

Energetics and Metallurgy

About us

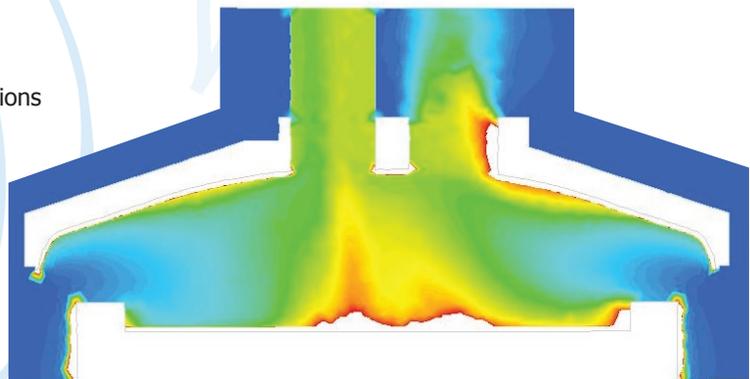
CFD.HU Ltd. is a Computational Fluid Dynamics consultation company closely associated with the Department of Fluid Mechanics at the Budapest University of Technology and Economics and the distributor and support center of ANSYS simulation software in Hungary. With the support of market-leading ANSYS Fluid Dynamics, Mechanical and Multiphysics software and our own computer cluster the company's internationally acclaimed staff can precisely analyse complex fluid problems with large cell numbers in order to optimise future engineering designs.

The company is co-lead by the former Head of the Fluid Mechanics Department, professor Tamás Lajos and Gergely Kristóf, PhD., the chairman of the sub-committee of Fluid Mechanics and Heat Technology at the Hungarian Academy of Sciences (MTA). All colleagues have a rich academic background with years of experience in the field of Computational Fluid Dynamics. The company's close relationship with the University also provides the opportunity to perform wind tunnel investigations to validate CFD results and to involve experts of other disciplines.



The use of CFD allows us to:

- Analyse complex flow characteristics:
 - Investigate flow profiles
 - Examine non-Newtonian and visco-elastic fluids
 - Optimise furnace designs
- Investigate effective mixing systems:
 - Reduce energy costs by determining optimal configuration
 - Evaluate configurations in a simulated environment reducing investigation time and cost
- Evaluate flue-gas exhaust:
 - Ensure adherence to environmental regulations

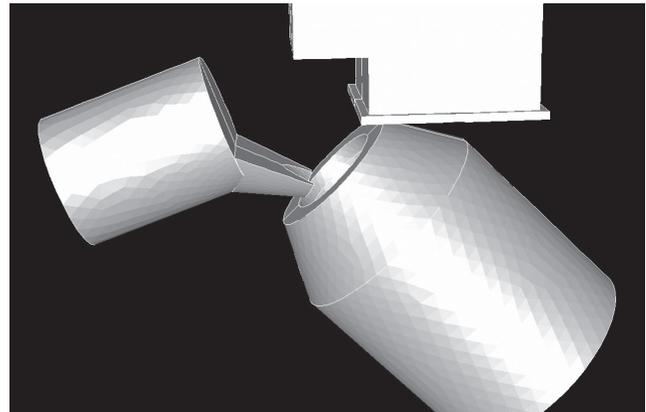
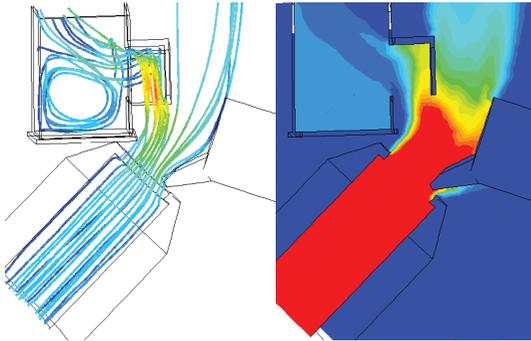


Flow in a metallurgic ladle

Foundry procedures involve extreme temperatures and conditions which require special attention when determining flow characteristics. In the case of mixing molten iron with an inert gas, flow field analysis can help to determine the movement of impurities within the metal. By evaluating the flow characteristics, the process can be optimised in order to improve the quality of the end product.

