A

MINI PROJECT REPORT

on

" Comparative Analysis of Biomass Pellets: Coconut Shell with Molasses Binder vs. Rice Husk with Sawdust Binder for Enhancing Coal Combustion Efficiency "

Submitted in partial fulfilment of the requirement for the award of

BACHELOR OF TECHNOLOGY

IN

CHEMICAL ENGINEERING

SUBMITTED BY :

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UNDER THE GUIDANCE OF :

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(Professor, Chemical Engineering)

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CERTIFICATE

We hereby certify that the work which is being presented in the B.Tech. Mini project Report on " Comparative Analysis of Biomass Pellets: Coconut Shell with Molasses Binder vs. Rice Husk with Sawdust Binder for Enhancing Coal Combustion Efficiency ". in partial fulfilment of the requirements for the award of the Bachelor of Technology in Chemical Engineering submitted to the Department of Chemical School of Studies of Engineering & Technology , Guru Ghasidas Vishwavidyalaya, Central University, Bilaspur, Chhattisgarh, India is an authentic record of our work carried out during a period from January 2025 to May 2025 (4th Semester) under the Guidance of Dr. Anil Kumar Chandrakar, Professor of the Department, Chemical Engineering Department. The matter presented in this project Report has not been submitted by us or by anyone else for the award of any other degree elsewhere.`

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This is to certify that the above statement made by the student(s) is correct to the best of my knowledge,

Signature of HOD
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ABSTRACT

The growing demand for sustainable energy solutions and the pressing need to reduce greenhouse gas emissions have intensified global interest in renewable biofuels. This study explores the potential of biomass pellets as partial substitutes for coal in combustion systems by conducting a comparative analysis between two pellet formulations: coconut shell with molasses binder and rice husk with sawdust binder. Agricultural waste materials were selected based on their abundance, renewability, and carbon-neutral nature, while natural binders were chosen to ensure environmental compatibility and economic feasibility.

The research involved the preparation of pellets using standardized pelletization techniques, followed by a comprehensive assessment of their physical properties (bulk density, moisture content, and durability) and thermal characteristics (calorific value, ignition time, flame quality, and ash residue). Combustion experiments were performed using a controlled domestic coal stove environment to simulate practical usage scenarios and evaluate combustion efficiency.

Results demonstrated that coconut shell pellets with molasses binder outperformed the rice husk–sawdust pellets, delivering a higher calorific value, more stable flame, faster ignition, and significantly reduced ash content. The inclusion of molasses as a binder not only enhanced the energy output but also contributed to better pellet cohesion and burn uniformity. On the other hand, rice husk pellets, while environmentally advantageous due to their widespread availability, showed lower thermal efficiency and higher residue generation.

The study concludes that biomass pellets, particularly those derived from coconut shells and bound with molasses, offer a promising renewable energy alternative that can be effectively integrated with conventional coal combustion processes. The use of such agro-waste-derived fuels can reduce fossil fuel dependence, mitigate environmental degradation, and contribute to the development of a cleaner, more sustainable energy future.