# Some thermo-hydrodynamic problems in blast furnace steel casts

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In this talk two models of the melt flows in a Blast Furnace channel will be presented.

In the first, a 3D modelling and simulation of the evolution of the flow from its discharge into the channel through the taphole will be considered. The fluid will be considered a mixture of pig iron and slag whose interface in the channel is consolidated by the difference in densities between them. An analysis of the simulations results as a function of the various taphole stream conditions (percentage of pig iron, exit velocity, diameter of the taphole, ...) will be presented.

To simulate the evolution of the flow during a whole casting campaign (about two months duration with about 200 casting cycles) a transient 2D model on a cross section of the channel will be considered. The simulation algorithms implemented in FEniCS incorporate discretizations and their optimization to reduce computation times. This 2D model, which will benefit from the knowledge derived from the previous 3D model (mainly at the beginning of each casting cycle), will allow analysing the influence of stops between cycles, and evaluating the thermal situation of the refractory materials in the channel. A comparative analysis with experimental measurements during an entire campaign will be presented.

[1] P. Barral – L.J. Pérez-Pérez - P. Quintela. Transient 3D hydrodynamic model of a blast furnace main trough. **Engineering Applications of Computational Fluid Mechanics**, 2023, 17(1), 2280776. DOI: https://doi.org/10.1080/19942060.2023.2280776

[1] P. Barral – L.J. Pérez-Pérez - P. Quintela. Transient thermal response with nonlocal radiation of a blast furnace main trough. **Applied Mathematical Modelling**, 105, 197-225, 2022. https://doi.org/10.1016/j.apm.2021.12.029

[2] P. Barral – L.J. Pérez-Pérez - P. Quintela. Numerical simulation of the transient heat transfer in a blast furnace main trough during its complete campaign cycle. **International Journal of Thermal Sciences**, 173, 146-159, 2022. DOI: https://doi.org/10.1016/j.ijthermalsci.2021.107349

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