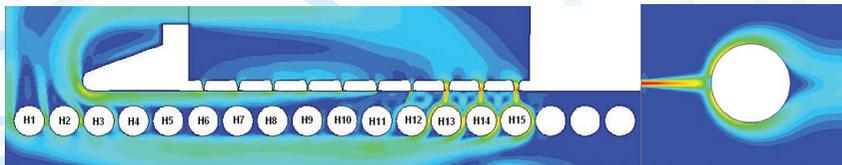
Flue-gas exhaust

The flue-gas exhaust system of a batch foundry process must be capable of dealing with unsteady gas production. Thermal expansion of the exhaust gas, as well as its naturally induced flow must be taken into consideration when developing the system. By analysing the gas flow, the efficiency of the exhaust system can be optimised and harmful gas emissions can be reduced.



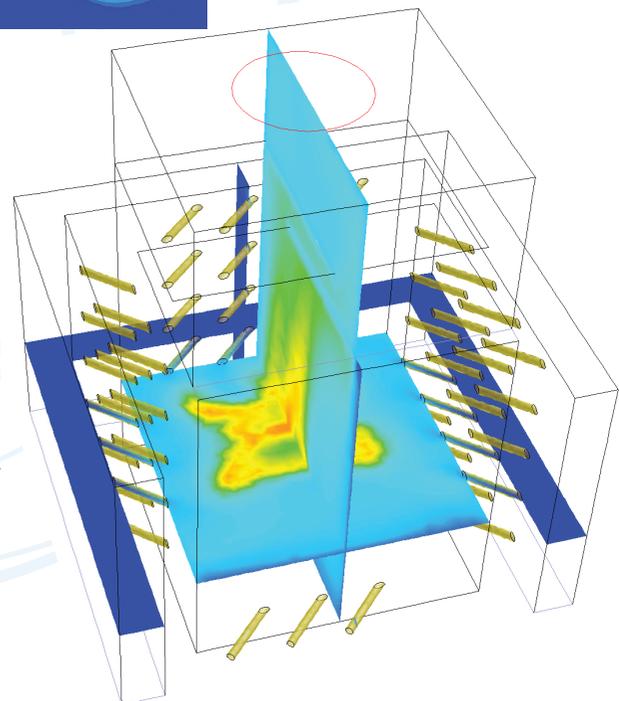
Annealing

The annealing process involves heating a metal product to a certain temperature in order to alter the finished product's properties. In the case of heat-treatment of aluminum cylinders, the desired temperature for recrystallization approaches the melting point of the material; therefore, equal distribution of the heat load is crucial in order to avoid melting the surface. CFD flow analysis can be used to optimise the air nozzle configuration in the furnace to improve the air flow pattern thus providing even heating to the metal.



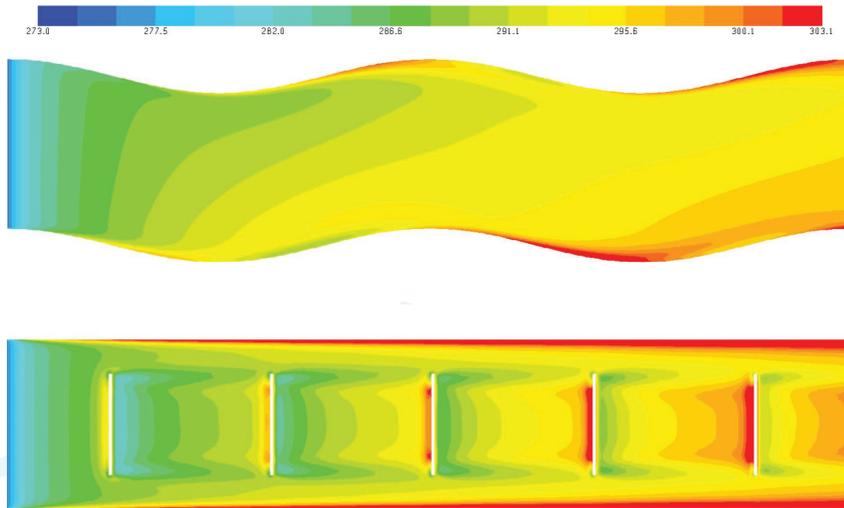
Modelling combustion in fireplaces

Fireplaces are designed to provide thermal and aesthetic comfort to a room, while emitting low noise and pollution. In order to reduce noise, fans are not incorporated and instead only naturally induced flow is used to transport the combustion air and flue gas. CFD analysis can help to optimise vent configuration to maintain a high flow of combustion air while simultaneously ensuring low levels of particulate matter in the exhaust stream.



