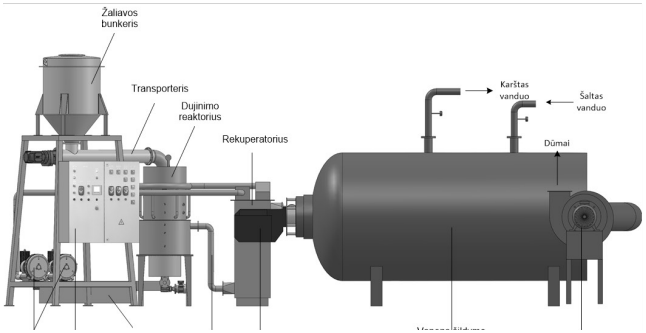
LABORATORY OF COMBUSTION PROCESSES

Development of innovative thermal decomposition technology and its application for sewage sludge utilization (INODUMTECH)

With an expanding infrastructure of wastewater collection and treatment, a resulting amount of sludge increases proportionally. Large sludge quantities are accumulated at its storage sites and therefore, management techniques used to date are becoming a threat to the environment and contradicts sustainable development principles. Therefore, effective way of sewage sludge treatment is an urgent matter. One of the innovative residual sludge disposal technology is gasification. By such technology, during thermal decomposition of sludge a valuable product is produced - flammable gas that further can be used for heat and power generation. Gasification process is not only used for volume reduction and extra energy production from sludge, but also for environmental pollution reduction.



Breslaujos g. 3
Kaunas, LT-44403
Lithuania
tel. +370 37 401805
fax. +370 37 351271
www.lei.lt

HEAD OF LABORATORY:
Dr. Nerijus Striûgas
tel. +370 37 401877
nerijus.striugas@lei.lt
www.lei.lt

LITHUANIAN ENERGY INSTITUTE

COMBUSTION RESEARCH

LABORATORY OF COMBUSTION PROCESSES

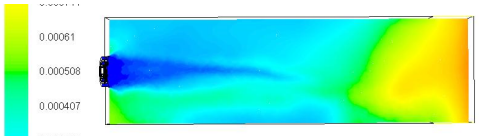
Areas of research

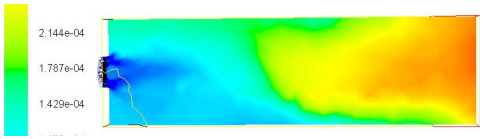
- INCREASING EFFICIENCY OF COMBUSTION PROCESSES
- REDUCTION OF POLLUTANT EMISSIONS
- DESIGN AND DEVELOPMENT OF BURNERS AND FUEL INJECTION EQUIPMENT
- INVESTIGATION OF SOLID-WASTE THERMAL DECOMPOSITION AND GASIFICATION
- NUMERICAL MODELING OF GRANULAR MEDIA AND MANY PARTICLE SYSTEMS
- NUMERICAL INVESTIGATIONS ON FUNDAMENTALS OF MEDICAL APPLICATIONS

Investigations of combustion processes are carried out in order to increase a fuel economy, reduce the environmental pollution and to thermally decontaminate various materials.

Modeling of combustion processes to reduce NOx generation

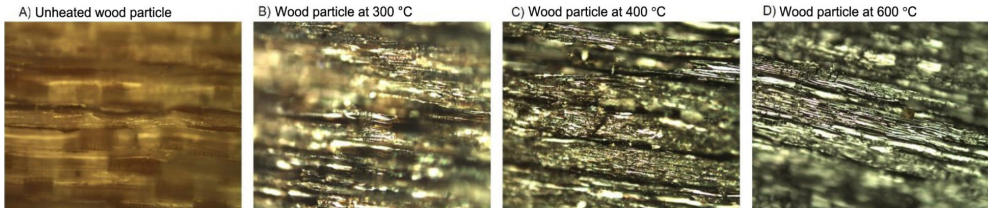
One of the secondary NOx reduction measures is an additional combustible gas supply to the flame zone. Modeling of any particular system can be done to ensure that optimal parameters will be used such as an additional gas flow rate, amount and angle of additional inlets, inlets head structure and an optimal combustible gas supply zone.





Experimental investigation of ongoing processes during biomass and biofuel pyrolysis

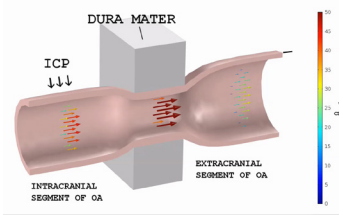
Lower quality biomass can be converted to heat or electricity by palletization and further use in the gasification process, during which the solid biofuel is converted into a gas fraction. Experimental investigation of the biofuel clumping phenomenon was carried out, which happened during the gasification process in the transition from pyrolysis to oxidation zones.



Optic microscope was used to capture topological aspects of various analyzed pellets.

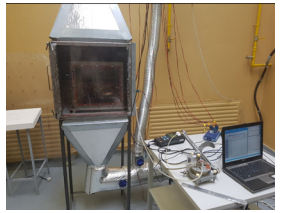
Numerical investigation of fundamental phenomena occurring during the noninvasive intracranial pressure measurement

For a prevention of secondary brain damage it is important to monitor intracranial pressure. Numerical modeling on the noninvasive monitoring technique is carried out in order to learn more about the fundamental phenomena occurring during the measurement and to find an optimal parameters for intracranial pressure determination.



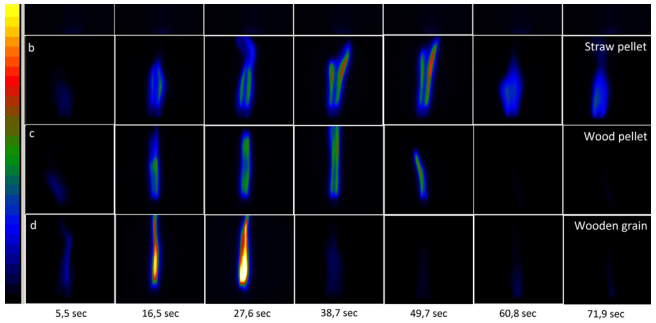
Experimental investigation of biomass drying intensification

Biomass moisture content affects a combustion process and an amount of useful heat release. An investigation of biomass drying intensification in the simulated furnace environment is carried out in order to find an optimal solution.



Investigation of chemiluminescence by atomic spectroscopy

Intensified CCD (ICCD) camera is used for a noninvasive investigation of gas combustion conditions and fuel parameters in a flame by analyzing the emitted radiation of chemiluminescent radicals.



Numerical modeling of granular media

Granular media is abundant in nature and also in many industrial applications. Solid fuel pellets is one of the granular media example used in industry for heat and power generation. Discrete elements method is widely used to model dynamics and interactions of granular particles.

Graph and community detection methods are used for large system evaluation. Modeling of granular media dynamics on a furnace grate allows to optimize the solid biomass, biofuel incineration technology and learn more about the involved fundamental processes.