Project „RFID-Overmold": Development of a production technique for a fully automated integration of RFID technology into plastic parts of thermoplastic and duroplastic material

In times of industry 4.0, in which the cross-linking of the manufacturing gains in importance, technologies with which produced parts can be traced and additional information can be allocated to the products, are of enormous economic and technological interest. Since the RFID (radio frequency identification) technology enables all this, it is currently in the focus of the applicants. At the current state of the art the RFID transponder are integrated manually or at the most semi-automatically into the product or they are applied on the products. Because of this, the product costs reach a level which makes the technology uneconomical for one-time products and low-priced mass products. Moreover, the RFID tags are exposed to all the environmental conditions and therefore not suitable for a long-term usage in almost all applications. The development of an innovative technique for a fully automated integration of RFID tags into plastic mass products should find a remedy, reduce the production costs and guarantee a media dense encapsulation of the RFID transponder and thereby their protection from external influences and abrasion.
For the technical integration of a radio frequency identification tags (short: RFID tag) in parts made of thermoplastic and duroplastic materials a new machine and process technique was developed in the line of the projected funded by the BMWi (federal ministry of economy and energy). The challenge lies in the fixing method of the tags in the cavity. The RFID transponder are filigree parts made of thin wires and sensitive semiconductor elements, which easily could be damaged by the high pressures, temperatures and shear stresses during the injection molding process.
Using a demonstrator tool, which was constructed and built for the project, different fixing methods were evaluated. Moreover, the RFID tags were adapted to the conditions during the injection molding process concerning technical, geometrical and mechanical aspects. To be able to integrate the filigree tags also in high viscos thermoplastic materials under conservation of the functionality, a carrier module was developed stabilizing the RFID tag. Furthermore, this module enables a simpler automated supply of the transponders.
The results developed during the project concerning RFID tag conception, design of the injection molding tool and the process steps necessary for the production of the plastic parts will be summarized in construction references.

RFID tag, 3D model of demonstrator part, molded part with integrated RFID tag, RFID tag in carrier module (left to right)

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Gefördert durch:
ZIM Zentrales Innovationsprogramm Mittelstand
Bundesministerium für Wirtschaft und Energie
aufgrund eines Beschlusses des Deutschen Bundestages

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