Debottlenecking EAF by extending life time

BACKGROUND
Customers needs

CONCEPT
Calderys solution

SUMMARY
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Concrete benefits

The background situation

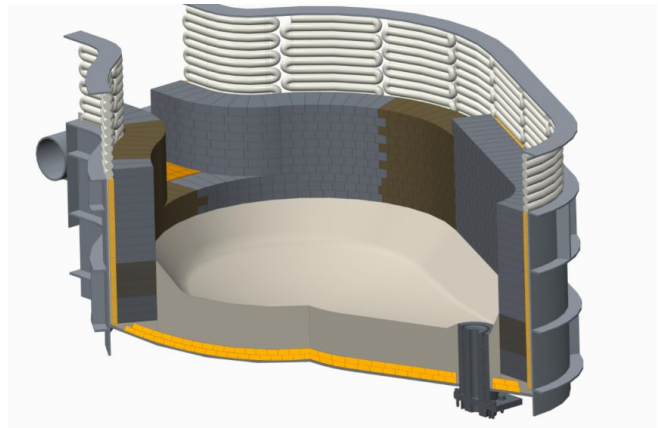
Typically the EAF is the bottleneck in a MiniMill's steel production process. Maximizing its availability is a critical consideration when deciding when and how to maintain the refractory lining of the Electric Arc Furnace. Maintaining the Brick side walls and the monolithic hearth require different approaches to successfully implement an efficient and cost effective maintenance program.

The request from the customer

Provide a new lining and refractory maintenance solution to maximize the availability of the EAF by increasing the furnace refractory life while reducing the time taken for maintenance and the number of maintenance events required.

The solution should:

- Be flexible and easy to integrate into the current steel making process and provide a reduction in the total refractory cost of the furnace.
- Safely extend the entire furnace refractory lining life to reduce the number of relines and partial relines required per annum



Analysis of the customer request

EAF of the customer is a single furnace operation, melting in average 70% scraps and 30% DRI.

The steel plant was conducting a partial brick reline every two weeks, resulting in 12 hours of lost of steel production each time.

A full reline of the furnace was conducted every 900 Heats. This full relining of the changeable shell of the furnace would take an additional 12 hours to complete.

