



The simplicity of the entire solution with CoDeSys, Galileo and SmartWire-DT is impressive. It enabled us to implement the project from initial planning up to commissioning in just half a year.

*Markus Hofmann
plant electrician at bmk Steinbruchbetriebe*

Overload Warnings by Tablet

Location:

Mundelsheim, Germany

Segment:

Materials Handling

Problem:

Early detection of overloads on conveyor belt drives, prevention of plant standstills; Automation of the entire plant

Solution:

SmartWire-DT with PKE motor-protective circuit-breaker, XC-202 and XC-152 controllers, Galileo visualization software

Results:

The direct transfer of motor data to the controller enables the early detection of critical states on the conveyor belt drives. The Galileo visualization software and Ethernet networking with hotspots enable warnings to be displayed directly on the tablets of wheel loader drivers. Reaction times for troubleshooting are reduced and standstills are prevented.

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Background

The most important business of bmk Steinbruchbetrieb GmbH & Co. KG (bmk) is the excavation of shell limestone. The material is used in different grain sizes and mixtures in the construction industry and in road building, as well as in the production of concrete and asphalt. From its headquarters in Talheim near Heilbronn, the 145 employees of the company manage its four plants and its joint venture companies.

One of these joint venture companies is KE Kies- und Schotterwerk Mundelsheim GmbH & Co. KG, which bmk operates jointly with the Stuttgart-based company Karl Eppe GmbH & Co KG. Here aggregate is excavated in grain sizes of less than 2.2 mm up to 45 mm and in different mixtures. However, a lot has to be done before the shell limestone is available in a manageable form: After it has been exploded from the rock, it is first cleaned in a crushing plant and ground in an initial stage. It is then taken to the treatment plant which produces aggregates in different

grain sizes and stores it in twelve silos.

Challenges

The material is transported in the quarry on belt conveyors, some of which cover several hundreds of meters. The drives on these systems are often the cause of faults, explains Markus Hofmann, plant electrician at bmk: "In our business, motor overloads caused by overfilled conveyor belts is a major problem.

The employees that transfer the material onto the conveyor belts with wheel loaders and dumpers find it difficult to determine whether too much material has been loaded on them." Once a belt with several tons of gravel is standing still, the motor doesn't normally manage to start up again. "The standstills involved here can last several hours – depending on the length of the belts," explains Gerd Bader, another plant electrician at bmk. In order to start up a conveyor belt after an overload, it must be completely emptied – usually by hand.

Solution

Hofmann and Bader wanted to solve this problem without fail as part of the modernization of the crusher plant. The main focus here was the automation technology which controls the entire material flow, the silo fill levels and pre-sieving of the materials. For the two electricians it was important that the new automation system is easy to design and implement. They found the solution in the form of Eaton's SmartWire-DT connection and communication system. This does not use point-to-point wiring to connect individual switchgear, drives and sensors, but uses a green "eight" pole cable, which connects all modules with simple plug connectors. The SmartWire-DT cable provides the connected devices with power and at the same time implements the data communication. "This generally excludes the possibility of wiring faults since wiring is no longer implemented in the conventional way," Hofmann explains. "It is also possible to save a lot of space in the switch cabinet since I/O modules are unnecessary."

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The XC-202 modular PLC controls our processes in the buffer silos. Thanks to the PKE motor-protective circuit-breakers networked via SmartWire-DT we can prevent an overload of the drives," says Gerd Bader, plant electrician at bmK

The plant electricians as well as the wheel loader operators are provided with a tablet PC or smartphone and can get a view of the plant from anywhere on the site

With SmartWire-DT the I/O level is integrated directly in the switching devices, variable frequency drives or controllers.

At the same time, SmartWire-DT can also be connected to different bus systems. In the Mundelsheim quarry, for example, the data such as from pushbutton actuators in the field, emergency-stop devices or rotational speed monitors can be read in via the ASI bus. Variable frequency drives on the other hand are connected via CAN bus. Gateways are used to connect these bus systems to the SmartWire-DT network in the various switch cabinets of the plant. An Eaton PLC is used to control the plant: The crusher plant and the gravel treatment section are each controlled by an XC-152 compact PLC. An XC-200 modular PLC controls the processes in the buffer silos. All controllers are networked together: "This gives me complete control of

the entire plant right down to the lowest level," Hofmann adds. Hofmann and Bader have also programmed the XC-202 so that the production data can be sent directly by email – thus for example enabling the company management or sales to be always aware of the aggregate supplies currently in stock.

Eaton's Galileo software is used in Mundelsheim for the monitoring and visualization of the entire plant. Thanks to the intuitive user guidance, users can also familiarize themselves with the software quickly without any specific programming knowledge required. "You can get to learn it easily," Bader confirms. With over 100 protocols for almost all commonly available controllers, Galileo can also connect with the PLC systems of other manufacturers. Like the Eaton controllers themselves, the system communicates here with the hardware independent

Codesys programming system. "Codesys enables us to connect easily the specific benefits of different vendors for different applications," Hofmann explains.

Results

Above all, SmartWire-DT solved the most urgent problem: the overloading of the drives. The system now makes it possible to supply directly a thermal motor image and the load current of each individual drive. For this Hofmann and Bader used the PKE motor-protective circuit-breaker from Eaton to integrate the drives into SmartWire-DT. This transfers all switch states, process data and status messages to the controller without any additional equipment. If the motor data exceeds the defined limit values, this is indicated by means of a text message as well as by a color signal in Galileo. In the Mundelsheim quarry this is not

only implemented via the operator panels in the plant itself but also via tablet PCs: "We have set up hotspots all over the plant," Hofmann explains. "Each wheel loader supervisor and each dumper truck driver has a tablet PC onboard, allowing them to log into the visualization software via the hotspot."

"In the event of a plant standstill the drivers previously had to find an operator unit first in order to localize the fault. They now just get out their tablet and can see immediately what has occurred," Bader explains and Hofmann adds: "By monitoring the motor current and the thermal motor model we can detect at a very early stage if the drives are being overloaded. This enables the supply of material to be slowed down in time in order to prevent a standstill."

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