

THE EVOLUTION OF CONNECTIVITY ON THE FOOD AND BEVERAGE PLANT FLOOR

How Industrial Ethernet To The Machine Level Can Help Reduce Downtime, While Improving Operational Safety And Real-Time Information Flow

INDUSTRIAL AUTOMATION

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Extreme conditions can delay the introduction of Industrial Ethernet to the food and beverage plant floor. A stainless steel connection system that includes products rated IP67 or higher can help manufacturers more securely make the transition.

The introduction of robotics and automated equipment into the food and beverage industry has led to multiple improvements in safety, product quality, productivity and profitability. Advancements in areas such as automatic process control and robotics, sensors for automated quality and safety control, and the development of machine vision systems are leading the way toward a more sustainable food industry. But much remains to be done as the food and beverage industry still lags behind in introducing innovative plant floor networking technologies.

Several factors have led manufacturers and processors to take a more cautious approach to improving their automation systems. Many have been using the same products for 20+ years and hesitate to upgrade, even to a better solution, until their outdated equipment is no longer viable. While the industry has fierce competition, it has been less impacted by the global economic recession than other industries so the incentive to change

is not as high. Additionally, food and beverage manufacturers have some unique challenges, making it more complicated to implement new systems. These challenges include: preventing product contamination; ensuring consumer and worker safety; environmental conditions such as temperature, moisture and vibration; harsh cleaning and washdown procedures; and compliance with state and Federal rules and regulations.

But the need to employ more advanced plant floor networking technologies is becoming clear as manufacturers look to increase operational efficiencies and bottom line profits.

CONNECTIVITY IS CRITICAL

Some of the most critical components of these advanced automation systems are the cables, connectors and communications systems that bring everything together. In many cases, hard wiring is still common on the plant floor because it is an inexpensive solution. However, it is extremely labor intensive so it is important that the connection system is easy to install, reliable and secure. Pre-wired distribution boxes save time and help prevent mis-wiring for applications with a high-density of input or output connections. In both cases, ruggedness is critical to withstand the harsh environment found on the food and beverage plant floor. Electric shorts due to water ingress into electrical and electronic equipment and devices are the number one problem on food and beverage manufacturing lines.

Similarly, communication systems such as DeviceNet, an open, devicelevel control

and information networking system for industrial devices, Profibus, a standardized global open network communication system and Modbus, a popular industrial communications protocol, require cables, connectors and receptacles that provide versatility, reliability and signal integrity in harsh environments.

THE BENEFITS OF MIGRATING TO ETHERNET

Originally designed for the office environment, Ethernet has recently gained momentum on the plant floor as companies look to gather realtime data and communicate back to the enterprise. This is especially critical in the food and beverage industry where the production process often requires continuous monitoring to maximize uptime and meet regulatory requirements. For companies looking to gain a competitive advantage by connecting their plant floor equipment to the manufacturing enterprise network, Industrial Ethernet can offer several distinct advantages:

- Increased business intelligence through enterprise wide access to information
- Faster information flow thanks to increased data transmission speeds
- Cost savings as a result of improved energy efficiency and resource management
- Decreased plant downtime due to enhanced equipment performance
- Optimized equipment performance from coordinated monitoring and control

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The leading Industrial Ethernet solutions are EtherNet/IP, which is used in factory automation, process control applications, robotics and is the standard managed by the ODVA (Open Device Vendor Association); PROFINET, an open industrial Ethernet protocol for advanced manufacturing and automation and Modbus TCP/IP, an extension of the popular Modbus protocol which is widely used in the industrial manufacturing environment. In all instances, the underlying infrastructure, including the cables, cordsets, switches, protocol stacks, interface cards and I/O modules, needs to be extremely reliable in order to implement a successful Industrial Ethernet network. By moving them out of the cabinet and onto the floor, manufacturers are exposing these critical components to extremely harsh duty environments. The commercially available products used in office suites are inadequate for these conditions. The importance of selecting suitable and reliable cabling and connectors is a critical factor to production uptime.

SELECTING THE RIGHT MATERIALS FOR A HARSH ENVIRONMENT

The extreme conditions found in the food and beverage industry have contributed greatly to the delay in moving Ethernet out of the office and onto the food and beverage plant floor. One of the biggest barriers is the washdown procedure, which is critical for preventing contaminants from adversely affecting product quality, but the extremely high water temperatures and caustic cleansers and sanitizers can easily damage sensitive electronic equipment. Another concern is the risk of rust and corrosion, which could potentially disrupt the manufacturing process or contaminate the product. Finally, extreme temperatures, moisture and vibrations can all take a toll on the performance and reliability of the communications infrastructure.

By choosing the right products, food and beverage manufacturers can securely make the transition to Industrial Ethernet. Some features to consider when evaluating the various devices, components and wiring options include:

- **Ingress Protection (IP) Rating:** The IP rating is an international scale in which the first number refers to the amount of protection against solid matter (such as dust particles), while the second number defines the level of protection against liquids. In many places on the food and beverage plant floor an IP67 rating, which indicates the product is dust tight and protected against the effects of short-term immersion, is acceptable. However, an IP69K rating, which indicates protection against ingress of dust and high temperature, high-pressure water, is ideal in locations where equipment must be carefully sanitized.
- **Stainless Steel Construction:** A smooth-surfaced, 316 grade stainless steel connection system helps prevent bacteria growth by limiting the area where it can collect and is able to stand up to harsh chemicals and high water temperatures without rusting. Additionally, rugged overmolds and cable jackets that can endure extreme temperatures provide added protection.
- **Push-to-lock Technology:** Connectors that incorporate a mechanical locking design deliver a secure connection not found with threaded cordsets. This built-in reliability reduces connector-related intermittent signals in the harshest environments. Fewer intermittent signals mean less downtime and better productivity.

- **DIN Rail Mount/Machine Mount:** By moving the Ethernet switches to plant-floor devices, manufacturers can save cabinet space, reduce cable costs and simplify installations. Heavy-duty enclosures provide protection from water and temperature changes, making them ideal for harsh industrial applications.

A well thought out migration to Industrial Ethernet will allow food and beverage companies to both retain legacy systems that are still relevant and tap into innovative applications that support future business growth.