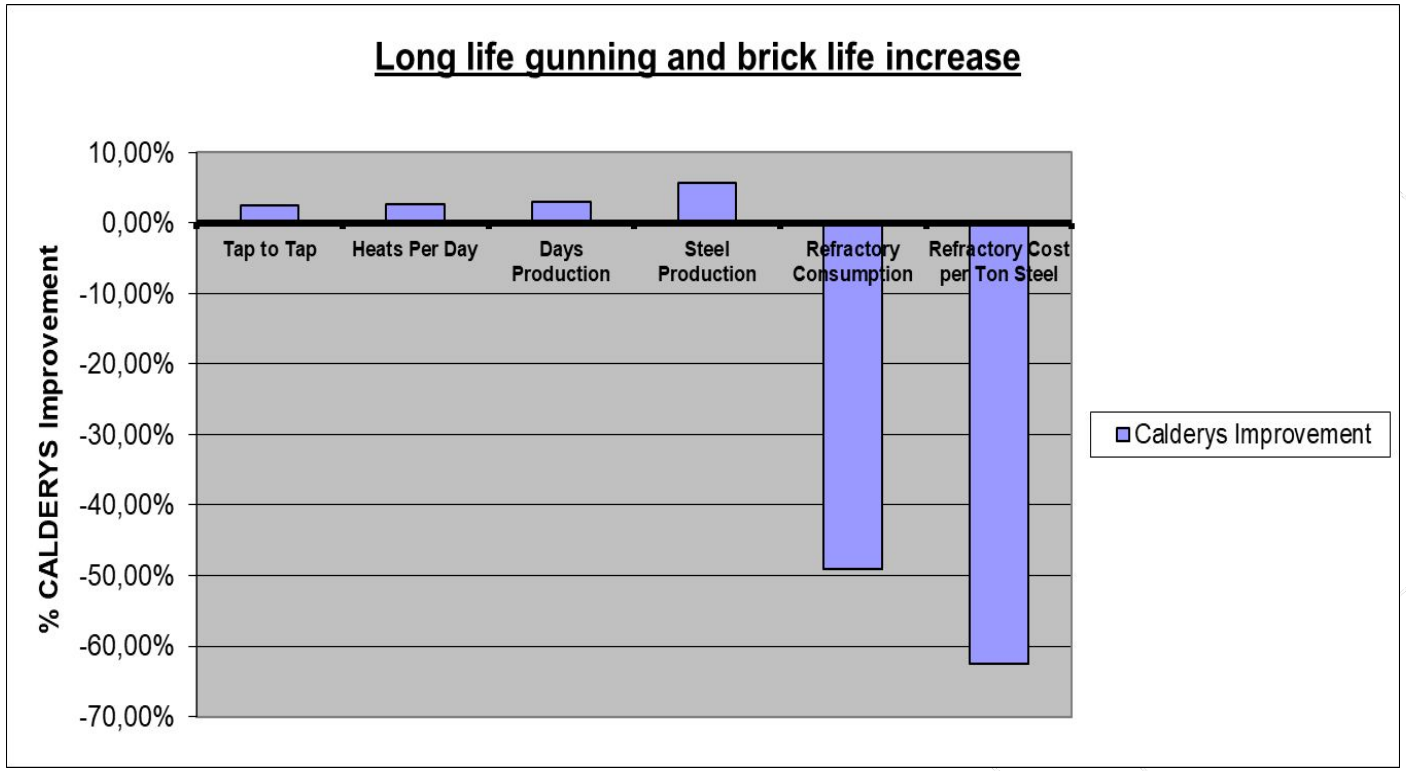
In total, this EAF was down for relining one full day per month.

Calderys solution

1. The Steel plant was converted from dolomite-based, blended hearth ramming and fettling materials to our naturally occurring Alpine magnesia products designed specifically for DRI melting furnaces. For new hearth installation, we now use **CALDE™ MAG DRY K75 G6** and fettling is conducted with **CALDE™ MAG FRIT 80 G8**
2. In addition, we introduced our high density, low iron containing gunning maintenance material, **CALDE™ MAG GUN G 89** to fast and effectively maintain the high wear areas of the bricked side walls.
3. In order to reduce the number of required gunning events, we selected the Calderys high refractory ‘G’ Bond system.

Benefits brought by the solution

- Furnace life has systematically and safely been **increased from 900 heats to over 9,000 heats**
- Fettling consumption has reduced **from 2Kg/t to 0.9Kg/t**
- Furnace maintenance gunning has **reduced from 1.7Kg/t down to 0.9Kg/t.**
- Maintenance down time savings have **increased production by 150 additional heats per annum**
- The furnace is now completely relined **only once per annum**
- A partial Brick reline is **conducted once every six weeks**



Product presentation

CALDE™ MAG DRY K75 G6, hearth ramming material and **CALDE™ MAG FRIT 80 G8**, hot fettling material:

- These products are based on a naturally occurring high lime, low Silica Alpine magnesia.
- This specific aggregate has fast and complete sintering which leads to formation of Dicalcium and Tricalcium Silicate that effectively resist high silica slag attack.
- The use of these products resulted in a significant increase of the Hearth durability, reducing the frequency and amount of maintenance material required.

- **CALDE™ MAG GUN G89** is a MgO based gunning material using the highly refractory and Calderys patented ‘G’ bond system. It was introduced to maintain the side wall bricks. Initially the material is fluid to fill voids and micro-voids in the brick. Rapid gelling then prevents slumping and reduces rebound
    - Our “G” Bond products are based on a unique high density, low iron, MgO grain in the fines
    - The MgO used in these products has four times less iron content than the standard Chinese MgO grain. It is also significantly denser and less porous

Thank you for your attention

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