

The Siemens logo is displayed in a white rectangular box. The word "SIEMENS" is written in a bold, teal, sans-serif font.A small, solid magenta square containing the word "Reference" in white, sans-serif font.The background of the top half of the page is a photograph of a hot rolling mill. A large, glowing yellow-orange coil of steel is being processed, surrounded by dark industrial machinery and structural elements. The lighting is dramatic, highlighting the heat of the metal.

Integration creates Efficiency

Industrial Wireless LAN for reliable Communication in Hot Rolling Mill

In the stock areas of a steel mill, software systems control and monitor the warehouse logistics and material movement. The communication between the material tracking system and the host computers is based on industrial Wireless LAN infrastructures.

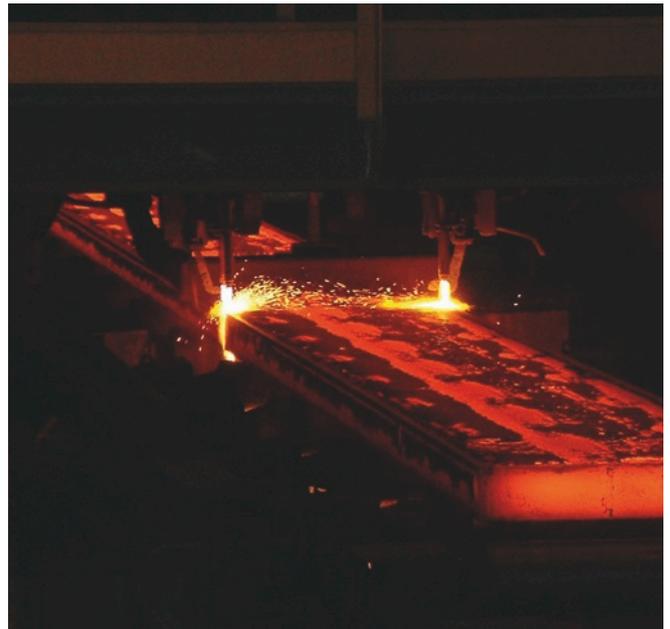
A Vietnamese steel group is erecting an integrated steel mill in the centrally located province of Ha Tinh, 340 km south of the capital Hanoi. It is currently the world's largest new building project in the steel industry. In the first expansion stage (start in the summer of 2016), approximately 7 million tons of steel are to be produced; a further expansion of the yearly production volume to initially 10 million tons and in the final expansion to up to 22 million tons of steel are planned. The steel mill complex includes blast furnaces; a steel mill for slabs, blooms, and billets; a hot rolling mill for flat products (coils); and various rolling mills for the production of long products (wires, steel bars).



The pig iron flows into casting ladles, in which it is transported by crane from the blast furnace to the casting machine.

Since the end of 2015, the hot rolling mill has been in operation with a production capacity of 5.3 million tons of hot-rolled strips with thicknesses between 1.2 and 25.4 mm, and widths from 900 to 1880 mm. Here, steel slabs with a length of up to 11 m and a thickness of 250 mm are rolled into strips, which are delivered as coils to customers especially in Southeast Asia.

The company commissioned the Logotek GmbH with the delivery of the warehouse management software and the hardware necessary for a complete material tracking throughout all manufacturing areas. Logotek – based in Marktheidenfeld (Germany) – develops and implements solutions for the automation of industrial processes. Logotek has specialized in systems for the steel industry, which enable an efficient logistics management by means of material tracking and identification.



In the continuous casting plant, the melt is cast into strands, which after solidifying are cut into individual slabs.

Brief Profile: LogoTek GmbH

Headquartered in Marktheidenfeld (Germany), the LogoTek GmbH offers a comprehensive range of products for industrial automation – since 2002. In addition, the company specializes in logistical systems, which enable the monitoring of the flow of materials by means of material tracking and identification based on the latest technologies. Warehouse management for the heavy industry, solutions for image processing and optical measuring, as well as customized software development (C++, Java, Oracle, S7 PLCs) round out the portfolio.

www.logotek-gmbh.com

For a continuous material tracking, the recording of all material movements between production and delivery is necessary. Beginning with the acceptance of the material at the continuous casting plants and rolling mills, a crane tracking system monitors all crane movements. As soon as a crane puts the material into interim storage, it automatically sends the current storage position to the warehouse management system, which is networked with the process control. Production planners can thus always identify when the material is to be taken.

The setup of the communication infrastructure for the different warehouses of the rolling mill is also part of the project. The planners opted for a wireless local network; SCALANCE components from the Siemens industrial WLAN portfolio provided them with the optimal combination of reliability and ruggedness.

