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Efficiency All Along the Line

How UHF-RFID technology optimizes the process and product quality in the production of automotive exterior parts

A renowned manufacturer of automotive exterior parts is relying on new RFID technology in the UHF range for the production and distribution of bumpers and sills. This facilitates the coordination and optimization of all workflows along the entire value chain, thereby consolidating its top position in terms of process and product quality. The absolutely successful introduction of RFID in this area has already resulted in multiple follow-up projects for the globally operating group.

The production of automotive exterior parts has a long tradition in the Franconian town of Pappenheim. In 1975, the world's first plastic bumper was manufactured in the plant now owned by the Faurecia group. Since then, the product portfolio was expanded and state-of-the-art production technology has been introduced. The roll-out of ultra-high frequency RFID (radio frequency identification) technology in further exterior plants of the globally operating manufacturer represents the latest innovation step. The target lies in improving the efficiency and transparency of the manifold processes along the value chain also in this area and in further advancing the products' quality.

Scalable, comfortable, cost-optimized

Prior to the project responsible executives in the production and IT-departments carried out a benchmark for the selection of a so-called middleware system. They tested special hardware and software for the connection of different identification and registration systems to the ERP (Enterprise Resource Planning) level. This resulted in the decision in favor of the SIMATIC RF600 UHF RFID system by Siemens and the "Tagpilot" middleware by Tagnology Systems GmbH (Graz/Frankfurt). Tagnology represents a certified Siemens Solution Partner who decisively contributed to the successful implementation of the RFID technology.

Readers of the new generation (RF650R) as well as antennas which are adjustable to the various applications both in terms of performance and size (RF620A, RF640A and RF660A) were the common first choice for the Pappenheim project. Besides global availability, high industrial standard (up to degree of protection IP65) and scalability, also the comfortable options regarding the system's integration, commissioning and maintenance were decisive factors. For example, the preferred readers can be rapidly and easily integrated in existing IT environments via RJ45 Ethernet interface and up to four – using a splitter even up to eight – different antennas can be connected to this assembly. This scalability allows for the very cost-efficient solution of both simple and complex tasks.

Instead of via handheld scanners, the parts are automatically detected during visual inspection in a contactless manner by means of RFID antennas (RF620A/RF640A) and the corresponding test screens are visualized.

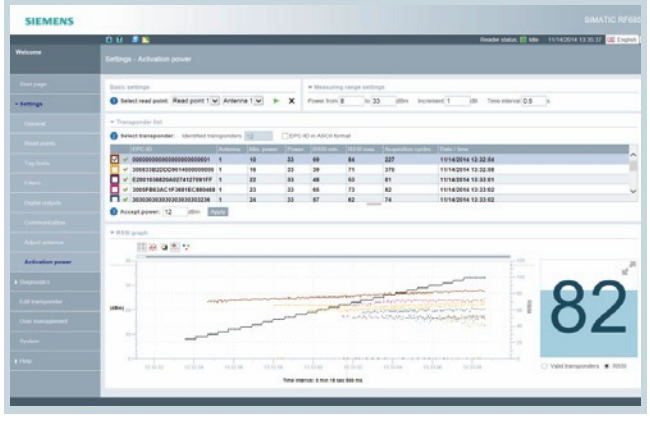
Also the application of Profinet-capable readers (RF680R/RF685R) is intended for future applications. This does away with separate communication modules, which further eases integration in the production environment. For example, read commands/results can be transferred directly and without middleware, e.g. from the control system to the reader in the field or to one or more subordinate readers via a SIMATIC controller. The Profinet readers can be configured and diagnosed during ongoing operation via a second Ethernet interface.

Easy handling via browser

All new SIMATIC readers make additional software for the commissioning, optimization and diagnostics of reading stations unnecessary as all required tools (setup tools) a re implemented in the device firmware for easy call-up via web browser. Constant software updates, for example when new devices with extended functions are added are rendered unnecessary.

