

Prediction of Nitrogen Content of Steel Melt during Stainless Steel Making Using AOD Converter

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Abstract

A mathematical model has been developed to predict nitrogen content in steel melt with respect to blowing time for making different grades (e.g., 304L, 204Cu, and 18Cr–18Mn–0.5N) of stainless steel using AOD converter. Firstly, bath composition and temperature are calculated based on thermodynamic modeling of refining reactions. Then bath nitrogen content is predicted considering the influence of the bath temperature and composition variation as well as the kinetics of nitrogen absorption and desorption of steel melt. Flux and alloy additions are also taken in account for developing this model. For the purpose of development and validation of the mathematical model for predicting nitrogen content of molten steel, the required plant data is obtained from stainless steel making process performed in a 50 ton AOD converter which is equipped with a top lance and five sidewall nozzles at Jindal Stainless Ltd., Hisar in India. This mathematical model will be effective and beneficial because nitrogen prediction by this model corresponds well with actual measured values collected from steel plant. This numerical model will also help in achieving optimum as well as effective use of argon gas and critical control over final nitrogen content in stainless steels.

