LITHUANIAN ENERGY INSTITUTE

ADMISSION TO PHD STUDIES FOR THE YEAR 2025

DOCTORAL RESEARCH TOPIC:

Study of fine particle distribution in logging residues and their influence on thermochemical processes

RESEARCH FIELD:

Energetics and Power Engineering (T 006)

BRIEF DESCRIPTION OF RESEARCH TOPIC:

Forestry logging residues are a significant source of renewable energy, but their quality can vary considerably based on factors such as particle size, moisture content, and ash content. These residues, which result from forest operations, can be effectively utilized as a renewable energy source; however, their properties can impact thermochemical processes like pyrolysis, gasification, and combustion that convert biomass into energy and valuable products.

The physical, chemical and thermochemical properties of logging residues depend on the various parts of plants included in the fuel feedstock, such as wood, bark, leaves, etc. Notably, logging residues tend to have a higher proportion of fine particles (less than 3.15 mm in size) compared to other assortments, which impacts overall fuel quality. The generation of excessive fines represents a significant loss of material that cannot be used in the subsequent conversion process. It has been observed that logging residues often contain more than 10% fines than other biomass ranges, and these fines increase the ash content and cause consequent problems in thermochemical processes. Screening out fine particles can significantly enhance fuel quality by reducing ash content and improving combustion performance.

The quantity and quality of logging residues can vary between tree species and harvesting methods, further complicating their utilization as a bioenergy resource. Additionally, forest biomass terminals play a crucial role in handling, storing, and upgrading these raw materials for energy production. Despite the potential advantages, the quality of wood chips derived from logging residues can also vary seasonally, and may not always meet ISO standards for efficient burning, as noted by Moskalik & Gendek (2019).

During combustion, the characteristics and behaviour of fine particles present challenges, including deposit formation and corrosion risks in boilers. Moreover, the chemical composition of these forest logging residues will depend on various factors, including species and the specific components involved, as highlighted in scientific studies.

Overall, proper management and processing of logging residues are essential to enhance their potential as a valuable bioenergy resource. Additionally, it is necessary to investigate alternative processing methods to reduce the generation of fine particles, or to explore beneficial uses of separated fine particles considering their thermochemical parameters, thereby improving the efficiency of biomass energy production and sustainable use.

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