AGGREGATES MANAGER
Your Guide To Profitable Production
PULL-OUT GUIDE

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OPERATIONS ILLUSTRATED

Absolute Automation

AGGREGATES MANAGER®
Your Guide To Profitable Production

Master the Balance Between Man and Machine

More and more producers are adding automation to their operations — not only with new plants, but also as part of retrofitting existing operations. Automation can provide anything from basic machine control to a high level of process control to maintenance and service control. Moving beyond single-machine control, a whole-plant system automates the entire plant so that all of the equipment, from the primary to the final conveyor, communicates well with each other — essentially acting together as one machine.

Total plant automation includes feed control, startups and shutdowns in the proper sequence, and automatic plant monitoring for problems and data collection. Running the plant manually can be difficult. The operator must pay close attention to plant flow and monitor everything manually because he doesn't have all of the data that is available. In comparison, an automated system monitors all equipment and catches issues quicker than an operator can, and it can stop the plant — in the proper sequence — before any catastrophic damage occurs and without the risk of messes and cleanups.

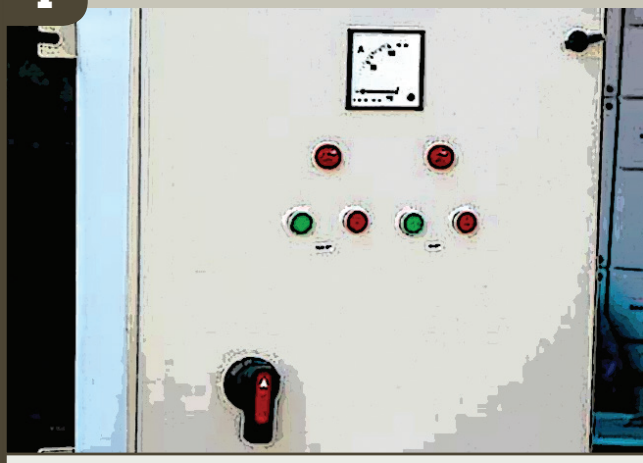
Whole-plant automation packages help improve plant efficiency through real-time monitoring that maximizes productivity and reduces downtime. It does this by helping identify bottlenecks, tracking equipment performance, and troubleshooting problems. From a proactive maintenance standpoint, an automated system helps schedule and plan preventive maintenance. From a service standpoint, data trending helps operators troubleshoot and then plan a plant shutdown and order parts before a failure occurs.

A whole-plant automation system can certainly be specified and built into a new plant, but a retrofit on any plant is possible. Most existing operations that choose to automate their plants discover the automation package can be installed with little or no modification to the existing equipment.

"'Why should I automate?' used to be the main question received by producers when we would meet about potential projects," says Matt Etheridge, president of Etheridge Automation. "We used to have to sell the concept more. But most producers, at this point, know it is better to have it — from the standpoints of efficiency, production, safety, and maintenance."

According to Arnold Connelly, Jr., area manager of aggregates for Tilcon New Jersey, "With the old school way of operating equipment manually, the operator would use amp draw in combination with 'slugging crushers' in deciding whether to tighten the crusher to maximize key products. But it's not a reliable or efficient operating method, and it often requires longer operating hours. A totally automated plant will usually lower your operating hours and increase throughput."

1 Old school: Manual controls



Plants that start, stop, and run manually almost always run at less than optimal production. The only real control an operator has after starting the plant is the speed of the feeders. Segregation occurs often within surge piles, creating fluctuations in material to crushers and constant gradation changes. To ensure that the plant doesn't have problems, the operator will run the feed at an "operator comfort zone" speed to handle the variables.

4 Improve safety and maintenance

An automated plant will run at the optimal speed without overloading equipment. Because an automated plant is interlocked between all equipment, if there is an issue, it can shut itself down quickly in the proper sequence. Most stages can run unmanned, reducing the overall amount of manpower required and taking the plant from two or three operators down to a single operator. The system can also see maintenance issues and alert the operator before the plant breaks down.

