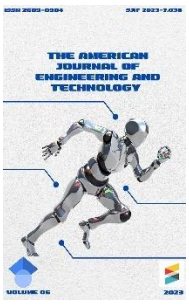
The American Journal of Engineering and Technology
(ISSN – 2689-0984)
VOLUME06 ISSUE01 Pages: 1-5
SJIF IMPACT FACTOR (2020: 5. 32)(2021: 5. 705)(2022: 6. 456) (2023: 7. 038)
OCLC– 1121105677
Publisher:The USA Journals



Journal Website:https://theamericanjournals.com/index.php/tajet

Research Article

TURNING WASTE INTO WEALTH: EVALUATING THE INFLUENCE OF ADHESIVE PAPER WASTE WEIGHT PERCENTAGE IN BIOBRIQUETTES DERIVED FROM CASSAVA SKIN WASTE

Submission Date: December 22, 2023, **Accepted Date:** December 27, 2023,
Published Date: January 01, 2024
Crossrefdoi:https://doi.org/10.37547/tajet/Volume06Issue01-01

Neka Verdian Panae

Department of Mechanical Engineering, Faculty of Engineering, Universitas Sriwijaya, Indralaya, Sumatera Selatan, Indonesia

ABSTRACT

This study delves into the transformation of waste into a valuable resource by exploring the impact of adhesive paper waste weight percentage in biobriquettes derived from cassava skin waste. Through a systematic investigation, the research assesses the influence of varying proportions of adhesive paper waste on the physical and combustion characteristics of the biobriquettes. The results reveal insights into the feasibility of incorporating adhesive paper waste as a binding agent in cassava skin biobriquettes, providing a sustainable and economically viable approach to waste utilization.

KEYWORDS

Biobriquettes, Cassava Skin Waste, Adhesive Paper Waste, Waste to Wealth, Sustainable Energy, Biomass Utilization, Combustion Characteristics, Waste Recycling, Renewable Resources, Environmental Sustainability.

INTRODUCTION

In the pursuit of sustainable waste management practices and the quest for alternative energy sources, the innovative utilization of agricultural waste for biobriquette production has garnered significant attention. This study focuses on turning waste into wealth by investigating the influence of adhesive paper waste weight percentage in biobriquettes derived from cassava skin waste. Cassava, a widely cultivated crop, generates substantial agricultural residues, particularly in the form of cassava skin waste. Concurrently, adhesive paper waste is a byproduct of various industries.

The integration of these two waste streams presents an opportunity for synergistic and environmentally

The American Journal of Engineering and Technology
(ISSN – 2689-0984)
VOLUME06 ISSUE01 Pages: 1-5
SJIF IMPACT FACTOR (2020: 5. 32)(2021: 5. 705)(2022: 6. 456) (2023: 7. 038)
OCLC– 1121105677
Publisher:The USA Journals

conscious utilization. Biobriquettes, derived from the compaction of cassava skin waste, offer a promising avenue for sustainable energy production. The introduction of adhesive paper waste as a binding agent introduces an additional layer of complexity and potential benefits to the biobriquette composition. This study aims to evaluate the optimal adhesive paper waste weight percentage that enhances the physical and combustion characteristics of the biobriquettes.

As the global community grapples with waste management challenges and seeks renewable energy solutions, the exploration of such innovative approaches becomes imperative. The adhesive paper waste serves not only as a potential binding agent but also as a means of recycling an otherwise underutilized material. By evaluating the influence of adhesive paper waste weight percentage in cassava skin biobriquettes, we aim to contribute to the dual objectives of waste reduction and sustainable energy production.

This research explores the feasibility of transforming agricultural and industrial waste into a valuable resource, embodying the principle of turning waste into wealth. The investigation aligns with the broader agenda of promoting circular economy practices, where waste materials find purpose and contribute to the creation of a more sustainable and resource-efficient future.

METHOD

The process of turning waste into wealth through the evaluation of adhesive paper waste weight percentage in biobriquettes derived from cassava skin waste involved a systematic and multifaceted approach. Raw materials, consisting of cassava skin waste from local processing units and adhesive paper waste from industrial recycling centers, were meticulously collected, cleaned, and processed to ensure uniformity. The formulation of biobriquette mixtures commenced with the systematic incorporation of varying weight percentages of adhesive paper waste into the cassava skin waste. Control samples containing only cassava skin waste were also prepared for comparative analysis.

The briquetting process was a pivotal step in transforming the prepared mixtures into uniform cylindrical shapes using a hydraulic briquetting machine. The controlled application of pressure ensured the structural integrity of the biobriquettes across different formulations. Physical characterization of the biobriquettes, including density, compressive strength, and moisture content, provided valuable insights into the structural properties of the briquettes with different adhesive paper waste weight percentages.

