


GIVE COSTS THE COLD SHOULDER

Tips for reducing energy usage and expenses for industrial ammonia refrigeration systems.

By Tim Clark, Director of Automation Services, Stellar

 Increased focus on sustainability, tough economy, industry regulations and building codes have contributed to a greater emphasis on energy optimization. Companies with refrigeration systems can slash energy use, because these systems can represent 50% or more of a facility's total energy cost. This article examines how manufacturers

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can reduce a system's energy use and focuses on ammonia refrigeration systems because of their popularity.

Making environmentally friendly and cost-effective choices in your refrigeration system starts with the proper refrigerant. While many refrigeration systems are used in industry, ammonia is favored for several reasons.

Ammonia is a natural compound that minimizes environmental harm, reduces a user's carbon footprint

(from the energy production) and eliminates impact on the ozone layer. Ammonia-based systems are favored by most building codes, including the National Electrical Code® and the American Society of Heating, Refrigerating and Air-Conditioning Engineers codes. The ammonia refrigerant operates at relatively low pressures compared to other refrigerants, which reduces operational costs and the low-pressure systems pose a lower safety risk.

Insulation

You can help reduce energy waste by improving the refrigerated building's shell. To achieve this, you can use insulated metal panels instead of concrete for new construction, or add an outer layer of insulated metal panels for pre-existing buildings.

Improvements or adjustments to a facility's shell typically result in a modest 3% in energy savings. When combined with other energy-conserving updates, it can provide a boost to overall savings.

Electricity

With utility rate increases across the country, many companies are cutting energy consumption and operational

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costs by monitoring, analyzing and reducing electrical power usage. You can achieve reductions by improving the refrigeration facility's electrical design and updating utilities with more energy efficient alternatives. These improvements can include replac-



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ing light fixtures with more energy efficient models, using motion detectors for lighting activation, and implementing high-efficiency motors.

Refrigeration System

You can make numerous updates directly to the refrigeration system to increase energy efficiency. These can include enhancements to both the evaporator and condenser.

Compressors

You can make improvements to the condenser through updates to compressors and condenser fans. For a more energy-efficient compressor, which compresses hot refrigerant gas to create the cool liquid gas necessary for refrigeration, variable-frequency drives (VFD) can be used on a designated selection of the facility's many compressor units.

VFDs ramp compressors up or down according to need, rather than all compressors continually running at full capacity. Depending on design and age, not all compressors are capable of running at reduced capacity. Therefore, analyze compressors before considering a VFD.

Compressors with Allen-Bradley® PowerFlex® 700 drives from Rockwell Automation are particularly effective for operating at either full or reduced capacity. They can help users save tens of thousands of dollars in monthly energy costs and are easy to integrate into new or existing.

Condensers

You also can reduce energy by using VFD control on condenser fans. Condenser fans circulate air across the condenser coils to cool the compressor and the refrigerant in the coils. VFD controls adjust condenser fan speed up or down according to wet bulb temperature, and prevent fans from running at a constant full capacity.

Condenser fans with Allen-Bradley PowerFlex 4 and 40 AC drives can provide improved fan operation and control of the compressor discharge pressure further reducing the compressor power load. This can produce even greater savings compared to other systems.

Evaporator

VFDs also are effective in the refrigeration system's evaporator section. The evaporator section cools by circulating air over the evaporator coils. VFDs allow evaporator coils to run at reduced loads by varying airflow across the coils, which lowers the system's compressor and condenser loads. When VFDs are applied to evaporator fans, they can reduce energy waste and decrease motor heat in critical refrigeration spaces

The PowerFlex 4, 40 and 400 AC drives are highly effective for saving energy in this portion of the refrigeration system.

Significant Savings

By using these energy-saving strategies and implementing PowerFlex drive solutions, Stellar has helped its customers achieve significant results. For example, one recent installation of VFDs on a cold storage customer's evaporator fans, in combination with the clients already-existing VFD on the compressor and condenser fan, created an 18% energy savings for a portion of the entire system. Based on previous work, Stellar typically anticipates energy savings between 25% and 30% for a total solution when these methods are implemented. □

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