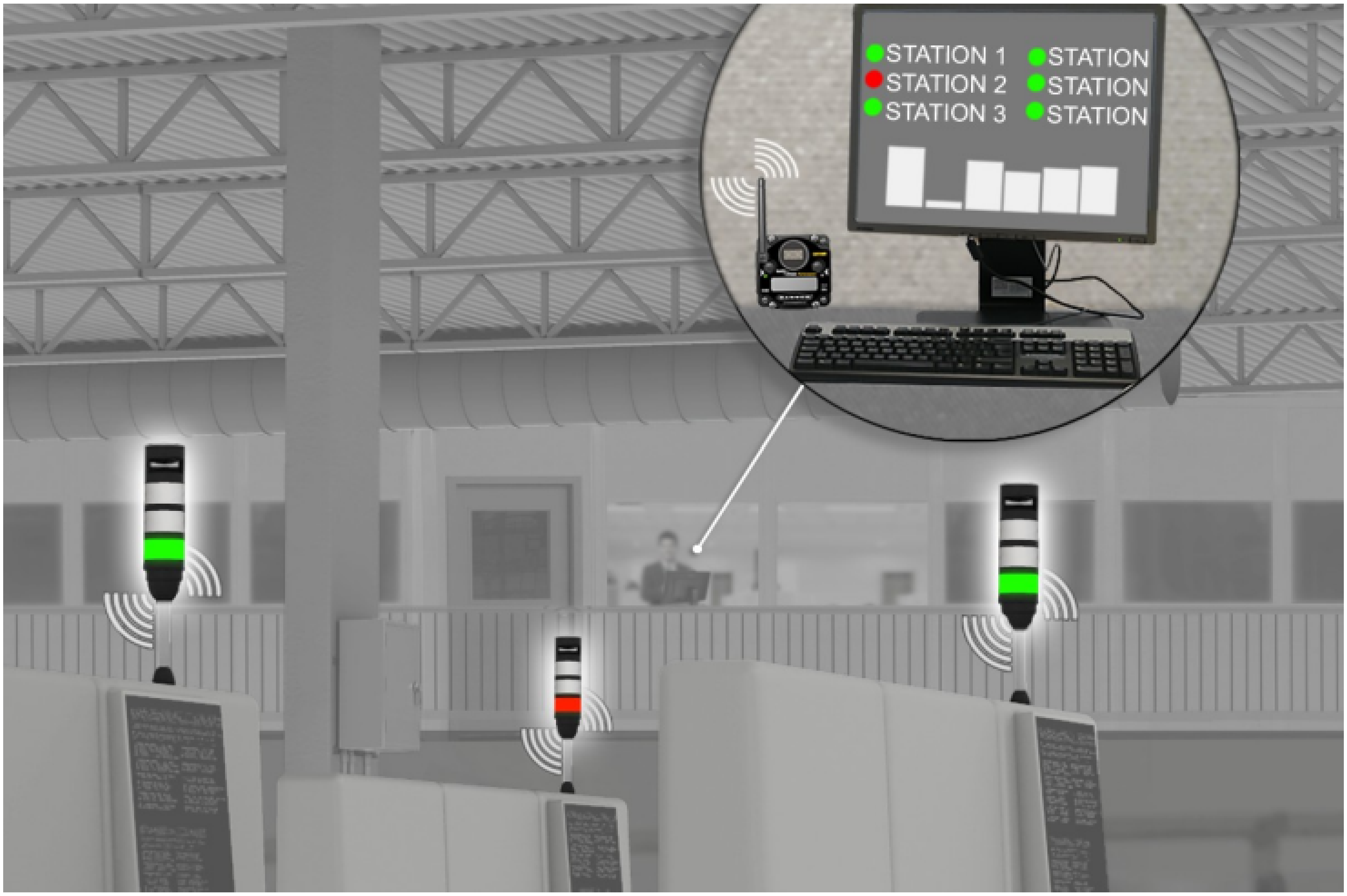

Remote Monitoring at the Field Device Level: How to Use Wireless Technology to Improve Overall Equipment Effectiveness (OEE)

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How to Use Wireless Technology to Improve Overall Equipment Effectiveness (OEE)

Data from sensors and other field devices was once difficult to access, if not completely unavailable. For many manufacturers, these field devices offer untapped potential for greater visibility into their operations and more advanced, data-driven decision making. With the trend of Industrial Internet of Things (IIoT), device-level data can now be made accessible to operators and plant managers, providing valuable insight into machine performance, process inefficiencies, and more.

Real-time remote monitoring of machine status allows operators to address any issues as they arise, regardless of whether an operator is present at the location of the concern. While providing clear indication of status at a machine is a necessary requirement, communicating status information from a machine to other devices allows personnel to monitor multiple machines on a factory floor from a convenient location. This capability can help minimize machine downtime and allow operators to resolve small issues before they become big problems.

