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EnergyLogix Solutions Inc.

energytalk

Cool Off Your Refrigeration Energy Bills

Key Factors:

- Use treatments specifically tailored for each facility and application
- Always try treatments first that don't alter operating hours or procedures
- Ensure the technologies are proven
- Is there a guarantee for savings? If so, what backs up the guarantee?

It's been said that 60% of the electrical energy consumed worldwide is dissipated in machinery and motor loads. For facilities with large amounts refrigeration and/or air conditioning, the figures can be even higher. Cold-storage warehouses, food and dairy manufacturing and distribution, ice arenas and datacentres are all examples of facilities with very substantial cooling systems. Other types of industrial manufacturers often have chiller systems for particular process steps, and large commercial buildings will also have large chillers for air conditioning. The question is how to make these systems more efficient, without raising temperatures or otherwise changing how things are operating.

The good news is that there are great options that don't require you to change how you do things, and won't break the bank.

When you do start investigating how to improve cooling efficiencies, make sure you choose the technologies to match the application, and ensure that whatever you choose is field-proven. You don't want to experiment on your mission-critical refrigeration systems!

Finally, work with partners that have experience working with refrigeration systems, and can demonstrate real and significant energy savings.

Technologies abound for enhancing refrigeration efficiency

Inside this issue:

Electrical Distribution Losses

Electrical distribution losses are the first items to look at when enhancing efficiency in refrigeration systems. These are energy losses incurred in the wiring between your electric meter and the motor load itself. Typically, the motors used in refrigeration systems do not have inherent power-factor correction, meaning they draw more current than is actually needed in order to perform the work. This extra current flows through the facility wiring (which can be hundreds of feet in length) and leads to additional heat losses — which you, the customer, pay for on your electricity bill. For motor loads not close to the meter, it's beneficial to add power-factor correction at the motor itself, to minimize these losses.

For a complete discussion on distribution losses, including technical details, the reader is encouraged to view the following blog posting:

www.energytalk.ca/PF_Topic.html

Polarized Refrigerant Oil Additives

Enhance compressor efficiency dramatically with polarized refrigerant oil additives

All refrigeration systems, as part of the refrigeration cycle, use some kind of mechanical means to compress the refrigerant while it's in a gaseous form. All compressors are mechanical machines, and like the engine in your car, contain oil to lubricate the moving parts.

An important consequence of this setup is that small amounts of compressor oil leak out over time into the refrigerant lines, ultimately lining the metal walls with layers of oil, which act as an insulator. This phenomenon, commonly known as "oil fouling", acts to reduce the efficiency of refrigeration systems by 7% in the first year, 5% in the second year, and by 2% per year in subsequent years[1].

Oil fouling can be completely eliminated with the use of a polarized refrigerant oil additive (PROA), which has an extremely high affinity for metal and actively displaces any oil attached to the walls of the refrigerant lines. The cooling efficiency is then restored to the level it was at when the system was first installed. For systems more than three years old, the energy savings can be tremendous, usually 15% or more.

[1] Per ASHRAE Handbook 1998, Sec 2.9

Smarter Temperature Sensors

*"Enable the thermocouple to measure **food** temperature, and not **air** temperature"*

In a typical reach-in/walk-in refrigerator or freezer, the thermocouple's job is simply to measure the temperature of the cooler, providing this reading to the thermostat, which signals the compressor to start or stop, if the temperature moves above or below the temperature setpoints. The problem with this setup is simply that the thermocouple is responding to the air temperature, and not the temperature of the food items contained in the cooler. When the cooler door is opened, the air temperature might temporarily rise, causing the thermocouple and thermostat to signal the compressor to turn on, when in fact the food temperature hasn't changed much at all. This causes more frequent compressor cycling and reduces efficiency.

How to fix this problem? Simply immerse the thermocouple into a medium that mimics the thermodynamic properties of food, so that it can get a more accurate reading of food temperature, instead of air temperature. This minimizes compressor cycling and can improve energy efficiency by 25% or even more.

Intelligent A/C & Refrigeration Controllers

Optimize compressor cycling to increase efficiency

Just as smarter temperature sensors can help improve efficiency in reach-in/walk-in coolers, intelligent controllers can improve efficiency in larger air conditioning and refrigeration applications.

A typical thermostat operates on simple principles, cycling the compressor on and off based on temperature setpoints. There may be some anti-short cycling control included, but that is typically the extent of the control intelligence.

A smart controller, on the other hand, utilizes an adaptive algorithm to analyze the demands and characteristics of the entire cooling system, and dynamically modifies the compressor cycle pattern. The result is less frequent and more efficient cycles.

Savings from this approach can be significant, at least 10% and often much more.

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EnergyLogix Solutions Inc. is a specialized energy services company offering diagnostic services, complete project design and installation of advanced electrical energy conservation systems. We reduce losses in the electrical distribution system, and improve the efficiency of motor loads, refrigeration systems, air conditioning and lighting.

Unique in the industry, we offer an insured guarantee on energy savings, backed by an insurance policy underwritten by Lloyd's of London.

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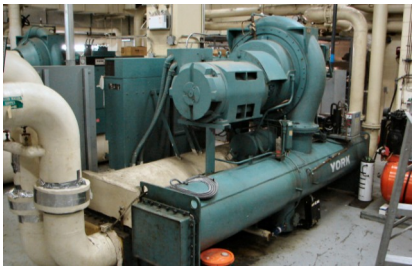
Large Building Chiller Systems

Large commercial buildings often have liquid coolant loop chiller systems installed for air conditioning. These systems operate with one or more compressors which act to cool a liquid coolant, which flows through pipes to air handlers, which then cool and dehumidify the air. Smaller systems may be air-cooled, with the compressor condenser coils located outside and cooled via fan-driven air. Larger systems are typically water-cooled, with the chiller located inside the building and the condenser cooled with water, which flows through pipes to a cooling tower, typically rooftop-mounted.

Even very efficient chiller systems employing centrifugal compressors powered with variable-speed drives can be made substantially more efficient. All water-cooled chiller systems have to contend with mineral scale and bioscale buildup within the water pipe system, which reduces heat transfer capability and harms system efficiency. Not only does this increase energy use, it mandates frequent manual pipe cleaning and increases the amount of water used in the process. A better solution is to use an integrated water management system, which uses RF technologies and ozone injection to eliminate mineral and bioscale buildup within the pipes. Energy efficiency is enhanced and water use reduced substantially.

Another area to look at is the compressor itself. Although standard centrifugal compressors are relatively efficient, you can gain another 30%+ in energy savings by switching to a "frictionless" centrifugal compressor, which contains no oil and uses a magnetic field to suspend the compressor shaft. Maintenance costs can be cut in half, and the systems run silently and vibration-free.



Typical Building Chiller

In the next issue:

Ontario's saveONenergy and Feed-In-Tariff (FIT) programs: what they mean for commercial electricity consumers