Volume 1 Number 3

E360 Outlook

Balancing All Aspects of the Commercial Refrigeration and Air Conditioning Industries

The Internet of Things

Coming soon to a commercial kitchen near you

PAGE 2

Making the Transition to Intelligent, Connected Stores

By Bill Bosway
Group Vice President
Emerson Climate Technologies

Every day, supermarket food retailers and foodservice operators are looking for ways to reduce energy consumption, equipment and system downtime, or general maintenance costs. But, the first challenge operators face is not knowing what their actual operating performance levels are. To understand this, they need real-time and reliable access to performance data in their stores. The move toward more intelligent, connected stores is providing this information.

Supermarket food retailers and foodservice operators both want to improve operational performance, but their day-to-day business challenges are significantly different.

The food retailer seeks to create a great in-store shopping experience, providing a variety of quality foods and brands. Energy consumption — driven mostly by HVAC, refrigeration, lighting and maintenance costs — tends to be their biggest challenge.

Supermarket retailers have led the way in connectivity. For years, they've employed electronic store and system controls to better manage and control their equipment. And, they've integrated these controls with their IT networks to gain access to real-time performance data. But this hasn't happened across the board, and particularly in older stores, the opportunity to drive better store performance still exists.

In foodservice, the drivers for equipment and building system connectivity are unique. Operators are in business to provide quality meals with speed and accuracy during breakfast, lunch and dinner. Their biggest challenge is the efficiency of the service processes, and the reliability of the equipment that makes up the "food factory." And, they need access to a strong service network often made up of preferred local technicians.

A typical foodservice store utilizes 40–45 pieces of equipment; most have electronic controls embedded in the equipment. But, unlike food retail, foodservice operators have not integrated store controls to enable an intelligent, connected environment. It would seem like common sense for them to want the capability to remotely manage equipment to ensure reliable operation, predict failures and resolve equipment issues before they occur — even program new menu options in real time. So why hasn't the connected concept taken off in foodservice? There are several reasons.

1. To become "connected," a store needs both store and equipment controls that can communicate with each other. Most store controls for small-format retailers have been overdesigned and are too expensive.
2. An IT infrastructure for connectivity and communication is required (i.e., WiFi, LAN, GSM, etc.). Most foodservice operators have not invested in this capability.
3. Contractors have not supported the move to electronic controls. It represents new technology and a new learning curve.

Today, we're working on solutions that address these foodservice challenges for small-format retailers. Our new ecoSYS site supervisory control platform enables communication between embedded equipment in the store. We've designed it to be easy to install and operate, and it's affordable. We believe that the connected foodservice store is coming soon, and we are excited to help the industry make this transition.

Clarification from *E360 Outlook* Volume 1 Issue 2

In the article that appeared in our previous *E360 Outlook* entitled "DOE Regulations Drive Significant Energy Reductions," we summarized the DOE's recommendations to comply with its 2017–2018 Final Rules on walk-ins, reach-ins and ice machines. Our intent was only to explore the design options and subsequent supply chain implications associated with the DOE recommendations and is not an endorsement or position by Emerson that the minimum efficiency levels established by the DOE can be achieved by the component or equipment changes itemized by the DOE. The article represents our deep awareness of the issues at hand and reflects a proactive response to the significant challenges imposed by these regulations.

FIRST WORD

by DON NEWLON

Is Technology on the Menu in Foodservice?

If you've had your eye on the foodservice industry in recent years, you've probably noticed that it's not what it used to be. A symbol of this shift recently flashed across the national newswire when it was widely reported that McDonald's was considering adding kale to its menu items. While the idea of a kale-flavored shake might not whet your appetite, the fast food giant was responding to increasing customer demand for healthier, fresher food options. That's not the only pressure the fast food industry is under, and it's clear we're in the midst of a significant transition.

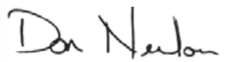
Fast casual restaurants like Chipotle and Panera Bread have encroached into traditional fast food territory. Capturing market share and the hearts of consumers, these trendier establishments offer a dining experience that splits the difference between fast food and fine dining. Their menus are designed to appeal to today's more sophisticated sensibilities, using organic, free-range, antibiotic-free ingredients in higher-quality, freshly prepared meals.

If that wasn't enough to shake things up, many convenience stores are also entering into the foodservice business as more consumers look to them as a viable option.

There's no question foodservice is an increasingly intertwined space, with a multitude of retailers competing for consumer preferences. It's a space where margins are tight and maintaining customer loyalty leaves little room for error.

Where does Emerson fit into this scenario, you ask? We may be widely known for our best-in-class refrigeration hardware, but for more than a decade we have been in the electronic controls business, working with refrigeration and air conditioning manufacturers to connect equipment and building systems. It's a concept often referred to as the Internet of Things (IoT). This technology has been put to use in supermarkets to reduce maintenance, protect food inventories, optimize energy and servicing efficiencies, and plan for future expenditures — all while giving facility managers real-time visibility into operations.

We're also actively exploring the vast potential of IoT for connected kitchens, equipment and building systems in foodservice. In this edition of *E360 Outlook,* we'll take a closer look at how the connected kitchen can be used to give foodservice retailers a much needed competitive edge. You'll also find examples of how connectivity is helping food retailers (both large and small) improve their operational performance. It's our hope that these concepts inspire you to consider the possibilities, and we encourage you to share your opinions.



