DERRICK TEAL | EDITOR-IN-CHIEF

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The Key to Effective Maintenance is Data

Maintaining uptime is becoming increasingly crucial, which is why data plays a central role in a maintenance plan to keep lines running.

FOOD AND BEVERAGE MANUFACTURERS are under more pressure than ever before to produce financially. Hyperbole? Maybe, but it doesn't change the fact that consumers are looking to get the best price for the goods they consume. It doesn't matter if the products they're looking for are name brand or private label. As much as private label has made inroads, even makers of private label products are seeing consumers hold off entirely on purchases because of the cost. And yet demand remains high—even though that's starting to change slightly as of this writing and may have changed entirely as you read the print issue. To meet the seemingly conflicting problem of increased consumer scrutiny but high demand, CPGs are trying to squeeze every penny out of anything within their control—which means putting a greater emphasis on efficient operations and uptime. This means having an effective maintenance plan in place is essential.

Everything stems from data

Perhaps unsurprisingly, the key factor in maximizing uptime is data. Informed data helps to produce goods more productively across the value chain. By collecting additional data from the factory floor and combining that with other enterprise operational data, a smart factory can achieve information transparency

IMAGE COURTESY OF SMARTSIGHTS

One of the primary advantages of data analytics in manufacturing is the ability to access real-time data. By leveraging technologies, companies can monitor every aspect of their operations—from machinery performance to supply chain logistics—in real-time.

and make better decisions. Accurate, real-time production data is pivotal to shop floor operations and the effective operation of each machine asset.

"Technology advances in both equipment and process have changed the way how a maintenance department should be run," says Logan Bemis, OEE Consulting Engineer with Process and Data Automation, a Control System Integrators Association (CSIA) certified member. "Although mechanical ability should still be a focal point, it is now only 50% of a modern maintenance department—with the other 50% being focused on automation and controls."

The use of data and analytics underpins Industry 4.0. Gathering, analyzing, and sharing data across the enterprise is the entry point to leverage manufacturing technology to create more value. The added benefits include improved productivity, decreased production costs, better resource management, and more profitability.

One of the primary advantages of data analytics in manufacturing is the ability to access real-time data. By leveraging technologies, companies can monitor every aspect of their operations—from machinery performance to supply chain logistics—in real-time. This real-time data provides immediate insights into bottlenecks, inefficiencies, and potential breakdowns, allowing for quick adjustments to maintain optimal performance. Additionally, operators can implement improvements that enhance overall quality.

"While accurate, real-time data is pivotal to operations, harnessing this data effectively requires advanced technology and analytical capabilities," says Cody P. Bann, Vice President of Engineering at Austin, Texas-based SmartSights. "Vast amounts of data are collected for industry reporting, predictive maintenance, and safety enhancements, for example, but organizations may be challenged to effectively manage and analyze the data. While monitoring and alarms can improve system efficiency, they don't automate the labor-intensive reporting process or provide much-need analytics that extract raw or summary values over a discrete time period."

Automated third-party reporting software, however, tracks all areas in a production facility. The finished reports are then distributed directly to preferred destinations, which streamlines the decision-making process and enhances operational efficiency. The ability to harness this data effectively can lead to smarter decision-making, improved processes, and a competitive edge. Analyzing historical data allows operations management to identify patterns, trends, and anomalies that may otherwise go unnoticed. Historical data analytics can help organizations transition from reactive to proactive planning and keep planning aligned with operations. As the data is collected it is summarized as key metrics, and the final output is published in a formatted document accepted by regulatory agencies.

Integrating additional software accelerates digital transformation with advanced data collection for OEE and manufacturing execution systems (MES), enabling plant personnel to have valuable insights into the operations and helping them make better and more informed decisions. "By deploying third-party advanced software, manufacturing plants can accelerate and drive OEE uplift, avoid problems before they occur, and reduce engineering time by up to 70%," says Bann. "Additionally, for a $1 billion company every 1% improvement in OEE—like integrating advanced software that reduces equipment downtime—is worth approximately $7 million annually, further lessening costs and improving operational efficiencies."

"If used properly, this can direct maintenance focus and lead to higher performance," says Bemis. "Unfortunately for most companies there has been a struggle in this area or a lack of understanding in how to use this information to drive maintenance."

Understanding production stops

Tracking minor stops provides visibility into their frequency, duration, and root causes. This awareness lets organizations identify patterns and make targeted solutions to minimize interruptions. "By collecting data on minor stops, organizations can analyze trends and make informed decisions regarding equipment maintenance, process improvements, and resource allocation. Capturing data from machine assets provides immediate insights for both people and systems, enabling them to make better, faster decisions, and drive automation," says Bann.

