Contribution ID: **83** Type: **Oral Presentation - Full Paper will be submitted**

Simulation of Mixing Efficiency in a Large-Scale Dephosphorization Converter with Combined Top and Bottom Blowing

Wednesday, 21 May 2025 12:00 (20 minutes)

To investigate the impact of combined blowing parameters on mixing behavior and dephosphorization efficiency in a dephosphorization converter, laboratory water model experiments were conducted on a 300t duplex dephosphorization converter based on similarity principles. The study examined 21 different configurations of bottom-blowing elements (varying in quantity and arrangement patterns), along with the effects of top-blowing intensity, oxygen lance position, and bottom-blowing intensity on bath mixing efficiency. Numerical simulations were performed for further comparative analysis. The results indicate that, under the condition of equal total gas supply intensity, adopting a symmetric and concentrated arrangement of 8 bottom-blowing elements, along with maintaining a high bottom-blowing flow rate, can significantly enhance the stirring effect in the molten pool. Industrial trials demonstrated that the average phosphorus content in semi-steel decreased from 0.0249% to 0.0173%, with dephosphorization rate improving from 75.3% to 85.4%, effectively enhancing both bath mixing efficiency and overall dephosphorization performance.
Key words: dephosphorization converter; top and bottom blowing; bottom blowing arrangement; water and numerical simulation; mixing time;

Speaker Country

China

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Session Classification: Impact of changed raw material mix on BOF process and secondary metallurgy

Track Classification: Impact of changed raw material mix on BOF process and secondary metallurgy