

VARIABLE FREQUENCY DRIVES FOR REFRIGERATION

A low condensing retrofit achieves a staggering ROI

With approximately 300,000 square feet of multi-temp warehousing in British Columbia, a warehouse owner was looking to retrofit his legacy refrigeration systems.

The customer objective

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 in 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

Reducing the cost of operation and ROI were the driving forces behind a successful outcome. With this in mind, Copeland and their team of authorized contractors

assessed the situation quickly and suggested a "low condensing" solution utilising Copeland electronic expansion valves and variable frequency drives (VFDs).

A proof of concept was authorized and one of the existing refrigeration units was upgraded with Copeland electronic expansion valves. This allowed operation to occur at much lower condensing pressures and temperatures. Two VFDs 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.

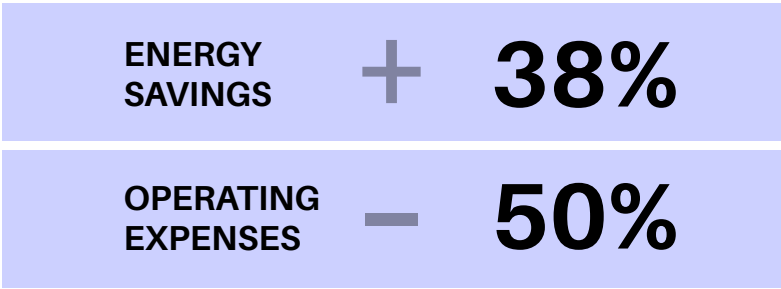
The solution reduced compressor and condenser fan cycling and allowed for a more consistent space temperature, while using significantly less energy. Based on the success of the pilot, all the facilities' refrigeration equipment was retrofitted.



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 table below details the total energy consumption of all refrigeration units pre- and post-retrofit.



