

## Services (2/2)

### Numerical simulation and process modeling

We conduct simulations of thermal and fluidic processes in industrial furnaces, metallurgical reactors and electric arc furnaces. Especially the following topics are covered:

- Flow and mixing phenomena in thermoprocessing plants (single as well as multiphase)
- Melting and solidification processes
- Magnetohydrodynamic fluid flows
- Combustion and heat transfer
- Fluid-Structure-Interaction, effects of fluidic and thermo-technical phenomena on load and furnace casing
- fast online/offline models of thermal processes

Furthermore we offer support for the fluidic design of thermoprocessing plants, we prepare energy and mass balances of thermal processes or plants, or we conduct heat flow calculations for you.

### Experimental investigations

Apart from theoretical calculations we can conduct experimental investigations on test rigs, which we also can build especially to your order. The scales of existing test rigs are according to application from 1:5 to 1:1. Our 495 m<sup>2</sup> technical centre has a thermal power of about 3 MW (natural gas) and an electrical power of 600 kW available.

Our equipment allows for the determination of heat transfer and emission coefficients, the qualitative and quantitative characterization of gas and water flows with conventional and laser measurement technology as well as the determination of numerous other process parameters like temperature and pressure.

## Equipment

### Heat treatment and melting furnaces

- 600 kW Pilot electric arc furnace
- Vacuum heat treatment plant up to 1600 °C with high pressure quenching
- diverse chamber and tube furnaces for operation under protective or reactive gas atmosphere
- Test rigs and firing chambers for the test and investigation of burners and radiant tubes

We conduct heat treatment and melting trials according to your order. Contact us for more information.

### Water models for the physical simulation of fluid flows

- Converter
- Ladle
- Tundish
- Thin slab casting mould

### Fluid flow test rigs

- Ventilator test rigs (radial, axial and cross-flow ventilator)
- Model of a high convective cooling section
- Test rig to determine the heat transfer distribution of nozzle fields
- Bell-type furnace model

### Measurement technology

- Particle Image Velocimetry (3D-PIV)
- Laser Doppler Anemometry (LDA)
- Laser Induced Fluorescence (LIF)
- 3D laser profile sensors
- Pyrometer for use in harsh environments
- diverse multi-hole probes and anemometers
- and much more



## Services and Equipment

Department for Industrial Furnaces and Heat Engineering  
RWTH Aachen University

# The Department

The Department for Industrial Furnaces and Heat Engineering is an internationally recognised research department with the mission to optimise processes and plants in the fields of manufacturing, processing and recycling of iron and steel, non-iron-metals, glass and ceramics.

The department is part of the Faculty of Georesources and Materials Engineering. As one of nine departments it represents the Division of Metallurgy and Materials Engineering.

Under the direction of Professor Dr.-Ing. Herbert Pfeifer and supported by numerous student research assistants the research staff works in three research groups on current topics of industrial furnaces and heat engineering. The team is completed by staff in the technical and administrative field, working in the department's administration and mechanical as well as electrical workshop.

The core areas of research at the department arise from the three research groups:

The research group „**High Temperature Flows in Metallurgical Melts**“ works on current topics of the physical and numerical simulation of high temperature flows.

Within the research group „**Industrial Furnace Technology**“ the research areas fluid mechanics/mechanics, combustion and radiant tubes are covered. The emphasis in this field is on research and development with a practical orientation and with the support of experimental and numerical methods.

Apart from the preparation of „**Energy and Mass Balances**“, especially for the process of electric steelmaking, the research group of the same name is active in the fields of process optimisation, environmental technologies and process development. In addition empirical and analytical modeling as well as numerical simulations are used.

# Services (1/2)

## Process analysis and optimisation

A complete analysis of a thermal or metallurgical process usually in a first step includes an energy and mass balance. Additionally often a process gas or off gas analysis is needed to evaluate the process efficiency. On this basis an optimisation of the resource and energy consumption can be developed.

Apart from a survey and analysis of the current state, case studies can help to evaluate the influence of modification measures or changes in process control on the efficiency of the process or plant. We offer comprehensive support and consulting for the optimisation of your process.

## Process gas analysis

Our services in this area are completed by process gas analytics. Apart from measurements according to current standards, we also develop individual measurement solutions for our customers on the basis of our long-time experience. Our sampling systems are specially adapted for high temperature use and for the harsh environments in metallurgical reactors and industrial furnaces.

- Gas composition (CO, CO<sub>2</sub>, H<sub>2</sub>, O<sub>2</sub>, ...)
- Air pollutants (CO, NO<sub>x</sub>, SO<sub>x</sub>, ...)
- Dust measurement according to VDI 2066
- Volume flow, velocity
- Temperature (conventional or with suction pyrometer)
- Humidity

Additionally further process data like flow rates, temperatures or pressures can be measured continuously. The available equipment contains several data logger, gas analysers, miscellaneous probes as well as pyrometers especially for the operation in steel plant environment.

# Contact

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