



ADVANCED CONTROLS, SIMULATION AND EMISSIONS

CLEAN ENERGY TECHNOLOGIES

LOWER FURNACE RADIATION MODEL

Scientists at CETC-Ottawa have developed a lower furnace radiation model that is designed to capture the radiative heat transfer processes in a furnace. This is a generic furnace model and therefore can be used to simulate any type of industrial boiler or furnace enclosure. It has been applied to utility boiler applications to predict the furnace outlet temperature and heat transfer to the walls with a high degree of accuracy. The model can be used independently or as a HYSYS unit operation.

Capabilities

The lower furnace model is extremely robust and models furnace designs with variation in:

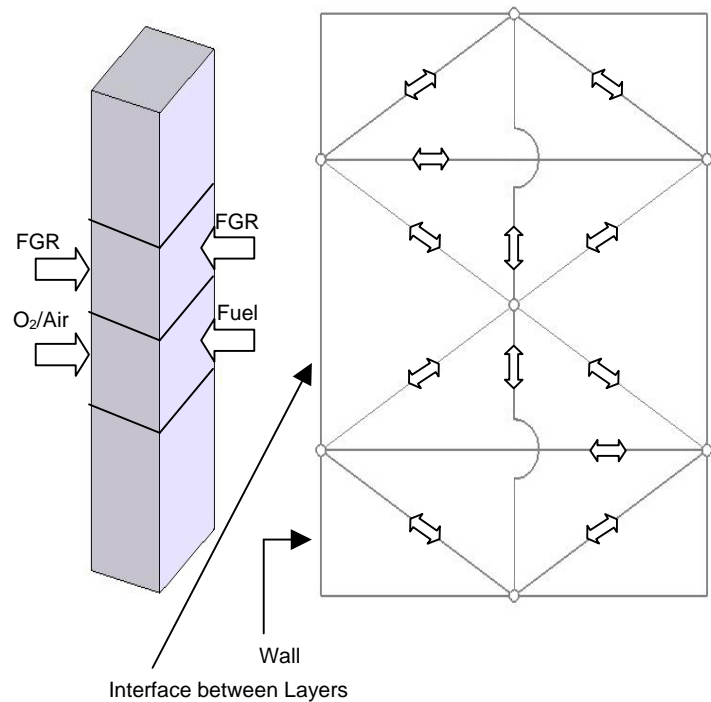
- Flue gas streams
- Less heat transfer equipment damage
- Furnace dimensions and pressures
- Burner locations and configurations
- Combustion chemistry
- Air and oxy-fuel modes of operation

Technical Information

The lower furnace model determines heat transfer in furnace cavities where the major mode of heat transfer is radiation.

Lower Furnace Layers

Radiant Energy Flows



Lower Furnace Radiation Solution Scheme

The lower furnace model uses a plug flow, multi-slice treatment, as a surface-to-surface radiant exchange. The problem involving a participating medium is solved based on the geometry of the furnace and the burner locations.

Accomplishments

The lower furnace radiation model has been vigorously tested against industrial scale reference data with numerous burner configurations and operating conditions. It has proven to be highly robust and accurate. The model has also been successfully applied in a Canadian Clean Power Coalition (CCPC) study to retrofit a 400 MW_e air-based boiler for O₂/CO₂ operation.

Possible Applications

The lower furnace radiation model is a powerful tool used in a variety of applications such as:

- Novel boiler system or furnace design
- Existing boiler or furnace retrofit
- Flue gas suitability evaluation
- Production rate optimization
- Quality control
- Thermal efficiency optimization



A Furnace Enclosure of a Small Boiler

Your Invitation to Work with Us

We are interested in collaborating with you. Please contact the Business Office to discuss your particular needs.

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