

CASE STUDY

PEPSIAMERICAS QUENCHES ITS THIRST FOR PLANT-FLOOR INFORMATION WITH ROCKWELL AUTOMATION LINE PERFORMANCE SOLUTION

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Des Moines facility improves efficiency by six percent and saves \$120,000 annually by turning production data into business intelligence

BACKGROUND

Today's factories generate incredible amounts of raw data that can offer insight into the production process from start to finish. PepsiAmericas is a company that is no stranger to the power of plant-floor information. The company recently embarked on a quest to gather critical production data from its beverage-making processes and present it in a format that would enable better decision making. The result – PepsiAmericas has increased information access and gained a clearer picture of the plant floor, which it has used to improve manufacturing and business processes.

PepsiAmericas Inc. is the second largest canning and bottling group within the PepsiCo organization. With operations in nine countries, the company manufactures and distributes Pepsi-Cola products to more than 122 million people worldwide and accounts for 21 percent of the total U.S. Pepsi volume. Like all beverage manufacturers, PepsiAmericas strives for the consistent quality, freshness and taste that customers expect from all products under the Pepsi-Cola brand. At the same time, retailers, government regulators and changing consumer preferences place increased demands on the company's ability to remain flexible, responsive and cost-efficient.

The PepsiAmericas facility in Des Moines, Iowa, is one of 19 U.S. beverage production and bottling plants operated by PepsiCo Inc. Nestled in the heart of central Iowa, the facility makes and packages more than 45 brands of Pepsi-Cola products and distributes them throughout the Midwest. In a single day, the plant produces nearly 60,000 cases of soft drinks, totaling more than 20 million cases annually.

The Des Moines production lines typically run 120 hours each week. To keep up with this demanding schedule, the facility relies heavily on automation. At the heart are Rockwell Automation control systems, which govern automated production from the blending of raw materials to packaging. The systems have links to all of the company's key performance indicators (KPIs) including productivity, quality and

service levels. This helps PepsiAmericas identify shortfalls and attack production problems – a key component of the company's strategy for ongoing improvement and cost reduction.

While the facility has a strong record of operating efficiency, it was experiencing unexplained interruptions on the canning line that were causing a chain reaction of bottlenecks in downstream processes. This resulted in large blocks of downtime, which began to drive up labor costs and prevented PepsiAmericas from meeting its high throughput goals. In an environment where an hour of downtime results in \$300 an hour in labor costs and \$10,000 per hour in lost product, several hours of idle production can result in tens of thousands of dollars in total losses.

To reduce costs, optimize performance, and keep up with the increasing industry pressures, PepsiAmericas realized it needed a clearer picture of what was happening on the plant floor from start to finish.

PUTTING THE FIZZ IN THE SOFT DRINK

As is the case with most beverage processes, production begins in the raw materials receiving area of the facility. A depalletizer breaks down ten-foot-tall pallets stacked with 8,000 cans layer by layer and shuffles them onto an air conveyor. The cans move in a single-file line overhead, snaking their way toward the other end of the facility. Each can is sanitized as it passes through an ionizer

and tumbles in roller-coaster fashion into the filler room.

In another part of the facility, the large batching tanks of the mass mix system combine flavored syrup and carbonated water to make the soft drink. The sanitized cans reach the filler room and make their way through a 72-valve filler station, which operates at speeds of up to 1,200 cans per minute. Here, each can is filled and charged with a shot of nitrogen as a series of rollers seal it with an aluminum lid, much like a can opener working in reverse. The cans leave the filler room upside down and make their way back out into the warehouse where they are warmed to prevent sweating that would destroy the cardboard packaging. Date and product information are then laser-printed on the bottom of the cans.

From there, the cans move to the packaging area, where they are put into one of three package options – a six-pack bound by plastic rings; a 12-pack, rectangular fridge-mate or a 24-pack cube. Finally, the 6-, 12- or 24-packs go to an automatic palletizing station for stacking, wrapping and preparation for distribution. The entire process – from unloading the cans to wrapping the pallets – takes less than 20 minutes.

