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Si
silicon

SisAl Pilot

Innovative pilot for Silicon production with low environmental impact using secondary Aluminium and silicon raw materials

Al
aluminium



The timing of SisAl Pilot is impeccable with respect to key European challenges; the transformation to a circular economy, the strongly enhanced focus on climate and future expected EU-ETS CO₂ allowances with associated risk for carbon leakage from Europe, the rapidly increased difficulty of exporting aluminium scrap from Europe to China, and modern society's ever-increasing need for silicon metal. With SisAl, all these challenges are turned into new European opportunities.

THE PROJECT

SisAl Pilot aims to demonstrate a patented novel industrial process to produce silicon (Si, a critical raw material), enabling a shift from today's carbothermic Submerged Arc Furnace (SAF) process to a far more environmentally and economically alternative: an aluminothermic reduction of quartz in slag that utilizes secondary raw materials such as aluminium (Al) scrap and dross, as replacements for carbon reductants used today.

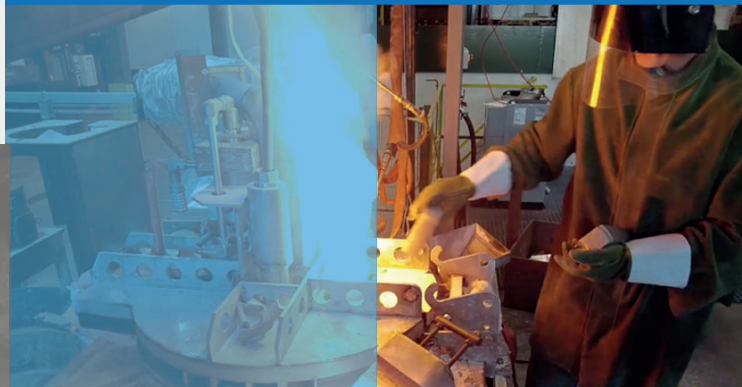


OBJECTIVES

The overall objective of SisAl Pilot is to scale up and demonstrate a new, carbon clean European technology to produce silicon and silicon alloys, along with metallurgical grade alumina (MGA) and high purity alumina (HPA), at TRL 6-7, validating raw materials and product quality, environmental impact and economic parameters to lay the ground for commercialisation.

Specific objectives:

- Assess the performance and availability of raw materials for the SisAl process and its products
- Pre-industrial/pilot scale production of silicon and alumina products in five different pilot locations in Europe and South Africa
- Develop business case scenarios for industrial project partner clusters
- Benchmark the environmental and economic performance of the SisAl process and its products towards current technologies and products
- Disseminate and communicate the value created for Europe.



IMPACT

Since the project applied for funding and was awarded, the urgency with which new, carbon-free production technologies has to be implemented, has only been enhanced. For silicon production, the short-term solution of using bio-carbon sources as quartz reductants is challenging due to the extensive competition/high prices for this resource for use in chemicals, fuels etc. As such, and in light of increased focus on circular economy, the use of secondary aluminium sources as reductants is more relevant than ever. Underlying Si supply issues to the EU from China have also worsened, making EU industries vulnerable in both the short and long term. The power situation in China has meant that Si production has dropped and prices increasing more than 300% in less than two months during the fall of 2021.

RESULTS

In the second year of SisAl Pilot 22 pilot trials were performed at Elkem, with a focus also on RWTHs upcoming pilot trials and on the initiation of FRey's trials in Spain.

Results from small scale experiments at NTNU and RWTH as well as modelling input provided by SIMTEC and ITMATI have been the basis for these pilot trials. Enough slag for the upcoming basic and acidic hydrometallurgical pilot trials at MYTIL has been produced by Elkem and shipped to Greece. NTUA's and SiQA's small scale hydrometallurgical experiments have proven that the produced slag is sufficient for both acidic and basic leaching. The business cases, flow sheets models, LCA and resource mapping have been improved by BNW, HZDR, NTNU and Sintef, respectively.