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Title:	CompositesReloaded – Collaborative robots and flexible automation for composites production
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In the wake of demands for increasing energy efficiency, lightweight construction solutions in particular are playing a key role. Such solutions are already regularly used in the automotive and aerospace industries. However, there is also a steadily increasing demand in other sectors such as mechanical engineering, energy generation or sports.

Fibre reinforced plastics (FRP) are the most promising alternative to traditional materials such as metal, aluminium or wood, especially when it comes to lightweight construction. They are characterised by a low weight combined with outstanding mechanical properties.

However, the production of FRP is under constant pressure from low-wage regions. Especially the production of small series of medium to high complexity is mainly done in labour-intensive processes in Asia. Large corporations such as BMW or Airbus have found their own ways to automate production with custom-built equipment. However, these are extremely costly and financially unsustainable for small and medium-sized enterprises (SMEs). This is due to the fact that the core competence and competitive advantage of SMEs is not the production of large series, but rather the great flexibility in production.

Aim of the project

The aim of the CompositesReloaded project is to enable SMEs in the FRP industry to flexibly automate their processes by introducing collaborative robots and semi-automated manufacturing cells.

Results

Within the framework of the research project, flexible automation solutions and collaborating robots (so-called Cobots) for the FRP industry were investigated in cooperation with the Belgian research partner Sirris and first basic findings for industrial application were collected.

The main results include the assessment and recommendation of automation solutions for the production of FRP in terms of cost, complexity, implementation effort, flexibility and suitability for SMEs. For this purpose, production strategies and cost accounting tools were developed to identify suitable automation solutions.

Furthermore, automation guidelines have been developed to increase the productivity of SMEs producing FRP components. For the first time, lightweight grippers for handling textiles and textile semi-finished products with Cobots were developed. The automation tools as well as grippers were demonstrated to interested companies in "Meet-the-Cobots" workshops and validated together with the companies of the project accompanying committee.

Within the framework of four industry-oriented use cases, active activities of human-robot collaboration could be implemented for the first time in the production of fibre-reinforced plastics. The cost accounting tool developed in this context enables the selection of the most economically reasonable alternative for flexible automation projects.

However, further research efforts are needed for the general implementation of active human-robot collaboration. Based on the Composites Reloaded results, it is planned to submit project proposals in the areas of imitation learning, draping and collaboration.

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