Development of heat exchangers

Heat exchangers are widely used in many industrial settings. Besides traditional metal heat exchangers, many are now fabricated from plastic, a more chemically resistant alternative. The new material presents different heat transfer characteristics which need to be determined in order to optimise designs. With our help, hydraulic resistance and the heating power of these heat exchangers can be identified and inconvenient flow phenomena can be avoided.

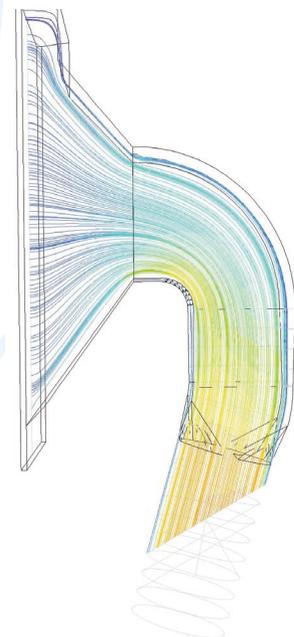


Simulation of flow in a condenser

When enlarging or improving energetic systems, spatial, environmental and technological limitations must be considered. Our colleagues were involved in a project to upgrade a steam condenser unit used in a power plant. The investigation focused on the operation of a new surface condenser in parallel with the existing mixing condenser. Special consideration was given to the head losses at the bifurcation point which is responsible for splitting the flow. Using CFD simulation, the steam distribution and the hydraulic and energetic characteristics of the new parallel operation were cost effectively defined.

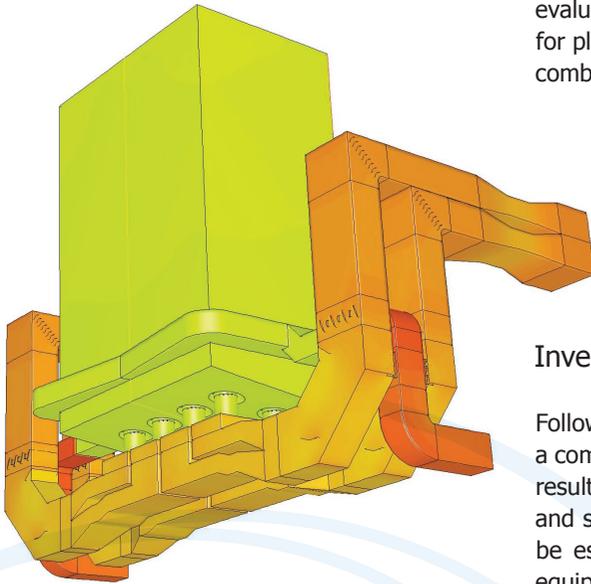
Electrofilter diagnostics

Placement of measurement devices in channels with complicated geometry depends on complex flow patterns and secondary flows. Often the flow is inhomogeneous in the streamwise and transversal cross sections of the channel. Volumetric flow and emission control systems require data that is representative; therefore, the measured data of velocity and dust concentration must equal the average of the considered flow cross section. After plotting the channel streamlines, the points representing the mean values can be determined allowing the optimal placement for the measurement devices.



Reduction of NO_x emitted by a natural gas power plant

The 21st century has brought with it an increased emphasis on the environment, resulting in stricter emission regulations. The alignment of the gas lances have been shown to have an influence on the nitrogen-oxides emission of natural gas combustion plants. CFD simulations evaluate and identify optimal lance configurations eliminating the need for plant shutdowns. CFD investigations can also help to optimise the combustion air and recirculated flue gas sub-systems.



Investigation of the mixing chamber of a gas turbine

Following the combustion chamber of a gas turbine is the mixing box, a component exposed to significant temperatures and pressures. As a result, it requires regular replacement. By analysing the temperature and surface heat flux distributions, the lifetime of the mixing box can be estimated and the early or unnecessary rejection of a valuable equipment can be avoided.

Visit us at www.cfd.hu to learn more about our references, or contact us at info@cfd.hu.

