SIEMENS

Reference

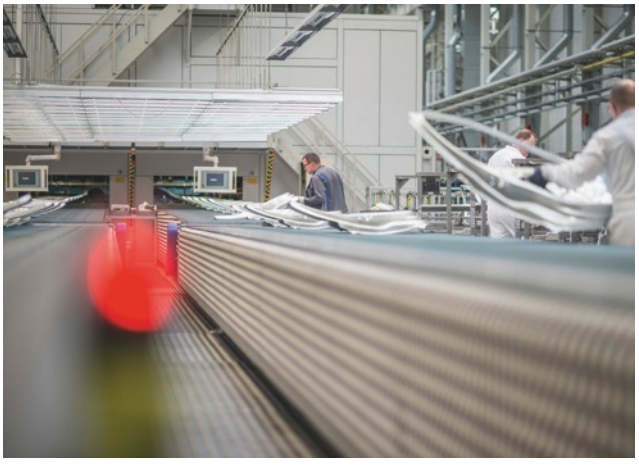
Industrial Communication

New network, new possibilities

Volkswagen gains greater process knowledge and reliability

For a press shop to guarantee a high level of productivity, not only the efficiency of the processes must be taken into account. The control system, too, has to seamlessly communicate with the presses, conveyor systems, and robots. At Volkswagen in Emden, Germany, Siemens implemented a completely new network infrastructure employing its network components as well as PROFINET as the Ethernet standard for the automation.

In automobile manufacturing, the press shop stands at the beginning of the process chain – and that with exceptional dynamics. At Volkswagen's Emden factory, these dynamics come from two press lines running in parallel, which shape the body parts – such as roofs, doors, hoods, trunk lids, or entire side sections. Furthermore, they make all measurement-determining interior parts. At the moment, stamping parts are primarily for the sedan and station wagon versions of the Passat B8 as well as for the Volkswagen CC. Emden also produces platform parts, among other things, that are supplied to external facilities.



At the Volkswagen Emden factory, doors, hoods, trunk lids, or entire side sections of the current Passat B8 are formed on two parallel-running press lines.

"In the past, it seemed much louder here," describes Jörg Lottmann – IT and system administrator at Volkswagen Emden – the happenings: "Today, we are working with a wave-shaped process sequence, where the forming and transport of the parts seamlessly intertwine." This process runs fully automatic in a completely enclosed area. Following the initial cutting of the sheet metal by the blank cutting machine, they are delivered to the loader of the press line via automated guided vehicles (AGVs). There, two unstacking robots ensure that the running conveyor system is supplied with the metal blanks in the proper cycle time. "The forming to the final component takes place in six steps, with each stroke able to handle up to four stampings."

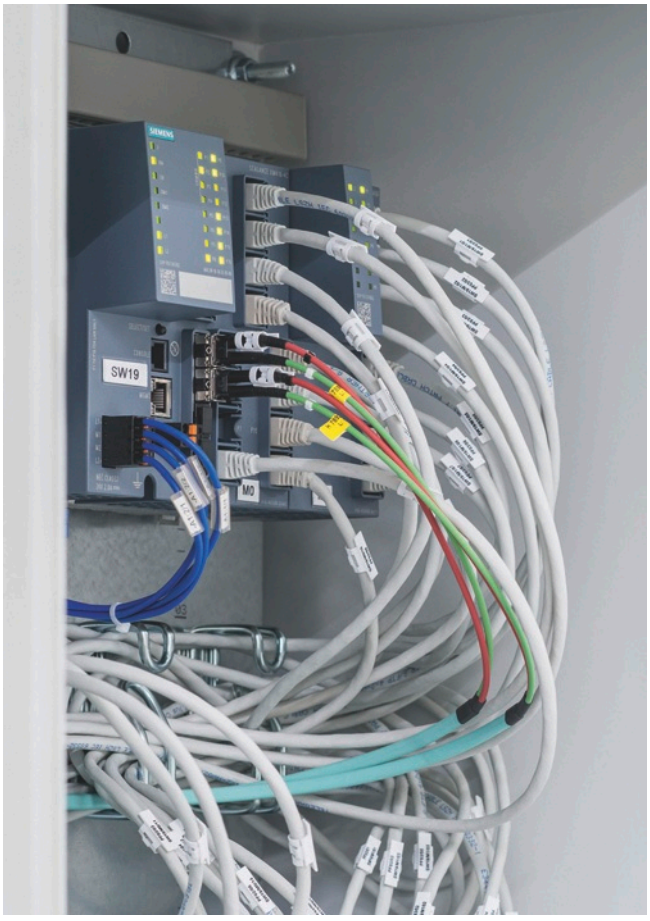
Fascinating is the flowing interaction between presses and transport systems. As soon as a press tool moves upwards, the transfer device grabs the part and positions it under the next press, which at that point is already moving downwards again. These time-saving, seamlessly meshing process steps are what make both press lines so productive.