Don Newlon
Managing Editor, E360 Outlook
V.P., Refrigeration Marketing; G.M., Integrated Products Division, Emerson Climate Technologies

CONTENTS

Publisher
Emerson Climate Technologies

Managing Editor
Don Newlon

Email Us
Please email us at **e360.climate@emerson.com** with any comments or suggestions. We would love to hear from you.

Website
EmersonClimate.com/E360

The Case for Connected Kitchens in Foodservice

How technology is enabling restaurants to succeed

Paul Hepperla, Director of New Solutions Development and Enterprise Product Management for Emerson Climate Technologies, explains the emerging trend of kitchen connectivity.

We've all had experiences at fast food or quick service restaurants (QSR) that left a bad taste in our mouths. Maybe the fries were cold, or they tasted like strips of cardboard. The ice cream was more cream than ice. The chicken sandwich was overcooked, or worse, raw. Or, you found yourself staring at the same old menu options that you've seen for what seems like years.

All of these problems can be directly attributed to issues in the food factory, or the equipment and personnel that makes up the food assembly line. In today's competitive foodservice environment, QSRs are only as good as the last meal they've served. It only takes a few of these negative experiences to tarnish a brand's reputation in a consumer's eye. And there are enough options to make it all too easy to permanently avoid a particular establishment (or even franchise) altogether.

What's really at stake in foodservice is the QSR brand's reputation. Today's consumer is increasingly food conscious and more discriminating about their dining choices. Fast casual restaurants that offer fresher, healthier menus continue to gain more market share, while fast food restaurants scramble to tap into their trendier sensibilities. Utilizing technology in a connected kitchen can help both segments achieve their goals.

Already connected in food retail

Connected, communicating kitchens is a relatively new concept in foodservice. In other industries, such as supermarkets, connected equipment and related technologies have been embraced for more than a decade as a means to optimize facility operations.

This technology is often referred to as the Internet of Things (IoT) because it combines machine to machine (M2M) connectivity with Internet and/or cloud services to store enterprise data and leverage that data for analytics. It often relies on a supervisory system controller as the "brain" that monitors and controls nearly every aspect of a supermarket's operational infrastructure.

Those who have embraced this technology in food retail have reaped its many benefits, including:

- Reducing HVAC, refrigeration and lighting energy costs
- Limiting equipment downtime through preventative maintenance
- Predicting equipment replacement to allow for planned capital expenditures

With these proven results, it's clear that the technology is available to make the concept of connected kitchens a reality. However, most foodservice retailers are doubtful of its feasibility or unaware of its vast potential to help them gain a competitive edge.

Consumer, industry trends drive wider adoption

Changing market conditions in the foodservice industry are helping to build a compelling case for connected kitchens. To start with, 35 percent of total energy consumption in a QSR is directly attributed to food preparation, representing the largest factor contributing to overall energy usage in a restaurant:

- 35% Food preparation
- 28% HVAC
- 18% Sanitation
- 13% Lighting
- 6% Refrigeration

Restaurant chains can no longer afford to ignore the opportunity to improve energy efficiencies in food preparation.

Perhaps more importantly, consumer demand for healthier, fresher and a greater variety of food options is forcing QSRs to retool their menu options. To respond to this demand, restaurants will need a much more effective method of rolling out new menu options, especially across a large number of locations. And, they will need ways to ensure that product consistency and food quality don't become casualties of these expanded menu options.

But here's the reality: traditional food factories are currently not equipped to quickly respond to menu changes and expansions. In most QSRs, menu changes take place approximately every six months; and the average cost per change is $40,000. Compare that fact to a connected kitchen that can roll out changes across entire regions or districts in near real time — and do so with greater accuracy with feedback on success or failure (see inset) — you can see its transformative potential.

To make this scenario a reality, foodservice equipment manufacturers are now integrating controls into their systems. Multi-purpose ovens, grills, fryers, holding stations and the like are all being designed with M2M and IoT connectivity in mind. The ultimate goal is to capture data points from nearly every piece of equipment in the restaurant.

A single-site gateway controller, such as Emerson's ecoSYS supervisory system, provides enterprise-level monitoring of the restaurant and its building systems. This data can be accessed remotely to provide managers with real-time energy and operational analysis, including how food preparation equipment is being used.

Ushering in a new era of connectivity in commercial kitchens will pose some implementation challenges. First, there's the question of kitchen density — connected equipment must be able to accomplish more within existing space without infringing on the customer experience. Second, the technology must be nimble enough to be deployed without requiring burdensome supporting IT systems. Third, because of the franchisor/franchisee relationship, the offering must be flexible to meet varying requirements.

Ensuring food integrity is the most essential component to preserving consumer loyalty and the brand's reputation. Maintaining compliance with HACCP (hazard analysis and critical control points) food safety methodologies ensures the highest level of quality expected by today's consumers.

For employees manning the food factory, connected kitchen technology utilizes touch-screen device interfaces similar to the ones used in today's

Inside the "Connected" Food Factory

Speed without sacrificing quality

To meet customer expectations, casual restaurants and QSRs often deploy an assembly line approach to food preparation. In a perfect world, order fulfillment would take no longer than 45 seconds.

