BRNO UNIVERSITY OF TECHNOLOGY

Institute of Process and Environmental Engineering

/ Faculty of Mechanical Engineering / Brno University of Technology

INSTITUTE CONTACT

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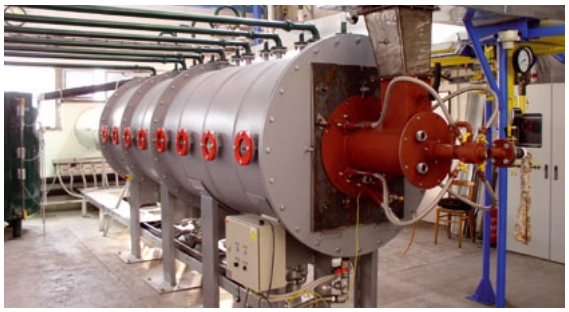

THEMATIC RESEARCH FOCUS

RESEARCH AREA

Waste/biomass to energy systems with advanced heat recovery and polluted gas cleaning subsystems - complex approach

EXCELLENCE

- Heat transfer and its application - thermal processing of waste including energy utilization (waste to energy)
- Process furnaces and heat exchangers
- Process integration
- Energy savings and emissions reduction
- Simulation calculations and optimization in the process industry
- CFD application

MISSION

Our aim is to form a Process Engineering Centre with an international reputation focusing on exploitation of waste and energy. We want to offer a high (European) standard of education, research and services for companies and penetrate the market with original and efficient solutions in the above mentioned fields. By utilizing the established NETME Centre (www.netme.cz), we aim to become one of the world's leading groups.

DEVELOPED TECHNOLOGIES

CONTENT OF RESEARCH

- Thermal and non-thermal treatment of waste
- Waste to energy systems
- Heat and power systems
- Alternative fuels
- Flue gas and polluted gas cleaning
- Experimental research of combustion
- Modelling, simulation, CFD and optimization
- Equipment design
- Heat transfer systems
- Heat exchangers
- LCA and process integration

MAIN CAPABILITIES

Research and development of unique (frequently „tailor made") solutions with direct applications in industrial practice. Our R and D products are mostly concerned with thermal and non-thermal treatment of waste, waste to energy systems, equipment design and heat exchangers (see above) and include patents concerning waste gas cleaning, various software tools for data processing , simulation systems for evaluation of process and energy parameters, computational tools for evaluation of energy recovery from waste incineration and optimization in the field of alternative fuel utilization (particularly biomass) in heating plants. Functional samples cover areas of combustion related activities such as combustion air preheating in liquid fuels, equipment designed for homogenization of gaseous-liquid mixtures and atomization for the dosing of liquids fuels into the combustion chamber.

FIELDS OF RESEARCH RESULTS APPLICATION

- Waste/biomass to energy processes and systems
- Alternative fuels
- Devices for combustion, energy transfer, waste and biomass processing
- Process engineering – wide spectrum for utilization in various industrial fields
- Engine construction
- Plant and apparatus engineering
- Wide scope of industrial sectors as well as the municipal sphere

ALUMNI PROFILE

Our alumni acquire a broad scope of knowledge which may be applied in various fields of engineering practice including the power industry, all the fields of process industry (e.g. food industry, chemical industry), environmental protection, engineering administration, business, etc.

NUMBER OF RESEARCH POSITIONS ↘

SENIOR RESEARCH STAFF

18

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

19

KEY RESEARCH EQUIPMENT ↘

LIST OF DEVICES

- Experimental unit for thermal and catalytic treatment of waste gases (polluted by VOC and carbon monoxide)
- Research facility for burner testing – most modern testing facility in Central Europe
- Two experimental units for flue gas cleaning by the method of filtration and/or catalytic filtration with a flowrate capacity of 1000 m3/h and 40 m3/h
- Experimental unit for flue gas cleaning by the method of two-stage absorption
- Prototype – 1MW unit for energy exploitation of various kinds of biomass (full scale reference unit in permanent operation)
- Reactors for anaerobic digestion

BUDGET ↘

TOTAL (MIL. CZK/ MIL. EUR)

34.9 / 1.4

PART OF THE TOTAL BUDGET FROM PRIVATE RESOURCES (%)

25

PART OF THE TOTAL BUDGET FROM FOREIGN RESOURCES (%)

1.4

MAIN PROJECTS ↘

2005–2011: Waste and Biomass Utilization focused on Environment Protection and Energy Generation (institutional research plan MSM0021630502 financed by the Ministry of Education, Youth and Sports)

2008–2011: Waste as raw material and energy source (project 2B08048 financed by the Ministry of Education, Youth and Sports)

2009–2013: NETME Centre (New Technologies for Mechanical Engineering) (project ED0002/01/01 financed by the EU)

ACHIEVEMENTS ↘

- Patent Homogenization of gas-liquid mixture used in cleaning of industrial waste gases and its homogenization equipment
- W2E „Waste-to-energy" Simulation system for evaluation of process and energy parameters

MAIN COLLABORATING PARTNERS ↘

COLLABORATION WITH ACADEMIC PARTNERS

- UoM – University of Manchester Institute of Science and Technology (UK)
- University of Maryland (US)
- CERTH/CPERI - Centre for Research and Technology – Hellas (GR)
- Universität Dortmund (DE)
- Kharkov State Polytechnic University (UA)
- Polytechnic University of Bucharest (RO)
- University of Pannonia (HU)
- Brno University of Technology (FIT, FCh, FAST, CZ)
- Karlsruhe Institute of Technology (DE)

COLLABORATION WITH COMPANIES

- W. L. GORE & Assoc. (US)
- Koch-Glitsch (US)
- ABB Lummus Global (CZ)
- Procter & Gamble (US)
- PBS Industry Engineering (CZ)
- ZVVZ Enven (CZ)
- Phosphoric Fertilizers Industry s. a. (GR)
- EVECO Brno, s.r.o. (CZ)
- Kannegiesser (DE)
- Česká rafinérská, a.s. (CZ)
- Královopolská SAG, s.r.o. (CZ)
- Královopolská RIA, a.s. (CZ)
- Ústav aplikované mechaniky, s.r.o. (CZ)
- Vítkovice ÚAM, a.s. (CZ)
- Elya Solutions, s.r.o. (CZ)
- Chart Ferox, a.s. (CZ)
- Moravská energetická, a.s. (CZ)
- Vítkovice Power Engineering (CZ)

EXPECTATIONS ↘

REQUIREMENTS

- Professional and reliable collaboration
- Cooperation based on mutual profitability

OFFERS

R&D common projects and common business in the fields specified above, e.g.:

- Burner and jet testing
- Design of systems for cleaning and combustion
- Design and computing of atypical heat exchangers
- Energy and mass balance of industrial units
- Technical measurements of emissions incl. determination of dioxine concentrations
- Analyses
- Conceptual proposals of processes and devices
- Analyses and optimization of heat and power plants, incineration plants, industrial processes

04 / 2011