Amongst others, the RSSI value (Received Signal Strength Indicator), i.e. the "activation power" of each transponder in the sensing range, can be determined and reduced to the required level via the push of a button. Both the current as well as the best attained signal strength are shown on the web browser in the form of a bar chart. Using the setup tools which can be parameterized via web interface, reading stations can also be rapidly and comfortably set up under difficult local conditions as well as under the influence of changing reflections. Onboard diagnostics during ongoing operation facilitate the settings' checking and adjustment, which allows for rapid responding to changed reader alignment or conditions in a reading station's environment.

The devices support access across multiple user levels, for example for plant operators, set-up and service staff. Subject to corresponding authorization, the assistants also support remote access via the network, which helps to bridge long distances and minimize downtimes. An LED row on the devices which is clearly detectable even from a great distance essentially supports the set-up of reading stations within a machine without laptop or network access. These LEDs indicate the RSSI value of the responding transponder in the form of a "thermometer". This considerably eases set-up and diagnostics and results in significant time savings.



Easy handling via web browser: In the "Activation Power" menu of the reader's web interface, the parameters for a specific target transponder can be determined and parameterized without additional software.

Transparency and efficiency from injection molding to the warehouse

Faurecia initially introduced the new technology to its production area for the manufacturing of injection-molded bumpers and side sills for a German premium automotive manufacturer. In addition to the software and its integration in various infrastructures, the Solution Partner Tagnology also realized the entire steel construction. This particularly refers to so-called RFID gates, which are tailored gates on which the manufactured parts are detected in bulk when passing through on forklift trucks.

Using SIMATIC RF630L labels, Faurecia Automotive Exteriors traces injection-molded bumpers on their way through the process, provides the parts with quality features and detects these in the ERP system.

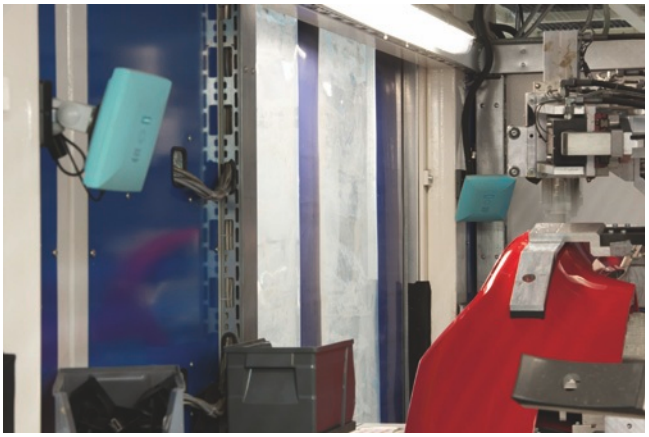
Starting with the injection-molded parts' removal from the machines, RFID now accompanies the entire manufacturing and distribution process in the production area. For this purpose, the corresponding RFID label RF630L is attached to a defined position on the parts' interior. The Tagpilot middleware acts as the connecting link between the RFID hardware (and other detection systems if required) and the ERP level. Each label features a unique identification number (UID) which allows for the parts' reliable contactless identification in the further production process. Component-specific work contents are called up and initiated from a central database via UID. Absolved steps and the quality status (OK/NOK), including information regarding the type and position of errors, are written back and "enclosed" with every single part, so to speak. The labeled bumpers or side sills are deposited in transport frames, electronically assigned to these cradles, stored intermediately and transported.

The parts' control on the skids is a further incorporated application. The system checks the bumpers' allocation to the paintwork station via RFID. This ensures the reliable prevention of component and painting robot damage as well as resulting downtimes, which was hitherto impossible in this quality grade. The workflow for the components' robotized flame treatment prior to painting is comparable. The broad portfolio of various applications with tried-and-tested RFID transponders (labels/tags) by Siemens also comprises a (chemically as well as thermally) suitable and proven version for this application. The selected RF630L adhesive labels are suited for application under increased temperatures up to 90°C and support multiple painting processes. Siemens also develops and tests customized versions for special requirements.

Based on the RFID labels, the system also checks the bumpers' positions on the paint skids, which helps to prevent damage to painting robots and parts.

