LITHUANIAN ENERGY INSTITUTE

ADMISSION TO PHD STUDIES FOR THE YEAR 2024

DOCTORAL RESEARCH TOPIC:

Numerical investigation on the cleaning of harmful solid particles by the action of sound

RESEARCH FIELD:

Energetics and Power Engineering (T 006)

BRIEF DESCRIPTION OF RESEARCH TOPIC:

Ambient air pollution by various anthropogenic materials is one of the most relevant modern issues directly affecting climate and human health. Micro-nano particles released into the environment by energy facilities through burning various types of fuels is considered as one of the main components of environmental pollution. These particles are characterized by a variety in composition, physical state and size and they have a high surface to volume ratio and can carry toxic substances, microorganisms and viruses. The main concern is fine particles with a diameter of less than 2.5 µm (PM2.5), as current cleaning methods are inefficient in capturing them.

One way to increase the particle capture efficiency is to agglomerate them into larger structures, under the influence of an acoustic field, thus facilitating their deposition. For some problems e.g., small scale thermal conversion power plants, acoustic agglomeration could be the most efficient cleaning improvement, especially in terms of PM2.5.

A major problem for practical application of acoustic agglomeration is the fact that its efficiency is dependent on acoustic as well as the pollutant source parameters e.g., sound pressure level, sound frequency , particle size distributions, etc. In addition, agglomeration process requires an extensive amount of energy. Currently, there is also a growing interest in using various biofuels, which when burned, leads to different pollutant parameters (compositions, size distributions etc.). Owing to these specifics, acoustic cleaning processes must always work near optimal conditions in order to be applied in practical applications.

During the PhD, research will be carried out in order to determine optimal working conditions for acoustic agglomeration for various acoustic as well as the pollutant source parameters. The major focus will be on implementing and using the state-of-the-art numerical modelling techniques. Numerical models incorporating the two-phase flow affected by the acoustic field will be created and simulations will be performed to obtain the dependencies of the sound parameters and pollutants as well as the overall energetic efficiency of the acoustic agglomeration.

SCIENTIFIC SUPERVISOR:

Dr.Edgaras Misiulis
Laboratory of Heat-Equipment Research and Testing

Lithuanian Energy Institute
Breslaujos 3, 44403 Kaunas
Lithuania

Edgaras.Misiulis@lei.lt

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