tion costs much less than this energy. One must also consider that this additional electricity power supply is not always available, for example if there is nowhere available to build a power installation.

Example

Members of the Russian Association of Climatic Industrial Enterprises (APIK) equip modern properties with HVAC facilities and supply about 80% of the market sector in Russia. Building automation introductory courses by the Training and Advisory Center of APIK often show examples of calculations for the amount of investment in automation of technical building equipment systems.

Partners of APIK found that during the realization of a project designed to equip a Moscow building complex, the equipment used in the property doubled the available supply. In order to reduce energy consumption, a whole set of different measures had to be implemented: use of energy-saving technology, realization of special algorithms to control the building's technical equipment, which made the distribution to the largest energy consumers possible at that time. Only then could the entire energy consumption be reduced to meet the level of supply available, saving a large amount of money and avoiding future problems.

Specialists from one of the leading companies, Korpus Group, submitted detailed statistics about the use of automated control systems in a property with a total area of 43,000 square meters and a severely restricted power supply. The completed system controls five main room types, with more than 30 types of individual configurations, error diagnostics and remote control of appliances as well as archiving of all data. A broad deployment of LonWorks technology, made it possible to effectively distribute 4.5 mW of energy for cooling and 400 kW of energy for lighting the office zones. In this property, over 25,000 data points were installed. The total volume of the visualization system amounts to over 800 graphic schemes, which are controlled by seven control stations.

The automation enabled maintenance costs were considerably reduced, 12%-17% of the energy was conserved and altogether between US$120,000 and US$170,000 per year was saved. Additionally, thanks to continuous control of the data delivered by the cooling system controller, the operator was able to identify any changes in the plant operation. This led to a reduction in the level of repairs which would have cost US$12,000. This is only one of several examples.

At the same time operating personnel could be reduced to eight people, bringing a further savings of US$93,000 per year as well as improving the operating quality of the entire technical building equipment.

Training Program

These examples show that under conditions of limited power supply and the demand for guaranteed stable and complex system control, the automation of new properties is necessary. Therefore, engineers, project managers and planners who specialize in the application of air conditioning equipment are increasingly posing more questions about automation. In order to be able to keep up with this demand for information, a special training course is being compiled by the Training and Advisory Center of APIK. This course is directed at chief engineers, architects, and specialists from management and investment companies and is devoted to methodological questions about work on projects, including the application of modern automated control systems.

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Technical Corner

Industrial-Class Controls

The LonMark magazine is published with a particular theme every quarter; sometimes home systems, sometimes outdoor lighting, etc. Writing for this quarter's theme was surprisingly difficult: the interfacing of industrial controls to the facility. Ironically, it wasn't from lack of information available but rather, too much information. It is such a broad classification in LonWorks control descriptions. Purely looking at industrial automation, should I write about coal-mine safety applications? Incarceration controls? Nuclear reactor monitoring? Locomotive braking? Hospital security systems? Automotive paint-spray applications? Beer or wine making? Point-of-sale alcohol dispensing systems? Textile dyeing machines? Airport access systems? Or should I focus on the more aesthetic: lighting for the millennium celebration on the Eiffel Tower or the fountain show at the Bellagio Hotel in Las Vegas?

Yes, LonWorks has filled a gap in industrial automation and has become a part of many automated processes. To be fair, LonWorks cannot replace systems that require precise, time-slotted, high-speed repetition – as would be found in DVD production, for example – but it could certainly drive the conveyor belt system that moves boxes of DVDs from one distribution point to another within a facility; and it could allow for the intercommunication of an automotive conveyor system in Detroit to communicate with one in Stuttgart or Honshu over the Internet.

Operation of a conveyor belt is one example of a function that can be tightly related to the sensors that must maintain count and product continuity across those belts. It is through asynchronous coordination that the LonWorks sensor detects a jam on a conveyor belt and notifies the drive motors of that conveyor system to reduce speed or halt the belt entirely. Asynchronous sensing and communication are strong points of LonWorks systems. But can we take this conveyor system further? That is to ask, what would we gain by tying the conveyor system into an HVAC system, for example? If a system running at high speed produces a certain amount of waste heat – and that system, running at a lower speed produces significantly less waste heat – then it would seem that tying the conveyor system into the HVAC system could result in significant savings through reduced cooling of the surrounding area. While the area could certainly be monitored for increased or decreased ambient temperatures, the direct correlation between the reduced conveyor system and a reduced need for cooling could result in greater efficiency due to the lack of time delay between the cause and the actuated response: The conveyor belt slows and the demand on the cooling system is reduced; rather than the scenario of the belt slowing, ambient room temperature dropping, and (after a latency period) the cooling system is reduced.

