SOL-GEL bonded product for safety and energy savings

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Customers needs

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Calderys solution

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The background situation

Today, Europe is putting a lot of stress on industrial practices with regards to Environmental, Health and Safety (EHS) to offer better working conditions to its workers and preserve the environment.

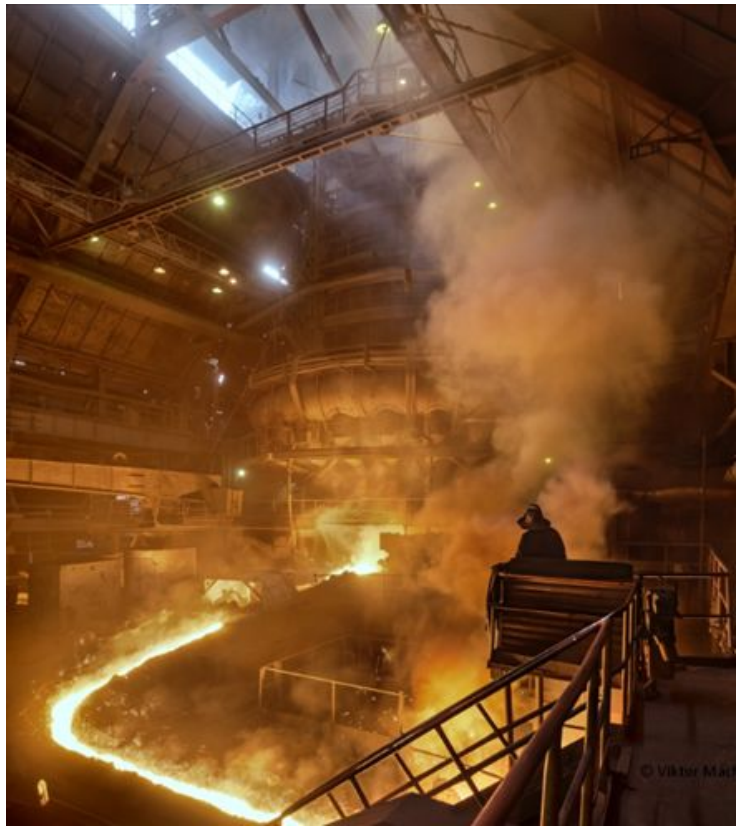
This situation creates challenges for the steel manufacturers as well as on the refractory producers.

The request from the customer

The customer, a large EU steel producer, has consulted Calderys in order to develop a product without hydrogen release for a **blast furnace casthouse application**, with the main priority for the secondary runners (slag and iron).

Indeed, hydrogen is causing problem in terms of EHS but also in terms of industrial operations as workers are not allowed to be on the casthouse during the hydrogen release.

Calderys has worked on a new product development to offer a safer environment for the workers as well as flexibility and enhanced performance for the customer.



Analysis of the customer request

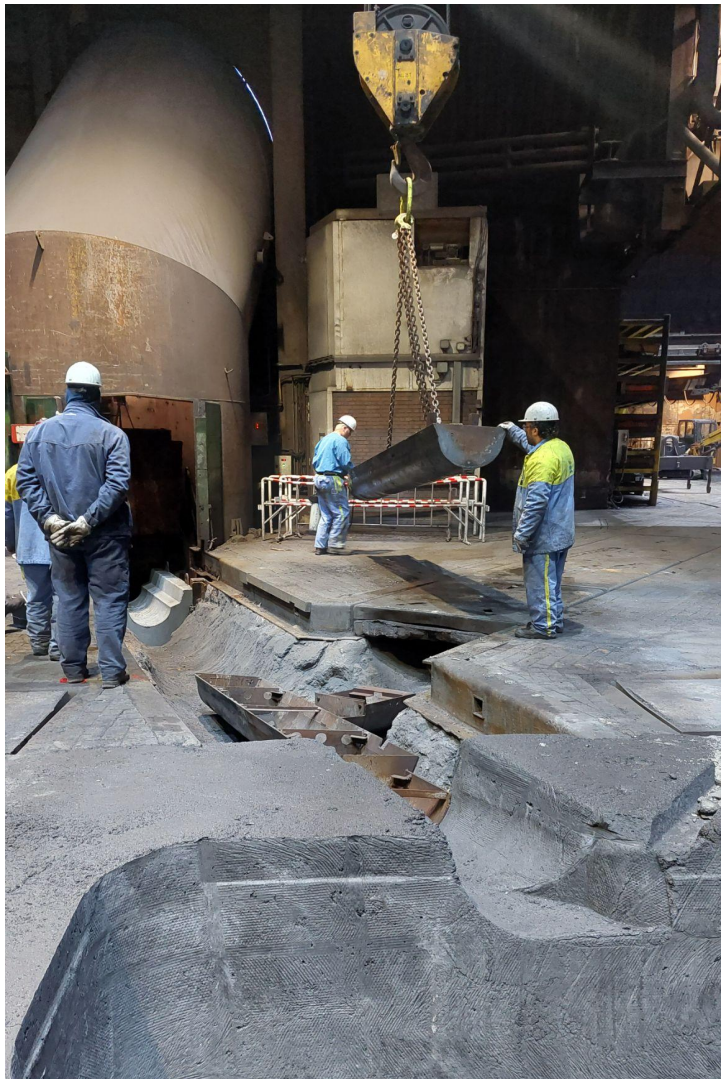
The generation of hydrogen is a phenomenon which is linked to the bonding system and additives which are added to the matrix of the refractory material in order to reduce the risk of explosion during the drying cycle.