Moreover, also the handling process for polishing and quality assessment by a plant worker is made easier and more comfortable by RFID technology. Beforehand, the bumpers had to be detected and identified via a handheld scanner, which could result in damage caused by the scanner as the barcode labels were not optimally positioned for this purpose in the parts' interior. Today, the RFID label is automatically detected via antenna when the parts are placed on the rotatable test rigs and the plant worker is immediately shown the corresponding assessment matrix on an industrial-standard tablet. The system has access to all hitherto detected quality data and supports the plant worker by indicating potential NOK criteria, as a result of which certain (critical) quality features can be particularly focused. This eases and accelerates also this process step.

The bumpers in a robot punching station in the final assembly area are automatically detected via RFID in a similar manner, albeit from a greater (safer) distance. Also here, the executed work steps and corresponding quality are transferred from the robot controller to the quality assurance system via UID and "enclosed" with the parts. This way, the system also detects whether a required punching step has already been implemented in order to prevent renewed processing and resulting damage/quality defects.



Also in the robotized punching, the parts are detected via RFID, relevant worksteps are initiated and absolved steps are indicated via the unique identification number (UID).

Intelligent arrangement and evaluation for maximum process reliability

Following this final step, the readily processed bumpers are deposited on customer transport cradles and transported to the interim warehouse with a forklift truck. For the (process-)reliable detection of outgoing production components, a total of eight RF660A RFID antenna are mounted on each hall gate; respectively four of which are arranged diagonally inwardly and outwardly. The reading stations of one side (left/right) are assigned to a reader on this side and the read results are transferred to the middleware via Industrial Ethernet for allocation and logical evaluation. This makes long cables and laborious measures for cable routing on the gates unnecessary. Not only does this arrangement of reading stations and readers allow for driving direction detection when passing through, but the smart evaluation of signal strengths furthermore prevents the detection of components deposited in a gate's environment. When passing the gate, only the data of the currently moved components are thus considered and automatically transferred to the ERP system.

Four small RF620A antennas are installed on each gate in order to detect sills labeled on different positions (top/bottom).

This is also the case with so-called "sill gates", which were set up by Tagnology for the detection of various side sills during transfer/pick-up by forklift trucks. For space reasons, four small RF620A antennas are installed on each gate in order to detect sills labeled on different positions (top/bottom). Thanks to the application of antenna splitters, multiple antennas assigned to the same task can be operated on one reader, allowing for full exploitation of their resources, which in turn minimizes the number of devices and corresponding system costs.

On so-called "sill gates", two antennas are connected to a reader via a splitter for space and cost reasons. Two antennas each detect the labels attached to the sills' top or bottom.

High-end process and product quality

Together with the "Tagpilot" middleware by Tagnology, the high-performance SIMATIC RFID technology by Siemens thus coordinates the workflows at Faurecia Automotive Exteriors along the entire value chain. All in all, its introduction at the beginning of 2015 has resulted in a significant improvement of both processes and product quality. Staff members have been benefiting from advantages in terms of faster and more reliable task completion.

Project manager Mike Mülhausen is excited with the manifold options and is already in the process of implementing further RFID projects within the Faurecia group. Container management in the Pappenheim location is for example realized on the basis of RFID for shipping control in assembly centers and for compliance with specific maintenance cycles. Moreover, the labeled bumpers and sills also facilitate the improvement of cross-plant process steps between supplier and user and allow for the development of optimization potentials. "Word of the manifold options of RFID technology has long since gotten around not only to the group's top management level, but has also spread throughout the automotive sector via joint committee work", summarizes Mike Mülhausen. As a result, he was able to rely on full internal support and there was no manufacturer who has not yet made an inquiry on the subject.

Faurecia – global partner of leading automotive manufacturers worldwide

Since the merger of the Bertrand Faure and Ecia companies in 1999, Faurecia has developed into one of the world's major automotive suppliers with its four business divisions of Emission Control, Automotive Seating, Interior Systems and Automotive Exteriors.

Faurecia Automotive Exteriors is the European market leader and offers a manifold product portfolio, including:

- Painted bodywork components such as bumpers, side sills, hatchbacks, fenders and spoilers
- Front-end modules, including technical or structural support element, electric fans
- Composite structural components such as vehicle underbodies, roof structures, rear vehicle areas and crash management systems

Security information

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