CASE STUDY: AMMONIA SUCTION CONTROLS
Electric Savings

Success Story

The plant manager had worked with many automation systems and had integrated many automation processes at the plant. One of the points included in previous projects was the glycol tank temperature.

Integrating the new PLC control system into the existing plant network allowed access to this point with no additional hardware required for install. The previous investment in collecting and recording data, which was previously used as a status check only, and an alert to maintenance, is now able to be integrated into the control system, reducing the cost of the new system, and increasing the savings capabilities of the system at no production disruption, and no incremental cost.

While it is not always apparent that collecting data for its own sake is cost effective, in the long run, having access to key values in the plant will open many opportunities for continuing improvements that may not have been obvious at the time.

Dairy Plant Improves Refrigeration System Efficiency Using Floating Suction Pressure Controls

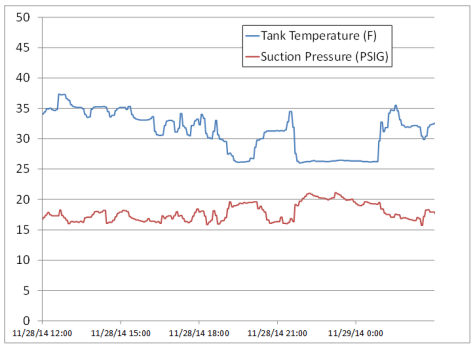
CHALLENGE— Achieving Maximum System Efficiency with Varying Load Conditions

A dairy processing plant, focused on fluid milk pasteurization and bottling, was installing a comprehensive ammonia refrigeration control system and wanted to achieve maximum system efficiency of the central system, optimizing compressors based on load conditions. The system included three single-stage compressors. Baseline operation included operating at one of two fixed suction pressures, depending on which compressor was running in the trim position, using onboard pressure sequencing.

After measuring system performance, including power logging, pressure logging, and equipment reviews of the compressors and condensers, a comprehensive plan was proposed to reduce energy use of the system. Part of the plan included improving the system efficiency using a floating suction pressure control optimized to maximize the compressors' efficiency, reducing suction as demanded by the system loading, and floating the suction up when loads allowed.

SOLUTION— System Optimization Through Integrated Controls, Floating Suction Pressure Based On System Critical Load

The control system was installed, including a floating suction pressure control. The system was reviewed, and the critical load in the system was determined to be a glycol system with a primary-secondary cooling configuration, and up to four individual loads being served from the single tank on secondary loops. The tank temperature would fluctuate depending on how many loads were operating at a given time, and how heavily loaded each system was at the time.



Monitoring the tank temperature allowed the new control system to dynamically reset the suction pressure of the compressors. When the tank temperature was low, that ...

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SOLUTION—Continued

indicated that the system was satisfied, and that the compressors could more easily meet the load, and suction pressure could be raised. If the tank temperature rose, that indicated heavy loading, and the suction pressure was dropped to increase the approach on the primary loop, increasing the capacity of the system to match the loads. Using this control, the suction pressure in the system was raised by an average of 1.6 PSI, benefitting all other loads in the plant. As a rule of thumb, a 1 PSI rise in suction pressure will result in about 2% efficiency improvement in compressor efficiency. In this system, at the actual part loads we saw, the effect was closer to 3% per PSI.

RESULTS— Significant System Energy and Cost Savings, Large Utility Incentive Payment to Help Support the Effort

Key Results

Annual Energy Use Reduced by 39% .
System Peak Demand Reduced by 32% .
Annual CO_2 Emissions Reduced by 743 Tonnes.
Annual Cost Savings of $ 96,900.
Awarded an electric utility incentive of over $290,000.
1.0 Year Simple Payback.
Suction Pressure Controls account for ~12% of project savings

Key Benefits

Cost Savings	Total annual savings of $ 11,600.
Energy Savings	Annual Energy Savings of 191 MWh
Carbon Reductions	Annual Reduction of 89 Tonnes of CO_2
Fuel Type	Electricity
Payback	1.0 Year Simple Payback, after Incentive

Financial Data

Investment	Development: $ 17,800 Component of Larger Capital Project
System	PLC Control System, Touch-Screen Interface, System Commissioning & Personnel Training, Long-Term Monitoring & Central Control System Tie-Ins.

Customer Profile

Headquarters	Carlinville, Illinois
Locations	14 Production Locations in 7 States throughout the Midwest.
Number of Employees	Approximately 1,000
Estimated Sales	$1 Billion
Industry Type	Dairy – Fluid Milk, Juice, & Beverages