# Simulation of Slag/Gas and Slag/Iron Interface Tilting in Blast Furnace Hearth During Slag Tapping

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## Abstract

The blast furnace hearth drainage constitutes a major part of the blast furnace operation. Especially, keeping track of the iron and slag levels is crucial to adapt the tapping strategy. The operational target is usually not only to empty the blast furnace as far as possible but also to keep the slag below a critical level to prevent flooding of the tuyeres where the hot blast is injected into the furnace. Tuyere flooding leads to the most serious dangers and damages which may occur in blast furnace operation. Therefore, characterizing the movements of the slag/gas and slag/iron interfaces during tapping is an important issue.

The flow through the coke bed (or so-called deadman) in the hearth is modelled using the Brinkman and Forchheimer equations in COMSOL Multiphysics®. The slag/gas and slag/iron interfaces are modeled using the moving mesh physics in COMSOL Multiphysics®. Since the iron viscosity is much lower, it is assumed that during the first period of tapping, i.e. iron only tapping, the iron/slag and slag/gas interfaces are horizontal. However, the high viscosity of slag causes a tilting of the interfaces during the later mixed iron and slag tapping period which is the main focus of this study.

The tilting effect depends on a variety of conditions, e.g. the permeability of the dead man, the properties of the liquid phases and the tapping rate and position. To achieve a computationally efficient model, the deadman is assumed to be uniform and stationary. The introduced model can estimate the residual iron and slag remaining in the hearth after tapping hence it serves as a tool for accurate tracking of the liquid levels in the blast furnace process.

## Figures used in the abstract

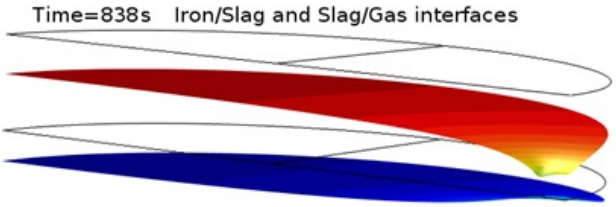


**Figure 1**: Slag/iron and slag/gas interfaces.