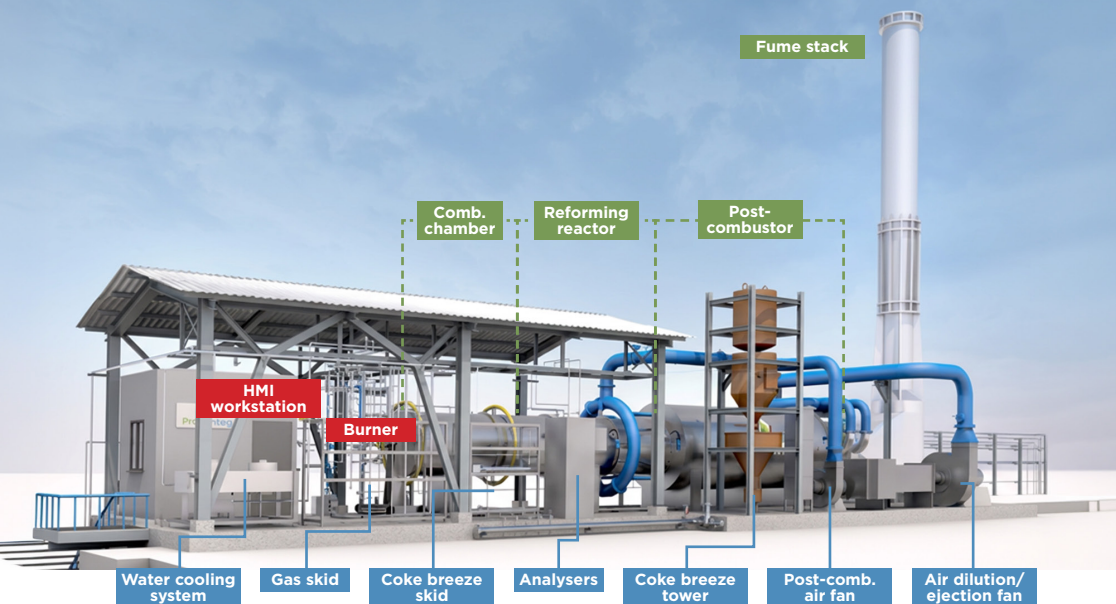




ProSynteg

Production of Hot Hydrogen-Rich Syngas in
Integrated Plants for Efficient Injection in
the Blast Furnace and CO₂ Mitigation

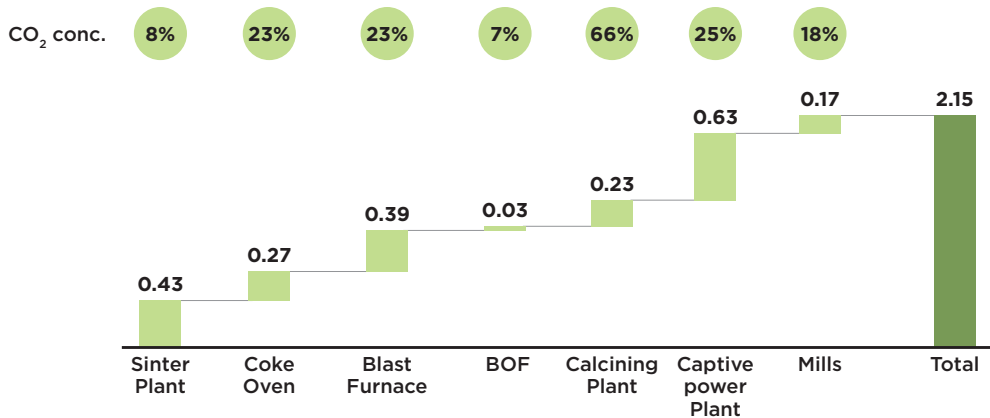
The ProSynteg pilot plant - 3D rendering of the reforming facility



H₂-rich syngas injection in the blast furnace:
up to 210 kg CO₂ emissions reduction per tonne of steel

The challenge

The EU steel industry is responsible for ~6% of total European CO₂ emissions. **The blast furnace route alone emits 2.15 t CO₂ per tonne of steel** – a figure that must be significantly reduced to meet the **European Green Deal** targets and the goal of a climate-neutral Europe by 2050.