Consistent productivity requires seamless coordination among employees and equipment to ensure repeatability, consistency, flow between stations, and uptime of the equipment like holding cabinets and ovens.

To facilitate efficient food assembly, connected food factories are designed to provide simultaneous monitoring of multiple equipment data points. Requirements of a connected kitchen in a fast food factory include:

- Deploy equipment and menu options quickly
- Monitor and manage equipment usage and status for maximum food quality
- Transmit new cooking programs/menu items with minimal disruption

Menu broadcast and programming flexibility

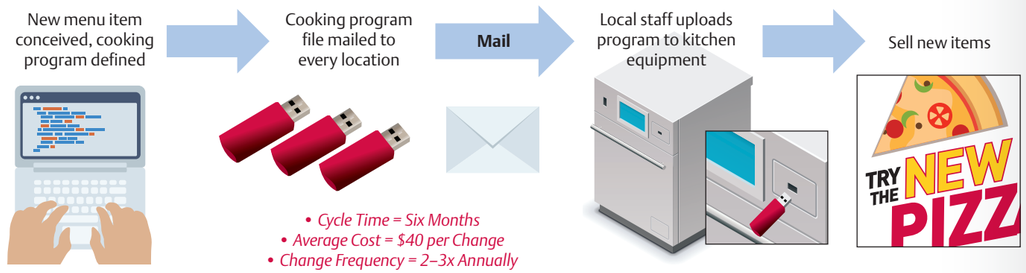
Today, the process of making menu changes is time consuming and costly. Once the corporate office has created a new item, the cooking program is loaded onto USB drives and mailed to each location. The restaurant's management staff then manually uploads the program to the affected kitchen equipment and trains the food assembly crew. The process can take months, and many times there's no way to ensure proper implementation of the menu change.

In the connected kitchen model, the new menu item (and its associated cooking program) can be broadcasted and uploaded digitally to each location. Kitchen equipment is remotely reprogrammed (no staff is required), and the menu item can potentially be made available to customers in the same day.

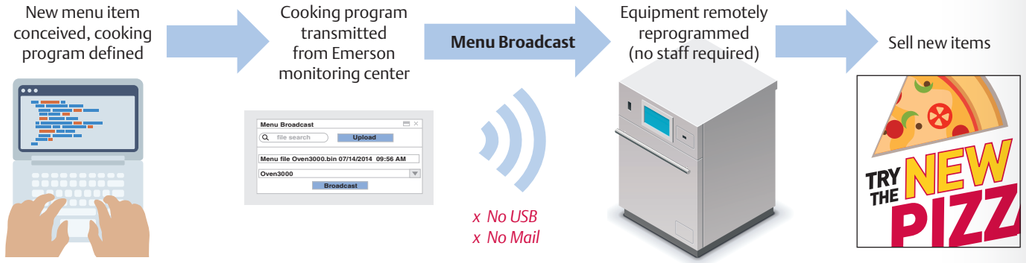
45
SECONDS
for order fulfillment

Menu broadcast: Moves changes from months to minutes

Traditional Way



Connected Kitchen



connected mobile devices. Even so, training will be required to establish familiarity with the new equipment and repeatability in food factory.

Connecting buildings and kitchens to maximize quality and profitability

In a connected restaurant, communicating kitchen equipment and building systems can be monitored and controlled to achieve optimal operating conditions. Information from each data point is aggregated and stored in the cloud where it can be accessed for detailed analytics and reporting. Operations managers can use this data for three primary objectives:

- Preventive maintenance
- Planned expenditures
- Predictive modeling

From a day-to-day standpoint, operations and store managers can rely on the site supervisor to monitor and control HVAC, refrigeration and lighting. Not only do systems send out automated alerts upon detecting "out of tolerance" conditions, they reduce the cost of unplanned service calls. Connectivity also enables precise energy monitoring and implementation of specific demand response and energy-reduction practices.

In communicating kitchens, equipment data points can be used to closely monitor what matters most to the consumer: food quality and consistency. This data can reveal a variety of information that impacts food quality and perception of the brand, including:

- Ovens/grills usage — helps to plan for demand/peak cycles
- Unusual cooking cycles (adding 30–45 seconds) — indicates deviations in menu programming
- Cleaning schedule — reveals when the equipment condition may be affecting food quality

The connected kitchen also ensures menu quality and restaurant uptime by preventing critical points of failure in ovens, holding tables and heated landing pads. And to ensure safety, it even provides HACCP monitoring.

Of course, the ability to broadcast menus over the Internet in real time would open up a new era of unprecedented menu flexibility.

Restaurant chains can utilize operational and equipment use data to make consumption plans that are optimized to peaks and valleys at each specific location. Even minor adjustments can have a dramatic impact on profitability.

