

Building Block Boom - Full Modularity Along the Line

Smart Automation developed a modular production line with decentralized control for an automotive supplier – using a wide range of products from the Turck portfolio – from sensors to multiprotocol I/O modules, pre-assembled connection technology, LED lights right through to RFID

Modern production plants for industry require increasingly more flexible solutions. Whether it's changing production volumes, dynamic demands placed on the shape and size of the parts to be produced, and the need for rapid changeovers for new products, manufacturers in many industries are faced with the task of efficiently mastering the new challenges. The challenges are also causing machine builders to rethink their approach. Hierarchically structured machines with a central control system had been state of the art for a long time. Today, many requirements can usually be implemented much more efficiently with modular machine and system concepts, which make it possible to decentralize the control of individual modules.

Polish system integrator Smart Automation is a specialist in the automation of industrial processes and has many years of experience in various industries, including the furniture, food, chemical, pharmaceutical or automotive sectors. The company, headquartered in Olsztyn, Poland, relies on innovative approaches for its customer-specific solutions based on Industry 4.0 technologies. Smart Automation developed a production line for valve covers for a tier 1 automotive supplier, based on modular machines and decentralized control. This modular concept enables more flexible and efficient production, allowing a faster response to changing market conditions and customer needs.

Modularity on multiple levels

The development of the modular production line was a particular challenge, because of the customer's need for flexibility on the one hand and its size on the other. Never before had Smart Automation designed and implemented a production line on such a scale. The

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Polish system integrators Smart Automation developed and implemented a new production line for valve covers for a tier-1 automotive supplier. The modular concept of the production line and the decentralized control was able to meet all the customer's requirements. Components from the Turck portfolio, which boasted a host of features including Ethernet multiprotocol functionality and the ARGEE decentralized onboard logic, provided the flexibility and reliability of the dynamic line.



The supplier's extensive production line has a modular design and can therefore be flexibly adapted to future requirements



»Turck's extensive portfolio enabled easy handling of a wide variety of signals, from standard digital and analog signals to RFID, which have been used for both operator logging and process tracking. By working with Turck, we were able to achieve a high level of modularity along the entire line.«

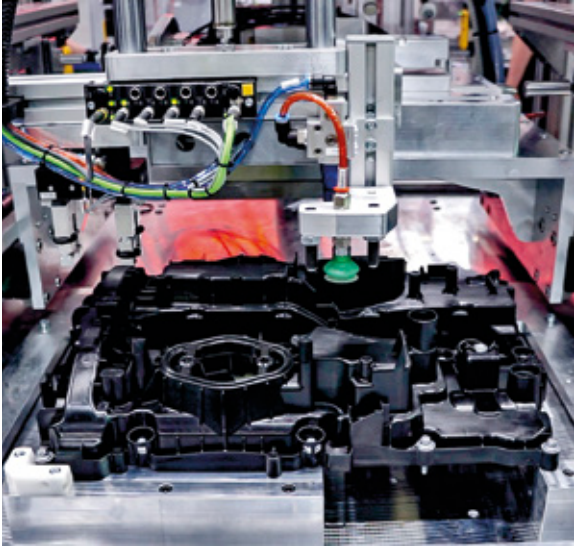
Cezary Zakrzewski | Smart Automation

line combines modules for numerous tasks, including the UV laser printing of data matrix codes for traceability, induction heating, assembly and measurement of aluminum inserts, and robot-based deionization and surface cleaning for rubber sealing. Numerous measurements and leak tests also had to be carried out,

from diameter and roundness to leakage, flow and pressure drop tests. Each workstation consists of three submodules for transport, process and construction. With the modular structure of the workstations, Smart Automation was able to achieve standardization at the design, assembly and programming levels, which



The RFID read/write devices in the line record all goods carriers and thus allow seamless process documentation



Turck's Ethernet multi-protocol I/O modules ensure efficient data communication along the plant

greatly simplifies any changes that may be necessary later in the life cycle of the machine. To implement this highly flexible line, the system integrator chose Turck as its automation partner. "Turck was already involved in the concept phase of the project," recalls Cezary Zakrzewski, sales manager at Smart Automation. "This helped us to discuss the optimal solution together with the customer and facilitated the subsequent phases of project preparation."