This article describes how wireless technology provides users with remote monitoring capabilities on the field device level and explains how this data can be used to help improve Overall Equipment Effectiveness (OEE).

Wireless Sensor Networks for Remote Monitoring

Wireless networks provide remote monitoring capabilities and allow manufacturers to increase overall process efficiency and productivity. By eliminating the wire limitations experienced with conventional systems, wireless networking systems improve data logging, process monitoring and control, while maintaining high levels of security and integrity. Wireless sensor networks are especially advantageous where wired solutions are impractical, ineffective, or cost-prohibitive.

Although historically wireless systems were difficult to install and complicated to maintain over time, wireless technology has advanced significantly over the years. Today many remote monitoring solutions are available that offer a reliable wireless communication integrated into a single, inexpensive unit.

These new wireless industrial I/O devices are easy to install, and then uninstall and move to a new location as monitoring requirements change. Because the radio, I/O terminals, and LCD screen are included within a single housing, fewer mechanical and wiring issues need to be incorporated into a maintenance schedule. This means valuable time and cost savings—without sacrificing capabilities.

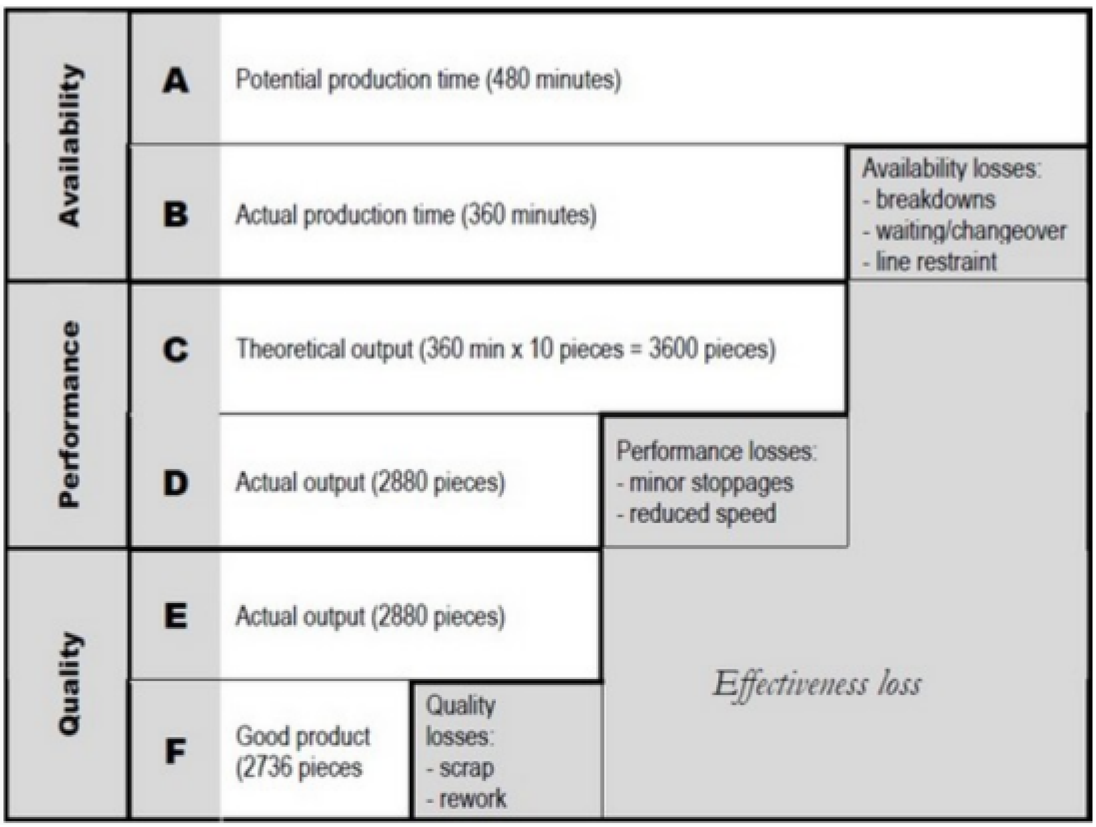
A single wireless I/O device can collect both digital and analog sensor readings and forward this data to a central collection point for analysis. Furthermore, 2-3 sensors can be connected to a single node, and 47 nodes can exist within a single radio network. This means multiple sensor readings can be aggregated into a single gateway device before being forwarded to a host-controlled system for analysis.

Serial data radios further extend this wireless I/O network. Serial data radios are backhaul devices that receive serial data from another serial data radio, or a serial connection to a gateway, and forward the data to another remote serial device. Chaining data radios can expand this network to meet the remote monitoring needs of a wide variety of applications.

