

Wireless Done Right

A wireless control system eliminates the need for a permanent control room or a dedicated operator.

Wireless hardware and control systems allow producers to monitor equipment, troubleshoot problems, and gather processing information.

Key personnel can view operational information from any location with a tablet, laptop, PDA, or desktop computer.



AGGREGATES MANAGER

Making Wireless Work

Creating an efficient, effective wireless automation plan for aggregates operations is predicated largely on two factors: performing a site survey before installing the system and having well-trained personnel who can troubleshoot when necessary.

“A site evaluation is the most important thing,” says Ron Ruth, an automation engineer with the Williamsport, Pa., office of Schaeffler Yesco. “I can’t stress that enough.”

Doing a site survey allows experts to come in, evaluate the conditions that may interfere with the system, and mitigate problems in advance. For example, some sites have “dead spots” where the wireless technology doesn’t transmit well. If a system designer knows these locations in advance, the system can work around them.

“You have to take your best guess as to where to mount the wireless hardware and then test it out thoroughly,” says Jerry Saul, a process control engineer at State College, Pa.-based Glenn O. Hawbaker, Inc.

Both Ruth and Saul agree that aggregates sites change constantly, so requirements may need to be altered as well. Stockpiles may grow. The operator may move deeper into the pit. A portable plant may be relocated. All of these changes can impact communication between hardware. “Once you become operational, plan on making some adjustments because it’s inevitable,” Saul warns.

In addition to physical changes in the plant, it’s a good idea to

have spare parts on hand, he adds. At Hawbaker sites, spare wireless radios are kept in stock so they can be swapped out if one goes down. Programs are also backed up and saved on a regular basis.

To facilitate changes and maintenance to the system, it’s important that the site personnel or corporate support can troubleshoot as much of the system as possible. Although the wireless network may ultimately lower personnel costs, those who do operate it need to know what they’re doing.

“Training is important, but you also have to make the design so that it can be easily diagnosed by plant personnel,” Saul explains. “You can’t make it too difficult for them to determine what the cause of the problem is.”

Ruth adds that it is very helpful if aggregate companies have a staff member, such as Saul, who has a thorough understanding of how the system works, from the engineering design right down to repairing hardware. Although that expertise may not be available in some smaller companies, he says that many high schools and technical colleges offer high-quality technical training programs that can help a miner build the necessary skills.

In fact, Ruth says that he attends training himself three times a year and adds that many instructors are learning about new innovations in wireless technology right along with their students. “There’s a lot of new stuff out there, and you have to stay with it all the time,” he says.

OPERATE

Tips and Tech

1

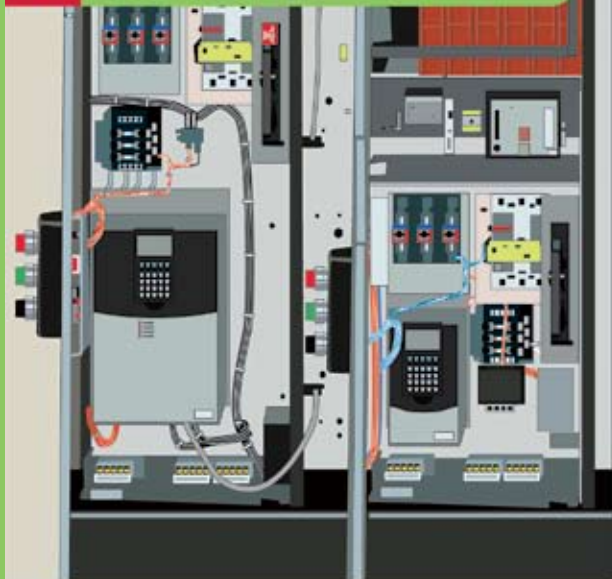
Consider economic efficiencies



If the plant office, primary, and secondary/tertiary plants are not within close proximity to one another, running fiber optic cables throughout the operation may be cost prohibitive. A wireless control system may reduce the need for additional personnel and construction costs because a dedicated control room is not necessary.

4

Streamline the system



Through the use of integrated hardware, software, and communication, bundles of control wiring may be eliminated. A plug-and-play set-up minimizes installation time and reduces plant downtime by providing diagnostic and predictive failure information.

TIONS ILLUSTRATED

Techniques for Implementing Wireless

OUR EXPERTS

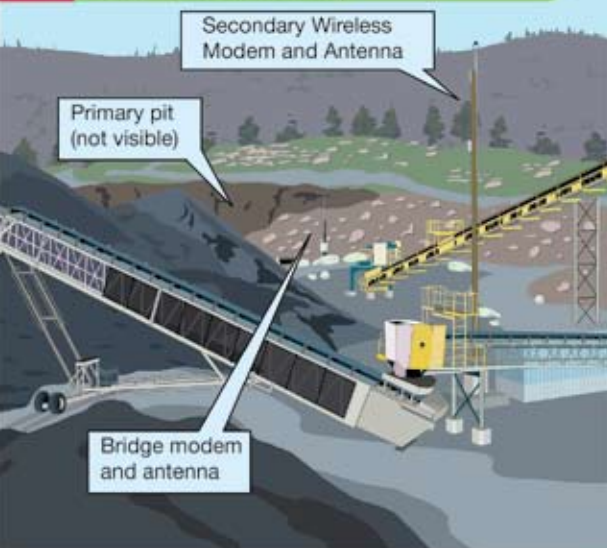


Jerry Saul is the process control engineer at State College, Pa.-based Glenn O. Hawbaker, Inc., and has been with the company for 10 years. Saul graduated from Lawrence Technological University in Southfield, Mich., with a bachelor's degree in mechanical engineering. He frequently speaks on automation topics at national and state meetings.



