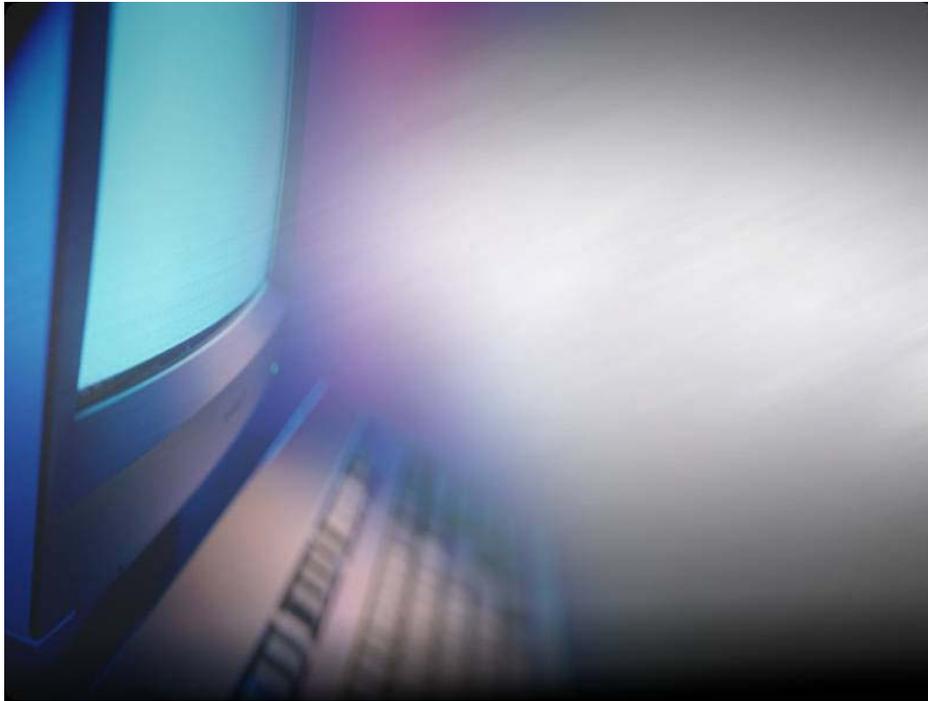


Internet Connectivity of Control Systems



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Overview:

In today's world of high-speed data transfer, instant connectivity is not only commonplace, it is expected. When attempting to extend this dynamic to the connectivity of yesterday's and today's control systems, this is not an easy task. Multiple factors figure into this task, including the network connectivity and processing speed of the older legacy controllers installed in many applications. That coupled with pressure to reduce installed and operating costs drives solutions focused on delivering consistent, accurate control of the refrigeration system and product case temperatures.

The Reality,

To gain a full appreciation of the importance of this task, we need to look at the magnitude of what is being controlled in today's systems.

Refrigeration Controls:

Today's refrigeration control systems are very complex and handle several hundred tasks per minute. At stake are hundreds of thousands of dollars in refrigeration equipment and the food safety of all of the refrigerated cases in a store, not an easy task. These control systems are constantly balancing the entire refrigeration system to provide both the best quality of product for the end user, the consumer, and for safeguarding the energy consumed by the refrigeration plant to minimize the operating expenses of the store.

In a typical supermarket today, refrigeration is accomplished through the use of Single Condensing units or through the use of a larger rack system. Single condensing units are smaller individual compressor bearing units that take care of an individual case or section of cases. A rack system utilizes multiple compressors tied together to control large sections of the store at one time. Both of these types of system have their own inherent values but the basic operation is similar. In both scenarios, the control system is responsible for sensing the internal pressures in the system, controlling the discharge and suction pressures, orchestrating the multiple defrosts and sending out alarms.

A typical refrigeration controller contains about a half a million lines of software code and can have approximately 4,000 individual points of control. The seemingly simple task of overriding a setpoint or changing a temperature set point can easily touch 15 to 20 different individual points within the control system including alarm delay times, alarm notifications, suction setpoints, temperature set points, suction stepper position, defrost delays and internal controller parameters. Clearly, the control systems in place today of the 80's

were not written with rapid Internet access in mind. Accessing large quantities of data can take anywhere from a few seconds to minutes depending on the tasks being executed by the controller and the type of information requested. This is especially true when the goal is to not interrupt the control system and the refrigeration system it is designed to manage.

HVAC Controls:

Today's heating and cooling controls are receiving many of the same pressures for advancement that Refrigeration controls are seeing. New strategies to maximize and treat the air and how the units control and anticipate the needs of the buildings are very complex. As building codes change and the price of electricity continues to grow, the need for HVAC systems to operate more effectively is becoming more and more of a concern. One typical HVAC control system may provide some of the same temperature functionality as a thermostat, but the similarities end there. In today's modern supermarkets, the need to properly control makeup and outside air, duct pressurization, CO² levels, effectively handle load shedding or curtailment and system staging is no simple task. This task is amplified when dozens of units are all being simultaneously orchestrated on a single store.

The typical HVAC Control system has approximately a quarter of a million lines of software code and has over 800 control points. As more and more systems become integrated in each store, this task will not become easier. The effective handling of the physical environment is typically the single largest area for cost reductions in a store, but more than that, it is one of the first opinions customers make about your store.

The Future,

Architectures being deployed today and for the future will include wider support for information technologies. As the networking services of in-store control systems improve, the ability to access large amounts of information in real-time becomes possible. In addition, connectivity throughout the enterprise, coupling store systems to corporate LANs will replace many of the stand-alone philosophies of today. This will enable the enterprise wide control of the physical plant much as the enterprise wide financial systems of today are integrated.

Modular architectures and embedded microprocessor performance gains make it possible to provide bandwidth beyond that necessary to accurately control refrigeration plant capacity and maintain high quality product temperature control. Industry standard methods of presenting that information will also be deployed such that resident databases can be easily queried and monitored for anomalies.

Summary:

As market demands grow, the key is to delicately combine the functionality and information from these older systems in the stores today with advanced functionalities such as food quality and predictive maintenance programs. These programs can enhance the functionality of today's control systems without incurring the high cost of a retrofit of an entire stores control systems.