Solid Coverage of the Radio Areas

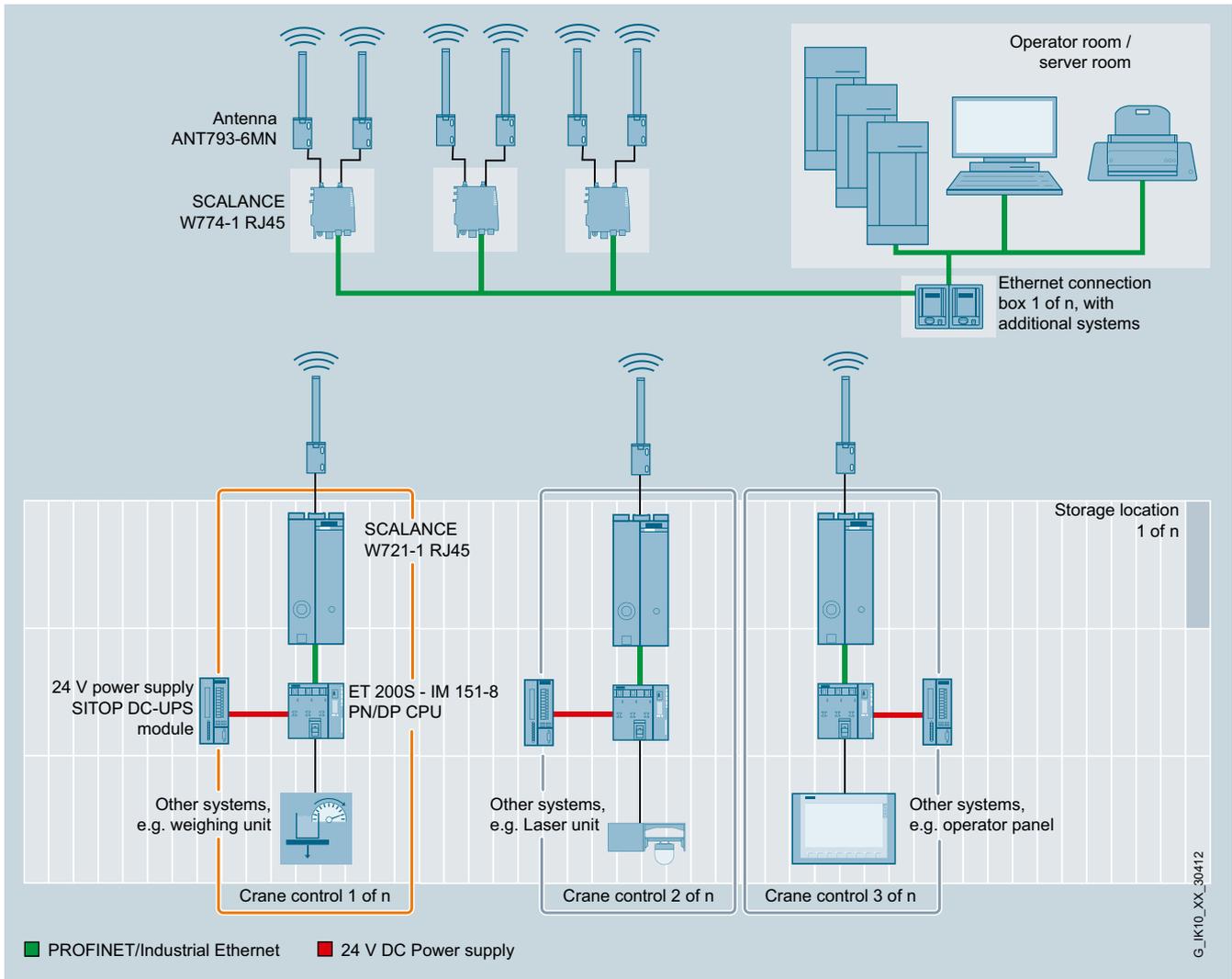
According to managing director Matthias Knoke, the compact IWLAN Access Points SCALANCE W774-1 were ideally suited for setting up the local wireless network in the warehouses. Due to the rugged construction and minimal susceptibility to dirt, shock, and vibration, the devices were particularly well suited for the industrial environment. For the decentralized automation, the choice fell to the peripheral system SIMATIC ET 200S. By connecting the interface module IM 151-8 with integrated CPU, the Logotek technicians upgraded it to a PLC corresponding to a SIMATIC S7. The processing of data takes place directly on the altogether 17 (in the final expansion 35) cranes – so that a quick response in time-critical situations is always possible.

