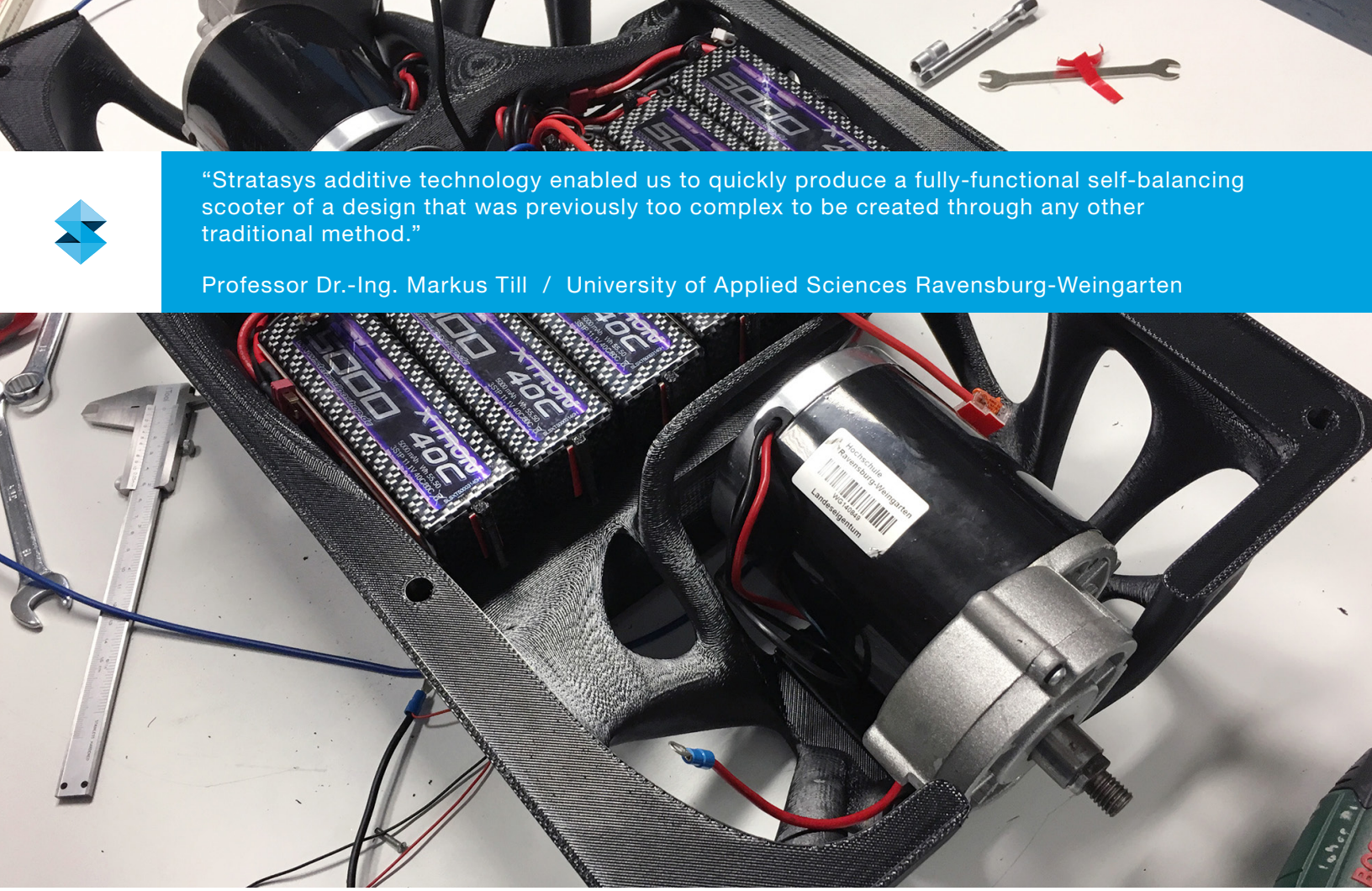

> “Stratasys additive technology enabled us to quickly produce a fully-functional self-balancing scooter of a design that was previously too complex to be created through any other traditional method.”
>
> Professor Dr.-Ing. Markus Till / University of Applied Sciences Ravensburg-Weingarten

The 3D printed scooter frame houses the batteries and electric motor.

