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AUGUST 2021

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# Cyber Sleuthing for TROUBLESHOOTING

Enhanced data-gathering allows ingredient handling systems to identify potential problems and alert bakeries when to fix them.

by Dan Malovany

Detect a problem before it occurs or alert an operator as soon as it does. It seems so elementary, but many bakeries still rely on flashing warning lights and blaring horns to signal the maintenance crew to jump into action and figure out what's gone wrong after production comes to a grinding halt.

Today's ingredient handling systems, however, are often applying advances in digital detection to pinpoint potential problems remotely.

"The world has become a global economy, and the means for communication has improved as well to accommodate this in our industry," said Darren Adams, vice president of engineering, The Fred D. Pfening Co. "We are able to log onto our systems' PLCs anywhere in the world to see real-time systems operating and to implement software system modifications and improvements. We can download the systems operation trend data and charts at any time, which allows us to go back to look at past data that may help find recurring operational or batching issues, as well."

By connecting a control system to a secure industrial virtual private network (VPN) router, many equipment companies can troubleshoot issues from anywhere with-

out travelling to the bakery. In fact, Louis Schwartz, business unit manager for ingredient handling systems, Gemini Bakery Equipment/KB Systems, noted the capability to connect has become increasingly affordable.

"In addition, recommended maintenance intervals can be built into the control program, and notifications can often be sent via text message or email to both the bakery's and vendor's contacts," he said. "This can be beneficial to both parties, because the vendor can advance orders or manufacture spare parts required, and the delivery time to the bakery can then also be reduced."

Jason Stricker, vice president of sales and marketing, Shick Esteve, pointed out it's not possible to make physical repairs or conduct remote maintenance for equipment in ingredient handling systems, but a data management system through the Industrial Internet of Things (IIOT) provides the information to direct onsite personnel to the equipment that needs attention.

"The overarching goal of a data management system is to provide customers with a forewarning of an impending maintenance need versus being reactionary to a failed piece," he explained. "By constantly monitoring the critical process parameters, we can often predict

Using a data management system through the Industrial Internet of Things can direct onsite personnel to the equipment that needs maintenance.

*Shick Esteve*



## INGREDIENT HANDLING

A remote supervisory control application along with the ingredient batching system allows various departments to monitor the operation.

Sterling Systems & Controls

when something is nearing end of life. This allows customers to schedule focused maintenance efforts around planned downtime rather than repairing post-failure.”

### 24/7 cyber inspection

Jack Kilbride, vice president systems and automation engineering, Zeppelin Systems USA, observed that modern control systems provide visibility into the process by comparing current and historical data regarding a bulk ingredient handling operation.

“Bakers need to monitor the data regularly and check for changes in pressures, temperatures, fill rates and more,” he said. “When an anomaly is found, you can investigate thoroughly the portion of the process where the operation of the system has changed.”

Becoming familiar with all components is critical when troubleshooting a pneumatic ingredient conveying

system, suggested Tom Leach, national sales manager, pneumatic conveying systems, Camcorp, a member of the Scheuch Group. These parts include the blower, piping, filter receiver and the various valves such as airlocks, divert valves, butterfly valves and slide gates, to name a few.

“It’s important to have a good understanding of these parts’ function and design features,” he said. “And don’t forget the controls, the brain of the pneumatic system. Understanding the normal operational state of the equipment and the system will help when it comes to discerning problematic issues.”

Kevin Pecha, sales manager, AZO Food, observed that smart technology also enhances an ingredient system’s reliability.

“Good programming methodologies help to not only promote consistent functionality of the equipment but also monitor for signs of issues such as valves taking too long to switch or motors pulling higher amperage ratings,” he said. “Some changes to hardware may be needed to take advantage of some control items.”

However, Mr. Stricker stressed, bakeries need to do their detective work when a system’s controls signal that something has gone awry.

“Proper PLC and HMI programming will provide visual alarms when things are not operating as intended. It is difficult for a PLC to provide the exact cause,” he noted. “It can only point you to the malfunction. Determining the cause of the failure is really the territory of the data management or IIOT portion of the controls.”

Still, digital technology and software today is a lot more intelligent — some may argue intuitive — than just a few years ago.

“Smart variable-frequency drives (VFDs), which can control multiple motors, allow for the data capture of motor amperage of each connected motor,” said Joe Lewis, marketing, Sterling Systems & Controls. “This allows the ingredient batching controls system to monitor and sound alarm warnings if conditions fail.”

Most control components, he added, can be interconnected with minimal wiring using Ethernet communications to capture data and transmit it to PLCs.

Mr. Schwartz observed that programmable controls also verify that a system is in good working order before it’s fired up. Prior to starting a conveying air blower, for instance, there must be a clear path to the correct destination, such as a bin or holding tank, which then must be vented in some way.

