Taking the Heat

Turck's RFID system ensures correct positioning of the charging carriage in the dust-laden heat of a Chinese carbide production plant

Hot location: The correct position of the charging carriage is reliably detected with RFID, eliminating the problem of slippage

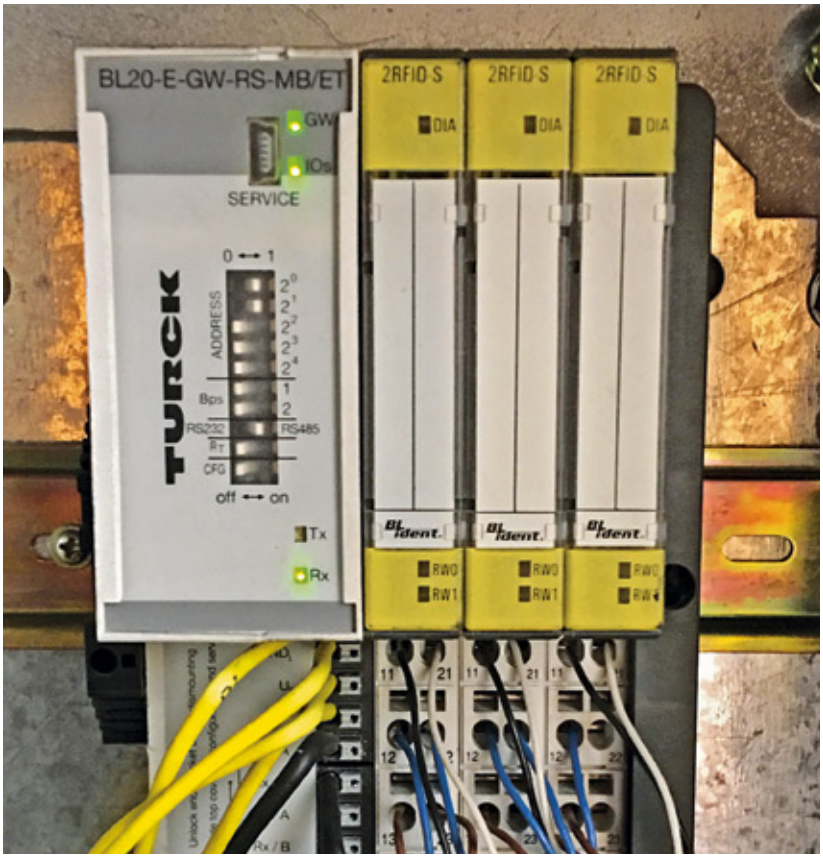
The most important materials required for the manufacture of calcium carbide are coke and lime. They are converted in arc furnaces at high temperatures into carbide and carbon monoxide. Carbide production is a cyclical process. After the burnt carbide is removed from the furnace it is reheated and fed with coke and lime. The temperature is then further increased until the optimum reaction temperature is reached and maintained. During the reaction, the carbon contained in the coke and the calcium of the raw lime chemically combine and produce carbide.

Alignment of the charging carriage error prone

A Chinese carbide producer urgently had to optimize its production process. A rail-guided carriage for feeding the raw material in the carbide furnace has to be correctly aligned to the charging door. With the previous solution, the position was measured using an encoder. However, the frequent acceleration, deceleration and braking of the carriage can cause this to slip a little. The slippage distance is not measured by the encoder, so that the encoder's position data is no longer correct. This resulted in the carriage no longer being aligned to the charging door.

In this case, personnel are required to make a manual intervention. However, the area surrounding the charging door is very hot since the furnace is situated directly beneath it. It is a dust laden, highly flammable and explosive environment. The severe conditions present in this area mean that personnel have to wear protective equipment and are exposed to a considerable safety risk. All in all, not an environment in which a person would wish to work frequently.

The plant owner therefore chose an RFID solution for positioning the charging carriage. The solution essentially consists of three tags fitted on the charging carriage: one at the opening of the carriage, and one each at a specific distance in front of and behind the opening in order to indicate the position. A read/write head is positioned on the rail at the position of every charging door. If the charging carriage moves on the rail, the tags on either side of the carriage opening pass the read/write head at the charging door. The read head reads the information from the tags and sends a feedback signal to the controller, which then slows down the charging carriage. If the tag on the carriage opening is opposite the read/write head at the charging door, the read head outputs the information from the tag. After the controller has received the information, the charging carriage is stopped and the material fed in. This is executed in fractions of a second and the correct position of the carriage is guaranteed by the



The BL20 gateway with an RS485 connection provides communication to the controller, while the RFID-S slice module enables simple connection without any programming

With degree of protection IP67, an extended temperature range and large read/write ranges, the TN-80 readers are optimally designed for use on the hot charging line

reliable RFID positioning system. Any manual corrections and the associated inconvenience are thus considerably reduced.

Solution concept with BL ident

As the customer uses a Supcon process control system, an RS485 interface is already provided at the installation site. Turck therefore supplied a BL20 fieldbus gateway which supports RS 232/RS485. As the tags are only used for indicating the position, the data requirement is very small. An RFID-S module, which can be integrated easily, is perfectly sufficient. The customer requires no programming in the PLC for S-Interface (S stands for simple). The RFID interfaces can be used as conventional inputs. As the installation site is exposed to considerable dust, the user had to install the gateway and the modules in a fire-proof cabinet. The read/write heads with degree of protection IP67 are suitable for use at temperatures from -25 to +70 °C and can be fitted directly at the installation site. The tags are made from epoxy resin and are extremely robust. Even if the surface is scratched or dirty, its function is not impaired.

Conclusion

Through the use of Turck's BL ident RFID system, the operator could increase the production capacity of the plant and make considerable improvements in terms of energy savings, reduced consumption and safety at the same time. As a result of the even more stringent requirements placed on the precise positioning, the customer also intends to use the RFID solution in other parts of the production plant. The RFID solution offers a wide scope for development in this field.

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The position of the charging carriage in a Chinese production plant was previously determined by an encoder on the carriage wheel. However, this information became increasingly incorrect due to slippage during acceleration and braking, making it necessary to carry out manual position corrections. Today, the manufacturer measures the position using RFID tags on the carriage and a read/write head on the transport rail. This enables the carriage to be reliably positioned in front of the charging door. Neither the IP67 read/write head nor the robust tags are damaged by the dust and heat from the production process. Today the plant operates with greater energy and consumption efficiency, while employees work in a safer environment.