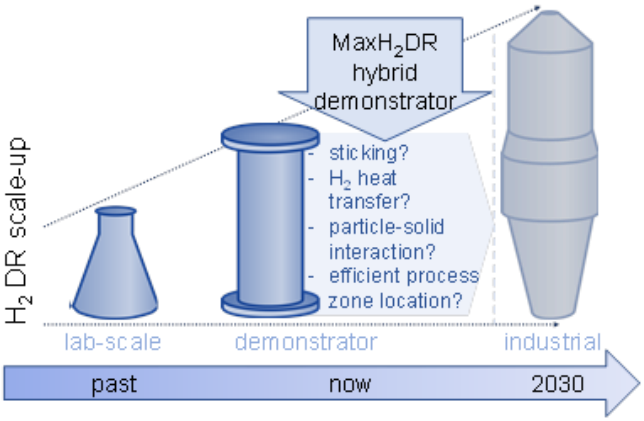
MaxH2DR

BFI Angewandte Spitzenforschung | VDEh-Betriebsforschungsinstitut GmbH

Maximise H2 enrichment in Direct Reduction shaft furnaces



Initial situation

- Direct reduction with hydrogen will have a key role in steel industry decarbonisation
- Operating Direct Reduction with high shares of hydrogen changes reactions, energy balance and temperatures
- Solid materials will have different properties
- Digital tools and pilot trials are needed to support scale-up and process optimisation

Working points in the project

- Reduction tests with different pellets and varying gas conditions
- Investigation of physical DRI properties (e.g. softening, movement)
- Investigation of linked material and gas flow with physical and numerical models
- Develop validated digital twins for industrial H_2-DR plants
- Process analysis to assess possible limits and issues of H_2 enrichment

Partners

BFI, Scuola Superiore Sant'Anna Pisa, RUB, Åbo Akademi, Hippocratica Civitas Studium Salernitanum, Université de Lorraine, CiaoTech, ESTEP European Steel Technology Platform, Łukasiewicz Upper Silesian Institute of Technology, TATA STEEL

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Expected results

- Provide new process know-how of DR plants with H_2 enrichment
- Provide digital twins for process analysis and process control
- Assess H_2 enrichment in DR plants and develop measures
- Determine stable operating points and rate possible issues
- Support of investment planning / scale up
- Maximise process stability with maximum H_2 enrichment
- Optimise process chain (DR, EAF)

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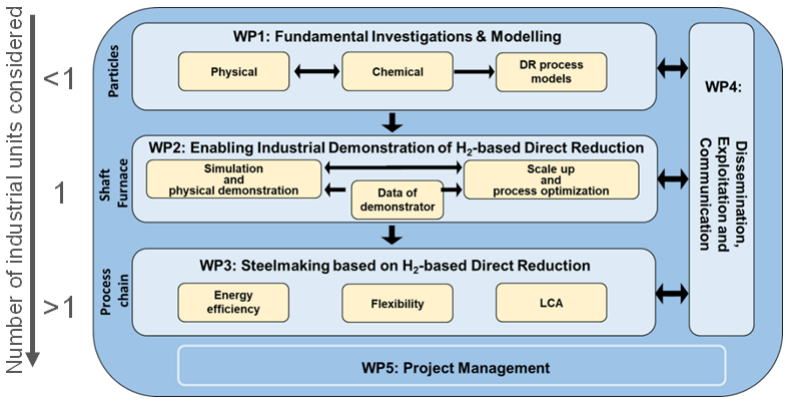
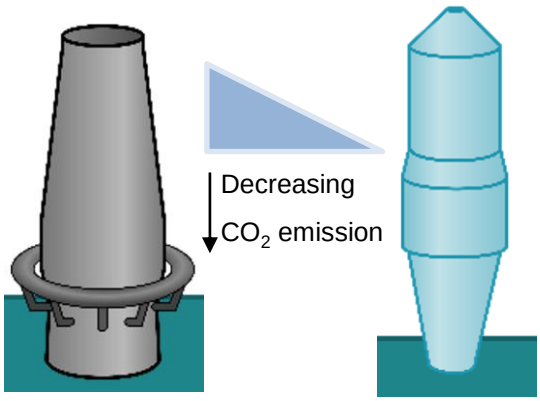
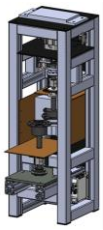
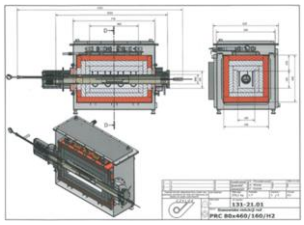


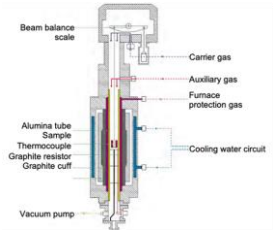


Workpackage 1:
Enhanced **Modelling & Verification** of Sticking Phenomena & Reaction Kinetics

- Investigation of chemical and physical parameters for H_2 direct reduction
- Development of a new kinetic submodel

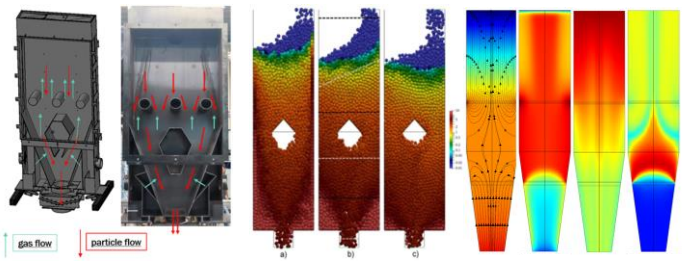






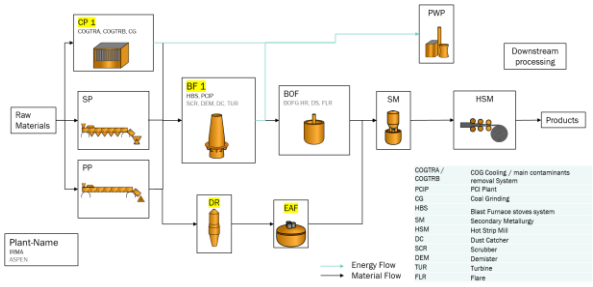
Workpackage 2:
Process optimization for H_2-based DR Shaft Furnaces on demo scale

- "hybrid demonstration" (physical + digital)
- Bulk flow experiments with gas counterflow
- Development of digital simulation tools for H_2-based Direct Reduction Shafts



Workpackage 3:
Process integration into integrated steelplants, overall process evaluation

- Development of a process chain multipurpose toolkit
- Optimising integrated steelworks with H_2-enriched DR towards sustainability and flexibility



Contact person	Technical Coordination	Funding reference	Funded by
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