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Food Bank Pays It Forward and Nets Refrigeration Payback

Digital refrigeration upgrade leads to utility rebate and increased reliability



As an affiliate of Feeding America, the West Ohio Food Bank serves 170 food pantries, soup kitchens and shelters throughout 11 counties in western Ohio. The non-profit organization stores both purchased and donated items in its 35,000 square-foot facility, including a wide variety of nutritious frozen and refrigerated offerings in its 5,000 square-foot freezer and 2,500 square-foot refrigerator. In recent years, the refrigeration equipment supporting these cold storage units was becoming failure-prone, resulting in excessive maintenance costs and unwanted headaches to the West Ohio Food Bank's operators.

So, when representatives from Emerson approached the non-profit about donating all-new equipment and components for a digital refrigeration system, operators were intrigued. When they found out that the system could significantly reduce their energy footprint, greatly improve refrigeration reliability and significantly lower maintenance costs, they were all ears. And, when Emerson secured a \$2,500 rebate from the utility, AEP Energy, based on analysis of projected efficiency gains, operators officially gave Emerson the green light to begin the project in late 2014.



Meeting the food bank's cold storage requirements had become increasingly difficult for the facility's legacy, fixed-capacity refrigeration system.

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In with the new, low-condensing operation

The West Ohio Food Bank had inherited their refrigeration system from the facility's previous tenant, a supermarket warehouse. Like many traditional, fixed-capacity compressor and mechanical component systems, theirs was characterized by a high rate of compressor cycling (on/off) to match the required refrigeration capacity. The legacy system had become a source of excessive downtime and repair costs for food bank operators, requiring the purchase of replacement fixed-capacity compressors to keep the system running and resulting in as much as \$20,000 in operating expenses.

For Emerson, the project presented an opportunity to demonstrate a proof-of-concept that utilized their Copeland Discus™ Digital compressor for precise capacity modulation and the components needed to enable low-condensing operation. Although low condensing is not necessarily a new concept, improvements in controls technology and a reduction in costs are making it a more valid option for many operators seeking to reduce energy consumption while improving refrigeration reliability.

Low-condensing systems allow the head pressure to float from 10–20 °F above the ambient temperature down to 60 °F, as opposed to fixed-capacity systems that are designed for 105 °F conditions, regardless of the actual ambient temperatures. Floating the head pressure allows compressor capacity and energy efficiency to increase as the ambient temperature drops, delivering up to 15–20 percent energy efficiency ratio improvements for every 10 °F decrease in head pressure.



Like money in the “food” bank

Once the installation was complete, AEP Energy monitored the facility’s power output to verify that the actual system performance met the efficiency criteria on which the rebate was given. Not only was the system performing as expected, it rectified the problems that the West Ohio Food Bank operators had been grappling with since taking ownership of the facility. Following is a brief summary of the new system benefits:

- **Maintenance** — the system has not required maintenance since being installed. The low rate of compressor cycling increases system reliability and compressor/system longevity, and provides much improved energy efficiencies.
- **Efficiency** — low-condensing operation and precise digital modulation result in significant improvements to energy efficiency, as the system now is capable of adjusting to the changes in the seasons and ambient temperatures.
- **Performance** — in addition to eliminating downtime, the new digital upgrade delivers improved temperature control within 1 °F. Suction pressure control is also significantly tighter — as much as 89 percent improvement in some cases. 🌱

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The makings of a digital refrigeration upgrade

Emerson donated the following system components to West Ohio Food Bank for a significant upgrade to the facility’s refrigeration equipment. All but the VFD fan were Emerson components.

- **One Copeland Discus Digital compressor** replaced the previous fixed-capacity compressors. Not only does this allow the system to modulate and precisely adjust its capacity, it also eliminates the problem of compressor cycling.
- **Two EX Series electronic expansion valves (EEV)** enable tight control of the floating head pressure process, making it possible to lower the system’s condensing temperatures with the ambient temperatures.
- **Two electronic controllers** serve as the drivers for the EX Series valve.
- **Variable frequency drive (VFD) fan** provides the method through which the system reduces condensing temperatures without cycling.

