Painting in Extremes

A Chinese car manufacturer uses Turck's BL compact stations, connectivity products and proximity switches in its new paint shop

In recent years, China has grown to become the world's most important automotive market next to the USA. This is benefiting Chinese manufacturers. The production complex of a Chinese car manufacturer – and Turck customer – managed to achieve sales of around 2.4 billion euros. The upstream and downstream industrial sectors, such as the supplier industry or logistics also benefit from this economic strength.

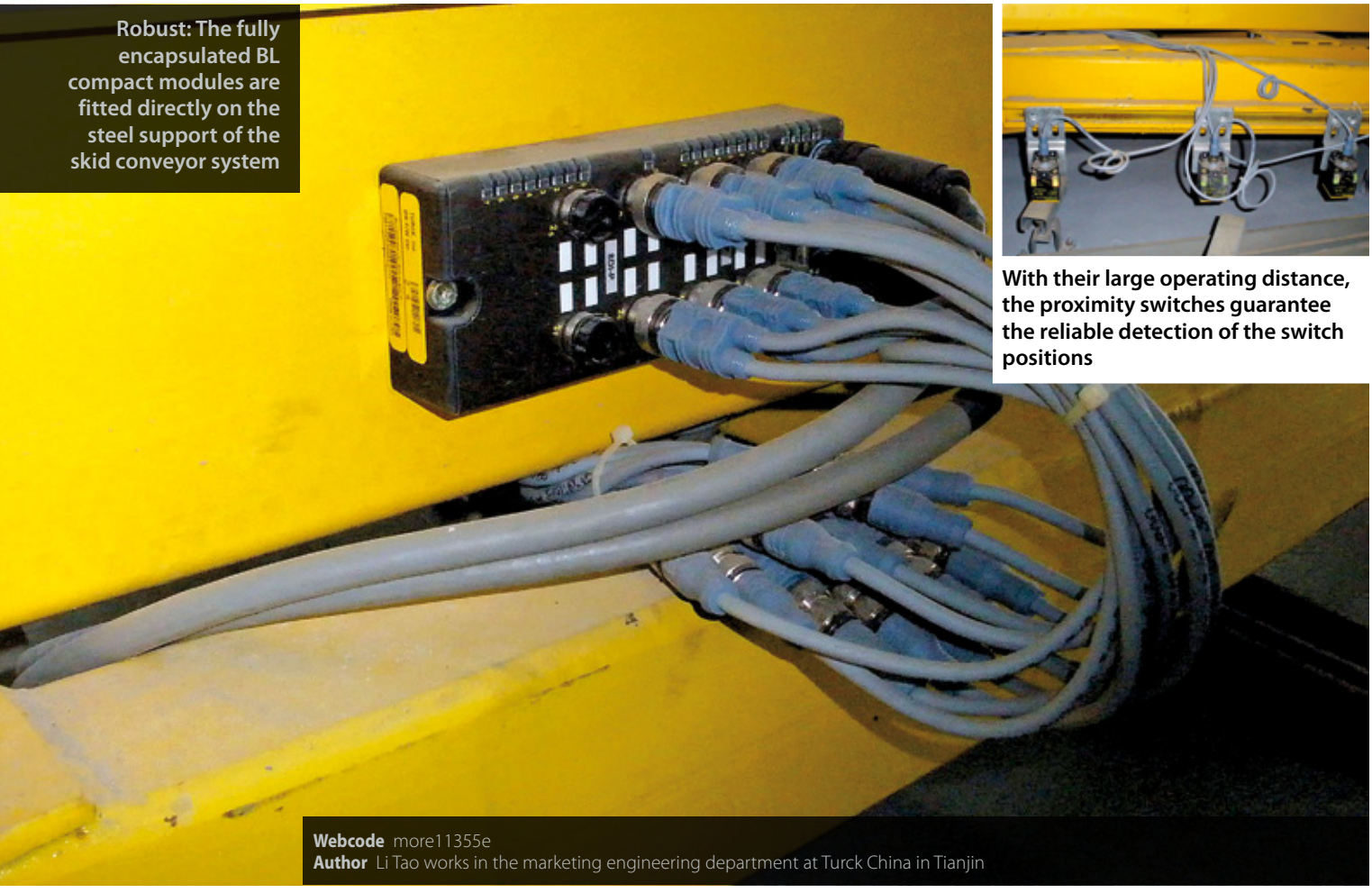
The car manufacturer has belonged to the premier league of the Chinese automotive industry for several years. In order to increase its annual production to 300,000 cars, the manufacturer added a production line to its production plant. The investment for the paint line alone was almost 40 million euros. Today 150,000 car bodies are painted here each year. As well as the construction of the paint shop, the project involved a press shop, the body construction section, as well as an assembly line including engine production. With BL Compact fieldbus stations and connectivity products, Turck ensures that the signals of the field devices of the paint line are sent to the controller reliably and cost effectively.

Harsh ambient conditions in the paint line

The car body parts are first pressed, welded to form the chassis and then painted. Oil and grease are first removed in the paint line at high temperature from the surface of the chassis using high pressure jets. The subsequent cathodic immersion painting process and a phosphating process protect the car body from oxidation and corrosion, i.e. rust. After thorough pre-treatment, the chassis is primed, painted and then dried.

