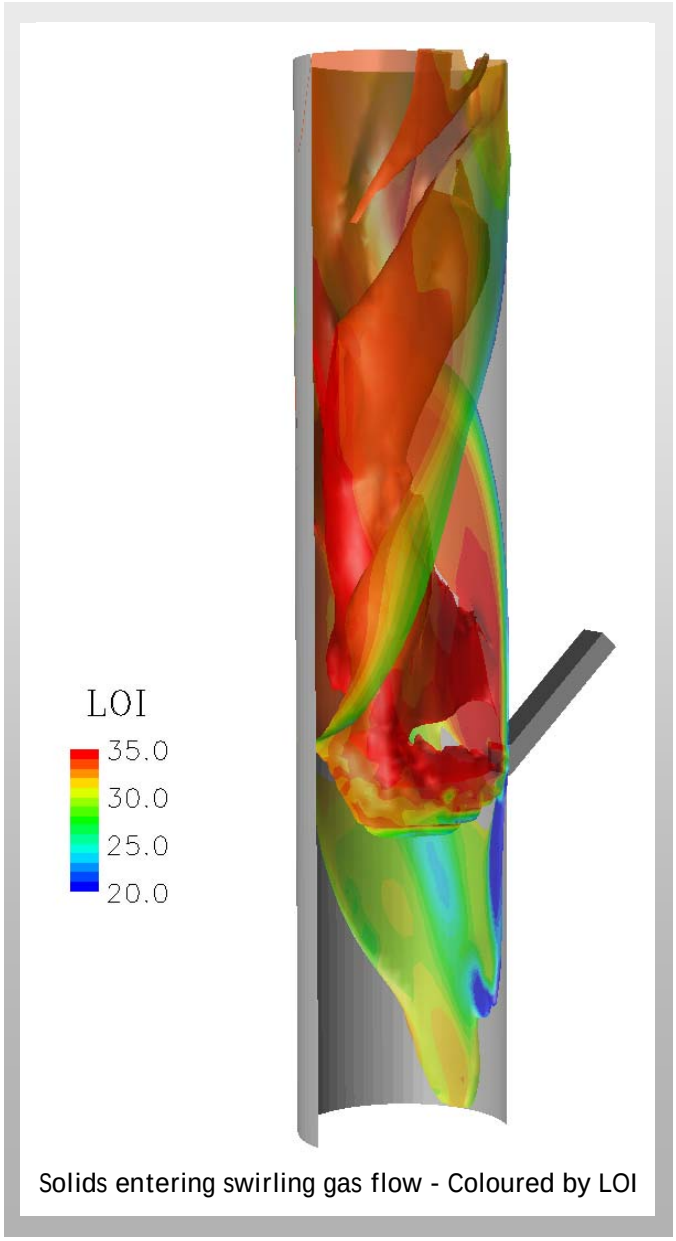
Engineering CFD
Design & Engineering

# Calciner Furnace Modelling


**CFD Design & Engineering** is an engineering company specialising in Computation Fluid Dynamics (CFD) and related engineering design services for the process industries.

We have many years experience modelling alumina calciners with projects covering different aspects of the process including cyclones, furnaces, risers, solids pickup, ESP's and duct design. Through this experience we have developed modelling approaches that ensure the correct physical processes are modelled.

Developing CFD models of calciner furnaces requires careful consideration of the relevant physical process including the gas flow, turbulence, flow of solids particles, fuel combustion and the calcination process. All these variables are closely coupled and the interaction between the phases must be correctly considered in order to produce realistic simulations.




Solids entering swirling gas flow - Coloured by LOI

*Gas-Solid Flow* The momentum of the solids entering the furnace is significant and alters the gas flow and turbulence within the furnace. With regions of high solids loading present both the gas-solid and solid-solid interactions must be correctly modelled.

*Combustion* The combustion process can involve fuel oil, natural gas or coal particles. The process of combustion adds significant energy to the gas flow and changes the gas composition and volume.

*Calcination* As the particles undergo the calcination process the chemical reaction produces water vapour and absorbs energy. Both these process have a significant effect on the gas volume and density.

## THE RESULTS

By considering the physical processes coupled together within one model, the complex behaviour of the calciner furnace can be modelled. These furnace models greatly enhance the design process by providing the following information.

- solids feed and distribution within the furnace
- solids retention times
- calcination rates and particle composition exiting the furnace
- interaction between the combustion zone and calcination reaction
- gas distribution and effect of burner placement
- identify high temperature regions responsible for NOx production



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