FLUFF

Provision of experimentally proven CFD-models for the thermal conversion of refuse derived fuels

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Project partners:

- Ruhr University Bochum (project management), Department of Energy Plant Technology (LEAT)
- Karlsruhe Institute of Technology (KIT), Institute for Technical Chemistry (ITC)
- Karlsruhe Institute of Technology (KIT), Institute for Automation and Applied Informatics (IAI)

At present, Germany is a leader in the utilization of refuse derived / solid recovered fuels (RDF) from wastes. In the cement industry, RDF is typically applied supplementary to the standard fuel pulverized coal. Since the solid recovered fuel contains a renewable fraction it has a positive effect on the CO_2 – balance of the facility. By far the greatest mass portion of high-calorific wastes in the cement industry (1.9 Mio tons, equivalent to ca. 36 Mio GJ) is represented by processed RDF. RDF is a heterogeneous solid, dispersible fuel with fluffy particle shape (FLUFF). FLUFF is a mixture of different fractions, e. g. paper and cardboard, wood, plastic foil and 3D plastic particles. Characteristic for FLUFF is the complex composition and the different motion- and combustion behavior of the particles. The project comprises the following research topics:

- Camera technique evaluation of the flight trajectories and ignition time statistics of the particles reacting inside a rotary kiln and in a “hot” drop shaft
- Extension and improvement of the existing RDF models, which describe the flight and the conversion behavior of complex shaped particles
- Validation of the flight and reaction models by the means of experimentally determined particle trajectories and ignition points of time
- Measurements under close-to-reality conditions

In order to determine the motion and combustion behavior of FLUFF-particles ITC together with IAI will conduct combustion experiments at a pilot-plant scale at BRENDA. From the flight trajectories of the reacting particles crucial component data, e. g. drag and lift coefficients can be determined.

Hence, the project aims at the provision of 3D computer code combustion simulations (CFD-simulations) for description of the flight behavior and combustion of RDF, which represent a cost-efficient alternative to experimental investigations at industrial scale by the substitution of standard fuels.

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