#### SUCCESS STORY



K1-MET SusMet4Planet Competence Center of Sustainable Digitalized Metallurgy for a Climate Neutral and Resource Efficient Planet

Programme: COMET – Competence Centers for Excellent Technologies

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metallurgical competence center

# HYDROGEN PLASMA SMELTING REVOLUTION: GREEN STEEL FOR A SUSTAINABLE FUTURE

THE HYDROGEN PLASMA SMELTING REDUCTION DEMONSTRATION PLANT OPERATED BY K1-MET GMBH GETS ADAPTED TO CONTINUOUS OPERATION

The hydrogen plasma smelting reduction process has been under development at the Chair of Ferrous Metallurgy of the University of Leoben since the early 1990s. Currently, there is a demonstration plant located at the site of voestalpine Stahl Donawitz GmbH, operated by K1-MET GmbH. In this process, hydrogen plasma is used as a reducing agent for iron ores. Due to the absence of carbon, the product is raw steel produced in a CO<sub>2</sub>-neutral manner. With this process, the blast furnace, oxygen converter, sinter plant and coking plant can be replaced by a single reactor. To demonstrate the economic viability of the process, it is necessary to increase hydrogen utilization and efficiently utilize waste heat from the process. As a result, the demonstration plant is currently undergoing a conversion from batch operation to continuous operation. This conversion includes the implementtation of a pre-reduction stage with simultaneous preheating via utilization of the process's off-gas. Laboratory experiments are being conducted at the Chair of Ferrous Metallurgy of the University of Leoben to select a suitable reactor concept and determine the optimal operating conditions. As part of the conversion, the plant capacity is being expanded to process up to 200 kg of iron ore per hour. One challenge in adapting the plant is ensuring a sufficiently high exhaust gas temperature to enable a fast pre-reduction of the iron ores.

Federal Ministry Republic of Austria Climate Action, Environment, Energy, Mobility, Innovation and Technology

Federal Ministry Republic of Austria Labour and Economy

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## Impact and effects

By successfully and economically implementing this process, the high CO2 emissions of the steel industry can be significantly reduced. Research on this cuttingedge and internationally interesting topic also contributes to strengthening the Austrian science and industry sector.



Overview of the current configuration of the hydrogen plasma smelting reduction demonstration plant (Copyright voestalpine Stahl Donawitz GmbH)

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