More safety from the ground up

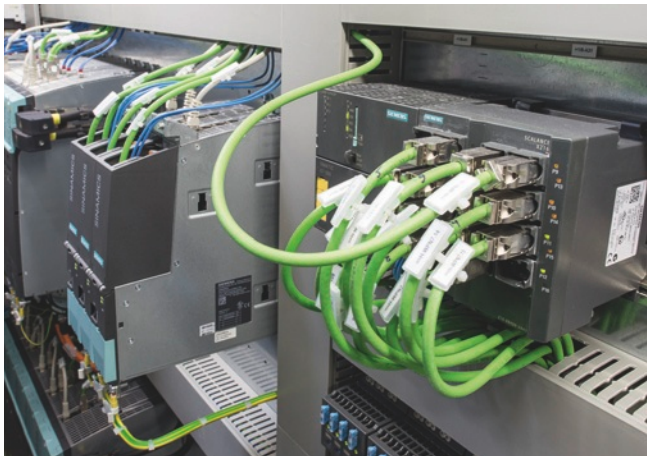
When the retrofit measures at the press lines began three years ago – with the main drives being switched from DC to AC technology – Volkswagen Emden also decided to update the communication system at the same time. The automation system at the Emden factory corresponded to the worldwide Volkswagen standard and was primarily based on SIMATIC S7-300 PLCs, SIMATIC ET 200 IO systems, and SIMOTION motion control systems. Extensive Siemens know-how thus already existed, and the obvious idea was to bring Siemens on board again for the conversion of the network infrastructure.

Redundant network

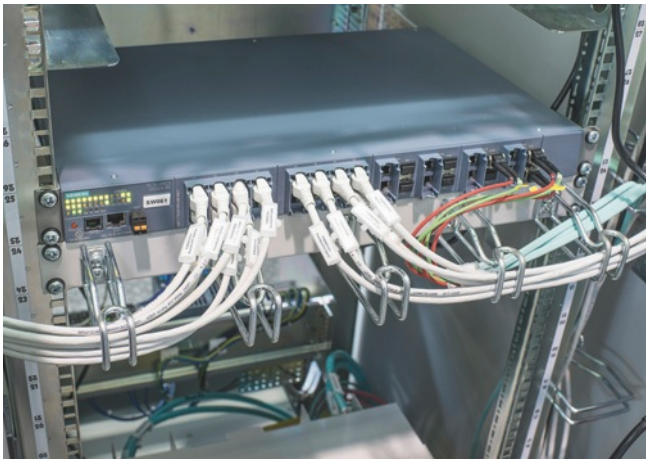
The result was a fundamentally new design of the existing network structure. While the ring-shaped topology in the past only had one ring, the press shop's system now consists of 14 redundantly designed rings. In addition, an industrial backbone based on the SCALANCE XR-500 was set up, which controls all of the data traffic via multiple, likewise redundantly designed, subnets with routing mechanisms.



