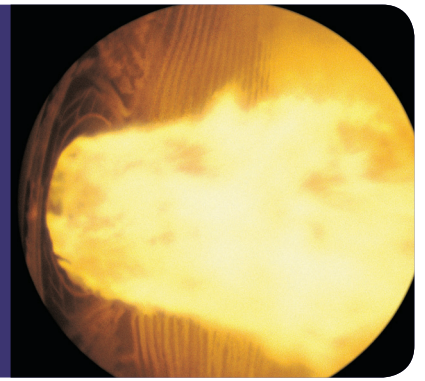


Performance Services

Combustion Fluid Dynamics (CFD) calculations

For optimised combustion



The computational fluid dynamics (CFD) is used for combustion modeling as a design tool for design, trouble shooting and optimization of combustion in boiler retrofit projects. It is especially used for studying combustion, heat transfer, pollutant formation and destruction of multi-burner boiler furnaces.

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The computational fluid dynamics (CFD) based modeling tool, has been used since 1992 in Fortum for the development, troubleshooting and design of burners and furnaces, and it has proven to be a powerful design tool in many fields of engineering.

CFD is based on the combination of physical and chemical models for combustion implemented to a commercial CFD package. It consists of several fundamental physics models ranging from mass, momentum and energy balance to reduced elementary combustion and NO_x-emission formation and destruction chemistry derived from empirical measurements and elementary chemistry.

The sub models and computational methods in the code have been chosen such that the most essential processes in the furnace can be simulated with reason-

able accuracy and acceptable computing time and costs. The modular structure of the program allows an easy replacement of a sub model with a more proper or accurate model when available.

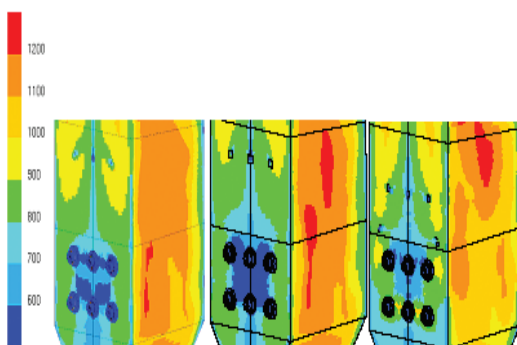
The CFD has been successfully used for e.g. solving the slagging problem at Fortum's coal-fired power plant in Naantali, Finland. A fuel change from lignite to hard coal has been designed by using CFD for two power plants in Eastern Europe.

CFD calculations were used for solving the high temperature corrosion problems at Fortum's Meri-Pori coal-fired plant in Finland.

Low-NO_x-burner performances have been improved by used CFC at several coal, peat, lignite, oil, gas and biomass firing power plants globally.

Key benefits:

- Models based on theories of physics and chemistry
- 3-dimensionality
- Design, problem solving and optimization
- Qualitative comparison of alternatives
- Good quantitative accuracy
- Cheaper than measuring or experimentation
- Easy scaling



Boiler temperature profile at burner level

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