PAPER-BASED TECHNOLOGY

PepsiAmericas was using manual paper- and pencil-based systems to collect performance data from the can line. Operators monitored the line's production and recorded

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throughput and downtime events during each shift. This information was then manually plugged into the company’s enterprise financial system, which logged how many flavors, cases and package sizes were made each day. Management also reviewed the data to identify shutdown incidents and attempts to troubleshoot the problems.

In addition to being unreliable and cumbersome, the process gave management little insight into what was really happening. While operators were meticulous in recording downtime incidents, they were only capturing the obvious issues – 10- or 15-minute-long events – that were easily recognized as problems. What they were not seeing were the short blocks of downtime – a few seconds here, a minute or two there – that, over the course of a day, could add up to significant loss. In addition, merely noting the downtime episodes could not help management understand why they occurred, which left PepsiAmericas playing a never-ending guessing game in how to improve can line operations.

“With the old system, we were relying on people to collect and record the data and then log it into our business system without flaw each day,” said Dave Bramow, production manager, PepsiAmericas. “This was a tedious, error-prone process that in the end, couldn’t give us the information we needed to correct the problems causing the downtime.”

OUT WITH THE OLD

PepsiAmericas knew that in order to eliminate the bottlenecks and stoppages, it needed an accurate picture of the canning process. This meant up-to-the-minute access to real-time information to help management capture the short intervals of downtime that were going unaccounted for. To do so, it needed a sophisticated data-acquisition system that could gather information from the entire line and present it to management in a usable format for better decision making.

In the summer of 2004, PepsiAmericas enlisted a team of engineers to identify and implement the solution. The team, led by Bramow, sought an automation supplier with the industry expertise and technical capabilities to provide a solution that could turn plant-floor information into business knowledge. The solution needed to deliver accurate, real-time information to help management identify the root cause of problems and drive continuous improvement initiatives. In addition, PepsiAmericas wanted a solution that could integrate its disparate systems to improve supply chain visibility and streamline production from start to finish.

PepsiAmericas evaluated proposals from five technology suppliers. It was important to find a company that could provide not only the right technology, but also deliver reliable service after the installation. Simplicity was another essential factor. The team wanted a solution that was easy to

operate and made data gathering and reporting simple and painless. In the end, PepsiAmericas chose Rockwell Automation as its automation partner.

"We've had a long relationship with Rockwell Automation and the majority of our applications are built on their control systems," said Bramow. "Rockwell Automation listened to our problems and offered a solution that could be tailored to help us overcome our unique challenges. We also had peace of mind knowing that we had local support during and after the installation. We didn't get that assurance from the other vendors."

Selected as the backbone for the beverage producer's enterprise data acquisition was the Rockwell Automation® Line Performance Solution – a suite of pre-integrated software and services based on the Rockwell Software® FactoryTalk® production and performance software suite. The solution provides a deeper view into a production line's operational processes by aggregating and contextualizing key performance data to help correlate the many variables that impact overall equipment effectiveness (OEE). The system provides operators and managers with on-demand access to downtime monitoring and alerts, production performance analytics, and equipment operating metrics. Numerous reports display production metrics associated with time, shift, operator, work order and product.

"The Line Performance Solution offered everything we were

looking for in terms of functionality, robust data gathering capabilities and ease of use," said Bramow. "It was essential for improving our overall visibility, tracking and control of the line's performance, so that we could maximize its capacity and ensure product quality. It also had the best format for communicating the information to those who use it, both at the operator and supervisory levels."

A STICKY SITUATION

PepsiAmericas wanted to identify all interruptions of 10 different work cells to give management a clear picture of production without overwhelming them with information. More specifically, the team wanted data on the number of downtime incidences, the duration of each episode, and what caused the events in an easy-to-read format. The new system also needed to be able to generate throughput, waste and efficiency figures and have flexible reporting options so management could break performance outputs down by the shift, operator, hour, minute or second.

Finally, PepsiAmericas wanted to maximize its technology investments. With an installed base of nearly 95 percent Rockwell Automation control system hardware and software, PepsiAmericas wanted to leverage its existing automation infrastructure for maximum impact and return on investment.

