SisAl Pilot

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

Enjoy reading the SisAl Pilot newsletter!

Updates on technical progress and results

SisAl Pilot is moving forward!

In this newsletter you will get a brief update on the latest progress in the project. Most importantly, we have finalized two out four pyrometallurgical pilot companies in WP2 and the third set off pilot trials are well in progress in Spain. The last and largest pilot campaign at Mintek in WP2 is coming up later this year. Focus now is on the design of the ladle to be used during that trial. Our new partner Reykjavik University has demonstrated that it is possible to purify the SisAl metal to high purity silicon based on the Silicor process. Also, one out of two hydrometallurgical pilot companies have been completed in WP3. The alumina produced will be sent to Hydro for validation in their electrolysis cells. Our partners in WP3, have shown in lab scale that high purity alumina can be produced from the SisAl slag through acidic leaching. This process will be scaled up in the last pilot campaign in WP3. In addition to the technical progress, detailed business cases based on LCA assessments, flow sheets and the resource mapping are being created in close collaboration with the industrial partners in the project.

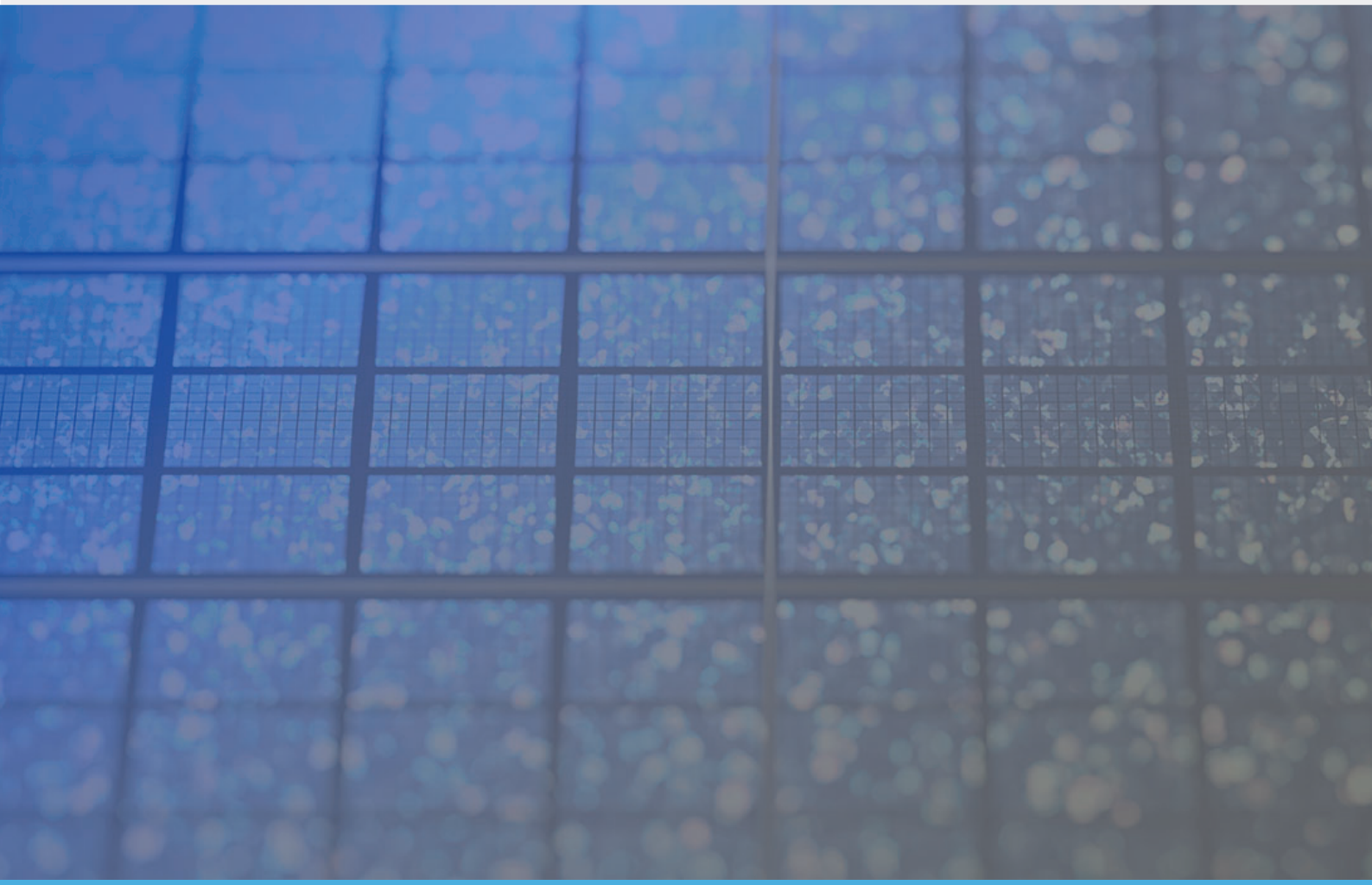
We are now approaching the last year of the project.