Calderys has developed a new hydrogen-free product dedicated to the customer process and conditions.

Description of the solution developed by Calderys

The main work was made on the bonding system with the use of a specific colloidal silica binder. In parallel, an optimization of the raw material skeleton architecture has been made in order to achieve the proper setting time and flow, to make large maintenance under different temperature conditions.

Different configurations, binder types and ratios were analyzed to find the best product in terms of chemical and physical characteristics.
Calderys also performed corrosion tests with blast furnace slag to evaluate the chemical resistance.



Benefits brought by the solution

The product developed is showing superior physical and chemical properties compared to the references at lab scale and in situ at the customer.

The product is reverting a better total cost of ownership due to a lower consumption as well as a a lower energy demand before usage, due to shorter drying time (until 50%).

Physical properties	Parameters	Reference	Sol Cast 1B3
@110 °C	Open porosity Bulk density MOR CCS	13.9 % 2.94 g/cm^3 4.3 MPa 49.7 MPa	13.1 % 3.04 g/cm^3 7.3 MPa 51.7 MPa
@1,500 °C	Open porosity Bulk density MOR CCS	15.4 % 2.95 g/cm^3 5.3 MPa 85.4 MPa	14.2 % 3.02 g/cm^3 8.9 MPa 129.9 MPa

Improved physical properties

Reference
Corroded area: 920 mm²
Deepness: 21 mm

Improved corrosion resistance un CIF test

1B3
Corroded area: 850 mm²
Deepness: 19 mm

Product presentation

Our Science and Technology department together with our Technical Support Engineers have developed a specific Sol-Gel bonded (colloïdal silica) product with outstanding physical and chemical properties. **This product does not release any hydrogen.**

This product helps reducing the total cost of ownership (TCO) of the customer due to:

- Shorter installation/maintenance time (no curing)
- Shorter drying cycle by 50% compared to the reference
- Improved performance

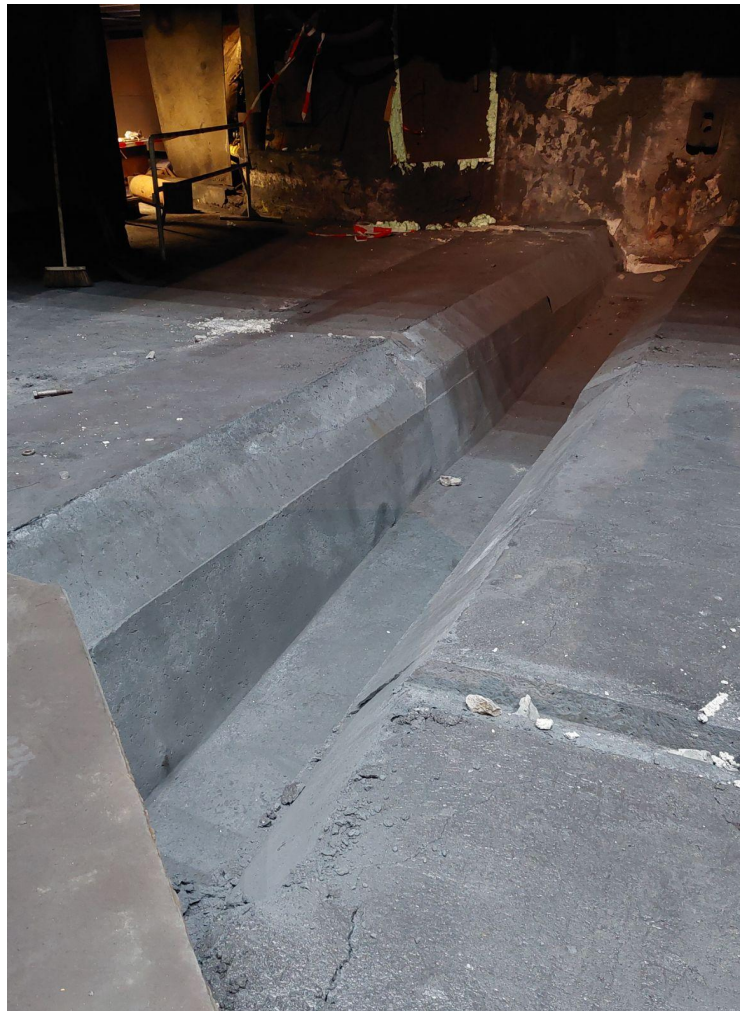
Services - Expertise

Calderys accompanies its customers in the steelmaking practices of tomorrow.

Our product development is following a global approach connected to EHS while keeping the product performance as a predominant key indicator.

We have been able to deliver an improved industrial solution to our customer concerning the hydrogen release allowing not only a safe environment but also a high grade technical solution improving the performance in-situ.

In addition to constantly developing new technologies for the industry of tomorrow, Calderys' iron experts have developed a full package service: from engineering & design to product installation, dry-out and commissioning as well as maintenance services.



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