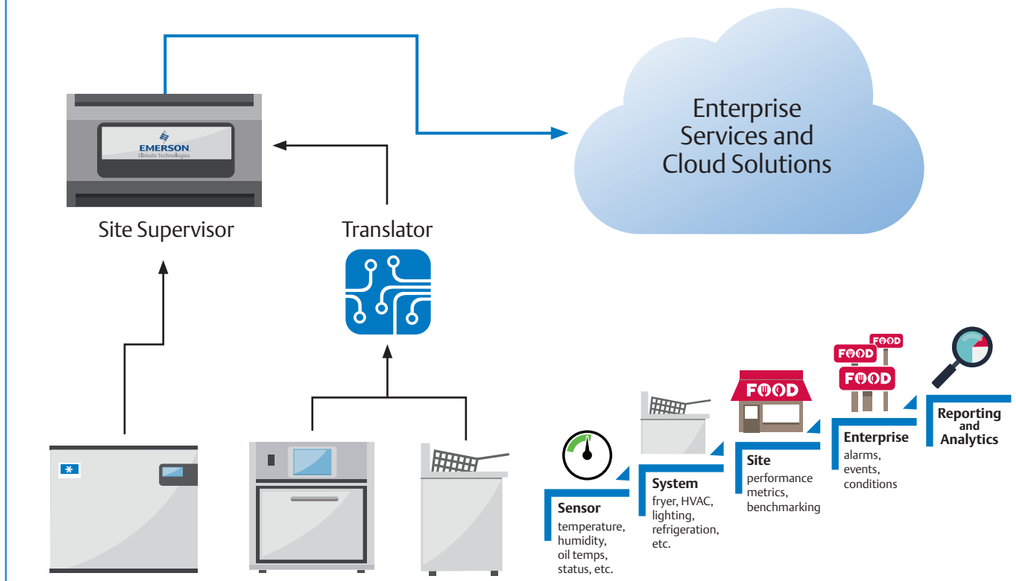
And with food preparation making up one-third of a restaurant's energy costs, the energy savings potential alone could provide a rapid return on investment for the cost of connected kitchen equipment. A chain that installs this energy-efficient footprint also enhances its brand by appealing to today's sustainable-minded consumers.

What will you do with your data?

The value of a connected kitchen should be measured on the degree to which chains can leverage the data being captured and transmitted. If you're considering moving to a connected kitchen architecture, there are several important questions to ask.

If your devices could communicate, will they have data that's worth the effort? More importantly, can someone take action on the knowledge gained? Will your IT group be involved? Finally, do you have the in-store real estate to make room for new equipment? The point is: there are many factors to consider before making the switch.

Whether it's energy savings, operational improvements, improved food quality or brand protection, there are many compelling reasons to install a connected kitchen. And, as leading QSR market OEMs integrate this technology into their equipment and systems, the foodservice industry will likely begin to see wider adoption in the coming years.



Components of a connected kitchen

Site supervisor — gateway monitoring and control system; provides conditional alarms

Translator board — interprets data from the kitchen equipment into a language that the site supervisor can accept and the QSR can use

Cooking/staging equipment — built with sensors to capture data from multiple points (e.g., temperature, humidity, oil temperature, status, duration of cooking cycle, etc.)

Cloud-based enterprise services — stores enterprise-level data; provides services; data collection, reporting and analytics

A NIGHTMARE ON STEAK STREET: SAVED IN THE NICK OF TIME

Compressor diagnostics averted a loss of thousands of dollars in meat market

It's every business owner's nightmare: you lock the doors at the end of a business day and leave for the night; by morning, you have thousands of dollars in ruined merchandise and have to turn customers away for days until you can reopen. For large businesses, it can mean not meeting quarterly profit expectations; for small businesses, it could mean a loss of revenue that impacts operations for months or longer. And if your business is in highly perishable food items, like grocery stores and restaurants, this bad dream can all too easily become a reality if your walk-in cooler fails.

For a small-town meat market in the Midwest, this nightmare nearly happened last year. After the store was closed for the day, the defrost timer in the walk-in cooler failed. Because the timer couldn't operate properly, the compressor couldn't run when the thermostat switched on the cooling setting. On an ordinary system, this would start a domino effect: the compressor fails, the cooler slowly warms up and the meat spoils. But because the market's cooler had a scroll compressor with CoreSense™ technology, it intelligently responded to the issue and took early steps to save both the meat and the equipment.

Failure is not an option

When the compressor's on-board diagnostics technology detects a system trip fault, it flashes alerts on the compressor and, when connected to a supervisory controller, sends a text, email or automated call to designated personnel, such as a facility manager. The idea is the sooner someone can respond to an issue, the more likely it can be addressed and food temperatures can be maintained.

In the event no one responds to the initial alert, CoreSense diagnostics then directs the system to reset. When the compressor still cannot cool down to the appropriate temperature, the system continues to attempt to save the food, resetting itself for up to four hours. At the end of this four-hour period, it sets off an alarm and then defaults to saving the equipment by shutting off the compressor and waiting for a manual reset. While the temperature in the cooler would slowly start to rise at this point, the system's integrity would be maintained.

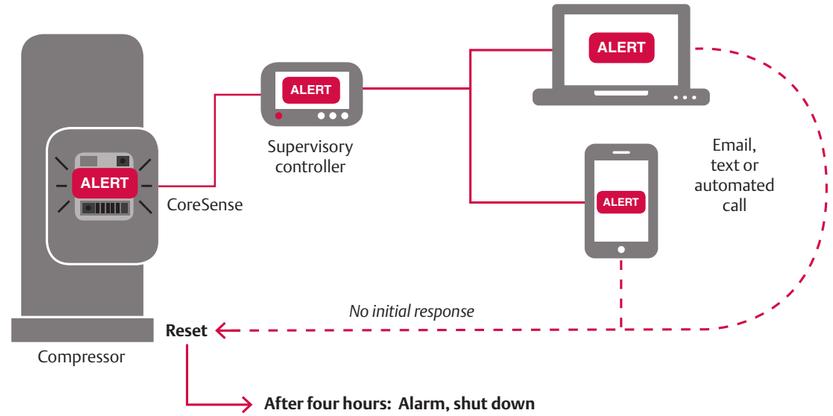
Big or small, protect them all

Because of the alarm, the facility manager of the meat market was able to respond in time. With a little troubleshooting, a qualified service contractor identified it was an issue with the timer, repaired it and reset the scroll compressor. While the timer is not part of the compressor itself, the diagnostics technology was still able to prevent the cooler from failing due to the issue.