There are still challenges to overcome but all in all we are very satisfied with the work that the consortium has accomplished until now.

In SisAl WP1 we have finalized a deliverable on selected quartz and lime raw materials, a deliverable on Si-slag scull and plant SiO_2 fines and a deliverable on Al scrap, dross, processed alumina and Si-slag properties.

We have also been working a lot with the 2nd version of the resource mapping report, which is dealing with more details on markets, prices, actors and qualities of the SisAl process raw materials. The outcome of this deliverable will be particularly important for the SisAl business case and LCA - evaluations of the process.

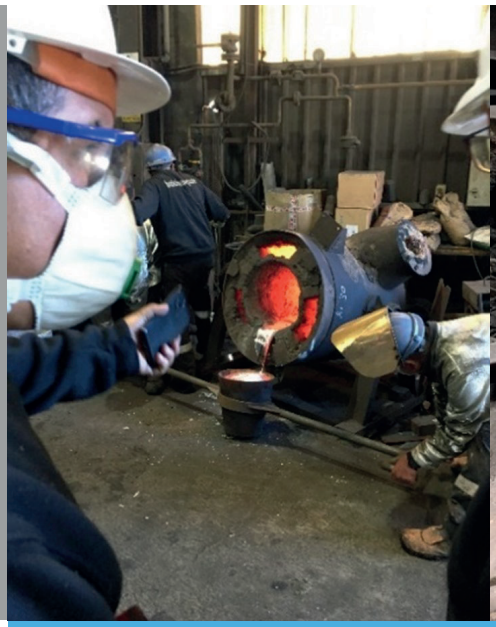
The main activities of IME RWTH University included the follow-up work of the reduction and refining trials coordinated by RWTH and carried out at Elkem Kristiansand. A report was prepared discussing the results and observations of the trials. Preparations were also made for further reduction trials in a smaller induction furnace.

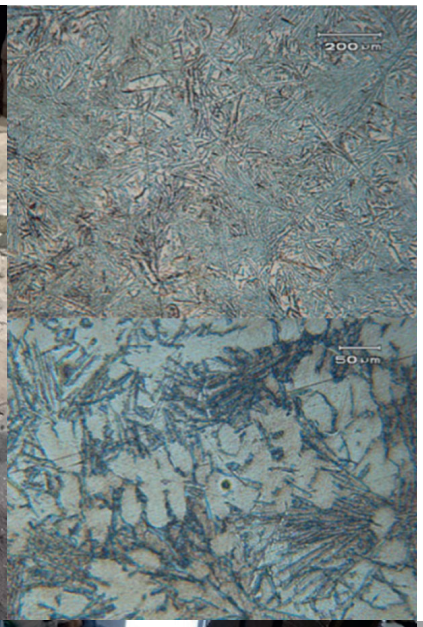


To completely demonstrate the Pilot assigned to FREY, an interesting trial concerning the manufacturing of a Alúminum/Silicon tube using a gas furnace was carried out. It was also used to check the feasibility of using this furnace in the SisAl project, comparing the results with those obtained with the induction furnace. The target was to obtain a tube with a minimum 20% of Si through a centrifugal casting process.

For that, alúminum ingots with a 3.8% of silicon and around 8Kg of Silicon fines with a 99% purity were used. Once obtained, the chemical analysis of the tube material shows that it has a 25% of Si, which is an excellent result. The microstructure of the material consists mainly of primary aluminum dendrites and Si crystals. With these trials, **one of the main objectives of the SisAl project for FREY, which is the manufacturing of an Al/Si high performance tube has been reached.**

During the last period of the project, new tubes will be manufactured, using the same furnace, but increasing the amount of Si, and test with 2 different cooling rates to compare the microstructure and the mechanical properties. Both 20mm and 50mm thickness tubes will be manufactured.





