Saarschmiede GmbH Freiformschmiede produces, among other things, turbine and generator shafts for power plant construction. In May 2010, one of the most advanced open-die forges in the world was inaugurated at the company’s premises in Völklingen, Germany. Turbine shafts for what is called 700°C technology are being forged in the huge production facility as well. This technology will enable future power plants to achieve an efficiency of about 53% – while reducing carbon dioxide emissions by 30%. The required material properties, however, can be achieved only with open-die forges with the latest plant technology – such as that found in Völklingen.

Uninterrupted radio contact via IWLAN

A 12,000-t press is used for forging the parts. Two gantry cranes handle the workpieces and hold them in place during forming. Because the cranes are an integral part of the production process, they also must be seamlessly integrated into the process control of the press. For this, Saarschmiede relies on IWLAN, which requires uninter-
ruptured radio contact between the press control and the two cranes. When a workpiece is machined by the press and held in place by one of the cranes, the deforming forces could cause strong additional loads that exceed the maximum load-carrying capacity of the crane. In this case, the press must be shut off immediately in order to keep the 300-t crane from overloading.

Fast response times

The crane’s load is continuously recorded by sensors and transmitted to the press control. When an increasing load is detected, the press is immediately stopped. The technology behind this includes two Simatic S7-300 controllers for the cranes and a Simatic S7-400 controller for the press, interconnected via a Profinet IO coupling. The IO coupling allows for update times of 16 ms, guaranteeing a fast response.

The crane control and the forge control are connected via IWLAN. This wireless solution has been designed for maximum operational reliability. Even under the extreme environmental conditions of the open-die forge, IWLAN is the optimal solution for seamlessly and securely connecting the cranes and the press into one functional unit. However, what appeared logical during planning proved to be extremely complex in practice.

Stable RF field despite difficult conditions

The production facility in Völklingen is a solid steel construction, which has an extremely negative effect on the propagation of radio waves. However, optimally positioned Scalance W786-1RR access points with omnidirectional antennas provide complete radio coverage over the entire route of the cranes as well as seamless connection of the IWLAN to the Profinet network. In order to obtain a sufficiently stable RF field despite the difficult transmission conditions, the project team implemented antenna diversity at both ends of the communication line. In this case, the technicians installed two omni antennas for each transmitter or receiver in order to reduce the interference effects arising during transmission.

Because the cranes are mobile, the access points have a rapid roaming function, which uses the industrial Point Coordination Function (PCF) and thereby enables extremely fast handover.

This “iFeature” – that is, a function especially designed for industrial use – ensures that the fast response time of the Profinet I/O system is maintained under all operating conditions.

Ready to start after comprehensive tests

Prior to commissioning the system, Siemens IWLAN specialists conducted comprehensive tests and measurements to determine the optimal coverage of the IWLAN signal, in collaboration with the Saarschmiede engineers. Several other IWLAN projects had already been successfully implemented with the same good collaboration, so the company continued to rely on the long-standing relationship with Siemens for its new forge in Völklingen, and thus on secure wireless data communication for greater freedom in process control.

Note on industrial security: Suitable protective measures (including industrial security, e.g., network segmentation) must be taken to ensure the secure operation of the plant. Further information on industrial security can be found at siemens.com/industrialsecurity.