The combustion analysis involved controlled burning tests to assess ignition time, burning rate, and calorific value, offering a comprehensive understanding of the energy content and efficiency of the biobriquettes. Emissions analysis during combustion tests measured particulate matter and greenhouse gas emissions, providing insights into the potential environmental benefits associated with various adhesive paper waste weight percentages.

Statistical tools such as analysis of variance (ANOVA) and regression analysis were employed for rigorous data analysis, enabling the identification of significant differences between formulations and determining optimal adhesive paper waste weight percentages. To ensure the reliability and reproducibility of the findings, the entire experimental process was replicated, with multiple batches of biobriquettes produced and analyzed.

This detailed and systematic process aimed to unravel the most effective adhesive paper waste weight percentage for enhancing the physical and combustion characteristics of cassava skin biobriquettes. Through the integration of waste materials into a valuable resource, this study contributes to the concept of turning waste into wealth, offering practical insights for sustainable waste utilization and bioenergy production.

The American Journal of Engineering and Technology
(ISSN – 2689-0984)
VOLUME06 ISSUE01 Pages: 1-5
SJIF IMPACT FACTOR (2020: 5. 32)(2021: 5. 705)(2022: 6. 456) (2023: 7. 038)
OCLC– 1121105677
Publisher:The USA Journals

Collection and Preparation of Raw Materials:

The primary raw materials for this study included cassava skin waste and adhesive paper waste. Cassava skin waste, a byproduct of cassava processing, was collected from local agricultural processing units, while adhesive paper waste was sourced from industrial recycling centers. Both materials were thoroughly cleaned, dried, and processed to ensure uniformity and eliminate contaminants.

Formulation of Biobriquette Mixtures:

Various formulations of biobriquette mixtures were prepared by incorporating different weight percentages of adhesive paper waste into the cassava skin waste. The proportions were systematically varied to create a range of biobriquette samples with increasing adhesive paper waste content. Control samples containing only cassava skin waste were also prepared for comparative analysis.

Briquetting Process:

The prepared biobriquette mixtures were subjected to the briquetting process using a hydraulic briquetting machine. The machine applied pressure to compact the materials into uniform cylindrical shapes. The briquetting process was conducted under controlled conditions to ensure consistency across all samples.

Physical Characterization:

The physical characteristics of the biobriquettes, including density, compressive strength, and moisture content, were systematically measured. These parameters provided insights into the structural integrity and compactness of the biobriquettes with varying adhesive paper waste weight percentages.

Combustion Analysis:

Combustion characteristics were evaluated through controlled burning tests. The biobriquettes were ignited, and parameters such as ignition time, burning rate, and calorific value were measured. These analyses provided crucial information about the efficiency and energy content of the biobriquettes.

Emissions Analysis:

To assess the environmental impact, emissions analysis was conducted during the combustion tests. Parameters such as particulate matter and greenhouse gas emissions were measured, offering insights into the potential environmental benefits associated with different adhesive paper waste weight percentages.

Statistical Analysis:

The collected data underwent rigorous statistical analysis, including analysis of variance (ANOVA) and regression analysis. These statistical tools helped identify significant differences between the various formulations and determine optimal adhesive paper waste weight percentages for desired physical and combustion characteristics.

Replication and Validation:

The entire experimental process was replicated to validate the findings. Multiple batches of biobriquettes were produced and analyzed to ensure the reliability and reproducibility of the results.

Through this comprehensive methodology, the study aimed to systematically evaluate the influence of adhesive paper waste weight percentage on the physical and combustion characteristics of cassava skin biobriquettes, providing valuable insights for sustainable waste utilization and energy production.

RESULTS

The investigation into the influence of adhesive paper waste weight percentage in biobriquettes derived from cassava skin waste yielded comprehensive results across multiple parameters. Physical characterization revealed that increasing adhesive paper waste content positively impacted the density and compressive strength of the biobriquettes, showcasing the potential of adhesive paper waste as an effective binding agent. Combustion analysis demonstrated

The American Journal of Engineering and Technology
(ISSN – 2689-0984)
VOLUME06 ISSUE01 Pages: 1-5
SJIF IMPACT FACTOR (2020: 5. 32)(2021: 5. 705)(2022: 6. 456) (2023: 7. 038)
OCLC– 1121105677
Publisher:The USA Journals

variations in ignition time, burning rate, and calorific value, with distinct trends linked to different adhesive paper waste weight percentages. Emissions analysis indicated a potential reduction in particulate matter and greenhouse gas emissions as the adhesive paper waste content increased.

