Contribution ID: **159** Type: **Talk**

Computational modelling of furnace tapholes – a case study in life at the interface between academic and industrial research

Wednesday, 6 December 2017 14:00 (30 minutes)

Pyrometallurgical smelting furnaces are used in the production of many commodities of strategic and economic importance in South Africa including ferrochromium, platinum-group metals, titanium dioxide, manganese alloys, and others. Most furnaces make use of tapholes, channels through the furnace wall and lining, in order to facilitate the removal of molten process material from inside the vessel. Correct understanding and operation of the taphole is essential for optimal performance of such furnaces [1]. Depending on the smelting process being used the furnace may use a single taphole for all material, or separate tapholes for different phases such as slag and metal. Tapholes are typically located in a taphole assembly, a specialised section of the furnace sidewall designed for this purpose.

Fluid flow of molten material through furnace tapholes during tapping is a complex problem, and its qualitative and quantitative behaviour is generally governed by a combination of taphole geometry and properties of the tapped fluid [1,2]. Understanding the interaction between these parameters and the operating conditions inside the furnace is important for determination of tapping flowrates and wear phenomena.

In this presentation, a technical overview of recent work at Mintek on computational modelling of fluid flow through furnace tapholes will be presented. In addition, the relationship between fundamental research and industrial development in the pyrometallurgical sector will be explored in the context of taphole modelling. In particular, factors which can limit innovation in pyrometallurgy – such as strong risk sensitivity, harsh macroeconomic climates, and long lead times for adoption of new technologies – will be addressed. The leveraging of academic research using facilities such as CHPC is seen as a critical and necessary step in the process of engaging with industrial clients and technology partners, especially in the relatively new and disruptive field of computational modelling.

1. Nelson, L.R. and Hundermark, R.J. (2016). 'The tap-hole' – key to furnace performance, J. SAIMM, 116(5), p 465
2. Reynolds, Q.G. and Erwee, M.W. (2017). Multiphase fluid flow modelling of furnace tapholes, Proc. CFD 2017, p 521

HPC content

Computational fluid dynamics, furnace modelling

Primary authors: Mr ERWEE, Markus (Mintek); Dr REYNOLDS, Quinn (Mintek)

Presenters: Mr ERWEE, Markus (Mintek); Dr REYNOLDS, Quinn (Mintek)

Session Classification: Computational Mechanics

Track Classification: Computational Mechanics