BRNO UNIVERSITY OF TECHNOLOGY

Heat Transfer and Fluid Flow Laboratory

/ Faculty of Mechanical Engineering / Brno University of Technology

RESEARCH GROUP CONTACT

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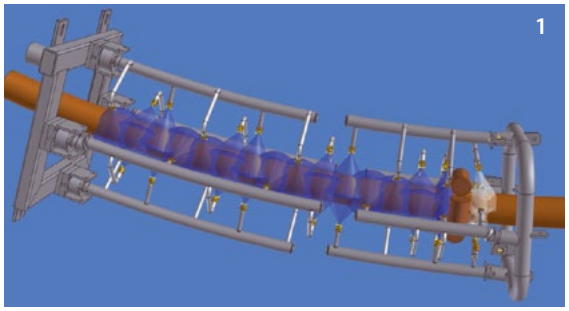
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THEMATIC RESEARCH FOCUS

RESEARCH AREA

- Heat transfer
- Numerical modelling of temperature and stress fields
- Experimental heat transfer
- Cooling
- Heat treatment
- Design of cooling devices
- Expertise in heat transfer and cooling in high-temperature area

EXCELLENCE

- Research and development in the area of heat transfer and high temperature applications

MISSION

- To be the top applied centre in Europe
- Have some intensive close contacts and cooperations with industry

DEVELOPED TECHNOLOGIES

CONTENT OF RESEARCH

- Interaction of flowing liquid with hot surface and inverse heat conduction problem
- Computation of the thermal boundary conditions from experimental measurements
- Numerical models – especially for continuous casting, rolling, and disposal of dross
- Calibration of thermal sensors

MAIN CAPABILITIES

- Numerical models applied in the metallurgical industry (continuous casting, rolling, descaling, optimization of cooling systems)
- Experimental work aimed at determining heat transfer boundary conditions

FIELDS OF RESEARCH RESULTS APPLICATION

- Metallurgy
- Engineering
- Saving of energy, cost reduction

ALUMNI PROFILE

The laboratory provides training only in doctoral studies, area – heat transfer, experimental research numerical modelling, design of cooling devices.

NUMBER OF RESEARCH POSITIONS

SENIOR RESEARCH STAFF

4

JUNIOR RESEARCH POSITIONS (INCL. PH.D. STUDENTS)

10

KEY RESEARCH EQUIPMENT

LIST OF DEVICES

Laboratory of thermophysical properties of materials in conditions up to 1600°C, Test benches for heat transfer measurements on moving surfaces.

BUDGET ↘

TOTAL (MIL. CZK/ MIL. EUR)

10 / 0.4

PART OF THE TOTAL BUDGET FROM PRIVATE RESOURCES (%)

63

PART OF THE TOTAL BUDGET FROM FOREIGN RESOURCES (%)

81

MAIN PROJECTS ↘

2008-2012: Advanced Method To Improve Work Roll Life Time By Coupled Oil Free Lubrication And Chilling (project CHILLUB financed by the Research Fund for Coal and Steel, European Commission)

2004-2008: Effective roll cooling (project EWRCOOL financed by the Research Fund for Coal and Steel, European Commission)

2002-2005: Experimental study of the Leidenfrost effect at the impact of water droplets on heat surface for application in metallurgy (GA106/01/0124, Czech Science Foundation)

ACHIEVMENTS ↘

Laboratory team has documented strong scientific potential in the last five years: total of 52 published articles, 3 prototypes (special devices for on-line Measurements of temperature in the load of rolls of hot rolling process and design of cooling units for hot and cold rolling), 14 functional samples, 1 proven technology. The team has been part of the European research environment – for the last 5 years, 4 international partner projects with a total financial extent of 7.5 million Euros. The team has had a strong relationship with the private sector in the last 5 years, contract research implemented in 112 projects in the contracted amount of 37 million CZK.

MAIN COLLABORATING PARTNERS ↘

COLLABORATIONS WITH ACADEMIC PARTNERS

» University of Technology, Faculty of Mechanical Engineering (Brno, CZ)
» University of Technology, Faculty of Electrical Engineering and Communication (Brno, CZ)
» Institute of Physics of Materials, Academy of Science of the Czech Republic (Brno, CZ)
» Geonics Institute, Academy of Science of the Czech Republic (Ostrava, CZ)
» Arizona State University (US)

COLLABORATIONS WITH COMPANIES

» Třinecké železárny, a. s. (Třinec, CZ)
» AllInvest (Břidličná, CZ)
» Vítkovice (Ostrava, CZ)
» Arcelor Mittal OV (Ostrava, CZ)
» VUHŽ (Dobrá, CZ)
» Lechler (DE)
» Alcoa (US)
» Posco (KR)
» Comalco (NZ)
» Mannesmann (DE)
» US Steel (SK)
» ArcelorMittal (Chicago, US)

EXPECTATIONS ↘

REQUIREMENTS

We are trying to find partners for the application of our products e.g. special cooling headers and other technologies for cooling and heat treatment. Application is the basis for our activities.

» Larger space for special use
» Cooperation with companies abroad

OFFERS

Technical help, measurements, consultation, research and design work in the area of thermal processes and cooling.

Figure 1 Design secondary cooling system of billet

Photo 1 HTC measurement: Continuous casting, secondary cooling

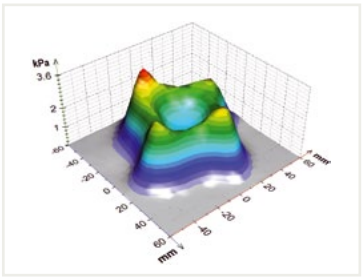

Figure 2 Impact forces measurement of nozzle jet

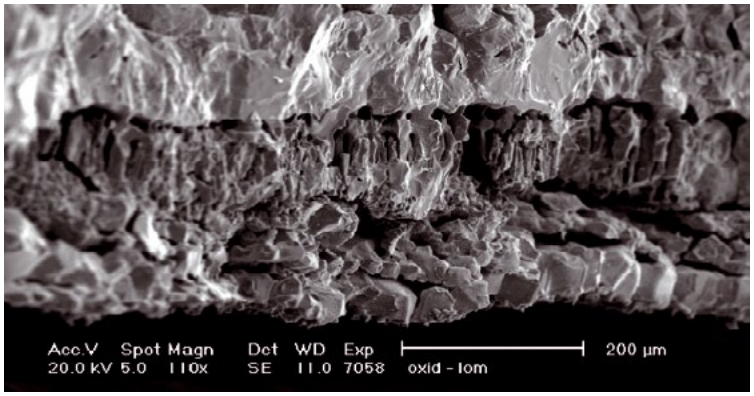

Photo 2 Structure of primary and secondary scales – electron microscope.