

Facility Case Study

COLD STORAGE



A Low Condensing Retrofit
Achieves a Staggering ROI



The Customer Objective

With approximately 300,000 square feet of multi-temp warehousing in British Columbia, a warehouse owner was looking to retrofit his legacy refrigeration systems. Their functional, but dated, systems were using mechanical expansion valves and basic fan cycling to maintain a high condensing pressure. The systems were still effective, reliable and most importantly, provided continuous operation which was essential for the facility to operate.

The legacy systems however, consumed unnecessary power regardless of the ambient temperature. The objective of the retrofit would be to address these high operational costs.

A requirement for the upgrade was to have a considerable reduction on operating expenses while not having an adverse impact on the customer's capital expense budget. A significant return on investment was the desired result of the proposed solution.

The Solution

OPEX and ROI were the driving forces behind a successful outcome. With this in mind, Emerson and their team of Authorized Contractors assessed the situation quickly and suggested a "low condensing" solution utilising Emerson electronic expansion valves and variable frequency drives (VFD's).

A proof of concept was authorized and one of the existing refrigeration units was upgraded with Emerson electronic expansion valves. This allowed operation to occur at much lower condensing pressures and temperatures. Two VFD's were also installed; one to modulate the condenser fans, allowing the condensing pressure to float with the ambient temperature and the second to modulate the compressor speed to match the load requirements.

A power monitor was installed to acquire baseline data. Data was then gathered from the newly retrofitted refrigeration unit as well as one nonretrofitted refrigeration unit. This would provide an analysis of energy usage and efficiency pre and post upgrade.



OPEX and ROI were the driving forces behind a successful outcome.

The Results

The solution introduced reduced compressor and condenser fan cycling and allowed for a more consistent space temperature, while using significantly less energy.

The tables below detail the energy consumption of the two refrigeration units.



ENERGY SAVINGS

+48.7%

OPERATING EXPENSES

-60%

TABLE 1: RETROFITTED REFRIGERATION UNIT 1

	Average Compressor COP	Average Unit kW/Ton*	Yearly kWh Usage (kWh)
Pre-Retrofit	1.25	4.28	125,883.4
Post-Retrofit	2.42	2.08	65,101.8
Difference	1.17	2.24	61,781.6

*kW/ton values are shown for the entire unit including compressor, condenser fans, and evaporator fans.

TABLE 2: NON-RETROFITTED REFRIGERATION UNIT 2

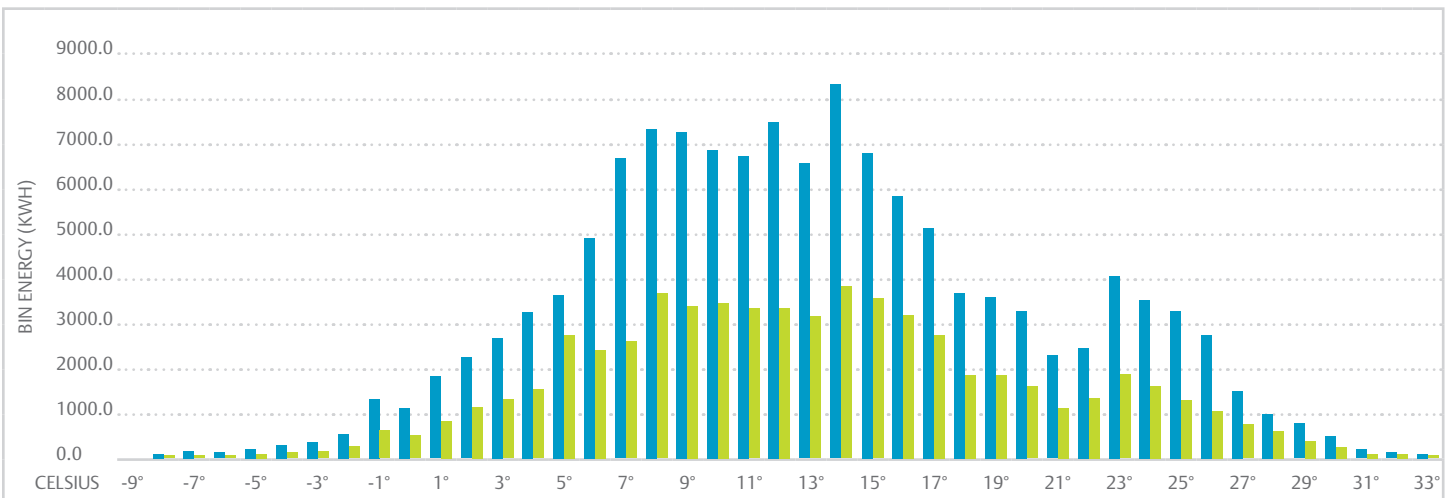
	Average Compressor COP	Average Unit kW/Ton*	Yearly kWh Usage (kWh)
Pre Time Period	1.33	3.44	148,543.3
Post Time Period	1.39	3.38	148,469.3
Difference	0.06	0.06	74.0

*kW/ton values are shown for the entire unit including compressor, condenser fans, and evaporator fans.

Refrigeration unit #1 efficiency measured in kW/Ton metric showed a 48.7% energy savings as compared to Unit #2, a significant improvement to the overall operating costs of the refrigeration unit. The overall energy consumption post retrofit was significantly reduced across all outdoor temperature ranges, as seen in Graph 1, below.

The solution provided the customer with an exponential ROI – OPEX decreased by close to 60%. Emerson completed this full end-to-end project by aiding in obtaining a provincial rebate for the retrofit which significantly reduced the CAPEX portion of the project.

GRAPH 1: UNIT 1 ENERGY CONSUMPTION COMPARISON





Emerson Commercial & Residential Solutions

145 Sherwood Drive

Brantford ON

T 519 756 6157

E Canadainfo.Climate@Emerson.com