Improvements in open-pit mining at RWE Power in Germany

Unmanned Operation Boosts Reliability
Storage and transport systems that optimize throughput times and guarantee requested quality output are an important part of advanced facilities for the transfer of bulk materials. Significant savings and improvements to get the requested material in the specified quality can be achieved through unmanned operation of stackers, reclaimers and combined machines. The answer of Siemens VAI is Simine MOM, a unique method to reliably and safely optimize reclaiming operations in unmanned operation. The patented solution achieves over 98.5% availability at lignite mines of RWE Power in Germany’s Rhineland area.

RWE Power is the largest German producer of electricity with around 17,000 employees and a yearly output of 180 TWh. Lignite makes up a good third of the installed capacity and is therefore an important pillar in the energy portfolio. With its yearly excavation of around 100 million tons, RWE Power is the world’s largest producer of lignite. Around 90% of the lignite excavated at the company’s open-pit mines in Garzweiler, Hambach and Inden is transformed into electricity. In the last years, a dozen rail-bound stackers and reclaimers at RWE Power’s Hambach and Garzweiler open-pit mines have been equipped with Simine MOM for unmanned operation.

Performance values for the modernization were verified during a test phase.

Siemens VAI entered the picture in 2002 with the implementation of unmanned operation at the stockyard of the Niederaußem power plant. The trigger for this project was the addition of a new 1 GW power station to the existing lignite power plant. The cutting-edge technology implemented for the first time in this project greatly increases efficiency and therefore leads to a tremendous reduction of CO₂ emissions. But in order for the technology to work, the lignite has to be of a consistent quality. This target could only be ensured by introducing an integrated stockpile management system that covers quality management of the stockpile together with unmanned operation of the stockyard machines. Simine MAQ, the material and quality management system for bulk material from Siemens VAI, is an integral part of Simine MOM. With the first implementation of Simine MOM in combination with Simine MAQ at an RWE Power stockyard, the goal to secure the delivery of the requested amount of lignite in the specified quality could be achieved. The availability of the equipment in driverless mode reached over 98.5%, which meant that for the long term the stockpile machinery could be operated without personnel.

Automatic operation in Hambach and Garzweiler

With the experience gained in the first project, RWE Power again awarded Siemens with the implementation of unmanned operation in the stockyards of the open-pit mines at Hambach and Garzweiler. The lignite excavated at the adjacent open-pit mines is temporarily stored at the stockpile facility before it is transported by train or on conveyor belts to the different lignite power plants and finishing plants. The stockyards are made up of two stockpiles, which can

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hold up to 400,000 tons of lignite. Each stockpile is 800 m long and divided into several sections for different quality levels. The average daily intake of the power plants and finishing plants is 140,000 tons of coal per open-pit mine.

A special challenge for both stockyards was commissioning unmanned operation of the stackers and reclaimers during running operation. The optimization of the stackers and reclaimers in unmanned operation as well as the training of the operating personnel in the control room took place during running operations. All required performance values for the entire modernization were verified and reached during a test phase. The implementation of the unmanned operation was finalized in 2008 for the stockyard in Hambach and in 2009 for Garzweiler.

Storage management based on a 3D model
A core component of Simine MOM unmanned operation is the 3D model of the stockpile. The model was implemented in a separate project before the introduction of Simine MAQ for material and quality management in the stockyards of Garzweiler and Hambach. The material parameters of the lignite necessary for quality tracking by Simine MAQ are integrated in the 3D stockpile model up to cubic-meter accuracy. Based on the current position of the stacker and reclaimer and the current stacked or reclaimed volume measured on each stockpile device, the model is updated continuously using mathematical algorithms for each stacking or reclaiming method. For the initial image of the stockpile and the case that the volume scanners mounted on each device fail, the height in the model can be measured and updated by a laser scanner.

For unmanned operation, the control-room personnel specifies working area and parameters for each job based on the model described above. A 2D view of the 3D model provides the possibility to select the desired working area, type of job and device. Further necessary operation data for the unmanned operation job are calculated automatically and, after approval by the operator, the new job is transferred to the device itself. During execution of the job no additional support from personnel in the central control room is necessary.

Additional operational support for the personnel in the central control room, like interrupting a running job, initiating a new job for the same device and restarting an interrupted job, is provided. This reduces the necessary support for the unmanned operation to a minimum.

Along with the core components of Simine MAQ and Simine MOM like stockpile management as well as job management for the unmanned operation, all status information from the new unmanned operation mode were integrated in the central stockyard control system based on Simatic PCS7.
The success story continues
In the last few years, RWE Power awarded Siemens VAI with further projects. For example, Siemens equipped the new Garzweiler II mine, an extension of the Garzweiler mine, with a new DCS system based on Simatic PCS7 including a new central control room and several other systems like video, communication network OTN, simulation and training systems, which are all necessary for operation of the mine. The electrical equipment for the new conveyor system for the extended mine was also delivered. The successful implementation of the new control system at Garzweiler II and RWE Power’s positive experience with the Siemens VAI regional mining competence center in Cologne were among the drivers that led to the order for the control system and conveyor system for the extension of the company’s Inden mine.