More than $10,000 in food was saved, and the compressor and cooler weren't damaged. Just as important, the reputation of the meat market remained intact; they opened the next day, and customers were none the wiser to the near disaster. And since store managers were aware of the issue as it occurred, they were able to closely monitor product integrity and ensure that they were maintaining the quality that their customers expect.

While the technology saved just one compressor in a smaller facility in this case, it is equally critical for large chain stores and restaurants. These facilities, which utilize multiple coolers, are all dependent on compressors to keep large quantities of food at specific temperatures — 24 hours a day, 365 days a year. Whether the store has one or ten coolers, it doesn't matter; the technology performs the same series of events to protect both the merchandise and the equipment, ensuring food retailers are ready to serve their customers' needs.

On-board compressor diagnostics detect system faults, trigger alerts and maintain proper refrigeration cycles — before shutting the compressor down to protect equipment.



SUCCESS STORY

Convenience Store Chain **Strikes Gold** and Saves Some Green

Facility supervisory system saves on energy costs and provides operational insights

Across America convenience stores serve as the mainstay of communities, a place where we go to not only refuel but even get a quick bite to eat and recharge our batteries. Nowhere is this truer than the South, a region known for its warm weather and hospitality. The Golden Pantry convenience store chain in Athens has based its reputation on this charm, serving northeast Georgia for nearly 50 years with now close to 50 stores.

The chain's operations managers know that their continued success will rely on their abilities to preserve their well-earned brand reputation, reduce energy consumption and improve operational efficiencies across all of its stores. So when they were presented with a technology that could simultaneously address these concerns, they were intrigued.

Electronic improvements to mechanical systems

The solution utilized the latest electronic store control technology that could manage the energy consumption of HVAC and refrigeration systems. But before considering a broader implementation, management embarked on a pilot program in one of its stores.

Previously, the Golden Pantry was using the thermostats for HVAC and refrigeration. In fact, there were no electronic controls or smart control devices in any of their facilities. That was all about to change.

Without replacing any of the HVACR equipment, the store optimization team upgraded the HVAC system with new electronic thermostats on a single network. Then, they installed electronic thermostats and refrigeration controllers on the store's four walk-in coolers and freezers. The new thermostats and controls fed into an electronic site supervisor system that monitored energy consumption and provided managers with operational insights.

Enhanced visibility and fault protection

While the goal of the installation was primarily focused on energy reduction and system optimization, store managers quickly discovered the value of the data the supervisory system provided. Just weeks after the installation, it detected a potentially catastrophic refrigeration system fault and sent alerts to store operations.

And when technicians arrived to investigate the error, they discovered a faulty condenser unit. Their quick response allowed them to replace minor parts and fix the issue, thereby preventing two larger, much more costly issues: product loss, and walk-in cooler (equipment) failure.

Precise control optimizes energy savings

With electronic controls in place, store operations were better able to identify high energy-consuming practices and implement new strategies. The first thing they did was establish an HVAC temperature setpoint and lock out any manual changes to thermostats. The setpoint was optimized to maximize energy efficiencies of the existing HVAC system and eliminate unnecessary strain from setting the thermostat too low during peak periods.

Electronic thermostats replaced inefficient mechanical ones in the store's walk-in coolers and freezers. These were then integrated with electronic refrigeration controllers and the new site supervisory system. As a result, store managers were able to exert much tighter control of food storage operations, including:

- Scheduled defrost cycles
- Utilizing case temperatures to assist with defrost on/off
- Two-degree temperature setback from midnight to 4 a.m.

The supervisory control system even notified store managers when walk-in doors were left open. All of this advanced control and visibility gave managers the tools to make full-scale operational changes, not only to reduce energy consumption but to manage the store's environment and improve the overall customer experience.

Early return on investment

The Golden Pantry's management team had hoped to meet their goal of a 36-month payback. But with the system producing 9.6 percent energy savings in its first year, they are now projecting to achieve ROI in only 18 months.

Strategic initiative manager, Robert Griffith, knows that the insights his team has gleaned since installing the system are just the tip of the iceberg. "While energy savings are more than paying for the system cost, the information we're gathering is helping us make important operational improvements now, and plan for equipment upgrades in the future," Griffith said. He also anticipates rolling this system out to other stores in the region.

by RAJAN RAJENDRAN

Building the **connected kitchen** of the future

In October, Emerson broke ground on a new 40,000 sq. ft. facility focused entirely on the research and development of new technologies in the HVACR industries. Located on the University of Dayton campus, the Emerson Innovation Center, or "The Helix" as we refer to it, is designed to serve as a hub where academic researchers and industry professionals can jointly develop and test concepts in real-world environments.