Researchers studied more than 100 global manufacturing operations worldwide to benchmark performance and correlate over 20 manufacturing key performance indicators (KPIs). To determine a manufacturer's competitive position, OEE was used as the top indicator of performance. Each manufacturer was ranked by OEE, and all other KPIs were viewed in context of this order. Some of the key findings include:

- Best-in-Class (top 25% OEE) and Average (middle 50% OEE) organizations exhibit an OEE more than two times over Laggards (bottom 25% OEE);
- Knowledge sets apart Best-in-Class performers over Laggards: only 0.5% of downtime reasons are unknown for Best-in-class versus 15.7% unknown downtime reasons exhibited by Laggards, a factor of more than 30 times;
- The poorest performing operations exhibit six times more minor stops per year than the best operations.

Results from this study can offer the industry strategic and operational direction for organizations to improve their competitiveness. All organizations, no matter how high they rank, always have areas to improve. Companies ranking on the lower end of the scale can immediately find where to start making improvements.

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> *— Cody P. Bann, Vice President of Engineering, SmartSights*

Preventative maintenance

Integrating third-party software to provide root cause analysis (RCA) identifies which asset issues led to underproduction or unplanned downtime. This process is vital in maintenance management as it leads to more reliable operations, reduces downtime, and saves costs in the long run. The software reports provide detailed data analysis, identify trends, and facilitate communication—which is crucial for effective root cause identification and resolution. Problems like downtime in secondary equipment, parallel operations, and process flows create challenges that require a holistic approach.

The goal of an effective maintenance and reliability program is to provide the right maintenance on the right assets at the right time. The goal of a maintenance program is to reduce the failures (rates/frequency), to prolong the production uptime, and reduce production loss. However, many companies in the chemical process industries, for example, prefer to replace malfunctioning equipment with the latest technology instead of performing a critical evaluation of the maintenance plans.

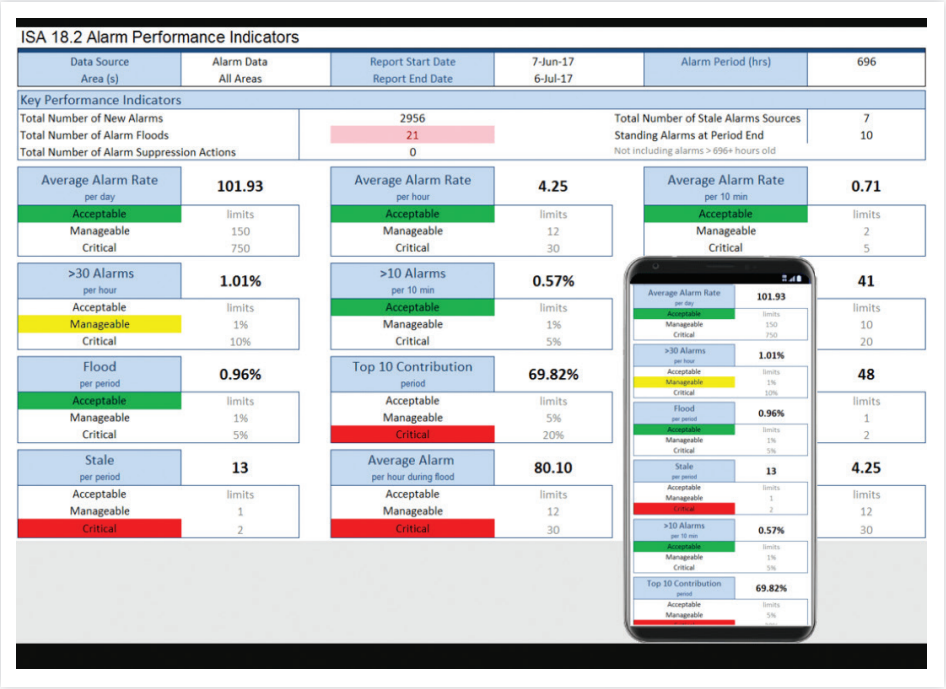

IMAGE COURTESY OF SMARTSIGHTS

A dashboard showing the Key Performance Indicators (KPI) uses configurable targets to show the health of the alarm system in an "at-a-glance" display.

