

## KUKA Aerospace Solutions

### Innovations award for FRP welding process

At the Würzburg Automotive Summit, the Augsburg-based team of engineers from KUKA Systems and its partners in the BMBF-funded project INDUFLEX received an innovations award from the Network of Automotive Excellence (NoAE) in the category "CO<sup>2</sup> reduction, lightweight construction and new materials" for the development of a new, highly flexible, inductive heating welding process for fiber-reinforced plastics (FRP). The cross-company initiative presented this award together with the trade journal "Automobilindustrie" for solutions that support reduced fuel consumption, and thus reduced CO<sup>2</sup> emissions, as a significant target for the automotive industry. What is innovative about this new KUKA development that is already available as a prototype? "The new technology allows the welding of spatially complex fiber-reinforced plastic components," explains Hans-Richard Tradt, coordinator of the composite research project and process development group leader at KUKA Systems. It is also characterized by high flexibility, low capital outlay and subsequent separability of the joined parts. If different parts are to be joined, only the robot programming and the fixture need to be modified – without the need for complicated and expensive design and manufacture of a new welding tool.

#### New joining process

"Furthermore, the use of industrial robots and handling devices ensures a high quality level that is also reproducible," affirms Thomas Kugler, process engineer at KUKA Systems. "Components made of thermoplastic fiber-reinforced plastics (FRP) are increasingly replacing existing metallic components," adds Kugler. While these FRP components can be manufactured using a variety of different processes, the first step is generally production of the mold, and the molds are joined in a second step. The joining processes used until now have either required long process cycle times, or they are not suitable for the materials, or they suffer from low production flexibility. In the new FRP welding process, a joining process has been developed that allows the welding of fiber-reinforced plastic composites with three dimensional seams. The heat required for the welding is applied to the joining zone by means of an alternating magnetic field. The process steps required for generating the weld seam have been integrated into an innovative welding head that is guided by a KR 125. This makes it possible to implement complex welding paths for the manufacture of curved structures. At the end of the product life cycle, simple separation of the joined components is possible – a major requirement for efficient and environmentally-friendly disposal. The induction welding principle that is used here is characterized by particularly short process times and high variability of the joined components.

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