

MULTISCALE MODELING OF FIRED HEATERS

Ravindra Aglave, Director-Chemical & Process, Siemens PLM Software

**Niveditha Krishnamoorthy, Technical Specialist-Combustion
Siemens PLM Software,**

**Thomas Eppinger, Technical Specialist-Reaction Engineering,
Siemens PLM Software**

Carlo Locci, Technical specialist- Reaction Kinetics, Siemens PLM Software

KEYWORDS

CFD, Discrete Element Modeling, Reaction Kinetics Design Space Exploration, Optimization, STAR-CCM+

ABSTRACT

The optimal design of complex chemical processing equipment like furnaces, process heaters, crackers and reformers is extremely challenging, due to the high thermal environment and multiple physics occurring at various scales from microscopic to macroscopic. Chemical plant operations involve handling and processing of large volume of chemicals and, as such, even small improvements in equipment and process efficiency will translate to improved operational efficiency and large cost savings. Simulation can help in the design of plants and processes to achieve these goals by mitigating risk, easing scale-up pains, troubleshooting existing processes and providing design capabilities beyond just process simulation. Furnaces, heaters and reformers are complex pieces of equipment involving the firebox side (ducts, burners) and the process side

In this work, we would like to present how computational fluid dynamics (CFD) for hot side modeling, discrete element modelling (DEM) for resolving packed beds, co-simulation between 3D CFD and 1D reaction kinetic calculations, reaction mechanism reduction, and automated design space exploration using SHERPA algorithm for optimizing air duct design has been used for multi-scale and multiphysics simulation for design and operation. This work was performed with the integrate engineering platform STAR-CCM+