CO₂ emissions by process for a typical BF-BOF route (t CO₂ / t steel)

The ProSynteg solution

ProSynteg produces **hot H₂-rich synthesis gas** through an innovative **dry-reforming process** that converts coke oven gas (COG) using the heat from **oxy-combustion of coke breeze** – a currently underutilized by-product.

The resulting syngas can be injected directly into the blast furnace shaft, partially replacing coke and achieving **up to 11% CO₂ emissions reduction** at the integrated plant level.

110÷130 kgCO₂/tLS
kgCO₂/tLS reduction

50÷60 kg/tHM
coke/tHM saved at the BF

5,0÷7,0 €/tHM
OPEX gain per tonne hot metal

4÷5%
BF productivity per 100 Nm³/thm

Aligned with the **European Green Deal** and the **RFCS** programme objectives for new and improved steelmaking processes targeting **CO₂ mitigation**.

Approach & technology



Oxy-combustion & dry-reforming

Coke breeze is burned with pure O_2 , generating hot CO_2 -rich flue gas that drives the dry reforming of natural gas in the COG into H_2 -rich syngas - ready for blast furnace injection.



Feedstock characterisation & lab testing

Systematic characterisation of coke breeze and alternative carbon sources. Oxy-combustion burner trials and small-scale reformer experiments.



Advanced modelling-digital twin of the reformer

Kinetic and CFD models have been validated against lab and pilot data for confident scale-up to industrial level.



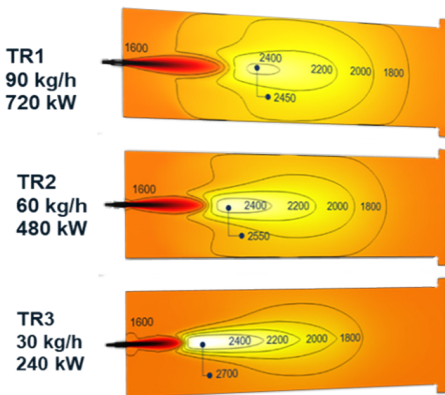
Experimental campaigns

Preliminary experimental trials at Dalmine combustion station + Long-term campaigns at the pilot plant at Italiana Coke (Savona) at TRL 6.

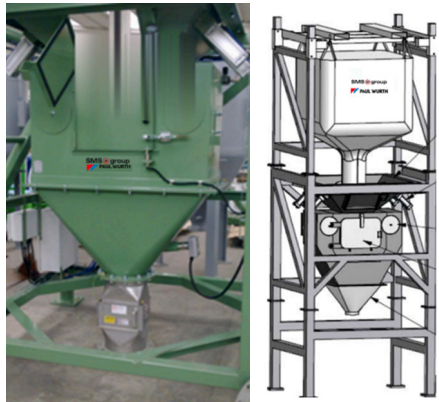


Full environmental & economic assessment

Detailed CO_2 calculations, life-cycle assessment (LCA) and techno-economic evaluation (CAPEX/OPEX) for industrial deployment.



CFD combustion simulation



Coke breeze feeding system

A near-to-market technology for clean, affordable hot metal production - contributing to the EU's 2030 climate and energy targets.

Consortium & key facts



RINA-CSM
(Coordinator - IT)



CRM GROUP
(Belgium)



ArcelorMittal

ArcelorMittal
(Spain)



Paul Wurth SA
(Luxembourg) +
Paul Wurth Italia SpA
(Italy)



Acciaierie d'Italia
(Italy)

Programme

RFCS – Research Fund for Coal and Steel
(Pilot & Demonstration)

Duration

July 2022 – December 2026

Coordinator

RINA Consulting – Centro Sviluppo Materiali S.p.A.
(Italy)

TRL progression

TRL 3 → TRL 6 (demonstrated in industrially
relevant environment)

Key KPIs

CO₂ emission reduction • Waste reduction
• Energy source diversification



www.prosynteg.eu



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<https://www.linkedin.com/company/prosynteg-rfcs-project>

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