MaxH2DR newsletter

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Maximise H2 Enrichment in Direct Reduction Shaft furnaces

The project falls under the funding programme of Horizon Europe – Clean Steel Partnership.

The call topic is related to Carbon Direct Avoidance in steel: electricity and hydrogen-based metallurgy.

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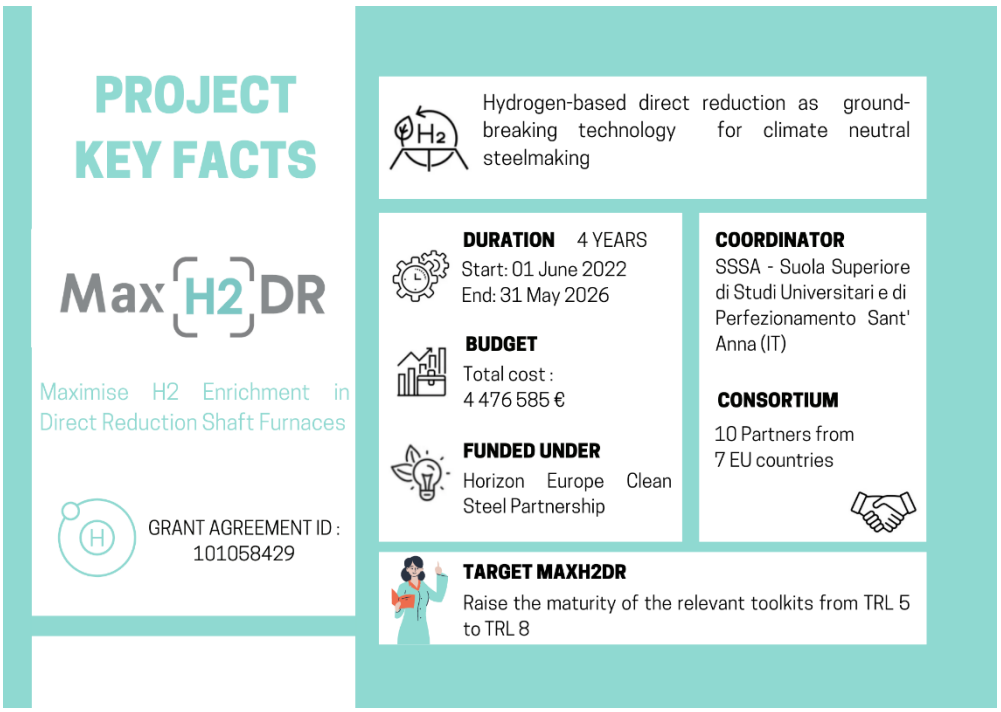
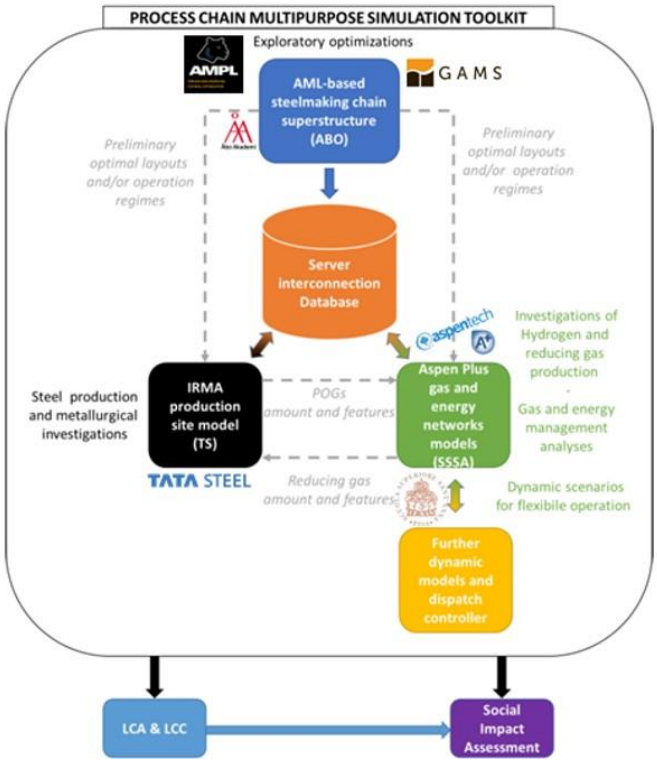
This project has received funding from the European Union under grant agreement n°101058429



Inside the MaxH2DR process chain multipurpose simulation toolkit

The project MaxH2DR provides among its activities the development of a multipurpose simulation toolkit to guide the transition towards H_2-enriched DRI-based steelmaking. Uncertainties exist related to some technological aspects and on the effects that this transition can have on the global management of the steelworks. Less impacting and most promising plant states and layouts for a gradual transition must be found and the influences of expected process modifications must be investigated both on production and energy handling sides. The digital toolkit will enable such investigations thanks to the combination of three different tools by maximizing their individual strengths and avoiding their weaknesses:

- an Algebraic Modelling Language (AML)-based simplified model will allow preliminary macro-analysis of promising optimal transition routes and stages when considering hydrogen-based steelmaking.
- An IRMA-based production site model will allow deep analyses of metallurgical aspects affected during the transition.
- an Aspen Plus-based gas and energy networks model will permit exploring the transition effects from the point of view of gas, steam and energy production, demand and distribution.



A multipurpose process chain simulation toolkit will allow investigations of best transitions steps to achieve effectively the H_2-enriched DRI-based route.

Benchmark standard integrated steel mill models & first development works

The simulation toolkit has been prepared for the planned investigations. Models and complex material-energy balances of a 4 Mt_{HRC}pa productivity standard European steel mill are being developed via IRMA and Aspen Plus respectively for the following sub-processes models: Raw materials section (Sinter Plant, Pellet Plant, Coke Plant and Coal Grinding Line), Iron and Steel making section (Blast furnaces, Basic oxygen Steel Plant, Casters and Hot Strip mill) and Gas-Energy section (BFG, BOFG, COG treatment areas, mixing and enrichment stations, auxiliary boilers, power plant, air separation unit). The model as a whole will act as benchmark and starting point of transition steps and related effects analyses that will be carried out after the integration of models related to DRI-EAF route.

An AML-based steel mill model has been also developed, featuring simplified unit models included in the reference BF-BOF route as well as in possible alternative routes including hydrogen-based reduction of iron ores.

Complementary, a complex IT infrastructure has been developed including a dedicated database, stored procedures, and further methods for allowing the collection of info and data related to investigated scenarios and the connection and interaction of the energy network models with upstream process models and vice-versa.

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