



Siemens AG | W. Geyer

In the cab, the Simatic mobile panel serves as a control element and tachometer

SAG GmbH, Germany

Safe control of large forces

Safety-related requirements for track moving machines in brown coal surface mining are high because they release enormous forces. Automating machines that were previously operated by handwheel and switch increases their functional safety while making them easier for operators to use. Vattenfall recently implemented a new standard based on a fail-safe control system.

Left: The grappler with lifting and pushing rollers lifts and shifts the tracks

Right: The track moving machine was automated for the first time using a fail-safe Simatic S7-315F-2PN/DP



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Vattenfall operates the largest excavating site in Europe in Lusatia. The unique brown coal seams with a thickness of up to 12 m run horizontally below an earth layer with a depth of about 80 m, making highly efficient surface mining possible. In this operation, huge conveying bridges work together with bucket wheel excavators to transport the earth over the pit and dump it in a targeted manner. In this process, accompanying raw materials are extracted for industrial use and nutrient-rich soil is recovered for land restoration.

Excavators and transport bridges drive for miles on tracks that are parallel to the open-pit rim. The rim moves as the excavation progresses, so the tracks must be moved repeatedly in the direc-

tion of the excavation. This work is performed by track moving machines, which look like extra-long railroad cars that have a grappler with lifting and pushing rollers in the middle instead of a pair of wheels. The grappler lifts the tracks, including the ties, and is able to shift them up to a meter from its axis. It seems impossible, but these machines move the tracks that they themselves are traveling on.

From handwheel to automatic control

Vattenfall develops and manufactures the track moving mechanism itself. The machines are used for many years, which is why they are subject to strict monitoring and are regularly overhauled. For the electrotechnical equipment, Vattenfall collaborates with SAG GmbH. Dirk Lüdtkke, division manager at the Schwarze Pumpe location of SAG GmbH in Spremberg, Germany, and his team equipped the first machine – originally operated via handwheel and switch – with a fail-safe Simatic S7-315F-2PN/DP in the rugged Siplus version for the surface mining operation in Nochten. The machine weighs about 100 t and is driven by a huge ship's engine. It needs to be able to handle different soil conditions and react quickly and safely to obstacles or breaks in the track. The huge forces could quickly cause great damage and obstruct the entire excavation operation in the event of a malfunction. The fail-safe automation significantly increases the machine's functional safety and brings it in line with the Machinery Directive. The software allows for substantially faster identification and elimination of faults while simultaneously increasing availability.

It is very important that the machine be easy to operate, as different employees need to be able to drive it safely. With a Simatic 277 PN mobile panel, the driver has a significantly better overview. The panel serves as a controller for all the important functions and as a tachometer with a display of the speed. It also displays relevant machine parameters such as temperature and power consumption. The driver enters the direction of travel and the desired speed;

beyond this, he or she needs to operate very few control elements, such as the throttle and, if need be, the emergency stop.

Future-proof technology

Lüdtkke chose up-to-date and future-proof technology for the automation and drive technology. For the customer, one important component of a future-proof system was integrated Profinet communication. This will allow the machines to also be monitored from a central location or mobile terminal device in the future. This is a crucial safety aspect, considering the extensive and remote nature of surface mining areas.

One unusual aspect for Lüdtkke and his team was the configuration of all the automation – including the fail-safe components and the Sinamics inverters – in TIA Portal. "Being able to use one interface for the entire project is great. We were already familiar with Step 7 and WinCC in TIA Portal; Step 7 Safety Advanced V12 was new to us. We were able to integrate even the safety-oriented system components without any problems. The Sinamics inverters were configured using Startdrive – via the same interface. A single compact project saves time during commissioning and will prove to be a clear advantage for maintenance as well. Faults can be detected and eliminated much faster," Lüdtkke explains.

Proven solution becomes the standard

The new equipment has already proven its worth and is to be implemented as standard in additional machines. Following the same operational procedures and the same maintenance procedures makes the work easier for all involved – and reduces the probability of faults. ■

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