

The Role of CFD Modeling in Development of the HIs melt Process

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INTRODUCTION

Direct smelting has been a holy grail for the steel industry for a long time. Environmental issues associated with blast furnace ironmaking are intensifying and a viable alternative is urgently needed. However, the task is a difficult one and there have been many failures. In particular, scale-up has offered the greatest challenge and has led to most disappointments.

After a 20-year development phase involving multiple pilot plants, HIs melt has recently emerged as the only ferrous direct (bath) smelting process thus far to proceed to commercial status. Rio Tinto, together with Nucor Steel, Mitsubishi and Shougang Steel as JV partners, is now in the process of building a 0.8 Mt/a plant in Western Australia.

Difficulty associated with harnessing complex fluid mechanics is the major reason this process was not developed 50 or 100 years ago. Adequately understanding the fluid mechanics has only become possible, through Computational Fluid Dynamics (CFD) modeling, quite recently. HIs melt initiated CFD studies in the mid 1980's and has continuously refined this capability to the point where it is considered the most advanced of its type. Within HIs melt, CFD is regarded as a major risk-management tool with considerable predictive power in terms of scale-up and process optimization. It has helped de-mystify the behavior of the system to the point where full commercial implementation now is possible with a high degree of confidence.