“Instrumentation and signal devices, such as limit and pressure switches, provide the ‘permissives’ that allow the final desired action to start,” he said. “If a system does not start, the permissives for a given operation can be checked and then used to easily determine what is preventing the system from starting. While the ladder





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logic may need to be checked, it is also possible to show permissives on an operator terminal to make it much easier to determine the cause of the problem.”

To ensure an ingredient handling system is working correctly, the Bühler Mercury system evaluates the weighing cycle for the ingredients and compares each of them under normal operation against times when there are issues. John Hunter, sales account manager, bakery and ingredient handling, Bühler Inc., noted the system monitors fill times to determine any issues with silo discharge or the evaluation of transfer pressures for the pneumatic system to ensure accurate system performance.

Since the pandemic started, he added, Bühler stepped up its 24/7 automation support system to allow the company or a bakery’s supervisors to monitor ingredient handling operations remotely.

“When carrying out maintenance remotely, the control system can be accessed without needing to go to the production office,” he said. “This can be accessed using an iPad, tablet or smartphone, using the Bühler Mercury system.”

Mr. Lewis suggested integrating preventative maintenance planning software into the system controls. This application allows for maintenance scheduling for the entire facility. Additionally, the maintenance manager can set up multiple components and operation centers with alarms, spare parts planning and scheduling of maintenance personnel.

Moreover, he said, remote supervisory controls along with the ingredient batching system allows various departments to interact and work with the automated batching control system from their remote offices. Outfitting a system with alarms and high-quality sensors also can detect potential problems.



"Don't skimp on this feature of an automated ingredient batching system," Mr. Lewis said.

For security reasons, don't forget to monitor the programmable controls, too, to make sure any tinkering of the system is done by someone who thoroughly understands the formulas and the process, especially when it comes to minor and micro ingredients. Just a small tweak can cause product quality issues.

"Was the program modified? Changes in the sequence of operations may be the culprit of system issues," Mr. Leach said. "Understanding the fundamentals of minor ingredient systems will prevent even the seasoned programmer from making a change that could have detrimental impacts to a system's performance."

### Breaking down the walls

Perhaps one of the biggest challenges involves gaining remote access to a bakery's operation, especially with

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## INGREDIENT HANDLING

Troubleshooting a pneumatic ingredient conveying system requires a thorough understanding of all components from blowers and piping to filters and different types of valves.

Camcorps

recent heightened concern over malware, ransomware and other high-profile hacking issues.

“Cyber security is a critical part of any company’s IT infrastructure,” said Josh Lamkins, controls engineering manager, Shick Esteve. “As a silver lining to the pandemic and the stay-at-home orders, many of our customers have implemented improved security measures and tools that allow for their employees to work remotely. With these security measures in place, customers have been more comfortable granting remote access to third-party vendors to provide remote support and service. An additional result is an increased use of remote sharing software to provide a solution to what used to be in-person meetings.”

Many companies, however, prefer to keep a firewall for their security.

“This is generally a protection that is well-respected, and so it is up to each company how they want to implement their remote system services,” Mr. Adams explained. “There are heightened security packages and techniques that permit safe remote service systems. We often have a login permission process required each

time it’s requested that we log in, so that there is a very safe way of managing it. A server manager permits access and then concludes the session, making sure traffic is closely managed. All said, we have seen a steady annual increase in the use of these remote systems, given the increased flexibility it offers.”

Mr. Lewis noted that many bakeries permitted greater remote access as companies restricted visits by anyone but essential personnel who worked on the production floor.

“In the pre-pandemic past, IT managers were almost paranoid and hyper protective about allowing remote access to their network systems,” he explained. “The



## COOL WAYS TO TACKLE EXTREME TEMPERATURES

It’s summertime, and many bakeries are feeling the heat. In addition to the South, this year’s scorching weather recently slammed the West and Northwest, and even Canada.

For bakeries, such climate change can wreak havoc on creating quality baked goods and producing them efficiently. Bulk ingredient handling systems often provide the first line of defense.

“Flour is the main source of temperature fluctuations during summer and winter,” said Stephen Marquardt, director, food processing plants, Zeppelin Systems USA. “Zeppelin provides flour cooling

systems by cooling with either carbon dioxide, nitrogen and/or with a conventional system using cooled air, preconditioning of raw materials and insulation of outdoor silos.”

Louis Schwartz, business unit manager for ingredient handling systems, Gemini Bakery Equipment/KB Systems, said heat exchangers can be added downstream of air blowers to cool the pneumatic conveying air flow for flour or sugar.

Bühler’s scale hoppers include probes to alert operators about flour temperature before it’s deposited into the mixer.

