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Effects of H2 as energy source and biocarbon injection in EAF

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The Electric Arc Furnace (EAF) is central for steel industry transformation toward Green Steel production, with ever increasing steel production via the EAF route. However, there are still significant direct fossil CO2 emissions connected to the common EAF operation. Two techniques aimed at reducing direct fossil CO2 emissions from the EAFs are replacing Natural Gas (NG) with H2 as fuel and replacing fossil carbon injection with biocarbon injection. These techniques are being investigated, among others, in the EU-funded Horizon Europe project GreenHeatEAF.

To understand and demonstrate the use of H2 in a Linde CoJet burner and biocarbon injection for slag foaming and slag reduction, pilot trials including 25 heats in the Swerim 10 ton EAF were successfully carried out within the GreenHeatEAF project. Reference heats with synthetic NG as fuel and fossil anthracite injection were carried out during the trials for comparison and evaluation of the effect from replacing NG with H2 and fossil carbon injection with biocarbon injection.

In order to ensure sufficient information for the trial evaluation, 3-5 slag and steel samples were taken at different stages of the EAF operation, together with a dust sample for each heat, numerous temperature measurements, and continuous logging of process data such as power consumption, fuel consumption, material consumption, off-gas analysis etc. These data are then used for stagewise mass- and heat balance calculations in HSC Chemistry to provide a detailed understanding of the EAF process at all stages in the pilot trial heats.

All fossil CO2 from the burners and carbon injection can be avoided without major process changes, according to the successful demonstration of replacing NG as energy source with H2 and fossil carbon injection with biocarbon injection.

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