



FReSMe

From Residual Steel gases to Methanol

Final Project Event

Welcome and Project-Explanation

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TATA STEEL



"This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 727504".



SSAB



1. FReSMe Goals



What we planned

The challenge



1. To demonstrate low carbon methanol production using residual steel gases (CO₂ and H₂).
2. To assess the feasibility of deploying CCUS in a Steel Mill
3. To provide a sustainable CCUS pathway for marine fuel production.

The objectives



1. **Combine** in a flexible way the **SEWGS carbon capture technology, water electrolysis and renewable methanol production** for the first time
2. **Optimise output streams of the SEWGS unit to methanol specific conditions** by adapting the SEWGS operation
3. Optimise **performance of renewable methanol production** through multi-scalar catalyst development
4. Evaluate the **environmental impact of the process through LCA and analyse process scale-up** in different plant configurations.

2. FReSMe Results

What we achieved...



FReSMe pilot units

➤ Pilot plant

- Methanol production loop: 25 tons produced
- SEWGS unit with buffer tanks and gas conditioning units: 570,000 Nm³ of BFG treated
- Membrane system for H₂ purification
- Alkaline electrolyzer variable operation supplementing H₂ production

➤ LCA & Thermo-economic analysis

- Technological, economic and environmental parameters analysed
- Business case supported on simulations for technology scale-up

➤ Test settings performed

- Electrolyser only: CO₂ from BFG + H₂ from electrolyser
- Max rate: CO₂ from BFG + H₂ from electrolyser
- Electrolyser only: CO₂ from BFG + H₂ from electrolyser
- Membrane H₂ only: CO₂ from BFG + H₂ from BFG

➤ Novel catalysts & overall process engineering improved

- 50 catalysts synthesized and tested
- Sorption cycle modelling and development
- Process modelling and optimization

➤ Methanol fuel demonstration

- Successful methanol fuel bunkering in Stena Germanica ship connecting Gothenburg and Kiel



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THANK YOU!



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