One of the testing labs currently under construction is a fully operational, 1,500 sq. ft. commercial kitchen and working restaurant capable of serving 150 patrons. Unlike other research centers of its kind that are focused primarily on hot- or cold-side concerns, we're taking a holistic approach to addressing the many challenges facing today's busy commercial kitchens.

In addition to simulating hot and cold climates, we're evaluating everything from zoning, lighting and store comfort to humidity, food temperature and recycling scenarios. And, we're keeping the interests of the foodservice industry's three primary stakeholders in mind:

- Customers, with increasingly discriminating tastes and preferences, seek improved food quality and pleasant dining experiences
- Employees look for new ways to meet customer demands, enable kitchen efficiencies and reduce downtime
- Owners strive to minimize maintenance costs, maximize profits and differentiate themselves in a competitive marketplace

"The Helix" Innovation Center will house a fully operational commercial kitchen.

The concept of connectivity in equipment and systems will be integral to our research in the commercial kitchen. Utilizing the latest technology from foodservice equipment manufacturers and Emerson's own electronic controls and food recycling systems, the connected kitchen and restaurant module is designed so that every piece of cooking equipment and building system will be able to communicate multiple data points. The intent is to give owners and operators visibility to know exactly what's happening in the restaurant at any given time — and from any location.

While the facility is still under construction, the research process has already begun. We've assembled a commercial kitchen research team that has been visiting local kitchens to evaluate real-world scenarios, brainstorm potential solutions and prepare to test these theories in the lab. We're excited to have the opportunity to develop the connected kitchen of the future, as well as share new solutions and insights with the foodservice industry.

Refrigerant Update

One SNAP proposal final, another is pending

Last year, the EPA introduced two significant new alternatives policy (SNAP) proposals aimed at the use of refrigerants with high global warming potential (GWP) in refrigeration and air conditioning equipment. The first of these SNAP rulings, which sought to introduce a number of refrigerant alternatives, has recently been finalized.

The five approved substitutes have a GWP ranging from 3 to 675 and are intended to replace ozone-depleting substances and high-GWP hydroflourocarbons (HFCs) with GWPs from 1,400 to 4,000. These refrigerants were approved for use in specific applications:

- Ethane — very low-temperature refrigeration; non-mechanical heat transfer
- Isobutane — retail food refrigeration (stand-alone commercial refrigerators and freezers); vending machines
- Propane — household refrigerators, freezers, or combination refrigerators and freezers; vending machines; room air conditioning units
- R-441A (hydrocarbon blend) — retail food refrigeration (stand-alone commercial refrigerators and freezers); vending machines; room air conditioning units
- HFC-32 (difluoromethane) — room air conditioning units (one-third the GWP of its predecessor)

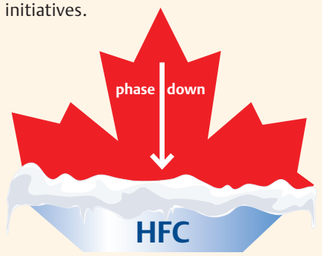
It's important to note that these refrigerants are already being used in Europe and Asia. And, other than HFC-32, all are considered exempt from the EPA's venting prohibition, who has stated that these refrigerants "pose no apparent threat to the environment."

The other SNAP initiative, in which the EPA has proposed to delist R404A and many other commonly used refrigerants, is still pending. From all indications, the final ruling will be announced later this year, near mid-summer. I have discussed the implications of this proposal at length in recent *E360 Outlook* editions, so please refer to those columns for more information.

Canada introduces HFC phase-down

Finally, the government of Canada recently took a stronger stance on HFCs with the announcement of its own regulatory measure via a "Notice of Intent to Regulate Hydroflourocarbons." Their proposal is based on a two-fold approach: 1) to prohibit specific HFCs by year and sector; and 2) to impose a gradual phase-down of HFCs from a calculated baseline. The latter is modeled after the North American Proposal (an amendment to the Montreal Protocol), put forth by Canada, Mexico and the United States.

It's more evidence that while the neighboring countries continue to take different regulatory paths, they are influencing each other and ultimately working toward the same objective. Like the U.S., Canada has invited industry stakeholders to participate in the development of regulatory measures in hopes of achieving mutual agreement on these environmental initiatives.



Dr. Rajan Rajendran is one of the most respected, global authorities on alternative refrigerants and their applications across a variety of industries. As Emerson Climate Technologies' Vice President, System Innovation Center and Sustainability, Rajan helps steer the company's strategic direction, research and product development.

iPro extends functionality of HVACR equipment

Many HVACR original equipment manufacturers rely on advanced electronics to ensure flawless equipment performance within clearly defined operating conditions. It's one way engineers can guarantee reliable equipment performance and keep product development within scope.