A total of 95 Scalance X switches form the interfaces of a network structure made up of multiple subnets, e.g., consisting of Scalance XM416-4C ....



... or Scalance X216; here installed in a control cabinet.



The managed switches SCALANCE XR528-6M with device network management from Siemens are connected with a 1 Gbit line.

The advantages of this infrastructure are clear: Failures of individual components only impact subsections of the network. “The danger of the entire process coming to a halt due to interrupted data flow is close to zero,” says Jörg Lottmann looking back to the past experience.

The unrestricted real-time communication via PROFINET is achieved through an end-to-end redundantly designed network consisting of several 100 Mbit/s subnets. In the focus are in total 95 Industrial Ethernet switches of the product family SCALANCE X from Siemens with FastConnect connection technology for RJ45, M12, or fiber optic cables.

The top layer is formed by two Scalance XR528-6M managed Industrial Ethernet switches with diagnostics capability – through Profinet connection to network management systems – as well as an integrated redundancy manager. They are connected to each other with a fast 1 Gbit fiber optic line.

PROFINET for an integrated communication

While the structure of the new network brought greater functional reliability in particular, the change of the entire communication in the press shop to PROFINET is setting the course for the future. PROFINET, the open Ethernet standard for automation, enables a transparent flow of information that extends from the control level to the S7-300 PLCs and ET 200 IO systems to the individual field device.

The key phrase here is “condition monitoring”, which is reflected in the form of a new monitoring server that does nothing but monitor the individual field devices, switches, routers, and drives. These components of the production facility continuously supply an abundance of data that provides information about their operation and general physical condition.

“We are in the process of systematically evaluating this wealth of data and collecting concrete experience about the long-term behavior of the individual components of the system,” explains Lottmann the current situation. “The goal is the development of a system for preventive maintenance, which makes it possible for us to anticipate emerging problems, recognize and eliminate error chains, and largely avoid unplanned system downtimes.”

In Emden, Volkswagen relies on the Siemens condition monitoring system SIPLUS CMS 4000 that runs with X-Tools. SIPLUS CMS X-Tools contains a comprehensive function library for analyzing, diagnosing, and monitoring drives, as well as status indicators for vibration, air consumption, oil consumption, and more.

A wave-shaped, six-step pressing process ensures a precise forming. The individual body panel require up to six dies, each weighing several tons

All from a single source

The implementation of a completely new network solution is of course anything but a trivial task. In particular, if it has to be carried out largely during the ongoing production and only a few time windows with complete plant standstill are available. Volkswagen Emden counted on the collaboration with Siemens, which has proven itself for many years.

The network specialists from Siemens not only took on the entire design and planning of the new network solution, but also the complete implementation on-site. For instance, the routing of the numerous fiber optic and copper lines involved over 100 SCALANCE X switches. At the Emden factory, Volkswagen is employing SCALANCE XR-500 components from Siemens for the first time. The experience gained in Emden was documented and will be incorporated at the other sites.

Jörg Lottmann is satisfied with the new network solution in the stamping area of the Volkswagen Emden factory. “Since the change to the new network structure with SCALANCE switches, there has not been any downtime due to network problems,” states Lottmann.

Automated guided vehicles (AGVs) deliver metal blanks to the loader of the press line, where they are processed further.

Bright prospects for maximum availability

When Volkswagen began three years ago to replace the complete network of the Emden site’s press shop, not only the operational reliability of the entire communication infrastructure was significantly increased. The associated change to PROFINET also set the course for a comprehensive condition monitoring system that makes the whole plant transparent down to each individual sensor, actuator, and drive. For this, Siemens installed a network structure consisting of a routing layer and multiple subnets, for which over 100 SCALANCE X switches were utilized. For the continuous monitoring of the entire system, a special monitoring server was set up, on which the condition monitoring system SIPLUS CMS 4000 is running. The insights gained into the condition and performance of the system can be used, for example, for a targeted preventive maintenance.

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