



DOCTORAL RESEARCH TOPIC:

Research and practical application of an innovative method of determining the properties of biomass, which determine the efficiency of its use in thermoconversion processes, based on non-destructive biomass image analysis

RESEARCH FIELD:

Energetics and Power Engineering (T 006)

BRIEF DESCRIPTION OF RESEARCH TOPIC:

The main contemporary tasks of the development of the energy sector are related to the wider use of renewable energy sources, which would help to further reduce dependence on fossil fuels and mitigate climate change. In order to efficiently use biofuel made from various types of biomass, it is important to accurately study the properties of biofuel in thermoconversion processes: calorific value, ash content, moisture and chemical elements. Most often, in practice, only certain properties such as total moisture, calorific value and ash content are determined for uncontaminated biofuel. Other parameters related to chemical composition are determined less often. Current methods for measuring biofuel parameters are time-consuming and require specialized equipment and expertise. These methods also have shortcomings in the accuracy and reproducibility of determination, which inevitably affects the quality of biomass thermoconversion processes and the efficiency of the equipment used. An accurate, fast, and reliable method for determining biomass properties is needed for the development and use of biomass energy technologies. Machine learning and artificial intelligence offer a promising approach to overcome the limitations of current methods and make the measurement of biomass properties faster and more cost-effective. By using image analysis and machine learning techniques to identify these visual attributes of biomass images, it may be possible to predict parameters such as thermality, ash content, total moisture and composition from the underlying biomass image. This approach can provide several advantages over traditional methods, including faster and more cost-effective analysis, non-destructive testing, and the ability to process large amounts of data.

These studies will enable not only to quickly and accurately assess the aforementioned properties, but also to optimize the use of biomass in energy production, reducing the costs of experimental research and increasing the efficiency of thermoconversion processes. During the preparation of the dissertation, it is expected to use the existing standard research and image analysis systems as a tool, to prepare an innovative analysis method that allows to perform the method of determining the main parameters of biofuel, recovered fuel and waste.

SCIENTIFIC SUPERVISOR:

Dr. Marius Praspaliauskas
Laboratory of Heat-Equipment Research and Testing

Lithuanian Energy Institute
Breslaujos 3, 44403 Kaunas
Lithuania

Marius.Praspaliauskas@lei.lt

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