"All of our systems were loosely tied together because our network was incomplete," said Bramow. "We wanted to upgrade to a

central data highway to improve integration and information exchange throughout the facility."

In addition to tying the facility's disparate applications together, the team hoped this would help them leverage the information housed in the Rockwell Automation control systems – a mix of Allen-Bradley® PLC-5® and SLC™ 500 controllers – to monitor efficiency and identify downtime. Nearing PepsiAmericas' peak season, all of this, including installation, needed to be achieved in a short time frame and with minimal impact on production.

LEARNING BY EXAMPLE

Coincidentally, a Line Performance Solution also was being deployed at the Des Moines facility's sister plant in Indianapolis. With installation at the Indianapolis facility underway for several months, Bramow's team was able to take advantage of the sister plant's experience.

"One of the things we discovered from our sister plant was that they were trying to do too many things in-house, including all of the wiring, programming and upgrading for the new solution," said Bramow. "To avoid these time-consuming processes, we relied on the Rockwell Automation services team to handle the site preparation and installation."

The PepsiAmericas team also faced the challenge of making sure it could transport all of the data coming off the Rockwell Automation controllers to the server. To do so, PepsiAmericas installed an EtherNet/IP network,

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which enables the Line Performance Solution to gather information housed in the controllers of each work cell and quickly send it back to the system’s central server. Once the network was installed, the solution integrated seamlessly into the facility’s existing architecture. In addition, the EtherNet/IP network enabled the team to connect each part of the process from unloading the cans to palletizing, creating a more integrated production system.

While Bramow and his team were leveraging engineering efforts from the Indianapolis project (including reusing templates and programming for similar machinery), Rockwell Automation consultants finalized and implemented the database design – a process that included developing tables necessary to house the data, creating interfaces for reporting purposes and constructing key procedures for data manipulation and archiving or purging.

The team then configured FactoryTalk® Metrics, a Microsoft® Windows®-based software application for evaluating the performance of critical production assets, on its production server. In addition, FactoryTalk® Historian was installed to help collect, analyze and report production data through Web-based reporting. FactoryTalk® Integrator transaction manager software acts as a transport mechanism, providing efficient data transfer between the controllers and the server. By working seamlessly with one another and the Rockwell Automation control systems, these

software tools help extract manufacturing data, allowing PepsiAmericas to review current and historical performance information.

“To ensure quick delivery of the solution, a Rockwell Automation project manager was at the Des Moines facility weekly,” said Bramow. “With the help of Rockwell Automation installation services, our facility completed the installation six months ahead of our Indianapolis sister plant.”

A BETTER UNDERSTANDING

After the Line Performance Solution was installed, the team went through a Rockwell Automation systems acceptance test to train PepsiAmericas staff on the new technology. Bramow and his team were able to test the system while using it. This helped operators learn where all of the data collections were coming from, how data was being gathered and most importantly, what the information meant.

“Training is a key element of any new project, but when it deals with critical plant-floor information, it is especially important that workers understand the systems,” said Bramow. “Rockwell Automation made sure that our system was accurate and working properly. And they also helped us to understand what the information meant, which is what really makes it effective.”

PepsiAmericas hoped that gathering and acting upon this information could improve the line’s performance by two to three

percent. To do so, it first needed to benchmark current production, which meant determining the line's OEE in addition to other performance variables.

"Another way Rockwell Automation really provided value was by helping us determine the meaning of OEE," said Bramow. "Our understanding was that OEE simply meant how long a machine was up and running. But we were forgetting the product piece, and we learned that we needed to factor actual throughput and product quality into that equation to have a comprehensive OEE measurement."

INFORMATION FLOW

Once PepsiAmericas determined a baseline for production and the solution was up and running, it began collecting, storing and analyzing production information. The Line Performance Solution started delivering a treasure trove of manufacturing data. This information is displayed in easy-to-read graphics and customized reports on a standard personal computer (PC) off the production floor. With a few mouse clicks, management is able to view general OEE calculations by work cell, downtime for each machine, quality data, changeover times, as well as specific events that cause line stoppages, such as a jammed can or spilled product. The obsolete paper-based system has been eliminated.