The most recent works of SIMTEC are based on a tight collaboration with Elkem and MINTEK. Numerical models of conductive and radiative heat transfer phenomena in different furnace designs, including heat generation by the electric current in graphite heating rods, have been developed to assist the Pilot project partners and to facilitate decision-making regarding the thermal design of furnaces. The validation of the work has been done in collaboration with Elkem by simulating the preheating of an existing furnace, used earlier in the framework of the SisAl Pilot project as a ladle furnace for aluminothermic reduction tests. By fitting the experimental temperature measurements, the internal model parameters have been tuned, making it ready to be used for simulating different designs of a bigger ladle furnace that is being currently constructed at MINTEK. The current modelling work at SIMTEC is focussed on designing an optimized heating rod geometry to find a configuration compatible with the available electrical equipment. The last modelling results show that the ladle furnace design proposed by MINTEK meets well the security and efficiency requirements for the furnace preheating stage.

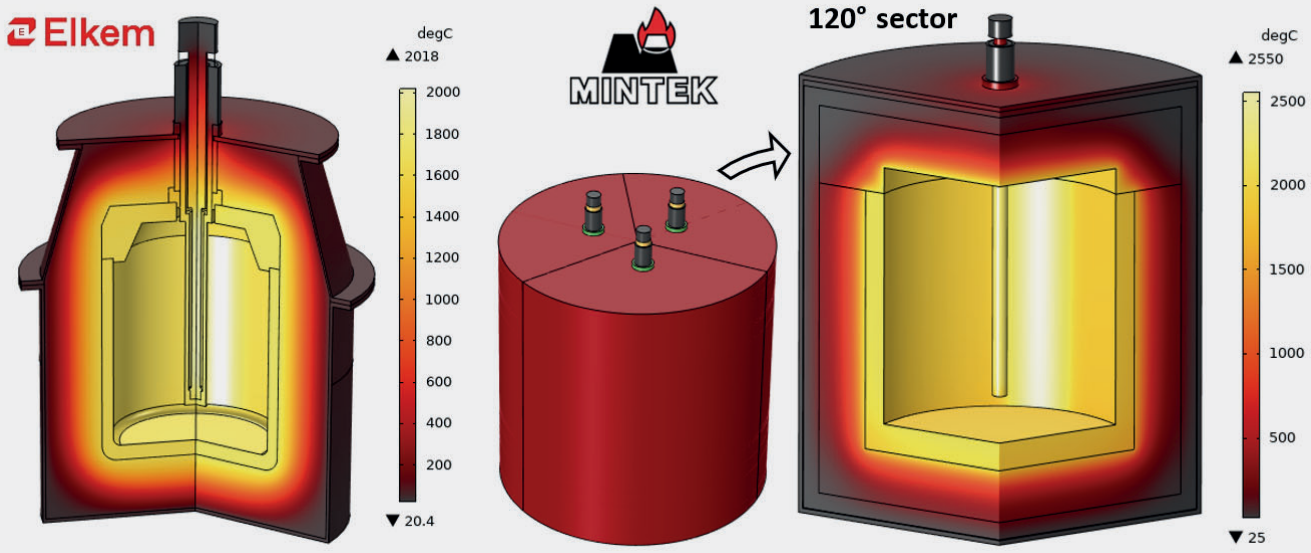


Fig. 1: Numerical models of the preheating of ladle furnaces at Elkem and MINTEK

During the last period it has been a close cooperation between WP4 *Exploitation* and WP5 *Environmental impact* and *sustainability assessment*. We observe that the prospects of industrial operations for materials production increasingly are influenced by lifecycle environmental footprints, as the cost of particularly carbon emissions no longer can be neglected. This means that economic viability assessments of new SisAl business cases must incorporate emission costs of all scopes. This is accounted for in the latest version of the Exploitation Roadmap, where the impact of raw materials- and product mixes on emission costs is evaluated.

The second version of the Innovation database is finished, and a Case study on SisAl process- & material flows vs. regulatory frameworks is developed.

Partners

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