How to Use Wireless Technology to Improve Overall Equipment Effectiveness

Overall Equipment Effectiveness (OEE) is a calculation of manufacturing process efficiency that considers three primary factors: availability, performance, and quality. The **availability** factor takes into account events that decrease total runtime, including planned stops (such as for product changeover) and unplanned stops. The **performance** factor takes into consideration anything that decreases the speed of the manufacturing process while it is running. And the **quality** factor accounts for parts or products that do not meet quality standards (parts that must be scrapped or reworked, resulting in wasted time).

The OEE calculation takes all of these factors account and expresses the result as a percentage value, with 100% meaning that only good parts are manufactured (quality), as quickly as possible (performance), and without any stops (availability). The results of this calculation provide actionable insights into the critical sources of waste in a manufacturing operation.



OEE is calculated by multiplying availability, performance and quality. Source: OEE Calculation

The OEE Foundation also identifies 6 big losses to manufacturing productivity:

1. Unplanned stops for equipment failure
2. Stops for set up, adjustments, or changeover
3. Idling or minor stops (for issues such as a material jam or a blocked sensor)
4. Reduced equipment speed
5. Scrapped work
6. Rework

In order to reduce these losses and minimize their effect, visibility into where and when inefficiencies occur is essential. This is where access to data from sensors and indicator lights become very important. Logged data from sensors and indicator lights installed on machines can help you calculate OEE and identify steps to improve efficiency of your machines, processes, and people.

Wireless Lighting Allows Manufacturers to Track Trends in Machine Runtime

Tracking trends in machine and process data can help manufacturers identify when and where losses are occurring. However, manually monitoring the status of production machines is a time-consuming process. Depending on the size of the facility, manually monitoring machine status slows down production and requires additional man-hours that could be more effectively used for other tasks.

With a wireless system, users can remotely monitor machines in a central point to log information. For example, using a tower light with a wireless radio base offers not only local indication of machine status but can also provide remote status of each light module. By logging results from machine status indicators like tower lights, users can track trends in individual machine up time and cycle counts, giving operators machine status updates when and where it is needed. Capturing machine status helps users determine when repairs are needed and make decisions about new machine investments. This system provides the information necessary to react quickly to system changes and drive efficiency improvements based on data that was previously unavailable.

Wireless tower lights allow users to track trends in machine run time and cycle time.

The data can be used to identify whether a bottleneck is caused by a machine or personnel issue. For example, in a recent manufacturing application, accurate machine runtime data was needed to determine why production goals were not being met. Operators blamed machine downtime for the failure to meet production goals, and maintenance personnel blamed operators for working too slowly. Based on real-time data collection, the facility managers were able to accurately verify when the delays were the result of machine down time and when the delays were the result of operator inefficiency.

For larger manufacturers with multiple plant locations, these trends can also be transmitted to a central location and compared plant to plant in order to identify and replicate the successes of the highest performing plants.

Wireless Vibration Sensors Enable Predictive Maintenance of Machines

In addition to monitoring machines for performance metrics, wireless sensor networks can also monitor machines for health, helping maximize machine availability. Predictive maintenance can help reduce the risk of unplanned stops by detecting potential problems before they escalate. However, predictive maintenance on machines can be difficult because minor performance changes can be hard to detect without the proper tools.

Remote condition monitoring using a wireless system plays a key role in predictive maintenance and helps prevent costly downtime. One important condition to monitor is vibration. Machine vibration is often caused by imbalanced, misaligned, loose, or worn parts. As vibration increases, so can damage to the machine.

By remotely monitoring motors, pumps, compressors, fans, blowers, and gearboxes for increases in vibration, problems can be detected *before* they become severe and result in unplanned downtime.

A wireless vibration and temperature sensor is a “check engine light” for machines

A wireless vibration and temperature sensor serves as a "check engine light" for machines by measuring RMS velocity, which provides the most uniform measurement of vibration over a wide range of machine frequencies.

After mounting the vibration sensor, a user must collect enough vibration data to establish a baseline for the machine. Initially, set the threshold at 1.5 or 2 times the baseline. When the threshold has been exceeded, the wireless temperature and vibration sensor can provide local indication of the problem, the signal can be sent to a wireless tower light on a central location, or an email or text alert can be sent. The vibration and temperature data can also be sent to a wireless logic controller or PLC for collection and analysis.

Conclusion

Remote monitoring capabilities are making it easier for manufacturers to identify and remedy causes of waste within their facilities. By utilizing wireless technologies, manufacturers can quickly and easily gather data needed for OEE calculations, as well as gain valuable metrics for predictive maintenance to maximize their machines performance.

For more information about wireless sensor networks for remote monitoring, visit www.bannerengineering.com.