The Access Points are mounted in the warehouses, which are up to 700 meters long, along the crane runways – with always three to four units connected to a switch. The control cabinets with the WLAN Clients are located on the gantry cranes. They ensure the reliable operation of the local wireless network even under harsh operating conditions. Slabs leaving the continuous casting plant have temperatures of 900 °C. For this reason, the Access Points are operated at protected locations with remote antennas. The omnidirectional antennas have a gain of 7 dBi. They provide for a solid coverage of the radio areas with a data rate of up to 300 Mbps. The high transmission speed also permits the remote maintenance of the crane clients using mobile PCs and tablets.

Since a WLAN for industrial applications has to meet considerably higher requirements compared to one for office use, the Logotek specialists carried out a detailed simulation of the radio field with the aid of software beforehand. Matthias Knoke said: “We first recorded the values for an optimal installation on-site. The software-assisted analysis gave us with precise information to set up the IWLAN infrastructure.” The potential locations, ranges, as well as the interference and attenuation of the access points were explored to precisely match the radio quality to the automation solution with regard to coverage and data rate. Based on the results, the developers designed the network topology and selected the appropriate components.

Calculation of the current Crane Position

A large part of the information flow for the warehouse logistics runs over the WLAN infrastructure. The signals pass from the SCALANCE W774-1 through switches and fiber-optic cables to the redundant servers in the computer rooms of the individual production areas. The databases and communication processes of the warehouse management system, which receives the production plans from the production management software, run on these servers. The warehouse management system determines the storage position of the steel parts, generates the transport orders, and sends the information to the crane client. The crane operator receives the exact position of the requested material, e.g., the coil, shown on her display. This ensures that the right material is taken and punctually brought to the destination. Without manual inputs, the crane client returns the position of the new storage location to the warehouse management software.



The crane control sends the information about the storage location to the warehouse management system via the WLAN Client.

For the automatic position determination, laser distance measuring modules are installed on the cranes. The laser devices transmit the X and Y coordinates of the crane bridge and the trolley to a PLC. Knoke continues: "The PLC on the crane evaluates the data and sends the information about the storage location to the warehouse management system via the WLAN Client." The data transmission takes place in the 2.4 GHz WLAN frequency band. Also connected to the PLC are sensors for monitoring the contact of the lifting tongs with the picked up material, as well as load sensors for the weight control and verification of the steel parts transported. As the controller, the S7-300-compatible IM151-8 is used, since it is compact, powerful, and very flexible in its I/O configuration. An industrial PC in the crane cab serves for the visualization of the situation in the warehouse.

The plant operator plans to expand the facility. Among other things, the capacity of the three coil warehouses is to be doubled. The six 700 m long warehouses will then offer space for 30,000 coils. Due to the increasing energy requirement, a cold rolling mill together with an upgrade of the power plant are planned as the next expansion stage. The plan to increase the storage capacity is primarily justified by the unstable weather conditions: the central Vietnamese province is often hit by bad weather. Since all of the material transport is handled via a port attached to the facility, ships collecting the products stay away during a storm. To prevent a production stop in the future, it was decided to double the storage capacity.



Space-saving and cost-effective setup of wireless network with SCALANCE W components, and seamless integration of the SIMATIC ET 200S into the industrial WLAN.

Systems run highly reliable

Looking back on the project, Logotek managing director Matthias Knoke draws a positive balance: "Since the founding of our company in 2002, we have been using Siemens products for industrial automation, and have been very satisfied with them." The local wireless network with 54 IWLAN Access Points and 35 SIMATIC controllers installed in the warehouses of the steel mill functions exceptionally well without any problems. Even in harsh industrial environments and under extreme climatic conditions, the systems run highly reliable. "Here, one can clearly sense the added value of the Siemens devices," states Knoke – adding that not even once were there roaming problems with the movement of clients between the radio cells.

At the end of 2015, following the approximately two-year planning and implementation phases, the WLAN infrastructure was put into operation together with the crane tracking system and the application for the warehouse management of the hot strip mill. Since then, everything has been running trouble-free. The plant management appreciates the high productivity and mobility of the employees, and the ability to access warehouse information in real-time – at any time. In the course of the project, the company management has come to know and value the professional competence of the Logotek team of experts. Practical relevance and detailed process knowledge of the team contributed significantly to the successful completion of this project phase.

Security information

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions only form one element of such a concept. For more information about industrial security, please visit <http://www.siemens.com/industrialsecurity>

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