Breakthrough in Applied Superconductivity: Demo200 Reaches 190,000 A for the First Time

Voerde, September 2024 – In a groundbreaking development, an interdisciplinary team of engineers, scientists, and technicians has, for the first time, successfully conducted an electrical current of 190,000 amperes through a superconducting busbar. This result was achieved as part of the Demo200 project, funded by the Federal Ministry for Economic Affairs and Climate Action (BMWK), in collaboration between Trimet, Messer, and the Karlsruhe Institute of Technology under the leadership of Vision Electric Super Conductors (VESC).

In the preceding project, "3S," industrial feasibility for a 20,000 A superconducting system was demonstrated in BASF's chlorine electrolysis. The goal of Demo200 was to increase the current to the operating current of Trimet's aluminum smelter of 180,000 A or higher.

Superconductors are materials that conduct electricity without resistance and electrical losses once they are cooled to operating temperature. This project used ceramic high-temperature superconductors from Theva, which operate at 77 Kelvin (approx. -196 °C) in boiling nitrogen.

Picture 1 From left to right: Mr. Pytlik (Trimet), Mr. Ludwig (Trimet) and Dr. Reiser (VESC) next to the demonstrator set-up.

An Innovative Superconducting Busbar System for Aluminum Production

At the end of July, the demonstrator of the newly developed superconducting busbar was delivered to the Trimet aluminum plant in Voerde. In this facility, aluminum is produced from aluminum oxide ("alumina") using a high-current electrochemical process ("electrolysis").

The demonstrator consists of two current leads and a superconducting busbar in between, which is extremely compact with a diameter of less than 30 cm. "The operation of the current leads with the superconducting busbar is a real milestone" explains CEO Dr Wolfgang Reiser from VESC. "We did not only achieve a current of 180,000 A, but we were even able to increase it to 190,000 A- a globally unique success in applied superconductivity."

Picture 2 The superconducting system in operation.

Setting the Course for Future Applications

Following the Demo200 project, the superconducting busbar system is to be used on an even larger scale. The corresponding follow-up project "SuprAl" is already in planning. As part of this project, a 600 m long superconducting busbar is to be laid parallel to an existing aluminum busbar, reducing the current transmission losses by around 90%.

Pioneering Prospects for the Industry

The use of superconductors for such high currents opens up new possibilities for using this technology in various high-current applications - from metal production to energy transmission. "Superconductors have the potential to transfer large amounts of energy without the disadvantages of conventional conductors," adds Wolfgang Reiser.

Further information on superconductors and their possible applications can be found on the websites www.vesc-superbar.de, www.demo200.de and www.ivsupra.de.

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