

Combustion & Thermal Flow Simulation Of An Industrial Boiler

Steam Boilers are widely used in many industries. Performance data for furnace and industrial boilers must have following requirements

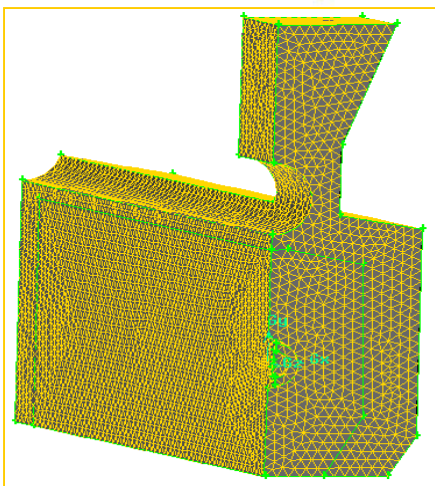
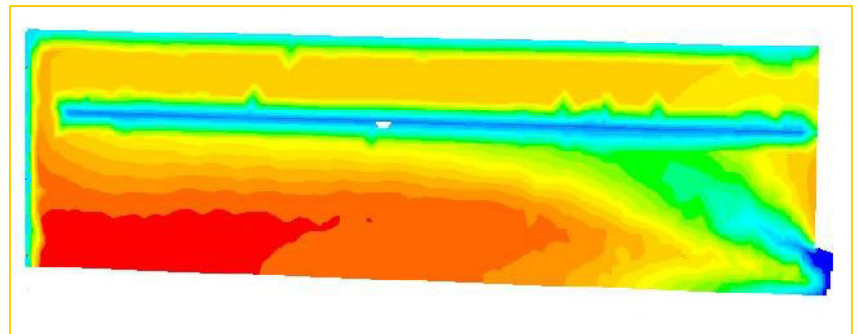
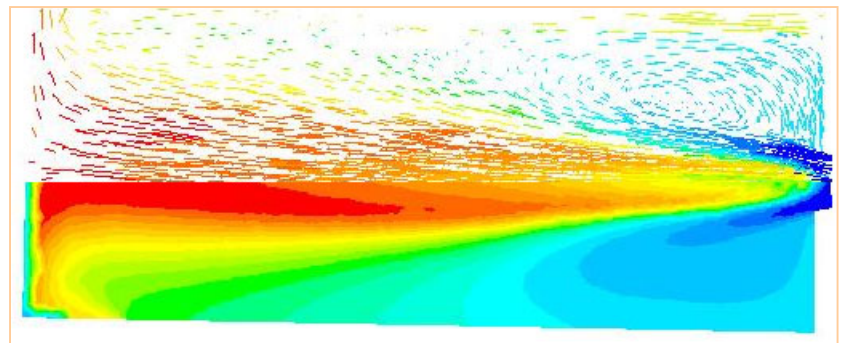
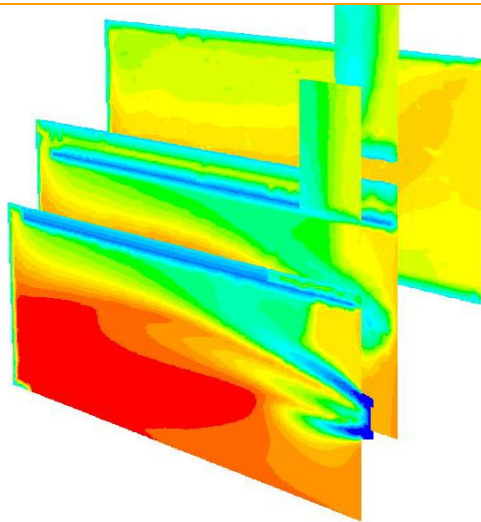
- Designed to absorb maximum amount of heat released in the process of combustion.
- High reliability during long-term operation.
- High Flame stability while firing fuels.
- Design and construction to accommodate expansion and contraction of materials.
- Furnace setting conducive to efficient combustion and maximum heat transfer.
- Low emissions (NO_x, CO).

Current Problems

- To meet more stringent emissions regulations
- Reliability
- Unexpected rupture of steam tubes
- Deteriorated Efficiency
- Unstable flames caused by fuel fluctuations

R & D Effort at ECCC

- Modeling the Burner, Boilers and Super heaters.
- Simulate Combustion and thermal flow in the Boilers.
- Prevention of super-heater tube rupture.
- Predict NO_x, and CO.
- Modify boiler flow pattern and adjust combustor to reduce emissions.



The Temperature Distribution on a vertical plane (above) and Horizontal plane (below) cutting through the center plane shows the flame propagation and flow pattern inside the combustion chamber of a steam boiler.

Figure shows the model an Industrial Boiler with meshing for CFD simulations. Only half section is shown due to symmetry.