CASE STUDY

First of Its Kind

3D PRINTING GIVES STUDENTS REAL-WORLD EXPERIENCE CREATING A SELF-BALANCING SCOOTER

The University of Applied Sciences Ravensburg-Weingarten in the south of Germany is an institution focusing on technology, economics and social sciences. The department of mechanical engineering undertook a project to create a first-of-its kind self-balancing scooter as part of a state-driven research project.

“One central goal of this project is to create and optimize an executable design process for the production of customized products – in this case a self-balancing scooter,” explained Dr.-Ing. Markus Till, head of mechanical engineering at the University of Ravensburg-Weingarten. “We challenged the students to explore different technologies and processes to overcome the limitations of traditional manufacturing when producing a quantity of one.”

Changing the Mindset

When creating the scooter design, the student team and Professor Till considered several technologies for product development. The most notable challenge came when developing the scooter's frame, which houses several parts from a motor to electrics. The structure was too complex for subtractive methods, while the turnaround times were too time-intensive to meet the production schedule. As a result, the team turned to Stratasys additive technologies to build the product development process, enabling the rapid manufacture of the customizable scooter parts.

3D printing enabled the manufacture of the scooter's organically shaped frame.

"Producing the prototype parts was a real stumbling block until we discovered 3D printing," said Till. "Stratasys additive technology enabled us to quickly produce a fully-functional self-balancing scooter of a design that was previously too complex to be created through any other traditional method."

According to Till, 3D printing the scooter's frame and platform changed the team's entire mindset when it came to product development. "The students started thinking additively, leveraging the capabilities of the technology to design with more freedom and with customization in mind," he explained. The change resulted in significant time savings throughout the product development cycle.

"When creating a customized product, the bottleneck is usually manufacturing, as tools, molds and specific fixtures need to be created – this takes a long time," continued Till. "For the product development method we created for this project, it takes three weeks until the design is ready for production. With traditional methods, the manufacturing process would have taken us another three weeks. With Stratasys 3D printing, this phase was reduced to four days, which is a huge time savings."

The finished self-balancing scooter designed and manufactured by the University of Applied Sciences Ravensburg-Weingarten.

The scooter's frame and platform were produced in tough FDM Nylon 6™ on the Fortus 900mc™, enabling the larger parts to be 3D printed in one piece. The platform was fitted with a 3D printed rubber-like cover for better grip, produced in Agilus30™ on the Connex3™ multi-material 3D printer. According to Till, the ability to leverage Stratasys multi-material printing to produce parts in different rigidities and material combinations allowed the team to overcome the geometry constraints of traditional manufacturing, and realize even more complex designs.

Broadening 3D Printing Use

The university has now extended the use of 3D printing to a wider range of engineering projects to verify designs and validate concepts.

"Not only is 3D printing playing a prominent role in our curriculum, we now encourage more students to bring their projects to life on our 3D printers to visualize and improve their design skills," continued Till. "We've also seen a change in student behavior, as they become more engaged with 3D printing and have the chance to be closer to the project. Global companies we work with have also approached us and asked that we further integrate 3D printing into our courses, demonstrating the growing demand for graduates who have knowledge and expertise in this technology."

The project, digital product life-cycle (ZaFH) (information under: https://dip.hs-weingarten.de) is supported by a grant from the European Regional Development Fund and the Ministry of Science, Research and the Arts of Baden-Württemberg, Germany (information under: www.rwb-efre.baden-wuerttemberg.de).

stratasys

STRATASYS.COM

ISO 9001:2008 Certified

HEADQUARTERS

7665 Commerce Way,
Eden Prairie, MN 55344
+1 800 801 6491 (US Toll Free)
+1 952 937-3000 (Intl)
+1 952 937-0070 (Fax)

1 Holtzman St., Science Park,
PO Box 2496
Rehovot 76124, Israel
+972 74 745 4000
+972 74 745 5000 (Fax)