

The infrastructure of the Gelsenkirchen plant of ThyssenKrupp Electrical Steel has been modernized

All photos: Karsten Rakas

ThyssenKrupp Electrical Steel and Siemens

An Efficient Team

ThyssenKrupp Electrical Steel supplies Siemens with innovative laminations that make power transformers more efficient. Siemens, as a partner in the low-voltage sector, has upgraded the low-voltage power distribution system of the plant in Gelsenkirchen, Germany, to the state of the art in terms of efficiency and safety.

In Gelsenkirchen, ThyssenKrupp Electrical Steel develops and produces grain-oriented electrical steel strip as a core material for distributor and power transformers. This steel product contributes significantly to reducing losses from magnetization reversals to a minimum during the transmission and distribution of electrical power. Siemens obtains laminations for power transformers up to 1,200 MVA from Gelsenkirchen, which are used in

power plants and high-voltage direct current (HVDC) transmission systems, for example.

Transformers' sound emissions and resource requirements are reduced by the electrical steel strip, while energy efficiency is increased – benefits that ThyssenKrupp Electrical Steel also wanted in its own production facilities. The plant in the Ruhr region has therefore been modernized in terms of both its process technology and its infrastructure.

Network planning based on requirements

For the refurbishment of its low-voltage power distribution system, ThyssenKrupp Electrical Steel looked for a partner that could view the issue holistically. All the main low-voltage distributors and a few core distributors needed to be replaced, and the structure that had evolved in recent decades needed to be checked to determine whether it was reliable and still made sense. ▶

PAC3200 measuring devices create the basis for highly effective energy management: the energy flows in the plant are seamlessly recorded



Sivacon S8 switchgear – in Switchgear Building 6 at ThyssenKrupp Electrical Steel – offers tested personal and plant protection even under arcing fault conditions

Highlights

- + Standardized planning from draft to implementation with the consistent support of Simaris tools
- + The precise use of the products and systems meets high standards while ensuring maximum profitability
- + Personal and plant safety without compromises
- + High transparency and integration into the existing process technology for optimal power management

▷ Siemens offered a persuasive solution with the Totally Integrated Power concept. Requirements for future power distribution were first defined together; these included electromagnetic compatibility, high availability, and transparency of all the energy flows and switching and protective states. In addition, cost-efficient standardization of the components was needed.

Then the system types and the grounding concepts were defined, and the grounded distribution networks were designed as TN systems with central grounding points.

Grounding measures necessary for correct function needed to be worked out, the switching polarity of the protective devices needed to be specified, and suitable insulation monitoring needed

to be found for the networks operated on an insulated basis.

A complete network calculation followed with verification of the selectivity. For this, ThyssenKrupp Electrical Steel called for a configuration with real products as well as clear documentation for the initial commissioning. This task was quickly and reliably accomplished in all areas using Simaris design software.

Selection and configuration of the switchgear

The task was then to convert the knowledge gained into switchgear. The basic electrical data were provided by the results of the Simaris design network calculation. Calculated operational and

short-circuit currents and required selectivity settings define switching and protective devices down to the smallest detail, but not the specific design of the switchgear. Here the internal standard of the customer needed to be taken into account. Due to its high degree of flexibility, the Sivacon S8 was able to fully accommodate the room dimensions and geometry of the building complex, which had parts that were more than 100 years old. The variable switchgear design allowed the connection of cables and bus bars from above and below, side-by-side installation, routing around corners, placement back to back, or arrangement as a double front.

Rated operational currents of up to 5,000 A and rated short-time withstand currents of up to 100 kA for 1 second with increased ambient temperatures of 40°C were no problem.

The most important priority for ThyssenKrupp Electrical Steel was type-tested safety. The Sivacon S8 offers tested personal and plant protection, including under arcing fault conditions.

The generic standards of IEC 61439 (VDE 0660-600-1/-2) are strictly complied with.

A special arcing fault test according to IEC/TR 61641 was also successfully passed. External and internal faults are controlled in terms of the thermal and mechanical effects. With regard to impairment of function, plant protection can be restricted to the desired range defined by the customer.

Full transparency, safe communication

In order for the switchgear to meet future requirements, bus systems are to be used to provide detailed information about switching states, safety-relevant conditions, and preventive measures. Profibus DP was selected after it was adjusted to the existing process level.

In the field, the 3WL1 open circuit breakers and the PAC3200 measuring devices received a Profibus DP module. Other indications such as switching position and electronic fuse monitoring

of the 3NJ62 switch disconnectors are wired on a Simatic ET 200M modular I/O system on a bit-parallel basis.

The supply and distribution of power is seamlessly recorded. For this, a PAC3200 measuring device, including the required 3-pole transducer set, is assigned to all 3WL1 open circuit breakers. All switchgear is successively wired to the higher-level management system Simatic powerrate for WinCC so that savings potential can be detected and power can be supplied in the most efficient manner possible. ThyssenKrupp Electrical Steel thus achieves its objectives of reducing energy costs and conserving resources, and it does so in a highly effective manner, thanks to technology from its partner Siemens. +

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+ www.siemens.com/tip

CONTACT:

+ frank.roehling@siemens.com

» For us, supplying power is far more than just reliable power distribution. As is the case with our own products, we expect state-of-the-art excellence here as well. We can only meet this standard if planning takes place in a manner that is application-oriented and consistent from the very beginning. This is a task that we were able to accomplish together with Siemens through Totally Integrated Power. «

*Markus Saal, Head of Electrical Engineering,
Gelsenkirchen Plant of ThyssenKrupp Electrical
Steel GmbH*

