Adding 'Smart' Industrial LED Lighting to the Rockwell Automation architecture Simplifies Management, Enhances Overall Plant Productivity with Future-Ready Automation

By Rizwan Ahmad, Vice President of Technology

Investing in state-of-the-art LEDs solves more than just a lighting challenge. It's a future-ready investment in total plant productivity and the Industrial Internet of Things.

LED lighting is already quickly becoming the new standard for illumination in a wide range of industrial applications. By virtue of its superior energy efficiency and long-life reliability, LED technology has dramatically lowered the total cost of lighting for thousands of facilities around the world, including petrochemical, heavy industrial manufacturing, warehousing and even off-shore and cold-storage facilities.

In addition to generating savings, LED technology also proven to be a much safer and more eye-pleasing light source than conventional lighting. And, with a wide range of form factors and output options now on the market, there's an LED fixture to fit almost any application, including high-temperature, extreme cold and classified hazardous environments.

But, perhaps one of the greatest advantages of state-of-the-art LED lighting is its ability to directly improve total plant productivity. By connecting advanced lighting controls to the Rockwell Automation architecture, LED lighting can not only save time and money, but also provide vital business intelligence data, reduce waste and redundancies, and enhance plant operations. Better yet, by choosing the right LED platform today, facilities can prepare for the future Industrial Internet of Things (IIoT), laying a solid foundation for enhancements that will transform today's lighting network into a vital link in the next-generation in total plant automation.

5 Ways LEDs Already Amplify Efficiency

The energy and maintenance efficiencies afforded by LEDs are already well-known. Not only do LEDs reduce electricity consumption by up to 60 percent compared to conventional fixtures, slashing energy costs as a result, but they also directly reduce the resulting greenhouse gas emissions to support corporate environmental initiatives and qualify for energy efficiency incentives and tax credits. The long-life durability of these solid-state fixtures also dramatically reduces maintenance costs, virtually eliminating lighting maintenance for up to 10 years.

In addition to these direct bottom-line benefits, today's LEDs also contribute to overall plant efficiency in a number of somewhat less obvious, but equally important ways:

1) **Free up personnel and resources for vital mission-critical demands.** Conventional lighting maintenance is a constant chore, placing a huge burden on maintenance staff and consuming a large part of the budget. That means less time and money for equipment upgrades and other bottom-line enhancements. Because of its dependability and maintenance-free performance, LED lighting eliminates this burden, allowing personnel and funds to be directed toward more mission-critical activities. With the lighting network integrated into Rockwell Automation systems, maintenance crews can monitor the entire lighting system for complete visibility into power consumption, temperature and remaining lifespan, plus receive reports, alerts and notifications to proactively address lighting issues before they become an emergency, enabling a more productive and efficient maintenance operation.

2) **Granular fixture controls enhance operational efficiency.** Some lighting systems allow for the adjustment of groups or banks of lights—to come on with motion detection, dim automatically, harvest daylight or schedule the on/off cycle—to reduce burn time and energy consumption. However, this may still waste light and energy, not to mention could require complicated networking and manual adjustment. The most advanced LED systems enable access to each individual fixture, providing more granular and detailed monitoring and control to maximize efficiency. Even better, these programs can be automated through Rockwell Automation systems so that they require virtually no human intervention, providing a more convenient and efficient system for fixture-level ROI optimization.
3) **Understand and optimize workflows.** With the myriad sensors already placed in the LED environment, these can easily be used to provide added intelligence to help optimize productivity. For example, motion detectors can help facility managers monitor traffic flow to improve bottlenecks or plan workflow enhancements. Integrating this capability with Rockwell Automation systems means gaining complete visibility in a single dashboard over the entire flow of the facility, providing a much simpler and more comprehensive way to analyze and fine-tune workflows for optimum efficiency.
4) **Use lighting networks for data transport.** Because lighting is so ubiquitous and modern LED fixtures already include built-in wireless nodes, these can easily be used to perform other jobs beyond illumination. For example, Wi-Fi signal boosters can be incorporated to enhance connectivity in dead zones throughout the facility. The system can be used as a facility-wide Wi-Fi network, eliminating the need for hard-wired connectivity, reducing IT burden and expense.
5) **Rockwell Automation Encompass Partners maximize efficiency.** Working with LED lighting suppliers that are part of the Rockwell Encompass™program ensures complete and reliable compatibility with existing Rockwell Automation infrastructure. This means integrating your connected LED lighting system is faster and easier than custom-engineering connectivity, which also introduces the risk for errors that could compromise the full capabilities of the system. Connecting Encompass Partners' lighting to Rockwell Automation systems provides facility managers and maintenance staff with direct access to the complete lighting network through the existing Rockwell Automation user interface for total facility monitoring and control from floor to ceiling and everything in between.

The Future Looks Even Brighter – More Innovations on the Roadmap

Like LED lighting, IIoT is quickly becoming a staple in progressive, high-efficiency facilities around the world. Connecting equipment, supplies, products and infrastructure to a centralized system provides unprecedented visibility, integration and efficiencies, eliminating manual processes ranging from production and maintenance planning to purchasing and requisition to personnel management.