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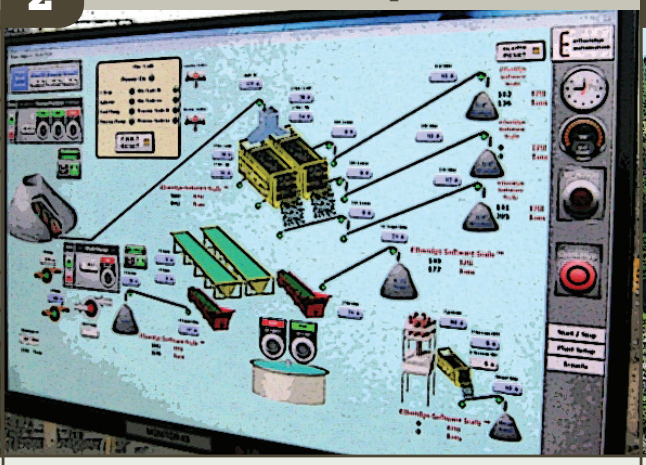
2 New school: Whole-plant automation

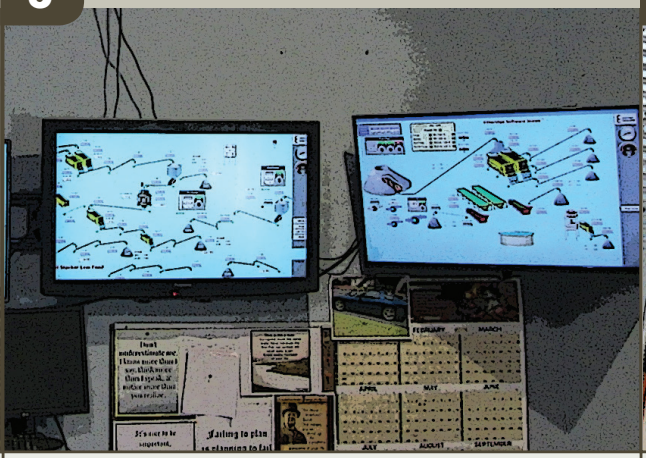


A plant that is totally automated runs with information from every component — including screens, bins, crushers, and conveyors. The automation software has more information than the operator and makes decisions on the fly about how much to alter speeds of specific components as needed to increase production. With interlocked components, the automated plant has the ability to shut down quickly, in proper sequence, providing greater safety.

3 Defining total plant automation

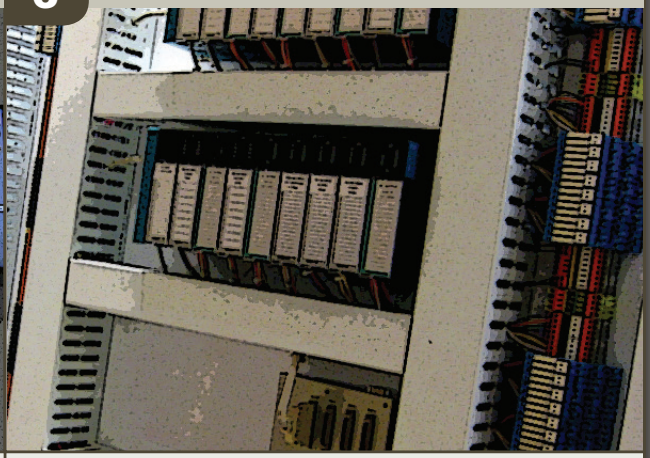
Just because a plant might have a PLC or a single component that is automated, such as a crusher, it is not actually a fully automated plant. If a plant can operate with decisions being handled automatically for every piece of equipment, adjusting the speed of all components from the primary feed to the final conveyor without input from the operator — that is total automation. Based on plant modes, the system will increase production of key products.

5 Track data



Automation allows operators to track productive and unproductive time. Managers on a regional or national basis can see the entire system remotely, allowing them to ask questions of the operator. By tracking data trends, operators and managers alike can adjust the plant for better performance. Historical data tracking ultimately improves the bottom line for better production and lower costs.

6 Automation challenges



Unlike automobile manufacturing or food processing, which are automated with uniform input and output, automation within the aggregates industry must be built to handle a large number of variables. In the automotive world, automation is sold as a package, with robots that handle production of uniform machines. In comparison, with aggregates operations, total plant automation requires vast knowledge of the process and understanding of each unique quarry's variables.

OUR EXPERTS

Matt Etheridge is president of Etheridge Automation, based in Powhatan, Va. He is considered an expert in the field of aggregates automation with more than 20 years of experience and hundreds of successful projects across the U.S. and Canada. Etheridge is active in NSSGA and is an experienced speaker on the topic of automation, having given talks at NSSGA, as well as various state associations. He is also a master electrician and resides in Powhatan, Va., with his wife and five daughters.

Arnold Connelly, area manager of aggregates for Tilcon New Jersey, has been with the company for almost seven years. With Tilcon, an Oldcastle Materials Co., he was a plant manager for the Riverdale and Mt. Hope quarries before taking his position as area manager. Connelly's plant management experience in aggregates goes back to 1996. He has a bachelor's degree in mining and mineral engineering from the University of Kentucky and an M.B.A. in general business administration and management from Centenary College.

