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Dolime-Based EAF Hot Repair Material — Successful Product Improvements

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ABSTRACT

Dead-burnt dolime impregnated with iron oxide is an established and proven solution for EAF refractory hot repair for decades. The corrosion mechanisms in comparison to other refractory repair are different, but with similar effect. With an optimized particle size distribution, densification and resistance to slag corrosion are increased. Sizing improvements bring the advantages: minimizing porosity, maximizing contact for enhanced bonding and imparting flow characteristics. The results received via pyrometric cone equivalent tests, thermodynamic calculations and slag corrosion tests are presented. By optimizing the particle size distribution, it was possible to improve the corrosion resistance for a higher performance of a commercial dolime-based fettling material from Dolofrit® product range.

Keywords: EAF, refractory, hot repair, fettling, dolime

INTRODUCTION

In the recent decades, EAF refractory maintenance strategies have made a substantial contribution to steel mills efficiency. Strategies employed by EAF steelmakers are always determined by the utilization rate of the steel shop aiming for an optimization between costs and availability of the vessel. To perform refractory maintenance of a vessel, only two families of hot repair materials are available to the industry: gunning mixes and fettling mixes. Gunning mixes are designed to maintain the wall and hot spots of an EAF. On the other hand, fettling mixes are employed to patch the most eroded areas of the hearth, banks and bottom of the vessel.

Fettling mixes are either based on magnesia or dolime. A steelmaker can choose between a magnesia- and dolime- based fettling mix by comparing the cost of the material and its performance. Usually, dolime-based materials are more cost-effective than magnesia-based materials. Despite a significant difference in their mineral composition (magnesia: 70 to 90 wt. % MgO; dolime: 35-40 wt. % MgO and 50-60 wt. % CaO), performance of magnesia- and dolime- based fettling mixes are similar. Firsbach et al. [1] in 2020 confirmed theoretically and industrially the absolute difference of performance regarding dissolution and specific consumption between a magnesia- and dolime- based hot repair material with iron ore coating is at most 6 %. The absence of a notable difference in performance between the two products is essentially driven by a similar dissolution mechanism.

SPECIMEN

In the frame of a research cooperation with Lucideon Ltd, formerly British Ceramic Research ltd, it was concluded that by increasing <2 mm fraction in Dolofrit® products, the sintering, strength, hence performance of the standard hot repair material currently produced could be improved. Two commercial dolime-based fettling material from Dolofrit® product range (labeled Dolofrit® A, Dolofrit® B) were used. Use of baghouse and refractory fines could assist in completing our circular economy,