Thus, we see another great benefit of LonWorks architecture: the ability to tie-in disparate systems through the use of unified technology. In high profile installations, such as the Eiffel Tower and the Bellagio Hotel, we see one-off installations; that is, a single Eiffel Tower and a single Bellagio Hotel fountain show. Both spectacular in their own right, they have very little need for integration with a facility. But in many applications, there is great opportunity for standardization of the facility-interaction functions: functional profiles of subsystem interaction. The members of LonMark have done this before with such successful subsystem interaction profiles as the "Elevator/Lift Fire-Systems Port" functional profile (profile number 140.41), where an independent vertical transportation system responds to the signals of a fire/smoke system; sending the elevator/lift cars safely to the ground floor and disabling the call-button functions.

A similar interaction could take place between an office scheduling system and HVAC system, whereby knowledge of a meeting of 50 people to be held in a conference room can be the catalyst to ensure perfect temperature, lighting, and airflow are present just minutes before the start of the meeting – entirely by an automated process; one that balances environmental and fiscal responsibility with that of occupants' comfort.

Taking the ubiquitous "green" concept into consideration: energy curtailment can be facilitated by a tight interaction between the demand-response calls from a utility and the electrically actuated mechanicals of a facility; and – via the parallel path of the enterprise data systems – it can allow for checks-and-balances of curtailment need and curtailment availability.

In the days of pneumatic HVAC controls and head-and master/slave industrial systems, it was inconceivable to think that industrial facilities could be tied into enterprise systems and the greater facility as a whole. Today, it is quite common to hear of lighting systems, fire systems, HVAC systems, and others being tied together in an automation showcase of a building. But the idea of interfacing industrial controls to the facility is still such a nascent concept that no catchy term has been coined to adequately do it justice. "I2F," perhaps?

But this is the "LonMark" magazine, after all. We should be discussing LonMark certified components: Profiling the functions of interaction would seem to be the next logical step. Today, what we see more often than not is the development of entire I2F systems, customized from the ground up, with no reuse of components/objects from other installations. Why not standardize the I2F interaction; just as we have done in the building automation world? Efforts like those of the International Forecourt Standards Forum are leading the way: integrating petrol/gasoline station pumps, point-of-sale systems, and the lighting and HVAC systems of those mini-, drive-up facilities.

The LonMark Industrial Task Group and the Building Automation Systems Task Group are just the right places for such a subsystem interaction to take place. Cross-participation in these groups is all it will take to create the functional profiles for an industrial-controls-to-facility port. I encourage all interested LonMark members to join us in blazing a brand-new path – to ride that conveyor belt from the factory floor to the office building.

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Integrator's Perspective

The U.S. Department of Defense (DOD) LonWorks Guide Specs and Open Systems – An Update

In 2000, Headquarters, U.S. Army Corps of Engineers (HQUSACE) called for the development of new guide specifications, with a specific focus on non-proprietary open systems. A four-year research and development project ensued. Extensive industry feedback and practical implementation expertise were sought. During this process a team led by the ERDC-CERL (Engineer Research and Development Center Construction Engineering Research Laboratory) investigated the breadth of what the industry had to offer including direct digital control (DDC), Modbus, LonWorks, BACnet, and vendor specific solutions. In 2004, the Corps released guide specifications for open controls systems based on LonWorks, and began implementing them. The guide specifications are available for download from both www.wbdg.org and the LonMark website www.lonmark.org.

In both 2007 and 2008, the U.S. Army Installation Management Command (IMCOM) funded the Corps to develop a strategy for the implementation of LonWorks systems at Army posts, and to implement this strategy at a few "trial" installations. (1)

Requirement for Open

It's a typical story – Army installations were getting locked into single-vendor systems and saw service drop while prices increased. In addition, U.S. Government procurement rules require non-proprietary procurement as part of its contracting actions whenever possible. It's important to note that the government definition of proprietary is different than that generally used by industry - for the government a system is proprietary if it requires or results in sole source procurement. While sole source procurement can be used if justified (due to being unavoidable), sole source procurement can be avoided using open systems technology.

History of Army Corps of Engineers Guide Specifications for Digital Control Systems

Until 2004 there were three Army Corps specifications:

1. SLDC (Single-Loop Digital Control) – This consisted of non-proprietary systems based on standardized and interchangeable modular (non-networked) single loop digital controllers available from a variety of vendors. While there were pockets of acceptance, industry as a whole never fully supported this specification, and as industry advanced to more fully networked controls, this spec became obsolete.
2. DDC (Direct Digital Control) – This consisted of networked DDC controls for HVAC with little/no supervisory interface. This specification did not address open vs. closed/proprietary systems, and often led to closed/proprietary systems.
3. UMCS (Utility Monitoring and Control System) – This consisted of networked DDC controls for HVAC including the "front end" supervisory interface. The content of this spec overlapped the DDC spec, and this specification also did not address open vs. closed/proprietary systems and usually led to closed/proprietary systems.