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CHPC

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Advancing the understanding of interactions between plasma arcs and power electronics with high performance computing

Tuesday, 3 December 2019 11:40 (20 minutes)

Direct-current (DC) arc furnaces account for a significant proportion of installed pyrometallurgical capacity worldwide. Their applications include steel recycling as well as smelting of various materials such as ferrochromium, ferronickel, ilmenite, and others. In order to provide power to such furnaces, alternating current from the grid or other generation sources must be converted into DC by rectification. At industrial scales the rectifier unit is often the single largest capital cost item, and any errors in its specification can result in the entire plant operating inefficiently (or not at all).

In this presentation, computational plasma arc models developed in OpenFOAM® are coupled with circuit simulations of solid-state furnace rectifiers in order to gain insight into the complex interactions between the rectifier's design parameters and the behaviour of the arc. Such approaches provide a first step toward true virtual prototyping and digital twin modelling for the electrical design and optimisation of DC arc furnaces.

High performance computing is a critical enabling tool in such studies, and various aspects of this – including solver performance scaling analysis, software automation, and use of methodologies from other HPC fields – will be touched on during the presentation.

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