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Many automobile manufacturers are currently evaluating the possibilities of continuous identification

Total Transparency

How the automotive industry benefits from the use of RFID technology – from the supplier to the delivery

Auto-ID procedures for the automatic identification of components, workpiece carriers or tools have been used in manufacturing for a long time. For decades, manufacturers have used optical procedures, like barcodes or data-matrix-codes for contactless identification, but the focus now lies on wireless identification technology RFID (radio frequency identification).

One of the main advantages of RFID: As opposed to the optical Auto-ID procedures, the user can read the authenticity features and also rewrite them to a data carrier. Data carriers (also known as tags) accompany the part through the whole production cycle or quality test; relevant data is written automatically onto the tag and read at the end of the production cycle. Together, with the finished product, there is also a quality management protocol available that shows all production steps of the product, as well as the quality test.

Another benefit of RFID technology is that the information transfer by electromagnetically radio waves is less susceptible to environmental influences. While the externally applied, printed bar codes become unusable through high temperatures, dirt or moisture, the special RFID data carriers and robust scanners allow the use of RFID systems under very rough conditions or through nontransparent media, for example in painting plants or kilns.

Rethinking in the automotive industry

The triumphal procession of RFID for the automobile production started about 20 years ago. For more than five years, Turck has been part of it with its modular RFID-system, BL ident, that was developed in close cooperation with automobile manufacturers at that time. One of the first BL-ident data carriers was a high temperature tag and could resist 210 °C without problems. This tag is attachable to a carriage – so called skid – that transports a vehicle body through production. That is how the path of the vehicle can be tracked from shelling to the final assembly, as long as the transport system stays the same.

This procedure is a typical example for the previous use of RFID-technology in the automobile production: Mostly monorail conveyors, skids or other carriers for the vehicle body and larger components, like engines or axles, are identified. Compared to optical measuring, this procedure increased the performance remarkably, but with further development of data carriers and combined read/write heads, the potential has increased even more. Nearly all automobile manufacturers think about equipping the vehicle bodies or even the single components with a tag directly instead of equipping the transport system. This has the additional advan-



Turck's modular RFID system, BL ident, can operate interference free HF and high transmission range UHF combined read/write heads at the same time

tage that control about the installed components is possible directly after the assembly. Also, assignment problems because of a change of the transport system are ruled out.

If a data carrier is firmly connected to the vehicle body at the beginning of the production process, the body can be identified safely at any time - from shelling to painting and the final assembly to the delivery. One of the pioneers in this field is Volvo. The car manufacturer has used vehicle body identification in its plant in Gent in Belgium for about three years. The RFID-tag is installed to the front side member of the vehicle at the beginning of the production process. Through the whole process, including the painting where tempera-

▶ Quick read

For more than two decades, the automotive industry has used RFID solutions, mainly for the identification of their vehicle body transport systems. Thanks to improved technology and the automotive knowledge of the RFID specialist Turck, the industry today considers equipping every single vehicle body and component with data carriers, to benefit from a continuous identification and quality control through the whole production process.



At Volvo in Gent, a robust plastic tag is attached to the side member of the vehicle body directly at the beginning of the shelling

tures up 200 °C can cause problems to the electronics of most data carriers, the tag stays on the vehicle. Most car manufacturers paint their vehicle bodies three to five times and expose them correspondingly frequent to the high temperatures. The electronics of conventional data carriers often break during this procedure. With a few technical tricks, Turck is able to deliver disposable data carriers that are able to resist a limited amount of high-temperature phases and therefore can stay on the vehicle all the time. Essentially it is only a question of the durability of the connection between the ICs and the antenna coil under the influence of high temperature. Classical solder connections are unsuitable. Instead, technologies like friction welding are used to guarantee a lasting stability. Alternatively, an inductive coupling can be used instead of the direct connection, although it needs more energy during the transmission.

Vehicle body identification demands UHF-system

When transport systems are equipped with tags, there are always defined, relatively small distances between the data carriers and the combined read/write heads, so that it is guaranteed that the maximum transmission range is kept. If the tag is attached to the vehicle body directly, the range is inevitably larger – it mostly varies between 30 and 100 cm. For this reason, HF-systems, which are working within the frequency range of 13.56 MHz, can't be used any longer. This frequency range is very popular because it guarantees failure free radio communication and a high read-write speed, so that the tags can be read very quickly while driving by. Since the transmission range is limited to 20 cm, another solution is needed for the vehicle body identification.

