Prototyping with industrial robots

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An industrial robot milling a mold for a large part. Credit: Fraunhofer IFF

Ship's propellers, parts for wind energy converters, turbine housings – such large-volume castings can only be produced with special molds. The procedure is elaborate and cost-intensive because foundry workers must still perform most of the work steps manually.

In the future, industrial robots will support skilled workers when they fabricate molds: Together with their partner firm Modell- und Formenbau GmbH Sachsen-Anhalt MFSA, researchers at the Fraunhofer Institute for Factory Operation and Automation IFF in Magdeburg have developed a procedure for this.

"The robots produce large-volume models and molds faster and less expensively. Depending on the process, this can cut costs by up to a third. Various tools can be combined flexibly with one another," explains

Torsten Felsch, Research Manager at the Fraunhofer IFF.

The molds are milled directly out of a block – without losing time on a product model. KUKA Roboter GmbH in Augsburg is supporting this project: Thus, among other things, a standard KUKA robot is being utilized. The Fraunhofer researchers are scrutinizing the basics of robot use: Which milling path is optimal? How can algorithms be used to calculate it? What tools are best for robot use? Their colleagues at MFSA are implementing the findings directly in production.

Another method is often more cost effective for large quantities than direct milling: Since a mold is destroyed when a finished casting is extracted, workers first fashion a model of the casting to be produced, which serves as a pattern for molds.

"The models are built up in layers. Usually, a worker saws out the individual sheets, bonds them atop one another and then machines the shape with a milling machine. Industrial robots will be able to take this over in the future," says Felsch.

How exactly does that function though? First, the KUKA robot mixes a liquid two-component foam and applies one foam layer after another to the machined surface. Since an average layer is two centimeters thick, a relatively rough model of a casting is produced. Just as in direct milling, the software then supplies the milling parameters to the robot: Where must how much material be removed? What tool is best to use? The robotic machining processes are currently still in development. They could be supporting foundries in their work in one to two years.

Source: Fraunhofer-Gesellschaft