Press release

Quality assurance in the production of electric motors: Researchers aim to automate air gap measurement

Press release dated September 16, 2025

Fully automating the production of electric motors and making an important contribution to quality assurance: these are the goals of the new "MotorInspector" research project. In this project, IPH – Institut für Integrierte Produktion Hannover gGmbH and MFP Messtechnik & Fertigungstechnologie GmbH are working together on automated gap measurement for electric motors. The IPH is currently looking for companies that are willing to contribute practical expertise to the research project.

The demand for electric motors is growing rapidly. Electric cars alone currently account for just under 20 percent of new registrations worldwide. This share is expected to rise to 40 percent by 2030 and to more than 50 percent by 2035[1]. However, electric motors are not only increasingly needed for cars, but also for ships, aircraft, industrial machinery, and much more.

The main driver for this change is climate protection targets. For a successful energy transition, it is essential to manufacture electric motors with high efficiency and long service life – and to do so at competitive production costs. As a rule, the higher the production volumes and the more automated the production, the cheaper the production becomes.

One unresolved challenge in the production of electric motors is air gap measurement, which is important for quality control and cannot yet be automated.

Air gap affects motor efficiency and service life

Every electric motor has a narrow air gap between the rotor and stator. This gap has a significant impact on the motor's efficiency and service life. If this air gap is inhomogeneous, the motor will not run smoothly, its efficiency will suffer, and it will break down more quickly.

The air gap is particularly sensitive to tolerances in a new type of electric motor known as an axial flux motor or "pancake motor." These motors are characterized by high torque and power density and are therefore considered a promising development for electromobility. However, a homogeneous air gap is particularly important in these motors, as even the smallest deviations can significantly shorten their service life. The maximum efficiency and longevity of an axial flux motor can therefore only be ensured with precise quality control of the air gap.

Automating air gap measurement is the goal of the new "MotorInspector" research project by IPH – Institut für Integrierte Produktion Hannover gGmbH and MFP Messtechnik & Fertigungstechnologie GmbH. For two years – until 2027 – IPH and MFP will be conducting joint research into automated

[1] Source: Fraunhofer ISI, https://publica-rest.fraunhofer.de/server/api/core/bitstreams/53502422-12a3-42f9-ad34-d5475dfd2848/content

quality control. The research project is funded by the European Regional Development Fund (ERDF) and the state of Lower Saxony.

IPH and MFP aim to automate air gap measurement

In the “MotorInspector” research project, IPH is responsible for the automation concept and MFP for the air gap measurement itself. The basis for this is a sensor developed by MFP. The “gapMaster” measures the air gap resistively by directly contacting and scanning the entire depth of the gap as it slides into it. This measurement method is comparatively robust and fast, but cannot yet be fully integrated into industrial manufacturing processes.

The aim of the research project is to develop an automated measurement system based on this sensor. The plan is to use a robot that is able to automatically and precisely insert the sensor into the center of the air gap with the aid of a camera or laser. In this way, the researchers want to enable automated quality control directly in the production process – without manual intermediate steps.

A demonstrator of an electric motor is currently being set up at the IPH. Tests will be carried out on this replica in the course of the research project in order to develop and iteratively improve an automation concept for air gap measurement.

Expertise from electric motor manufacturers to be incorporated into research

To ensure that this automated quality control system is ultimately practical and represents a noticeable improvement in electric motor production, the researchers first want to analyze industrial manufacturing processes and quality control procedures and incorporate practical expertise into the automation concept.

The researchers are therefore looking for companies that manufacture electric motors – in particular axial flux motors, but also radial flux motors – to participate in a survey regarding air gap control. Automotive companies and suppliers, as well as start-ups and research institutions working in this field, can contribute their expertise. The results of the survey will be incorporated into the research project in anonymized form; the scientists undertake to maintain confidentiality regarding all company-related information.

Companies that can contribute expertise to improve quality control for electric motors should contact project manager Simon Pauka by December 15, 2025, at the latest, by calling +49 511 27976 342 or sending an email to pauka@iph-hannover.de.

Further information on the research project is available at https://en-motorinspector.iph-hannover.de/.

