

SALCOS - Potentials and requirements of a flexible, hydrogen based deep decarbonization of primary steelmaking

Today, primary steel worldwide is predominantly produced via carbon based processes as the BF/BOF route. Consequently, steelmaking is responsible for more than 7% of global anthropogenic CO₂ emissions, leaving the decarbonization of this industrial sector as challenging as societally important.

Luckily, nature offers an alternative to carbon: It can be replaced by hydrogen as chemical reactant and by electrical energy as source of process heat, leading to virtually complete decarbonization in the end - but as a prerequisite it will first be necessary to change primary steelmaking equipment to suitable direct reduction reactors combined with downstream electric arc furnaces (DRP/EAF route).

As one of the first movers in this field, Salzgitter AG has coined the term „Carbon Direct Avoidance, CDA“ for the „hydrogen approach“ and - since 2015 - is proposing the respective gradual transformation project SALCOS (Salzgitter Low CO₂ Steelmaking), based on the stepwise implementation of DRP/EAF processes into our existing integrated steelworks, operating the direct reduction reactor(s) flexibly with ever increasing shares of hydrogen, replacing natural gas. CO₂ emission reduction is targeted to reach -95% compared to current levels.

Steelmaking will remain energy intensive, thus - if this industry shall have a future in Europe - society has to ensure the production and continuous supply of sufficient amounts of renewable energy.

Anyway, despite being the most sustainable, efficient as well as effective decarbonization pathway for steel, CDA with its obvious technical feasibility could not yet be realized on an industrial scale: As the cost of CO₂ lean steel production will rise significantly compared to the benchmark classical route, first a respective political and economic framework is needed to create and incentivize a market for „green“ steel in Europe - and soon.

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