

Using DDC Optimization to Conserve Energy

AT THE INTERNATIONAL AND DOMESTIC TERMINAL BUILDINGS

Using DDC to Balance Energy Efficiency and Occupant Comfort

One of the easiest ways to save energy is to operate equipment only when necessary to address occupant comfort requirements.

YVR's International and Domestic Terminal Buildings' heating, ventilation, and air conditioning (HVAC) systems use direct digital controls (DDC) to automatically adjust temperature and air flow according to pre-determined schedules. The goal is to keep occupants comfortable while they are working and to reduce the system's usage and associated energy consumption when they are not.

CHALLENGE

Mismatched Schedules and Occupancy

While this may seem like a straight forward task, the biggest challenge to ensuring optimized DDC is to continually maintain appropriate schedule settings. Over time, routines change. Typically, staff ask building operators to increase HVAC system usage to meet new routines, but often forget to let them know when older schedules are no longer required. The result: unnecessary system run time and energy consumption.

SOLUTION

Revisiting DDC Optimization

Knowing that needs and occupancy patterns change over time, the Vancouver Airport Authority decided to review the terminal buildings' DDC schedules. From May to June 2018, revisions were made to 42 weekly schedules, shortening them by an average of 3.5 hours/day.



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RESULTS

A reduction of 0.5 GWh electricity, 1800 GJ fuel, and 93.5 tonnes of eCO₂

The terminal buildings' HVAC units use big motors (50 – 100 horsepower vs. an office building which uses approx. 7 horsepower motors) and the associated results are significant. Calculations were done to determine the expected electrical, gas, and associated greenhouse gas (GHG) emissions savings, shown to the right.

By reviewing and revising the terminal buildings' DDC schedules, the Vancouver Airport Authority reduced electricity usage from the fan system by approximately ½ GWh/year, natural gas from the heating system by 1,780 GJ/year (equivalent to an additional ½ GWh/year) and associated greenhouse gas emissions by 93.5 tonnes of eCO₂. That's equivalent to the average GHG emissions produced by 13 households in Vancouver each year¹!

Continual Optimization

This story isn't complete. By continuing to monitor DDC schedules, zone set points, sequences and maintenance requirements and engaging occupants and building operators in the process, the Vancouver Airport Authority will continue to find cumulative energy and GHG emission savings.

Prepared December 2018

Cumulative Electrical Savings (CUSUM)

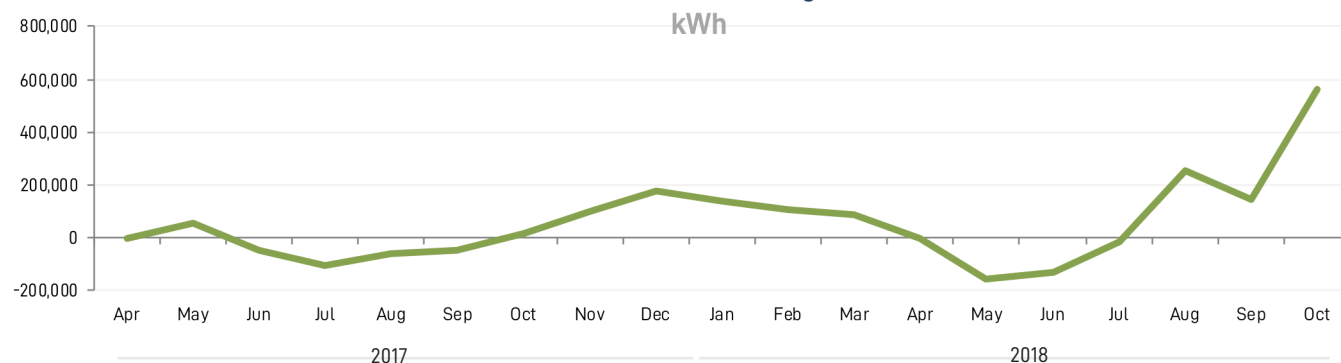


Figure 1: Cumulative electrical savings from May to October 2018

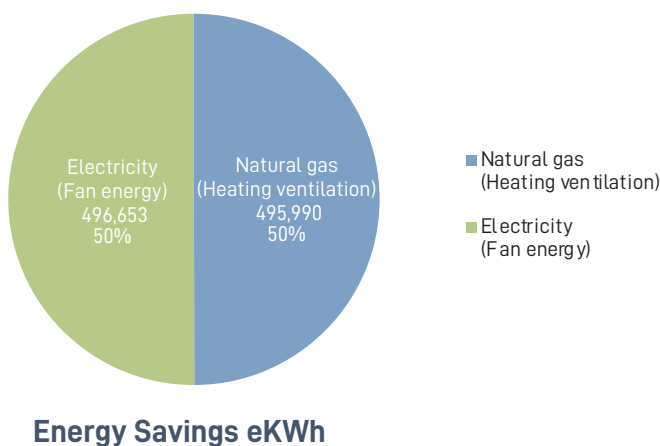


Figure 2: Electrical (fans) and natural gas (ventilation heating) annual savings in equivalent kWh

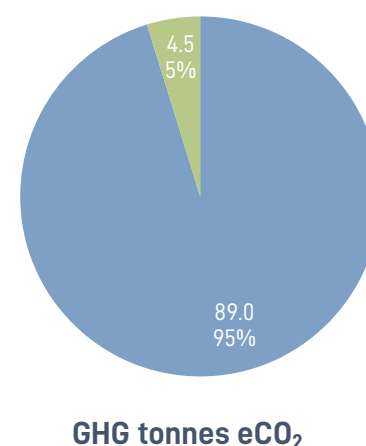


Figure 3: Greenhouse Gas emissions reduction by energy source

¹ Source: UBC Study
<https://news.ubc.ca/2016/07/27/montreal-households-the-greenest-in-canada-ubc-study/>