The solution is to find within the UHF-range of 865-868 MHz, that allows ranges up to three meters. Unfortunately, there is also the disadvantage that the installation is a lot more complex because of the high range. Through reflections, it can overreach the signals, so that the combined read/write heads read more than they should. Furthermore, there are often problems when an UHF-tag has to be read while standing upright, because interferences can lead to zero points in the transmission field. This is a challenge, because in the processes where the previously used barcodes are replaced by RFID, there is a process-related stop at the reading station because the barcodes can't be read while driving by. To be able to read UHF-systems while standing upright, Turck developed combined read/write heads with two antennas that change their polarization direction and simulate a moving field. The staff of Volvo in Gent works with this UHF-technology without any problems.

From the supplier to the final assembly

The fact that UHF-challenges can be mastered and carry considerably lower data carrier prices – a temperature resistant design costs about 50 cent today – convinced



At exhibitions, Turck demonstrates the feasibility of gen



Until today, usually the transport systems are identified by RFID data carriers, like in this example the transport hangers of the supplier Tower Automotive

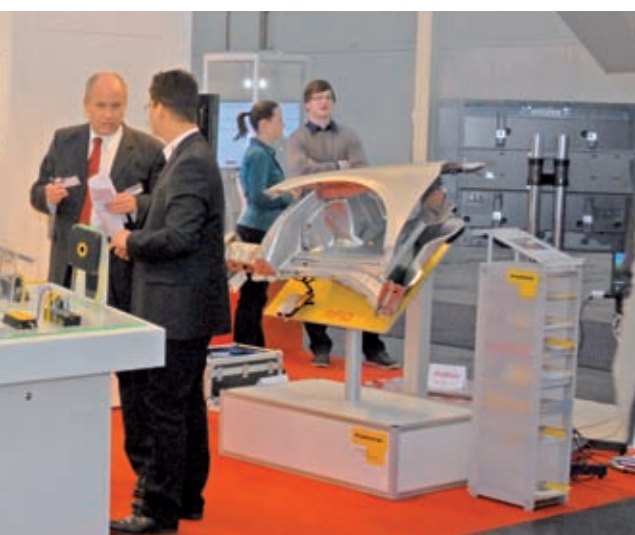
many automobile manufacturers to equip the coming model ranges with data carriers on the vehicle bodies, which means that they can be identified throughout the whole process, from shelling to painting. But this is not all: In further projects where Turck is involved, the possibilities are tested to also optimize the delivered parts of the suppliers with RFID and thereby optimize the whole production process up to the final assembly with the wireless identification.

At the moment, the delivered single components are still identified with barcodes, but they shall be equipped increasingly with data carriers in the future.

With RFID, these components can be identified without problems. Furthermore, RFID lessens the risk that wrong components are installed. An example: The barcode of an airbag is read before the installation. Afterwards it can't be read any longer because it is either covered by the vehicle body or was removed from the component. Based on the bill of materials it becomes apparent during the final inspection, that the wrong airbag was installed. Now an expensive rework is necessary. With RFID it would be possible to install a scanning station directly after the attachment mounting station. This scanning station reads the ID of the airbag and alarms the staff if something is wrong.

Conclusion

Turck has shown in numerous tests with suppliers and manufacturers that it makes sense to also equip the supplier components, like airbags, interior trim, seats or engines, with the powerful RFID technology to make them an efficient part of the production process. At innovation forums and events during fairs and conferences for the automotive industry, the automation specialists will present how the industry is able to benefit from the general use of RFID technology and the BL ident system. Most recently, Turck introduced its concept at the AutoID/RFID Solutions Park at the CeBIT. The next possibility to gather information about the benefits of RFID for the automotive industry will be at the 22. Automobil-Forum in Stuttgart at the 24th and 25th of May 2011, which takes place at the Forum of the Schlosspark in Ludwigsburg. ■



General wireless identification for the automotive industry