Future-proof thanks to standardized device integration

A key requirement for the production line was the use of different Ethernet protocols. With their Ethernet multiprotocol functionality, Turck's BL67 and TBEN series I/O modules were therefore the ideal solution for this project. They combine the three Ethernet protocols Modbus TCP, Ethernet/IP and Profinet in a single device and can be run automatically in any of the three networks. This enabled the number of device variants required to be effectively reduced. The identical planning of machine and plant sections with different Ethernet protocols also allows standardization in the integration of devices with different communication standards. A future reconfiguration of the plant can therefore be implemented without any major effort.

The Turck I/O modules used in the line also support the decentralized control approach with their ARGEE onboard logic. This field logic controller functionality can handle small to medium control tasks without placing any burden on the central controller. This means that when I/O modules are changed or replaced, the program in the central controller does not need to be adapted and the individual modules can be tested independently beforehand. They



therefore provide considerable support for the modular machine design principle, as Zakrzewski confirms: "By working with Turck, we were able to achieve a high level of modularity for the entire production line. As a result, we are able to easily redesign the process as needed."

Flexible process monitoring with RFID

To fully monitor the manufacturing process, Smart Automation has implemented an RFID-based tracking system in which Turck's TBEN-S module and HF read/write devices play a central role. All parameters and measured values of the manufacturing process are recorded for each individual part and stored in a database on a server and in the cloud. This solution makes it possible to flexibly design the manufacturing process, for example by skipping individual steps or reworking certain elements at any time.

Factor 1 sensors with maximum switching distance for all metals

The company chose Turck's uprox series for the inductive sensors required. As factor 1 sensors, the uprox devices detect all metals reliably and with the same switching distance, thus standardizing sensor selection – another benefit in machine design. The uniform use of these sensors enables an easier integration into the plant, since differences in distance and target material do not have to be taken into account. Installation and maintenance are also less complex. This makes the production of the plant more efficient.

Production in view with LED technology

In such a large project, it is very important to display the current status at the various production stages. The company chose the WLS27 programmable LED strip



WLS27 LED line lights display the respective status of a module by color



With their compact design, the TBEN RFID interfaces can be easily mounted almost anywhere

lights from Turck's optical sensor partner Banner Engineering to indicate the status of the machine in each module using different colors. K50 illuminated touch buttons were used for intuitive communication with the user.

Fast and error-proof: pre-assembled cables

Another challenge with the complexity of this line was the connection technology. But Smart Automation has also found a solution for this in Turck's extensive connectivity portfolio. Pre-assembled cables of various lengths were selected during the planning phase and passive hubs were used where necessary. This not only enabled connection errors to be ruled out from the start but made it possible to significantly accelerate assembly and commissioning of the individual modules.

Conclusion

The combination of modular machine building and decentralized control offers multiple benefits with regard to the increasing production requirements in the automotive industry. Thanks to the solutions used, it was possible to reduce the number of operators and the amount of cabling, as well as the time required for

the installation work. This would not have been possible with classic centralized control technology. The modular concept also increases system availability, as only one module needs to be replaced if it fails. Ultimately, the modular design offers easy expansion options for the plant to also meet future requirements. This increases flexibility and ensures long-term cost efficiency. "It was very important to us that manual operations could be easily automated if the customer requested it at a later date," Zakrzewski said. "Turck's extensive portfolio enables easy handling of a wide variety of signals, from standard digital and analog signals to RFID, which have been used for both operator logging and process tracking. By working with Turck, we were able to achieve a high level of modularity along the entire line."

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