

Case Study: Frick Engineered Control Solutions

Industrial refrigeration manufacturer integrates diverse equipment and systems with Opto 22 control systems.

Imagine life without ice cream, fresh fruit, or even scarier, ice-cold beer. Imagine not being able to send fresh flowers to that special someone.

For centuries we have preserved our food in storage cellars, outdoor window boxes, or even underwater in nearby lakes. Spring houses were also used to preserve food, where cool running water from a nearby stream trickled under or between shelved pans and stoneware pots.

Today, every time we walk into a grocery or warehouse store, we see one of mankind's most unsung heroes—and arguably the greatest invention of the 1800s—quietly humming along, doing its job: vapor compression refrigeration systems. Initially large systems, over time they became smaller and found their way into almost every modern home in the world.

Let's not forget about beer. The brewing industry was one of the first to realize the significant benefits that refrigeration offered. Refrigeration let breweries and other perishable product processors make a uniform product all year round. Brewing was the first activity in

the northern U.S. states to use mechanical refrigeration extensively, followed quickly by meat packing.

Refrigeration was at the heart of these industrial food processes, and quickly became an industry unto itself. To support its growth, large pieces of industrial equipment like compressors, evaporators, and condensers were required. Many manufacturers of other industrial equipment such as steam engines, tractors and sawmills began developing specific refrigeration components, each with their own marketable advantages.

One such vendor was Waynesboro, Pennsylvania-based Frick Company, which has been building industrial refrigeration system components since 1883.

The Challenge

As more manufacturers entered the refrigeration market, integrating disparate components from these different manufacturers became more difficult for refrigeration engineers. Industrial refrigeration systems



In this photo, Opto 22 control hardware is being added to a control panel. Frick Engineered Control Solutions builds on average 4000 panels per year.

today come in a myriad of sizes, configurations, and arrangements, and use a variety of components depending on the application requirements. System component diversity continues to be one of the biggest challenges for industrial refrigeration system designers and operators. Often each component is produced by a different manufacturer, yet the effect one component has on others can negatively or positively impact the system's overall performance.

For example, the modern industrial refrigeration industry predominantly uses screw compressors where reciprocating compressors were prominent in the past. Screw compressors are more compact and require less maintenance when compared to reciprocating compressors. Historically the part load efficiency of a screw compressor has not always been as good as a reciprocating machine. However with today's common use of variable volume control and variable speed drives on screw compressors this imbalance has more than been addressed.

Each component in each refrigeration system is chosen based on the application requirements of the system. With this much complexity, designing a refrigeration system can be a difficult engineering problem to solve.

The Solution

The Frick Company entered the refrigeration compressor market in 1883 and over time has designed and manufactured many products for refrigeration systems, including condensers, vessels, evaporators, sanitary air handling units, and heat exchangers. By the 1980s Frick had introduced automation into their manufacturing test systems utilizing Opto 22 products, and as a result had identified a new market opportunity—top-to-bottom, turnkey central refrigeration systems—and developed an improved go-to-market strategy to pursue it.

The new arm of the business, Frick Engineered Control Solutions, met a clear need for a more streamlined design, engineering, manufacturing, and support model in refrigeration applications.

The Frick Industrial Refrigeration brand sustains an annual average panel build of 4000 panels. The panels vary greatly, from compressor controllers to starters to complete turnkey PLC system controllers. Each and every panel is built in their high-tech UL508 shop in Waynesboro, PA.

A major portion of the annual build activity is the PAC-based central controls systems, which use Opto 22 products. The engineering design team is in the same building as the manufacturing team, allowing for an efficient design and fabrication process.



Compressors from Frick Engineered Control Solutions, like the horizontally oriented model pictured, benefit from Opto 22 control systems.



Vertically oriented compressor from Frick Engineered Control Solutions

Frick Engineered Controlled Solutions has become a one-stop shop for refrigeration control projects. Together with Frick Factors (Frick product-specific distributors), contractors, and design/engineering consultants (regarded as the top refrigeration experts in the industry) the controls team at Frick supports over 1500 industrial refrigeration systems installed across North America.

Most of those customers are large warehouse distribution centers and food processing plants, where reliability and efficiency is nothing short of a requirement. Typical refrigeration installations range from a few compressors up to systems with over 400 air handling units and almost 1000 evaporation units, all controlled through Opto 22 products.