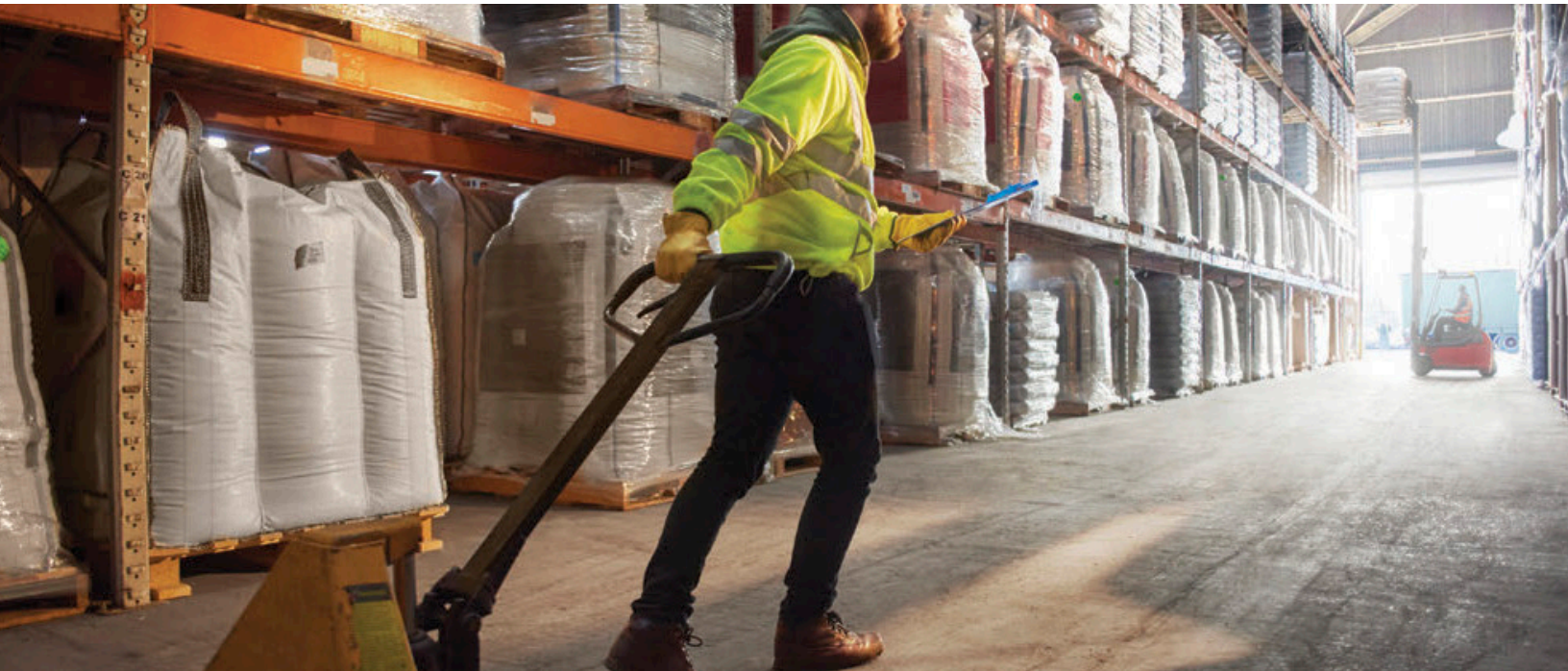
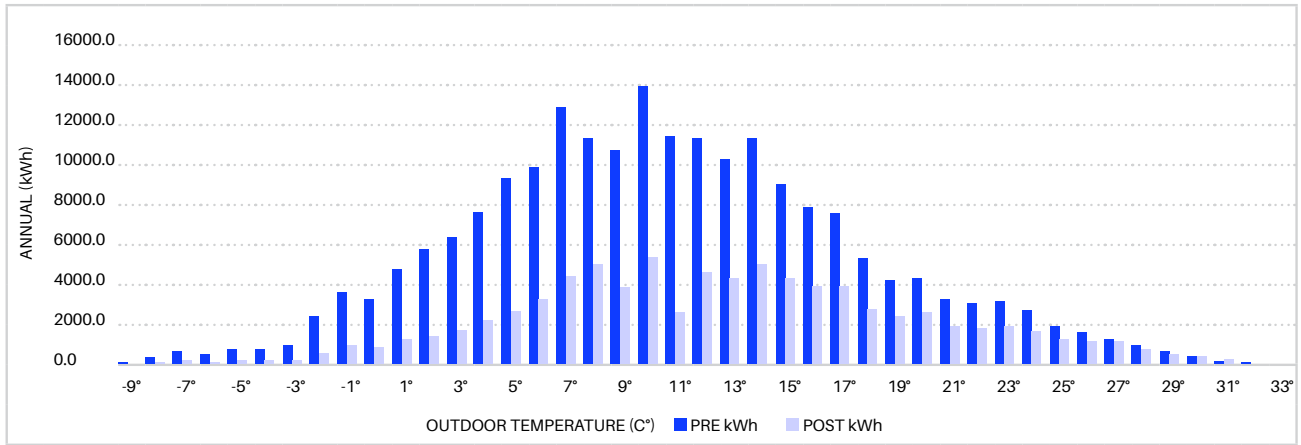
Unit	Pre-Retrofit Energy Consumption (kWh)	Post-Retrofit Energy Consumption (kWh)	Energy Savings (%)	Annual Energy Savings (kWh)
Unit #1	207,140.11	83,146.60	60%	123,993.51
Unit #2	177,113.31	116,919.49	34%	60,193.82
Unit #3	125,883.40	65,101.80	48.3%	60,781.60
Unit #4	221,381.86	146,377.00	34%	75,004.86
Unit #5	193,305.46	124,108.69	36%	69,196.77
Unit #6	199,796.44	151,715.42	24%	48,081.02
Unit #7	195,024.79	149,617.48	23%	45,406.31
Unit #8	198,589.47	101,880.12	49%	96,709.35
Unit #9	194,307.38	116,971.70	40%	77,335.68
TOTAL	1,712,540.10	1,055,835.30	38.3%	656,704.70

The total refrigeration unit efficiency showed a 38% energy savings as compared to the units pre-retrofit, a significant improvement to the overall operating costs of refrigeration. 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 50%. Copeland completed this full end-to-end project by aiding in obtaining a provincial rebate for the upfront cost of the project.

*Measurement and Verification Report completed by Renteknik Group, July 3, 2018

GRAPH 1: UNIT 1 ENERGY CONSUMPTION COMPARISON



Copeland Commercial & Residential Solutions

145 Sherwood Drive

Brantford ON

T 519 756 6157

E CanadaInfo.Climate@copeland.com

To learn more, visit [copeland.com](https://www.copeland.com)

2018CAN-01 ©2024 Copeland LP.

COPELAND
Engineered for Sustainability