Deploying the right LED lighting systems now can play a critical role in leveraging future innovations that can further amplify the benefits of IIoT automation. Here are just a few examples of integrations and enhancements that are already in the works:

- **Enhanced safety features.** Connecting smoke or hazardous substance sensors to LED lighting control networks could provide a highly effective early-detection system to improve plant safety. In addition to detecting airborne pollutants and triggering an alarm or alert, the sensors could even trigger the automation system to illuminate the

evacuation route dynamically based on the presence of the offending substance, ensuring personnel take the fastest, safest escape route.

- **Improved security.** The superior color rendering of LEDs has already been shown to improve visibility and clarity for HD closed-circuit security monitoring systems. But, with the miniaturization of HD/Wi-Fi security cameras, these could easily be added directly into lighting fixtures, providing maximum coverage and visibility using existing infrastructure, reducing IT costs and maintenance.
- **Better communication.** As previously mentioned, modern LEDs are already embedded with wireless nodes, which could be used to facilitate data transport across the entire automation system, serving as the connectivity backbone of the IIoT infrastructure. Eventually, we may even see those wireless nodes become obsolete as a new technology called Li-Fi emerges, using the visible light spectrum to transmit data. While still down the road a piece, Li-Fi would eliminate connectivity woes entirely, providing the ultimate ROI on lighting—the best in visibility and clarity paired with a ready-made, centralized system for data transport for any purpose. Not to mention, alarms and speakers could also easily be embedded into the lighting network for audible plant-wide communication as well.
- **Productivity tools.** In addition to motion detectors, LED lights could also host optical and RFID sensors that could help track equipment, people and materials. For example, RFID tags on fork trucks or other mobile machinery could help track its usability, optical sensors could detect inventory of product or raw materials/consumables and tie into requisition systems. Chip-embedded personnel tags could even monitor employee movement. In a warehouse where orders are picked by hand that tracking data could be used to optimize fast-moving product placement to eliminate steps and save time.
- **Custom illumination.** LED technology is evolving to support adaptive and tunable photometric characteristics that would enable custom color tuning or CRI optimization. By customizing light color and color rendering, LEDs can ensure ideal lighting for a variety of applications—no more one-light-fits-all. CRI could be manipulated for specific UV needs and color amplification to maximize light efficacy and visual clarity.
- **Facility diagnostics.** LED-embedded sensors could be used to collect data on operational, environmental and power conditions. For example, sensors in the lights could provide data about temperature, humidity and other atmospheric conditions. They can also be used for real-time monitoring of power consumption and detection of abnormal conditions on the circuit, such as a surge or low-voltage situation.
- **Automated demand response (ADR).** ADR—the ability to dynamically respond to utility demand for reducing consumption—will become increasingly important as growth in energy demand outpaces available utility output. Integrating smart LEDs into an automation network provides a simple, hands-free way to meet ADR requirements by programming the system to dynamically reduce lighting utilization or output in a phased approach as utility requests are received. This means power is reduced to nonessential lighting without compromising safety and with minimal impact on productivity.

LED Lighting: The Backbone of Future-Ready Automation System

Based on these current and future capabilities, it's not a stretch to consider LED lighting as the primary backbone of any IIoT network. Because lighting is ubiquitous and the network has the capability to collect, transmit and backhaul data across multiple operational systems, it is a natural solution to the overwhelming IT demand the IIoT-enabled future requires.

Fortunately, thanks to the Rockwell Automation's Encompass Product Partner program, building and configuring the network is simple with standardized integration protocols. The setup is as simple as developing a software or hardware interface between the lighting and Rockwell Automation. Because Rockwell Automation supports a wide variety of industry standard protocols, such as EtherNet/IP™, most facilities likely already have compatible networks in place. EtherNet/IP is the most popular, combining standard Ethernet technology with media-independent Common Industrial Protocol (CIP), making it the most logical and popular choice for lighting integration.

Specifically, here's how the system works:

> The lighting network includes all of the lights, sensors and gateways, as well as Enterprise Software. The Enterprise Software has a built in Ethernet/IP adaptor to communicate to the Rockwell Automation controller. In addition, custom plug-ins called "Add on Profiles" (AOP) and reusable code modules called "Add on Instructions" (AOI) are convenience tools to bring further simplification to integration with Rockwell Automation.

This technical compatibility ensures a smooth, seamless and rapid integration of next-generation lighting automation into current and future IIoT deployments.

Smart LED Lighting: The Logical Conclusion

As Industrial IoT technology becomes increasingly pervasive across every type of manufacturing, production and distribution sector, companies are connecting equipment, machinery, assets, and even office equipment and supplies, to monitor, track and gather intelligence across all aspects of the business—all toward the ultimate goal of using this insight to improve production and operational efficiency and reduce waste. Connecting high-efficiency LED lighting into the Rockwell Automation ecosystem not only extends those advantages to the lighting system, but also uses the lights themselves to expand on that functionality across a range of other areas and applications to simplify automation and maximize ROI facility-wide. The end result is full-facility automaton that ratchets up total productivity, output and the bottom line.