Ron Ruth is an automation engineer with Schaedler Yesco, a Rockwell Automation dealer and distributor located in Williamsport, Pa. He has 15 years of experience working with controls and PLC systems and has associate's degrees from Penn State and Pennsylvania College of Technology. He can be reached via e-mail at rruth@sydist.com.

2 Perform a site survey



Before implementing a wireless control system, work with your vendor to perform a site survey. Set up radios in order to detect dead spots in your operation and to determine what antenna types work best for your operation.

3 Select antenna locations



When determining the best location for each radio, the highest point of elevation is often the preferred option. Once installed, evaluate the network reliability to ensure that signal strength and integrity is solid regardless of weather conditions or utility factors such as dips and spikes in electricity.

5 Coordinate supply and demand



Through the use of a tablet computer, the loader operator can control the speed of the feeder as well as move the portable crusher when necessary. By allowing the operator to remain in the cab during a move, the wireless system provides a distinct safety advantage.

6 Simplify troubleshooting



When designing a wireless control system, keep the design as simple and straightforward as possible and make sure to provide proper training. This allows site personnel to better troubleshoot problems when they occur. However, remote access to the system also allows corporate technical support to troubleshoot.

OPERATIONS ILLUSTRATED

Making Wireless Work

Jerry Saul ▼

During recent years, State College, Pa.-based Glenn O. Hawbaker, Inc. has been an industry leader in the implementation of wireless control systems at its sites. It boasts a handful of sites using various degrees of wireless implementation including its \$5 million Canoe Valley site.

"Canoe Valley was the first site we deployed at, and we had very specific reasons," says Jerry Saul, process control engineer for the company. The operation was designed around a track-mounted portable crusher and screener. To meet specifications, the company wanted the flexibility to mine different seams of the deposit during a single day. Through the use of a telescopic conveyor, materials with different percentages of the desired aggregates are blended to meet the required spec.

"Right away, that made it difficult to keep hard wiring out to the portable plant," he says. "It lent itself to a wireless solution so that we didn't have to drag a communication cable into the pit."

Another goal was to be able to control the plant from multiple locations, without the need for a control room or operator. In the case of the Canoe Valley site, both the loader operator and the plant superintendent have tablet PCs that they can use to run the plant.

"The loader operator can speed up or slow down the feeder. If he has a plug in the feeder, he can stop it and prevent spills," Saul says. "If he has to move the crusher, he can pick up the stabilizer legs, turn on the crawler motor, and track the crawler to where it needs to go — all from within the loader."

Saul explains that although the loader operator currently uses the stop and start functions on the feeder, the mineralogy of the deposit has been more consistent than anticipated and the portable plant has not yet needed to be moved. "That's just a matter of turning that functionality on and then they can use it," he says. "It's the infrastructure that's important, and the wireless infrastructure is in place."

From the portable primary, material is conveyed to the secondary plant located above the pit. The same loader operator can control the secondary from the pit, which is set up as an interlocked mining process. "It's a continuous process from the primary feeder out to the stockpiles at the secondary," Saul notes.

The secondary plant also houses the server and acts as the hub of the network connectivity. A wireless link is the operation's sole means of communication between the primary and secondary. There is no hard wire backup.

Because the plant depends on the technology, Saul says that it's important to keep the automation system as streamlined as possible. "Downtime is built into the business scenario," Saul explains. "Rarely, do we have problems, but if there is an interruption for more than an hour or two, I can remotely troubleshoot it. Nine times out of 10, I can fix it remotely."

Ron Ruth ▼

Before implementing a wireless control system at an aggregate location, conducting a site evaluation is a smart first step, according to Ron Ruth, an automation engineer with the Williamsport, Pa., office of Schaedler Yesco.

Aggregate operations offer some unique challenges to wireless control systems that should be taken into account before installing the hardware, he says. For example, wireless signals can't be sent through rock or holding tanks, so the locations of items such as transmitters, receivers, and antennae should take these factors into consideration.

It's also important to think about the long-term mine plan when setting up the system. "The sites are constantly changing," Ruth says. "If somebody is going to do a large project, it's really smart to have the modem supplier perform a site survey." Ensuring line of sight between system components is particularly important. "You have to pay attention to where the machines are," he adds. "Usually, they don't get the antenna up high enough the first time."

If planning time allows, it's also worth performing a survey during different times of the year. Ruth notes that he has seen some operations, particularly in other industries, have no problems during the first few months of operation. However, once spring blooms, foliage can cause static in the signal. Aggregate operations often use trees and shrubs as a natural barrier around the site, but if they also exist within the plant itself, they should be taken into consideration prior to setting up a wireless system.

Although signal interference may have been an issue early on, it's much less of a concern with more modern systems. "Everybody is pretty locked down on their own channel. If you have a cell tower close, they should be on a different bandwidth, but the magnetic power can be very strong," he cautions. Another exception is if a contract or staff blaster is using wireless technology. If that is the case, it should be factored into a system design.

Energy issues should also be evaluated as part of the system set-up, Ruth says. "The first problem that usually occurs is that an aggregate site uses a lot of electrical energy," he explains. "Generators don't always play nice with wireless controls."

In addition, he says that radio modems are susceptible to lightning strikes. To protect a wireless control system, he recommends ensuring a good, clean power supply and using surge protection. "Put the right equipment in and you can protect yourself from most of it," he notes.

Although an aggregate operation should invest heavily in the pre-planning phase of the project, the benefits of the system — once installed — are significant, Ruth says. "You're not cutting wires all the time," he explains. Not only does the site become very mobile, it also allows easy access data. That information allows site and corporate personnel to not just monitor the site, but also to manage it.