PRESS RELEASE

Fraunhofer IGP at HM21: Robots for shipbuilding and wind turbine construction

At the HM21 Digital Edition in 2021, the Fraunhofer Institute for Large Structures in Production Engineering IGP from Rostock will present how automation will make work easier in the future, especially in the area of manufacturing large products. With no less than three exhibits, the scientists will demonstrate the opportunities that arise thanks to robot-assisted systems. In addition to increasing efficiency and quality, this will also improve working conditions for production employees.

Robot-assisted solutions facilitate the production of ship propellers

The MMG company in Waren (Müritz) is one of the world's leading manufacturers of ship propellers. The ship propellers with a diameter of up to 12 metres are cast from copper-aluminium alloy. The manufactured blanks are ground to the nominal dimension after casting. As a reference dimension for the grinding process, up to 1000 marking holes are drilled in a defined grid on all wing surfaces. Until now, the holes were drilled in a very time-consuming manner using a manually operated drilling machine. Together with MMG, the engineers of Fraunhofer IGP have developed a drilling robot application in which these markings are now placed automatically. Using 3D surface scans and laser tracking, the exact position of the propeller can be determined and the holes drilled by the robot with millimetre precision. The marking holes can now be set even more precisely, saving a considerable amount of time. The Fraunhofer researchers are currently working together with MMG engineers to also automate the grinding of the propeller. The particular challenge: currently, one employee operates a hydraulic manipulator (andromat) to grind the blanks. The quality of the result depends on how experienced and capable the operator is. In addition to developing a specific robot, the Rostock scientists are working on a solution for a tool that ensures the specified contact force and defined removal. This solution will also help to relieve the operator of the robot and reduce process times.

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The welding robot learns to see

Rostock researchers have developed an innovative method for programming welding robots in the production of shipbuilding steel volume structures. The method reduces the effort required to create robot programmes and thus increases productivity. The starting point of the programming method is the digitisation of the work piece to be processed using a 3D laser scanner. Based on the captured sensor data, the individual components of the construction as well as the welding seams necessary for the connection are automatically identified. The components are then converted into simplified geometric shapes and used for collision tests. A post-processor uses specially developed path planning algorithms to calculate the movements needed to weld the identified seams. Finally, the robot movements are converted into a system-specific robot programme. The developed programming method was integrated into an existing production plant and tested under real production conditions.

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High - higher - bolt-inserting robot: support for the construction of wind towers

Green electricity from wind turbines already makes an important contribution to climate protection. In order to be able to use wind turbines in regions with little wind, wind turbines with ever greater hub heights must be built. The increasing heights of wind towers also pose new challenges for tower builders. With the alternative construction of wind turbine towers in panel design, the economic efficiency decreases in comparison to the conventional construction method and the tower height continues to increase, and the construction of the towers becomes more and more expensive. The Fraunhofer IGP has therefore developed an automation solution for the mechanical joining of the panels together with an industrial partner. A bolt insertion robot supports the tower builder in assembling the elements. The fitter merely screws on the joining part of the connection system from the inside of the tower and then brings the parts together. The connecting systems are fed automatically from the outside of the tower. The bolt insertion robot moves autonomously through the connection points. To carry out the insertion process, the developed bolt insertion robot is pulled upwards at a predefined speed by means of a cable winch mounted on the panel. During this movement, the joining area on the panel is continuously monitored and evaluated by an image processing sensor mounted on the selection axis. If a joint is detected in the evaluation area of the sensor, the coordinates of the joint determined by the sensor are transferred to a higher-level control system. With the help of these coordinates, the control system calculates the required positions of the axes of the insertion system and carries out the bolt insertion process fully automatically.

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Fraunhofer IGP at a glance

The Fraunhofer Institute for Large Structures in Production Engineering IGP focuses its research on the innovative design of the production of large structures. Based on applied research, concepts for product and process innovations for many future industries are developed and realised within the framework of research and development projects with our cooperation partners. The current research portfolio includes manufacturing processes, automation technology, quality technology, company organisation and product development for the business areas of ships and offshore, construction, steel construction as well as aircraft and rail vehicle construction. Depending on the problem, holistic solutions are delivered from a single source through close cooperation between the individual development teams.

The aim is to develop holistic concepts that enable customers to manufacture more cost-effectively and with higher quality. These goals are achieved with practical, applicable concepts. The development of new manufacturing methods and processes as well as the implementation of technically demanding, new engineering findings from research in the company are part of the service spectrum of Fraunhofer IGP.

Fraunhofer IGP is recognised by the German Institute for Building Technology (DIBt) as a testing, monitoring and certification body (LBO) and carries out assignments at home and abroad. In 2018, the recognition as Germany's first and currently only testing body for approval group 4.1/10 was extended. Another important pillar of the Fraunhofer IGP is the accredited testing laboratory. This is closely integrated into ongoing research projects through the institute's areas of expertise and also handles testing tasks from industry.

Within the framework of a cooperation agreement, Fraunhofer IGP works closely with the chairs of Production Engineering and Joining Technology at the Faculty of Mechanical Engineering and Ship Technology at the University of Rostock and is a member of the network of Fraunhofer Institutes with a focus on production technology as well as various research associations and networks.