About the IPH – Institut für Integrierte Produktion Hannover gGmbH

The IPH – Institut für Integrierte Produktion Hannover gGmbH (which literally translates into Hannover institute of integrated production) is a service provider for production technology and was established in 1988 at the Leibniz University in Hannover. The IPH offers research and development, consultation and qualification concerning the subjects of process technology, production automation and logistics. Its customers include companies from the sectors of tool and mould construction, machine and plant construction, aerospace and the automotive industry, electro industry and forging industry.

The business has its headquarters in the science and technology park – Science Area 30X in the northwest of Hannover and currently employs about 80 people, of which about 30 are scientific personnel.

About MFP Messtechnik & Fertigungstechnologie GmbH

MFP is the inventor of gapMaster® electronic gap measurement, which is patented throughout Europe and unique worldwide. The company has now established itself as an expert in gap measurement in many projects. MFP's electronic gap measurement is used in almost all industries, including mechanical engineering, pharmaceuticals, automotive, and aerospace. A European standard for electronic gap measurement is currently being developed for aircraft construction.

The company was founded in 1987 and is based in Wunstorf near Hanover.

Note to editors

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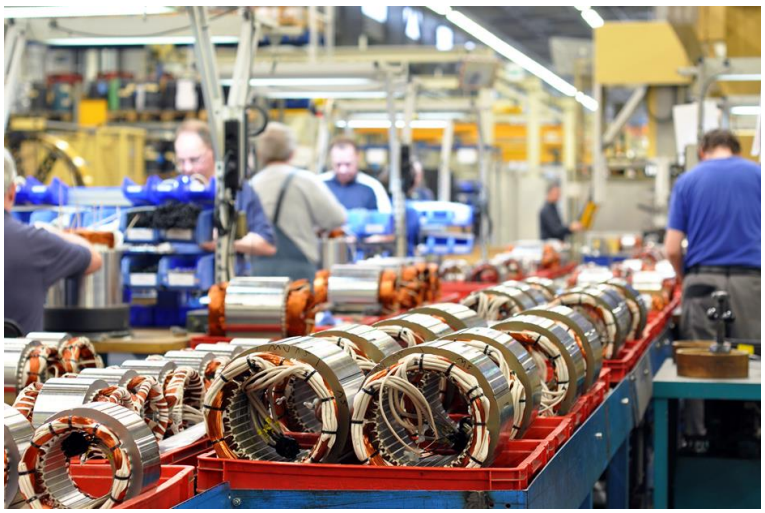
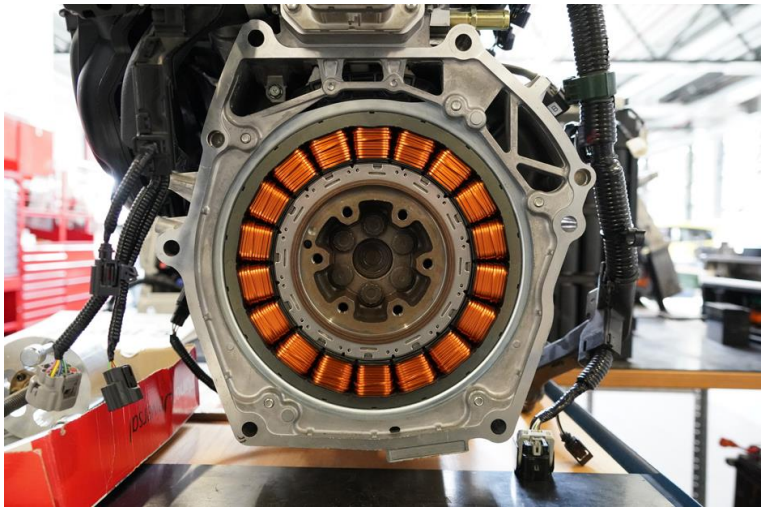
Images



Electric motor production: The aim of the “MotorInspector” research project is to improve quality control.

(Photo: industrieblick, https://stock.adobe.com/)



A look inside an electric motor: The narrow air gap between the rotor and stator has a significant impact on efficiency and service life.

(Photo: jrgn_flow, https://stock.adobe.com/)

MotorInspector

"MotorInspector" research project: In this project, IPH – Institut für Integrierte Produktion Hannover gGmbH and MFP Messtechnik & Fertigungstechnologie GmbH are working together on automated gap measurement for electric motors.

(Logo: "MotorInspector" research project, https://motorinspector.iph-hannover.de/)

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(Logos: Europe for Lower Saxony, https://europa-fuer-niedersachsen.de/)