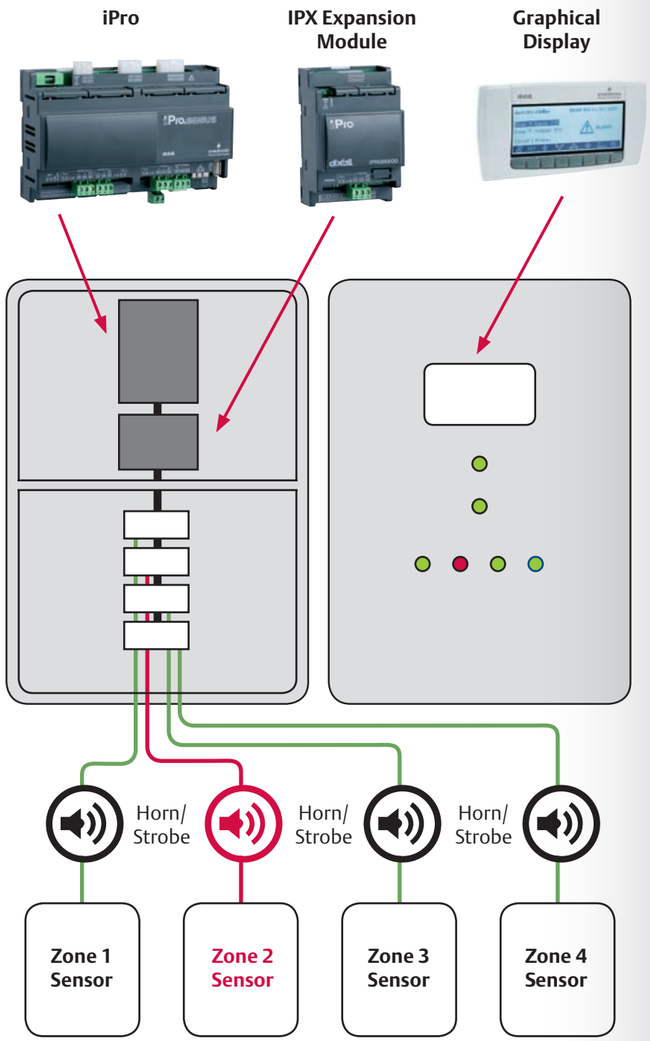
But the reality is, many end users have unique requirements that push the limits of their equipment's capabilities. Whether it's providing refrigerant pressure control, ensuring supermarket energy reduction or adhering to precise temperature across refrigerated cases, end users seek tools to extend the basic functionality of their HVACR equipment. Enter the iPro control platform.

What is iPro?

iPro is a multi-faceted electronics platform designed to give end users custom functionality for their varying requirements. At its essence, the iPro platform is comprised of two components:

1. iPro control module — a computer processor/hardware component that has generic assignable inputs and outputs and serves as the brains of the platform
2. Flexible software architecture — a customizable set of function blocks (firmware) combined as apps, similar to those commonly used with mobile devices

The iPro control module can be embedded in a panel with ancillary hardware (like relays or a display) in coordination with the specific functionality defined by the software application, to provide a complete packaged solution.



iPro control serves as the brains of the input/output panel.

For example, the inputs can be attached to performance sensors on equipment, from which the iPro control module processes the information and relies on the software app's instructions to perform specific actions (set off alarms, notifications, etc.). To provide greater visibility to its data, iPro also can feed into a facility's computerized management system, such as Emerson's E2 controller. Since the iPro control module has its own IP address, it can be accessed independently from a Web browser.

Nimble programming and application flexibility

iPro's modular application architecture allows for customization late in the product development cycle, after the equipment's core functionality has been fully engineered and tested. This means new functionality can be developed with minimal engineering effort, relying on an agile programing language and a short app development cycle.

Trained application engineers work closely with the customer to capture their requirements, and using the iPro hardware and a flexible set of code, can put the desired functionality into their hands in less than 12 weeks without the traditional — and sometimes lengthy — process of product development.

A growing library of functions

As application engineers respond to customer requests, the amount of available iPro function blocks continues to grow. These apps are stored in a library that developers can access to develop more complex functions. The iPro control module's nimble programming language supports integration between existing function blocks, allowing engineers to combine segments of executable code to assemble new apps for any number of advanced scenarios, including:

- Rack controller
- Case controller
- Supermarket energy reduction
- CO_2 high-pressure controller
- Rooftop compressor and fan controller

These applications can then be loaded onto the iPro hardware to provide the desired solution.

Case in point: Multi-zone refrigerant leak detection

Problem

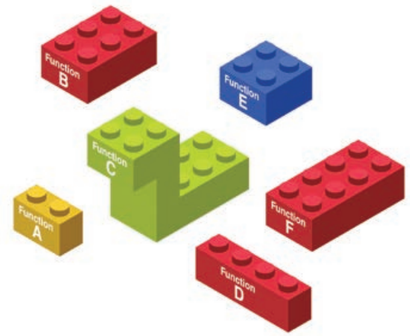
A well-known retail giant sought a leak detection system to ensure there were no refrigerant leaks in any of their many refrigerated zones in their stores. They had installed a series of leak sensors, but they were not connected to a single system, so response to issues was fragmented and couldn't be easily coordinated.

Solution

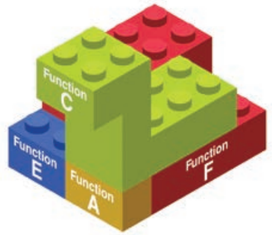
iPro was used to take data from leak detection sensors and centralize them into a single point that would allow them to integrate with their store controller system and set off alarms (buzzer and strobe lights). A leak detection sensor was placed in each zone and connected as inputs to the iPro control panel. The software was designed to process information from each zone, evaluate the existence of leaks and make decisions that result in output functions (e.g., to set off alarms and contact store management in the case of a leak).