Additionally, a dough temperature control system can be incorporated with the control algorithm that automatically adjusts the

process, noted John Hunter, sales account manager, bakery and ingredient handling, Bühler Inc.

Darren Adams, vice president of engineering, The Fred D. Pfening Co., said its Enviroblender will adjust water temperature for mixing.

“It can provide blended water automatically based upon reading the incoming city water temperature and blending it with the required chilled water to reach the desired dough temperature,” Mr. Adams said. “In situations where the current system cannot provide cold enough chilled water, Pfening offers ingredient water chillers to provide the chilled water needed for cooling down the ingredient water lower than your current capabilities to bring the dough to the desired temperature.”



## INGREDIENT HANDLING



pandemic forced senior management to move IT toward managing remote access rather than preventing, eliminating and restricting it. Now remote 24/7 support can be provided to baking and food processors with ingredient batching systems by the manufacturer with wired or wireless Internet access connection to the batching system controls.”

In addition to troubleshooting, Mr. Kilbride said, a connection through a secure VPN or remote desktop application allows bakeries to work with vendors to optimize an ingredient handling system’s performance.

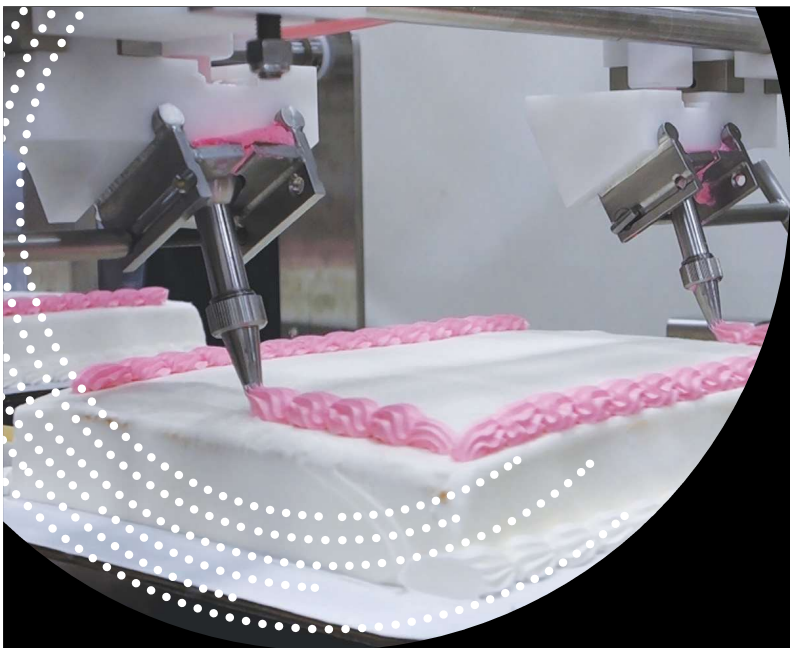
“This can be accomplished in a safe manner with vendor professionals working with your IT and engineering and maintenance staffs,” he said. “There are also products from vendors that specialize in security software that monitors the system, looking for threats to the control system.”

Mr. Schwartz pointed out that industrial VPN rou-

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Digital monitoring of key components like blower motors keeps bulk handling systems operating at peak performance.

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ers now offer robust security features, including two-factor authentication and connection audit trails, which is a log of every connection made to the router. A bakery's IT department can also physically lock and prevent remote access to a piece of equipment either with a key switch or HMI button.

In many cases, Mr. Pecha said, VPN systems tied to the process controller can reduce a bakery's downtime that often comes from waiting for an outside programmer or technician to visit the plant to resolve a simple issue.

Other companies, however, only enable remote access after a problem occurs.

"The introduction of the use of VPN provides a sense of security, but others continue to maintain a more stringent stance and physically disconnect the VPN cable until an issue or need arises that requires external connectivity, at which time, it is a simple plug-in of the connection, and the system is available to an outside user," he noted.

Mr. Leach urged bakers to provide proper ongoing training to ensure that operation and maintenance personnel know the system intimately.

"Oftentimes overlooked — as another unwarranted expense in capital budgets — is investing in vendor training for the personnel who will interact with the system," he said. "This training will go a long way in reducing troubleshooting time and related downtime expenses."

Understanding the original design parameters for the system's controls can also help when trying to diagnose why an operation isn't performing up to par.

"Over time, people may have made slight changes thinking that it might improve the operation," explained Buddy Nash, field service and technical service manager, Shick Esteve. "A combination of those slight changes can result in reduced transfer rates. Optimal balance between air and material ratios can be counterintuitive to equipment operation in other parts of the bakery."

To maximize their performance, ingredient handling systems require a combination of old-fashioned preventative maintenance along with the latest in digital detection to monitor consistency, ensure product quality and enhance production efficiencies. ●



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