This multi-stage painting process, the high level of automation in the plant, and the different process steps coordinated in the extremely harsh conditions present the automation components used and the integrator with a particular challenge. The restricted space and the combination of factory automation and industrial process requirements made the search for a solution even more difficult.

The central task of the project was to automate the transport system of the paint line. It is based on an



Robust: The fully encapsulated BL compact modules are fitted directly on the steel support of the skid conveyor system

With their large operating distance, the proximity switches guarantee the reliable detection of the switch positions

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automated skid conveyor system. The autonomous and safe control of the skids on the rails requires the use of many position measuring points, sensor signals and motor control signals. The fieldbus stations have to process the corresponding number of inputs and outputs. A central I/O station to collect and process all the inputs of the plant would have been more expensive due to the cabling involved. Troubleshooting in the event of a fault can also be very time consuming, depending on the type of central I/O station used.

Quick read

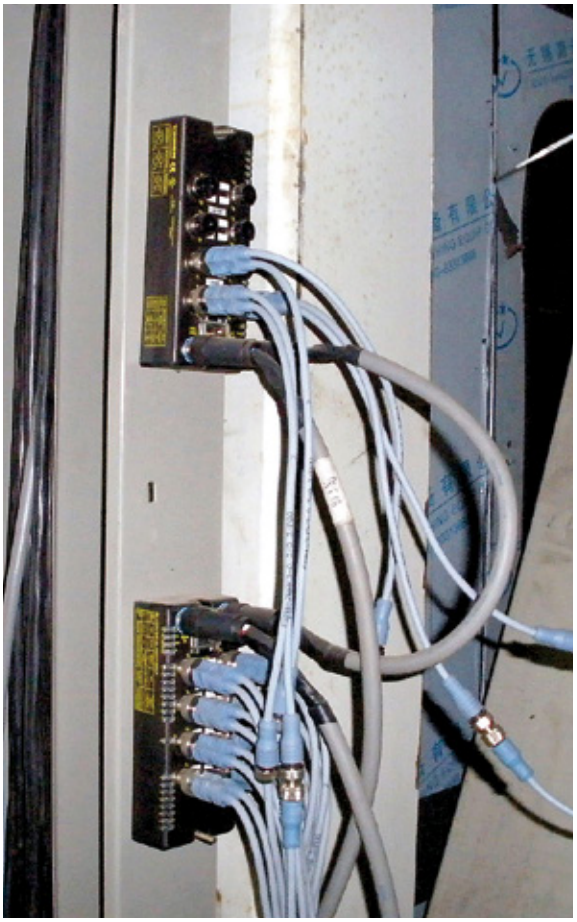
Paint processes present particularly demanding requirements on automation components. Turck's IP67 BL compact fieldbus stations withstand all the harsh environmental conditions in the plant of a Chinese car manufacturer and transfer the switch signals of the skid conveyor system cost-effectively to the controller. The matching connectivity products and inductive proximity switches from Turck round off the robust solution.

Open standard

The customer's specifications included the alignment and control of the paint robot as well as the flexible integration of the conveyor belt systems – and all this while maintaining a constant level of production efficiency in full operation. The responsible engineers wanted an automation system that was based on an open protocol and which could be implemented with standard cabling.

It was decided to use DeviceNet. This fieldbus standard is an open protocol that provides the level flexibility to optimally meet the requirements of the paint shop. Due to the size of the plant, the installation of compact I/O stations in the field was recommended. This made it unnecessary for every single sensor cable to be routed through the entire plant. Turck's BL compact stations are installed instead, which route all inputs further via the bus cable to the next I/O station, and then on to the master. Turck's BL compact DeviceNet modules with protection to IP67 were able to fully meet the requirements of the application. The compact modules are fitted on the steel support of the transport system along the entire length of the paint line – also directly next to the motor controller which coordinates the entire transport of the skids.

The customer uses BL compact stations with 16 digital inputs (BL CDN-8M12S-8DI-P) and the smaller version with eight digital inputs (BLCDN-4M12S-8DI-PD). They form the backbone of the entire bus system in the paint line. The 16 switch inputs are distributed to only eight M12 female connectors in the highly compact modules. One female connector routes two inputs – the version with four connectors being sufficient for eight inputs.



The Y junction cables carry two signals via an M12 male connector to the input to the bus

Extremely robust

The compact stations are fully encapsulated in epoxy resin in order to achieve their tremendously robust design and IP69K protection. The thermal performance of the block modules is also impressive: They can withstand temperatures from -40 to +70 °C. Despite the high temperatures, the paint line does not effect the modules. The extensive diagnostic functions of the I/O stations enable the customer to increase availability and the required level of reliability. LEDs on the module provide workers with reliable status indication of the inputs locally in the field. The matching Y junction cables as well as the bus cable likewise come from the Turck portfolio.

Turck offers BL compact modules for analogsignals, switch signals for connecting RFID read/write heads or other signal types. Individual BL compact stations were fitted with signal processors to meet the customer's special application requirements in order to save costs on stations and cables. The system is perfectly matched to the application, is easy to maintain, and also includes proximity switches from the Turck portfolio as well as the fieldbus stations and connectivity products.

The customer uses the Turck proximity switches for position monitoring points in the skid rail system. With their large operating distance, they guarantee the reliable detection of the switch positions. The proximity switches have the same EMC performance as the fieldbus stations. A satisfied customer and a fault-free production are the result of the intensive cooperation between the car manufacturer in China with its long-standing partner Turck. ■