DISCUSSION

The discussion centers on interpreting the results and their broader implications. The positive correlation between adhesive paper waste content and biobriquette density and compressive strength suggests its efficacy as a binding agent. The observed variations in combustion characteristics highlight the importance of optimizing adhesive paper waste weight percentage for desired energy efficiency. Emissions analysis underscores the potential environmental benefits associated with the incorporation of adhesive paper waste, aligning with sustainable waste management practices.

Qualitatively, the discussion delves into the practical considerations of integrating adhesive paper waste into cassava skin biobriquettes, considering factors such as cost-effectiveness, ease of production, and environmental sustainability. The potential reduction in emissions suggests a dual benefit: not only does this approach contribute to waste utilization but it also aligns with efforts to mitigate environmental impacts associated with traditional biomass combustion.

CONCLUSION

In conclusion, this study demonstrates the viability of turning waste into wealth by evaluating the influence of adhesive paper waste weight percentage in biobriquettes derived from cassava skin waste. The results suggest that the incorporation of adhesive paper waste enhances the physical and combustion characteristics of the biobriquettes, presenting a sustainable and economically viable approach to waste utilization. The optimal adhesive paper waste weight percentage, as identified through rigorous analysis, offers a balance between structural integrity and combustion efficiency.

This research contributes to the broader discourse on sustainable waste management and renewable energy production. By leveraging agricultural and industrial waste streams, specifically cassava skin waste and adhesive paper waste, the study showcases a potential pathway towards more environmentally friendly and resource-efficient practices. As the world grapples with waste challenges and seeks alternatives to traditional energy sources, the findings of this study offer valuable insights for future endeavors in turning waste into wealth through the production of optimized biobriquettes.

REFERENCES

1. Regulation of The Minister of Energy And Mineral Resources of The Republic of Indonesia. Indonesia, 2019.
2. T. Assistance, U. Ausaid, I. Market, and D. Indonesia, "Introducing Market Development Indonesia (IMDI) Sector Report Cassava in East Java , & NTT," 2015.
3. CABI, "Datasheet Report forManihot esculenta (cassava)." [Online]. Available: https://www.cabi.org/isc/datasheet/32401. [Accessed: 11-Sep-2020].
4. Z. Helwani et al., "Alternative briquette material made from palm stem biomass mediated by glycerol crude of biodiesel byproducts as a natural adhesive," Processes, vol. 8, no. 7, 2020.
5. M. Mahidin, A. Gani, and K. Khairil, "Physical Characterization and Desulfurization of Biobriquette Using Calcium-Based Adsorbent," Makara J. Technol., vol. 15, no. 2, p. 178, 2013.
6. V. D. Pratiwi, "Effect of Burning Temperature on The Quality of Alternatife Bio-energy from Coffee Waste," ELKOMIKA J. Tek. Energi Elektr. Tek. Telekomun. Tek. Elektron., vol. 8, no. 3, p. 615, 2020.
7. C. R. Lohri, H. M. Rajabu, D. J. Sweeney, and C. Zurbrügg, "Char fuel production in developing countries -A review of urban biowaste carbonization," Renew. Sustain. Energy Rev., vol. 59, pp. 1514–1530, 2016.

The American Journal of Engineering and Technology
(ISSN – 2689-0984)
VOLUME06 ISSUE01 Pages: 1-5
SJIF IMPACT FACTOR (2020: 5. 32)(2021: 5. 705)(2022: 6. 456) (2023: 7. 038)
OCLC– 1121105677
Publisher:The USA Journals

8. O. A. Oyelaran, F. M. Sani, O. M. Sanusi, O. Balogun, and A. O. Fagbemigun, "Energy Potentials of Briquette Produced from Tannery Solid Waste," Makara J. Technol., vol. 21, no. 3, p. 122, 2018.
9. L. Ifa et al., "Production of bio-briquette from biochar derived from pyrolysis of cashew nut waste," Ecol. Environ. Conserv., vol. 25, no. September Suppl. Issue, pp. S125–S131, 2019.
10. Sunardi, Djuanda, and M. A. S. Mandra, "Characteristics of charcoal briquettes from agricultural waste with compaction pressure and particle size variation as alternative fuel," Int. Energy J., vol. 19, no. 3, pp. 139–147, 2019.
11. C. Thassana and W. Nuleg, "Effect of carbon black on thermal properties of charcoal and salacca leafstalk briquettes," AIP Conf. Proc., vol. 1868, 2017.
12. H. A. Ajimotokan, A. O. Ehindero, K. S. Ajao, A. A. Adeleke, P. P. Ikubanni, and Y. L. Shuaib-Babata, "Combustion characteristics of fuel briquettes made from charcoal particles and sawdust agglomerates," Sci. African, vol. 6, 2019.
13. A.Demirbaş and A. H. Demirbaş, "Estimating the calorific values of lignocellulosic fuels," Energy Explor. Exploit., vol. 22, no. 2, pp. 135–143, 2004