Over the years Frick has transitioned from an Opto 22 PC-based DOS control system to the latest generation of programmable automation controllers (PACs) and SNAP

I/O. Frick also uses a large number of ICTDs (Integrated Circuit Temperature Detectors) from Opto 22.

“Before moving to an automated system, devices called time clocks were used to control valve groups,” says Tim Clark, Director of Engineered Control Solutions. “The problem with that system is that time clocks aren’t intelligent like Opto 22’s PACs and I/O. Time clocks had no way of communicating with each other or knowing what the other unit was doing. Often they would trigger a defrost cycle either too late or not soon enough.”

Frick engineers are experts at integrating refrigeration equipment from other vendors into a centralized control system for improved energy efficiency and system management, and Clark says they needed overall system flexibility.

“The SNAP PAC system allows us to bring many different refrigeration components into a single automation platform,” he says. “We can monitor temperature and humidity and control a variable frequency drive, all through the same platform. This level of interoperability allows us to dial in our customer’s refrigeration systems for the best efficiency and lowest energy costs.”

“Using SNAP PAC products allows us to give our customer situational awareness into all aspects of the refrigeration system,” says Kevin Dickinson, Control Products Supervisor. “By running compressor rooms and condensers efficiently, you’re actually reducing the use of compressors, which saves a lot of energy. Using VFDs (variable frequency drives) allows us to create a more consistent load on the system, so we can run compressors in their lowest operating mode to create the best efficiency possible. The Opto 22 control system lets us verify one compressor is fully loaded before starting up another one. And we can use compressor sequencing to make sure they all have equal duty cycles.”

Clark says ease of scalability was also important when choosing a control system. “With the Opto 22 system, we can deploy a rack with an I/O brain and up to 64 points of analog and digital I/O. We can also mix and match different types of I/O modules on the same rack. With other vendors, we would need to deploy a completely separate logic controller and I/O backplane.

“The SNAP PAC brains also have intelligence built into them. So we can push PID loop control down to the individual rack level, which prevents network outages from causing a problem with our system.”

Today the Frick Industrial Refrigeration brand is trusted and used all over the world. Each system they design employs best refrigeration control practices to ensure lowest cost of operation for their customers. Frick also provides lifetime emergency support at no extra cost. If a customer encounters a technical difficulty, a Frick support engineer will walk them through a resolution. If the system software gets corrupted or lost, a support engineer will help them reinstall it.

"The most important thing is reliability," says Clark. "I've been working with Opto 22 products for over 20 years, and I've never had a defective product shipped to our facility. The controllers are rock solid and most of the I/O is backed by a lifetime guarantee, from a vendor we can count on."

Looking Ahead

In the future Frick Engineered Controlled Solutions plans to leverage the SNAP PAC System's powerful built-in communications capabilities to develop Internet of Things (IoT) applications for their customers. With built-in support for web services such as HTTP plus notification features such as email and text messaging, the SNAP PAC System is a solid foundation for edge data processing and report-by-exception applications.

"We're also very impressed with the *groov* mobile operator interface product from Opto 22 and think it's a great tool for mobile operators who need an operational overview on the go or need to monitor multiple facilities from a single interface," says Clark.

About Frick Engineered Control Systems

Frick Engineered Control Solution Systems have been providing safe, reliable, and efficient operation of industrial refrigeration facilities since 1985. During that time our solution engineers have designed and commissioned 1200 plus control systems worldwide. This combination of experience in design and commissioning capabilities makes Frick Engineered Control Solutions (ECS) far and away the best selection for all of your Industrial Refrigeration Control needs.

<http://www.johnsoncontrols.com/buildings/refrigeration/industrial-refrigeration/frick-refrigeration>

About Opto 22

Opto 22 develops and manufactures hardware and software for applications involving industrial automation and control, energy management, remote monitoring, and data acquisition. Designed and made in the U.S.A., Opto 22 products have an established reputation worldwide for ease-of-use, innovation, quality, and reliability. Opto 22 products, including the *groov* mobile operator interface, use standard, commercially available networking and computer technologies, and are used by automation end-users, OEMs, and information technology and operations personnel in over 10,000 installations worldwide. The company was founded in 1974 and is privately held in Temecula, California, U.S.A. Opto 22 products are available through a global network of distributors and system integrators. For more information, contact Opto 22 headquarters at +1-951-695-3000 or visit www.opto22.com.