In addition, the iPro panel also included several modular add-ons to improve its monitoring functions:

- User interface/graphical display
- Panel lights and push buttons
- UPS panel



Function blocks can be combined to provide advanced new iPro functionality.



Making Sense of refrigerants, operational visibility and energy-reduction technologies.

Since early 2013, Emerson Climate Technologies has produced a series of free webinars with the goal of *Making Sense* of the most important issues in refrigeration. To date, more than 3,000 attendees have participated in 12 different webinars. This educational platform addresses current trends and focuses on three key aspects of refrigeration:

- The promising role of new and natural refrigerants
- The application of electronics to improve operational visibility
- Energy-reduction technologies

Our most recent webinar provided insights into meeting future Department of Energy (DOE) energy regulations. Kurt Knapke and Brian Buynacek discussed many of the design options that OEMs have at their disposal to meet the DOE's minimum energy efficiencies. These design options were segmented into two main groups: devices/components that consume energy; and design options that have large impacts on system performance. We recommended options that provide the best return on investment, considering limited design time, upfront cost and the total operating costs.

Recently Archived Webinars

Find archived webinars at **EmersonClimate.com/MakingSenseWebinars** and explore the relevant refrigeration industry issues that have been examined.

Meeting Future Refrigeration Energy Regulations With Today's Technology Alternatives	March 17, 2015
Staying Ahead of DOE 2017 Walk-In Cooler and Freezer Energy Efficiency Ratings	October 21, 2014
Staying Ahead of Rulemaking Proposals on Acceptable Refrigerants	August 26, 2014
Improve Refrigerated Marine Container Management With Pervasive Connectivity	July 8, 2014
Making Sense of Natural Refrigerants	May 20, 2014
Best Practices for Evaluating Compressor System Performance	March 11, 2014
A Conversation on Refrigerants!	January 21, 2014

E360 Forum

Emerson Climate Technologies is excited to take our educational platform on the road — this time to Dallas, Texas. Our February E360 Forum in Anaheim, California, was a huge success, with more than 120 foodservice and retail leaders gathering for in-depth discussions on important industry issues. We look forward to continuing the conversation in the South in September. Once again, this daylong event will feature prominent industry authorities as well as Emerson's own internal experts.

The E360 Forums give attendees an opportunity to participate in the conversations shaping the future of commercial refrigeration and air conditioning. We hope to see you in Dallas in September!

E360 Forum Schedule

Dallas, TX	September 3	The Westin Dallas Fort Worth Airport
	Additional 2015 venues to be announced	

At the February event, we discussed many of the upcoming challenges facing foodservice and supermarket OEMs and retailers. We received a lot of positive feedback from the attendees at the event. Read what they had to say:

What was the most meaningful takeaway from today?

"**Some of the biggest takeaways** *were learning about the changes happening in the foodservice industry, and how energy and environmental challenges are playing huge roles. Seeing how these things are interconnected was an eye-opening experience."*

— Bryan Tonn, engineering manager, H&K International

Would your recommend the E360 Forum?

"**I would absolutely recommend** *these E360 Forums to everyone in the industry who wants to grow their business."*

— Aamer Mohammed, manager of engineering, Stoelting

INDUSTRY EVENTS

AHRI Spring Meeting
Crystal City, VA
Hyatt Regency
May 5–7
ahrinet.org/site/412

NRA Show
Chicago, IL
McCormick Place
May 16–19
show.restaurant.org

West Coast Energy Management Congress
Long Beach, CA
Long Beach Convention Center, Hall B
June 3–4
energyevent.com

FMI Connect
Chicago, IL
McCormick Place, South Hall
June 8–11
fmiconnect.net

ATMOsphere America 2015
Atlanta, GA
The Grand Hyatt Atlanta in Buckhead
June 25–26
atmo.org/events.php

ASHRAE Annual Conference
Atlanta, GA
Atlanta Hilton
June 27–July 1
ashrae.org

HRAI Annual Meeting and Conference
Windsor, Ontario, Canada
Caesars Windsor
August 26–29
hrai.ca/events.html

FMI Energy & Store Development Conference
San Diego, CA
Sheraton San Diego Hotel
September 27–30
fmi.org/forms/meeting/Microsite/ESD2015

EMERSON
Climate Technologies

Emerson Climate Technologies
1675 West Campbell Road
P.O. Box 669
Sidney, OH 45365-0669

We'd like to hear your feedback.

Thank you for reading the third edition of *E360 Outlook*! At Emerson, we believe the challenges faced by the refrigeration industry cannot be solved in a vacuum. Only through collaboration and a commitment to innovation will we discover answers to the difficult questions before us.

We hope the information provided here will spark conversations and open all of our eyes to new perspectives. But for that to happen, we all need to contribute. And that starts with you. Feel free to contact us with your feedback, questions and insights. We look forward to hearing from you.

facebook.com/EmersonClimateTechnologies
@EmersonClimate
linkedin.com/company/Emerson-Climate-Technologies
EmersonClimateConversations.com
pinterest.com/EmersonClimate
EmersonClimate.com/en-us/Pages/RSS_News_Feeds.aspx
plus.google.com/+EmersonClimateTech/posts
youtube.com/user/EmersonClimateTech