PepsiAmericas also uses the FactoryTalk Historian model to log trend information critical to operations such as throughput,

waste and production speeds. Customized reports deliver essential business information to help management monitor production from an enterprise-wide view or with granularity by individual product count. The most recent addition is a root cause analysis tool that helps Bramow and his team monitor the filler – the heartbeat of the operation – to identify production issues and begin to understand why they occur. The team can view the process in a cascading system to see exactly what caused the downtime. If the problem occurred in a work cell that was five steps down from the filler, the team can pinpoint it using this function.

"Access to this information has helped us understand production inefficiencies and work to remedy them," said Bramow. "It's really eliminated the guesswork and finger-pointing that used to be a part of improvement initiatives."

A REFRESHING POINT OF VIEW

Thanks to the Line Performance Solution, PepsiAmericas has been able to identify training problems and fix them by defining best practices. For example, the team discovered that the second shift was having some trouble with the depalletizing station and was frequently spilling entire pallets of empty cans. In reviewing information from the depalletizer, management determined that operators were running the system in manual mode, rather than allowing the machine to run automatically. In a typical shift, it's

standard for the station to be turned to manual mode five to eight times. However, the second shift was switching to manual anywhere from 150 to 200 times per shift, a factor PepsiAmericas never would have discovered using a paper and pencil system.

"We used this information as a training tool to help the second shift understand the correct procedure," said Bramow. "Since then, they have not spilled a single pallet or lost any product. Previously, they were dropping about one pallet a month, and with 8,000 cans on a pallet, those mishaps could get very expensive and cause a lot of headaches."

PepsiAmericas also was experiencing mysterious blocks of downtime at the filler station and operators could not keep it running properly. By reviewing data from the Line Performance Solution, management realized that the layout of the filler's control panel had many of the process switches close to one another. The "sanitation mode" switch was right next to the one that shut off the filler.

"Before the Line Performance Solution, we ran into instances where we couldn't get the filler to run and we didn't know why," said Bramow. "After reviewing the data, we realized that operators were mistakenly turning the filler into sanitation mode, which resulted in several hours of downtime for each incidence."

BUSINESS INTELLIGENCE DELIVERING VALUE

Since the installation of the Line Performance Solution, the team at PepsiAmericas has worked to turn plant-floor information into business intelligence to build a competitive advantage. By using information to identify line interruptions and improving operations through corrective actions, best practices and training, Bramow and his team have achieved a six percent increase in efficiency, which equates to more than \$120,000 in savings each year.

With the success of the Des Moines facility, other U.S. PepsiAmericas plants will soon be deploying Line Performance Solutions. This will help PepsiAmericas compare apples to apples when analyzing production at all of its facilities. In addition, due to the scalable nature of the system, the Des Moines plant will soon be adding a second Line Performance Solution to its bottling line to provide a complete picture of production for both can and bottling applications.

"We selected Rockwell Automation not to just be a short-term, one-project supplier, but to be a long-term partner," said Bramow. "This solution has helped strengthen our competitiveness in the industry and it has enabled us to take a more proactive approach to optimizing our operations."

But it's the people, said Bramow, who should really receive the recognition for the plant's exceptional performance.

"What has made the solution a success is the people here who use it every day," said Bramow. "They're the ones who make these improvement initiatives work and help solve the problems. Production is a real team effort, from start to finish, and our employees take pride in doing their best."

And it shows. The warehouse entrance at the Des Moines facility proudly bears a 10-foot-long banner for the 2005 PepsiAmericas Plant of the Year. The plant received the award for demonstrating efficiency and optimizing productivity in 2005, outshining its 18 sister facilities.

"When all is said and done, our priority is to make quality beverages for our customers and Rockwell Automation works to provide systems like the Line Performance Solution that help companies improve operations," said Bramow. "By partnering and focusing on these objectives, we both succeeded."

Improved line operations through corrective actions, best practices and training led to a six percent increase in efficiency – equating to annual savings of more than \$120,000.

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