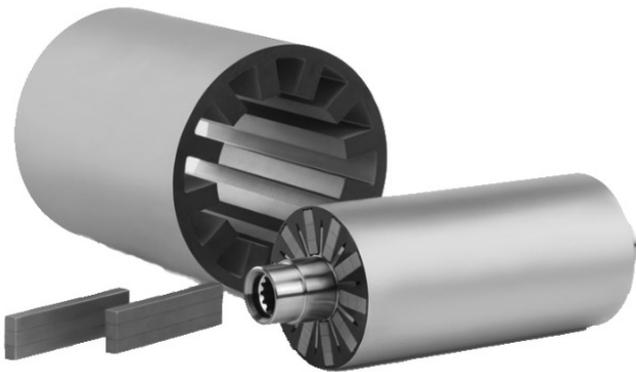


## Highly efficient materials for electric drives HOMAG - together into the future

HANAU – Since 2018, VACUUMSCHMELZE GmbH & Co. KG (VAC) has been working with partners from industry, research institutes and universities on improving the power density of electric motors for automotive and aircraft engines. In the project, which was funded by the German Federal Ministry of Education and Research (BMBF), groundbreaking results were achieved in the joint collaboration. Two components of the motors were considered – the rare-earth permanent magnets and cobalt-iron laminations. The size, weight and losses of electric drive systems should thus be reduced in order to establish more sustainable transport systems.



VAC succeeded in achieving an energy density of 282 kJ/m<sup>3</sup> in laboratory tests with the development of a new permanent magnet alloy based on SmCo. With this value, a new world record was achieved. In addition, a first batch of this new alloy VACOMAX<sup>®</sup> 278 HR was produced under series production conditions with promising results. The alloy is in the production transition stage, and further steps have been taken to increase quality and output. The

magnets were installed by VAC in rotors that were further processed into electric motors by the project partner MACCON and are now being tested by the industrial partners Daimler AG and Lange Aviation.

The high-performance material VACODUR<sup>®</sup> 49 with a cobalt content of 49 % is the first choice for the demanding requirements in high-end automotive and aviation applications. Here, the project developed a new joining technology for the CoFe laminations. The individual lamellae with sheet thicknesses of 0.1 mm are joined in a laser tying process. So far so familiar. The novelty is that the joint is created inside the stacks in a similar way to punch-packing and enables better cohesion. At the same time, the tying points can be significantly reduced compared to punching and significantly thinner sheets can be processed. This results in lamination stacks with a fill factor of up to 98 % and minimal eddy current losses. In addition, the process is scalable and can be applied to large quantities. The combination of high-performance material and cost-

optimized manufacturing process for large quantities makes it possible to reduce volume and weight and serve a larger market than before with high-performance, resource-saving products.

"The unique collaboration between research and industry has enabled us to develop a new alloy and manufacturing process in a very short time, both of which significantly increase the sustainability of transport systems," says Dr Matthias Katter, Head of Advanced Research Permanent Magnets at VAC and coordinator of the project. "We are very excited to see the results of our partners with the demonstrators and, thanks to our unique vertical integration of manufacturing, we see ourselves well equipped to realize even complex system solutions on a large scale according to the individual specifications of our partners."

VACUUMSCHMELZE (VAC) is among the world's most highly innovative developers of magnetic materials, inductive components and other related products. With a global network of Sales and Field Application Engineers, VAC designs and manufactures tailor-made solutions for a wide variety of industries, comprising renewable energies, automotive, industrial automation installation technology, and aviation.