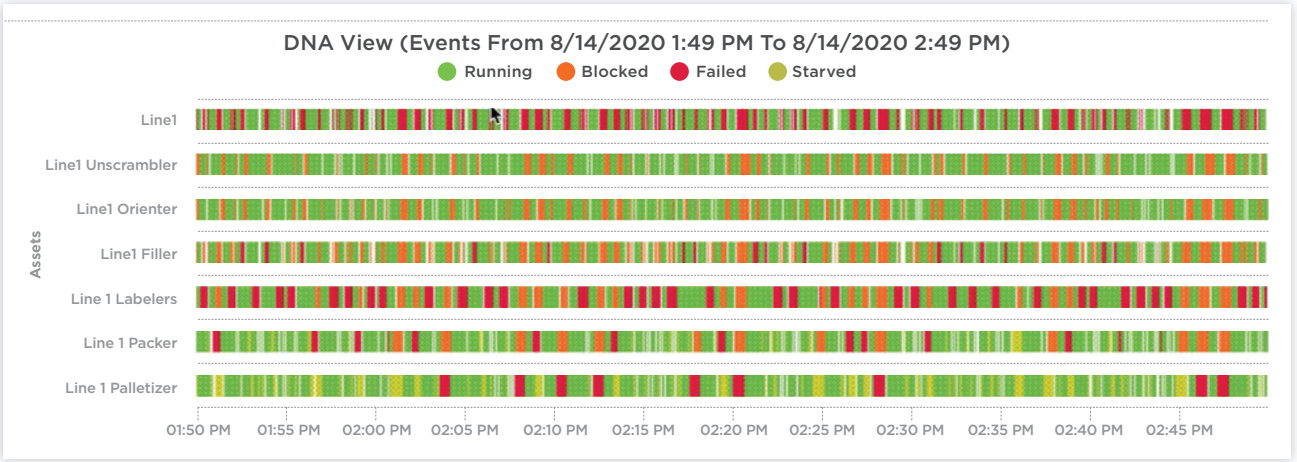

IMAGE COURTESY OF SMARTSIGHTS

Third-party analytics software streamlines production by modeling the line and its unit assets to produce a "digital twin." DNA charts are used to "replay" downtime incidents and understand the relationship between root downtime incidents, and the resulting upstream blockage and downstream starvation.

Material starvation in chemical processing can indicate unoptimized maintenance intervals upstream as such that the buffer inventory system between upstream and downstream assets runs dry before the maintenance is complete, creating unplanned downtime.

"A good maintenance program is key to having a high performing production line," says Bemis. "Maintenance [personnel] should not just keep the equipment in good and proper running order, [they] should also be used as equipment matter experts when the need arises from operations."

Implementing a preventative maintenance plan with RCA prevents recurring issues from happening by eliminating their root causes and understanding the origin through insightful software reports, with 100% of the downtime captured including stoppages of less than 10 minutes, which is often missed by manual data collection. In fact, a report from Copia Automation, the "1st Annual State of Industrial DevOps Workforce Report: People, Process, and the AI-Powered Future," finds that manufacturers lose an average of 45 hours every month to debugging tasks, largely due to reliance on manual tools like Excel for managing critical industrial code in 47% of organizations.

Predictive maintenance

While preventive maintenance relies on best practices and historical data, predictive maintenance (PdM) takes measurements from machine operations as they are occurring and uses this data to raise red flags when indications of a problem are noted. Like preventive maintenance, PdM is a proactive approach, and maintenance isn't only performed on machines when it is necessary. McKinsey Global Institute reports that implementation of PdM practices across manufacturing will have a $240-$627 billion cost savings across the industry.

"With continued improvements of automation machines are beginning to be able to self troubleshoot and alert to possible downtime issues prior to them happening. If used properly this can greatly improve equipment uptime," says Bemis.

SCADA systems serve as the backbone of predictive maintenance initiatives by providing real-time data acquisition, monitoring, and control capabilities across industrial processes. By harnessing the power of real-time data and predictive analytics, businesses can proactively address potential equipment failures before they escalate, thereby significantly reducing costly unplanned downtime. Seamlessly integrating third-party software that provide autonomous alerts, historical data analytics, and reports with SCADA systems can lead to smarter decision-making, improved processes, and a competitive edge. Using asset data helps predict when a failure may occur by catching asset malfunctions as early as possible. This helps avoid the need for more significant maintenance activities or lengthy and costly downtime.

"Leveraging aggregated data offers economies of scale for managers," says SmartSights' Bann. "With a summation of performance across all machines, larger performance inefficiencies become evident, and managers can develop a deeper understanding of their machine performance, people performance, and process performance."

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