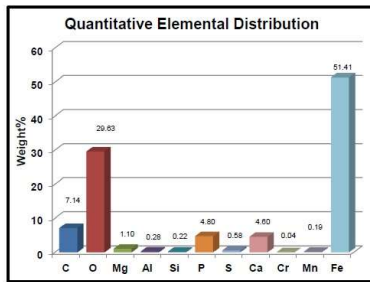
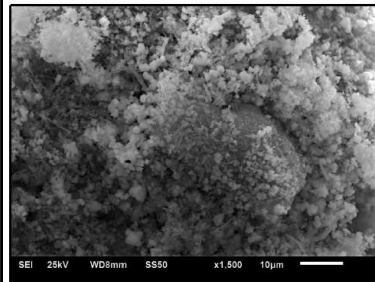
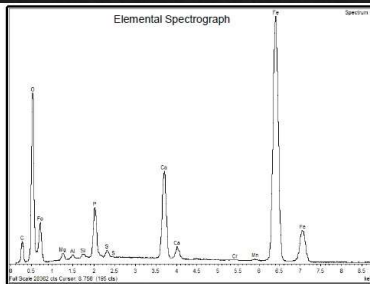
These systems are typically closed loops meaning they recirculate the same water. When water is lost due to maintenance or a leak, an automatic make up meter adds fresh water. The fresh water carries oxygen and minerals which corrode and foul the system.

This does two things, it causes pinhole leaks which adds more fresh water and accelerates the corrosion and it can causes the build up of minerals on heat transfer surfaces. A fingernail thick buildup in a heating system will increases energy consumption and emissions by 18%.

Do you have a Water Treatment plan?

How frequent are you testing?

Do you have an action plan when parameters are out of specifications?



Prevent Efficiency Loss

- Corrosion
- Scale
- Fouling



- 1) Regular Testing
- 2) Monitoring
- 3) Filtration
- 4) Flush & Clean

5-10%

Maintenance is key but what if you haven't maintained your water quality

Systems can be flushed and heat transfer surfaces can be cleaned.

Fouled systems can reduce energy consumption by 5-10% through a system cleaning procedure.

A flush is not recommend on all systems so consult a professional water treater before under taking a flush and clean.



Cooling Tower Efficiency

- **Scale**
- **Bio-Fouling**
- **Water Consumption**

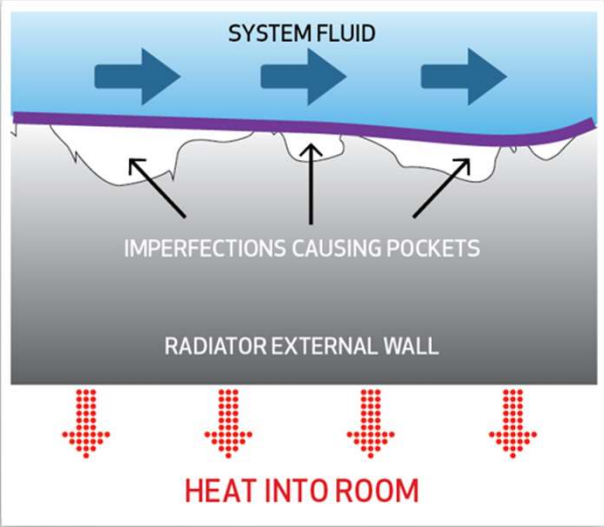
Cooling towers run an open circulation system where water is evaporated to produce heat loss and cool the building.

Each time water is evaporated it leaves behind its minerals. This builds up over time and “scales up” the heat transfer surface. A credit card thickness of scale in a cooling tower will increase consumption by 28%. The tower is also the ideal temperature for bio-logical growth which leads to the potential for Legionella growth and the spread of Legionella Disease.

Building regularly flush and replace system water to prevent the scale from building up which causes massive water consumption. A building like this could use over 1 million litres per year. The water is treated with a conditioner that helps prevent corrosion and keep the minerals in suspension so it can be used more times before it needs to be flushed. Building operators should check their tower once per day to make sure treatment levels and equipment are functioning properly. Realistically systems might get checked once per month.

Solution: Automated treatment and monitoring which connects via cell modem to a cloud-based platform and alerts the water treater and/or building operator if conditions fall

outside the recommended range. This allows buildings to identify issues within hours, preventing scale, corrosion or biological growth to develop and minimize water loss.



Energy Efficiency Additives

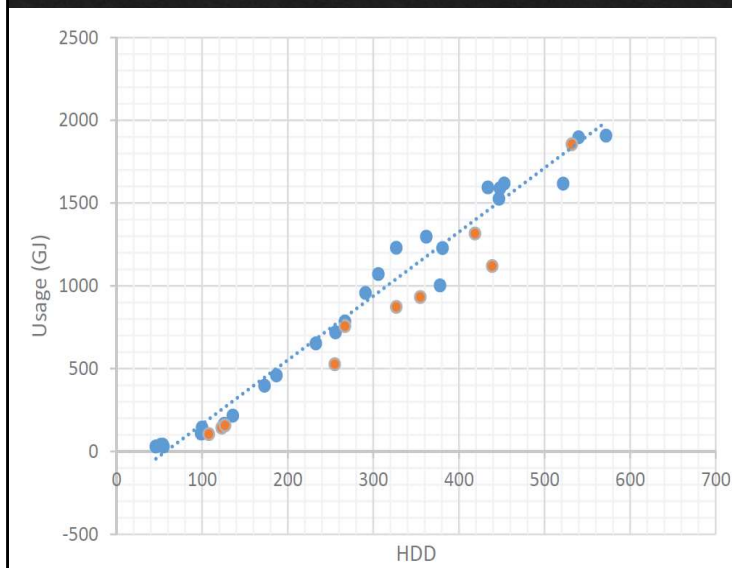
- **Reduce Surface Tension 60%**
- **Increase Heat Transfer 15%**
- **Lower Energy Consumption**

Water is a great heat transfer medium for buildings. It's easily accessible, safe for discharge and can hold 3200 times more heat than air. We know how corrosive it is but it has one other problem. Water has high surface tension caused by hydrogen bonding. The high surface tension prevents water from accessing all parts of the heat transfer surface effectively reducing the surface area available for heat transfer.

The automotive industry uses additives like Redline Water Wetter to lower surface tension and improve heat transfer in race car cooling systems. Unfortunately the technology wasn't suitable for HVAC use because they need to be drained and replaced often. It took some time but the technology has been improved and developed for HVAC use. Without disruption to the existing systems, a small amount of the additive will lower the system water surface tension by up to 60% and increase heat transfer by 15%.

PACE has used EndoTherm to lower HVAC energy consumption in hundreds of buildings. World-wide over 20,000 systems have saved on average 15% on their heating and cooling cost through the addition of EndoTherm.


The EndoTherm payback is typically 12-24 months with a longevity of over 9 years,



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To determine potential savings and measure actual results, energy consumption is weather normalized using heating degree days. Contact PACE if you are interested in determining your buildings baseline consumption and identifying savings opportunities with EndoTherm.



- ❑ **Cutting consumption reduces emissions**
- ❑ **Scheduled HVAC Water Testing**
- ❑ **Flush & Clean (If Required)**
- ❑ **Cooling Tower Monitoring System**
- ❑ **Reduce Surface Tension with Additives**
- ❑ **Consult a Water Treatment Expert (CWT)**

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Questions?

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