For the past four years, **Mark Cohen** has been the electrical maintenance manager for Tilcon New Jersey, an Oldcastle Materials Group Co. Prior to that, he was head electrician at the Mt. Hope quarry for a total of 20 years. Initially, the quarry was known as Mt. Hope Rock Products until 2001, when it was sold to Tilcon. Cohen was electrician helper at Mt. Hope from 1989 to 1992. He has worked at the Mt. Hope Quarry a total of 27 years.

Voices of Experience

Arnold Connelly and Mark Cohen

According to Arnold Connelly, area manager of aggregates, and Mark Cohen, electrical maintenance manager — both employees of Tilcon New Jersey, it is better to have total automation in a plant versus automating individual pieces of equipment. "Single machine automation is good, but it's like having a limb missing," says Connelly. "You're not getting all of the information you need, and it's difficult to make good management decisions."

Total plant automation gets the operator and management the accurate data they need from throughout the plant. "The whole quarry is one big electrical system. It monitors amp draw from every piece of equipment, and helps the operator in determining problems. It tracks the scales, the tons-per-hour — anything you want," Cohen says. "You can see problems before something breaks down. For instance, if the conveyor belts are slipping or the screen is running outside of the correct amp parameters, you can schedule preventive maintenance, rather than running into unexpected downtime for a repair."

For historical information, a total plant automation system will track and record data from every piece of equipment, so that decisions can be made for running the plant more efficiently. Scheduled maintenance is much more accurate because the operator has true knowledge of tonnage history and amp draw. "The ability to track history tells the truth about everything that has happened in the plant. Before automation, we had to rely on information from the operator, who didn't have all of the information. It's a lie detector, so to speak, because you have accurate data to review," Connelly says. "The ability to monitor the plant remotely through the boardroom allows area and upper management to see the entire plant from a remote office at any time, and ask questions of the operator."

Tilcon New Jersey is in the process of automating all of the plants in the area. And Cohen says the learning curve for using the automation system is typically quick because the system on the monitor looks graphically like the plant the operator has been running all along. Similarly, gaining buy-in from operators has been fairly easy.

"A 20- or 30-year plant veteran might be a bit nervous about it. Younger guys who grew up using computers adapt quicker," Cohen says. "After the system is installed, the manufacturer stays behind and works with the operators until they are comfortable with running the plant through the system. The manufacturer also gives great phone support and helps online if there are questions. Once the operators actually start using it, they love it. It makes their jobs easier and takes away a lot of the stress," he adds.

Matt Etheridge

"Almost all manufacturing processes in the U.S. are fully automated. Think of automotive manufacturing, food processing, etc.," says Matt Etheridge, president of Etheridge automation. "Our industry (the aggregates industry) is the only one that has lagged in the ability to be fully automated."

Why is this so? Etheridge explains that other industries that automate rely on uniform input into a process. The automotive industry purchases its automation systems in packages. The philosophy is that the robots handling welding and other tasks are handling uniform tasks for identical automobiles that advance along the assembly line. "It's easy to automate because the controls all repeat," Etheridge says. "Compared to our industry, it would be the same as trying to build a compact car, followed by an SUV, followed by a van coming down the line. The robots can't work with these variations because the parameters are constantly changing. There's no uniformity."

Etheridge says the number-one reason all quarries are not automated is that simple process automation doesn't work for them. When automating a quarry, the automation provider must be intimately familiar with the industry and the processes. "There are so many variables you have to work with when automating an aggregates operation," he says. "There are variables with blasting — how the material fractures, moisture content, gradations, etc. We have to write our own unique control loops into the PID (proportional integral derivative) every time. The automated system has to adapt to all variables and be flexible because no two quarries are alike. It must drive the process variables to a set-point value and then control the output.

"In a typical retrofit, we build the PLC (programmable logic controller) in the shop with all the relays and terminals. This is mounted in the MCC (motor control center). A wire goes to each starter for each piece of equipment," Etheridge says. "All wiring is in the MCC. We add some sensors out in the plant for bins, maximizer probes, levels in the crusher. We are able to use fewer of these than we did in the early years." Etheridge adds that automation packages today can monitor what is going on in the plant without a lot of outside sensors, which are easily damaged by the harsh conditions.

The PLC runs the plant and also talks to the computer, where the operator can see everything that is going on in the plant with one or more monitors. "The system has to be hard-wired so that every piece of equipment communicates between the PLC in the MCCs. We also can build systems that communicate with fiber optics or even wirelessly," Etheridge says, adding "Wireless has gotten better and better and better."