CoreSense™ Technology Gives Contractors a Sixth Sense

Compressor failure is a worst-case scenario in commercial refrigeration applications. For supermarket operators, it can mean catastrophic product losses compounded by the expenses of system maintenance, repairs and compressor replacement. For the service technician whose responsibility is to properly diagnose and prevent system faults before they occur, system failures can blemish their reputation.

In a perfect world, retailers would keep a dedicated service technician on-site to continuously monitor refrigeration system performance. But in reality, this scenario is just not feasible. That's why the advent of built-in compressor electronics — like Emerson's CoreSense technology — is revolutionizing the commercial refrigeration service paradigm. CoreSense technology provides continuous system monitoring, placing protection and diagnostics at the contractor's fingertips.

In the span of a few short years, the prevalence of on-board compressor electronics has grown dramatically. CoreSense technology, for example, is available on both Copeland Scroll™ and Copeland Discus™ compressor lines, in part to enable more advanced energy-efficient refrigeration techniques such as digital capacity modulation and liquid injection control. As contractors more frequently encounter these units in the field, the challenge is to not only embrace their obvious benefits, but to exploit their capabilities to their maximum potential.

Communications-enabled connectivity

Designed with advanced communication capabilities, CoreSense technology allows contractors to accurately diagnose and troubleshoot system issues — either at the customer's site or remotely via mobile device access.

- **PC interface kit** — once at the customer's site, contractors can connect their laptop to the CoreSense module via a USB to RS485 cable. Software then gives the contractor visibility to real-time system data and historical performance to help them quickly analyze and troubleshoot system issues. Contractors also have the option to leave a laptop connected to the controller to generate and capture data logs based on user-defined system performance criteria.

- **Remote access** — for maximum contractor benefit, CoreSense technology can be paired with a facility management or site supervisory system controller to extend its data to remote technicians in the field, a monitoring

service, or a service department headquarters. This gives contractors access to complete system performance data from their mobile device or laptop, allowing them to monitor all stores in their service area and receive alerts when there is a system fault at any of their connected locations. With remote access, historic system data can be quickly accessed to analyze and troubleshoot errors.

Failure protection

One of the most obvious benefits of CoreSense technology is its ability to protect the compressor from damage, primarily through its system trip or reset functions, including:

- Incorrect phase rotation protection (Copeland Scroll only)
- Discharge temperature protection (optional on Copeland Discus)
- Oil pressure protection (Copeland Discus)

In the event of a lockout condition that warrants compressor shutdown, CoreSense technology will stop the compressor until the event has been cleared by the contractor (either remotely or on-site). Fault alarm codes tell the contractor the source of the issue so they can begin troubleshooting. This not only saves retailers the cost of replacing a compressor, it saves contractors time by providing advanced diagnostics through troubleshooting "apps" to determine the root cause of the problem in preparation for repairs.

Advanced diagnostics

CoreSense technology gives contractors a wealth of historical system data that they can use, both for troubleshooting current issues or preventing system failures before they happen. Following is a partial list of faults and key performance indicators available:

- Over current protection
- Over/under voltage protection
- Unbalanced load detection
- Liquid injection
- Anti-short cycle time delay
- Digital fault code display/remote alarming
- Locked rotor protection
- Motor overheat protection (Copeland Discus)
- Welded contactor protection (Copeland Scroll)

On-board compressor diagnostics make good sense

While the emergence of compressor electronics may present a learning curve for some contractors, there's no questioning their benefits. Technicians can leverage the wealth of information available at the compressor to evaluate the entire refrigeration system. Not only does CoreSense technology allow contractors to analyze and perform key actions remotely, it also gives them the tools to quickly and accurately diagnose system issues and conduct more productive service calls. As the technology continues to evolve, contractors can expect the expanding integration of compressor electronics with even more diagnosis and protection capabilities, along with continued improvement to apps and the ability to access information.

Technology in action

By using the compressor as a sensor for refrigeration system failure, CoreSense technology has proved invaluable in the field. In addition to giving contractors access to data that allows them to limit nuisance service calls, CoreSense technology also helps them detect system faults before they lead to bigger problems, often preventing expensive food loss and compressor failure. Here are a few real-world examples that demonstrate its advantages.

Contactor failure — when CoreSense technology detected a voltage imbalance in the compressor of a supermarket refrigeration system, it triggered the shutdown of the compressor. Weeks later, it shut down the compressor and reset it again after sensing a missing phase and no three-phase faults. On closer inspection of the three recent errors, the technician identified and replaced a faulty contactor. Without CoreSense technology, the compressor would have continued cycling and led to a single-phase motor burn. The supermarket avoided a compressor failure and saved approximately $6,000.

Low pressure cut out failure — the compressor used in a convenience store's walk-in cooler was experiencing low refrigerant pressure, and the low pressure cut-off switch had failed. This caused the system to continue to run in a vacuum with the suction pressure below its setpoint. As the compressor began to overheat, the internal motor protection system prevented compressor failure. CoreSense technology sent system trip alarms to the contractor, who then responded to quickly diagnose and repair the pressure switch issue. The store avoided having to replace the compressor while maintaining a cooler temperature.

Frozen defrost timer — the freezing over of a defrost timer at a butcher shop had prevented the compressor from running, even while the thermostat called for cooling. This triggered CoreSense technology to send a system trip warning to the store owner. Four hours later when the situation persisted, the system generated and sent an open circuit alarm to the store owner, indicating no power at the compressor. The store's technician arrived shortly thereafter to remedy the issue with the timer and reset the scroll compressor. While the defrost timer was not part of the compressor itself, the diagnostics technology prevented product loss, estimated to be approximately $10,000.