World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(REVIEW ARTICLE)

Check for updates

Utilization of wood pellet for industrial use

Francisco J. Bacunawa Jr * and Angieneth S. Perido-Pascua

Dicksaw Woodworks and Furniture Trading, Magallanes, Philippines.

World Journal of Advanced Research and Reviews, 2024, 21(03), 2439–2441

Publication history: Received on 19 February 2024; revised on 28 March 2024; accepted on 30 March 2024

Article DOI: https://doi.org/10.30574/wjarr.2024.21.3.0990

Abstract

The use of wood pellets for industrial uses has grown significantly in recent years due to their sustainability, cost-effectiveness, and environmental advantages. Wood pellets have a wide range of industrial applications, including energy generation, heating, and manufacturing processes. They made from compacted sawdust and wood waste provide a renewable alternative to traditional fossil fuels, helping to cut greenhouse gas emissions and combat climate change. In the energy industry, wood pellets are a feasible substitute for coal in power plants, allowing for the transition to greener energy sources. Their stable quality and high energy density make them an appealing option for power generation, especially in areas trying to meet renewable energy requirements.

Furthermore, wood pellets are rapidly being used in industrial heating applications such as boilers and furnaces across a wide range of industries, including manufacturing, food processing, and agriculture. Their efficient combustion properties and dependable supply chain make them an affordable option for enterprises looking to save operating expenses and carbon footprints. Technological developments in the pellet production process, along with governmental frameworks that encourage sustainable practices and renewable energy, are anticipated to propel market expansion.

In summary, the use of wood pellets in industry presents a strong way to satisfy the rising need for environmentally friendly heating and energy sources. Wood pellets have the potential to be a key player in the shift towards a more sustainable industrial landscape by utilizing its renewable nature and environmental advantages.

Keywords: Wood Pellet; Renewable Energy; Climate Change; Energy Source

1. Introduction

The 20th century has seen a number of changes, including an increase in global air and ocean temperatures, a rise in sea levels, a long-term sustained widespread reduction in snow and ice cover, changes in atmospheric and ocean circulation, as well as changes in regional weather patterns that affect seasonal rainfall conditions. The additional heat in the climate system brought on by the atmospheric accumulation of greenhouse gases is what leads to these changes. Human activities including the combustion of fossil fuels (coal, oil, and natural gas), deforestation, agriculture, and changes in land use are the main contributors to these extra greenhouse gases. These actions raise the atmospheric concentration of "heat- trapping" greenhouse gases. The observed pattern of climate system changes is consistent with a stronger greenhouse effect. (Stocker, 2021)

Renewable organic material from plants and animals is known as biomass. The chemical energy from the sun is stored in biomass, which is created by plants during photosynthesis. Direct combustion of biomass for heating is an option, but it can also be processed into liquid and gaseous fuels. Biomass is utilized as a fuel for transportation as well as for the production of power and heat. In many nations, biomass is a significant fuel source, particularly for heating and cooking in underdeveloped nations. Prospective adverse impacts of biomass production such as deforestation, deteriorating

* Corresponding author: Francisco J. Bacunawa Jr

environmental quality, and competition between food supply and biomass production have led to a demand for developing appropriate sustainability indicators and criteria. (Matsumoto et.al, 2014)

As stated by Matsumoto et.al, wood pellets are little cylindrical chunks of fine- ground wood bark that are 10-20 mm long and have diameters ranging from 5 to 10 mm. Because of their small and set size, they are typically employed as fuel by automatically fed into a burner. Wood pellet can be produced by turning wood chips into saw dust, and compressing the saw dust into wood pellet using pelletizer machine. As a result, wood pellets have lower output energy to input energy ratio than wood chips; yet, wood pellets can be employed in residential homes to be burned efficiently in tiny stoves. To grow the use of wood pellets as a major energy source, the energy efficiency of the wood pellet production system must be enhanced in order to reduce greenhouse gas (GHG) emissions.

Dicksaw Woodworks and Furniture Trading located in Magallanes Cavite is one of the legal running woodworks business in the Philippines established in 2018, that used to be the supplier for local trades of bed frames, cabinets, wood tables, sofa set, garden bench, etc., and they have the international trading of woodworks project like chopping board, wood bench, display decors and etc., In regards with those projects that they have, they used to come up with the idea with the way for helping the environment as a return of how environment help their running business – and that is the production of wood pellet. From the researches globally in combating climate change, biomass is one of the solutions that most of the researchers and environmentalist figure out that could greatly help our environment as well as our industry. Since wood pellet is made out of the waste materials and saw dust. The Dicksaw Woodworks and Furniture Trading could be a contributor in making the biomass which is the wood pellet that can be used in our industry to lessen harmful chemicals and toxins through using of coal and fossil fuels. This research study has the data and properties of the wood pellet that is made by the Dicksaw Woodworks and Furniture Trading that can be utilized for industrial use.

2. Materials and methods

The researcher used comparative analysis and descriptive method to determine the characteristic of the wood pellet out of waste materials.

The researchers used the wood remnants from the products production of Dicksaw Woodworks and Furniture trading. Chipper machine is used for the production of husk to make it fine, and pelletizer machine was used to create wood pellets from the fine husk. The amount of moisture is also monitored by the use of moisture content identifier in this process.

In order to find out the composition of the wood pellet manufactured by the Dicksaw Woodworks and Furniture Trading, the wood pellet sample was directed in Department of Science and Technology – Forest Products Research and Development Institute in University of the Philippines (UPLB), Los Baños Laguna on September 14, 2023 to be tested. Proximate Chemical Analysis and Heating Value are the test / calibration requested in DOST-FPRDI in the given wood pellet sample.

3. Result and discussion

The wood pellets is tested in the Department of Science and Technology – Forest Products Research and Development Institute in Los Baños, Laguna. The result of the study is shown below:

Based on the given table, the heating value of the wood pellet sample of Dicksaw Woodworks and Furniture Trading is 4,206.37, with a plus minus of 17.90. According to ISO Certified Company Kerone Engineering Solutions Limited in Association with SVCH-Technologies in Moscow Russia, the high calorific value wood pellet range from 3800-4600 kcal/g.

The result of proximate chemical analysis of the sample, it shows that the moisture content percentage is 6.23 ± 0.03, volatile combustible matter 76.64 ± 0.49, fixed carbon percentage is 15.80 ± 0.51, and ash content 7.56 ± 0.07. Based on the specifications are listed in the product standard EN ISO 17225-2 (or technical requirements) for determining the certain chemical and physical characteristics of the fuel, the moisture content for wood pellet is maximum of 10% and ash content is 7%. Also, it stated that the lesser the percentage from the average percentage of the proximate chemical analysis, the better; the same with volatile combustible matter percentage and fixed carbon percentage. According to Dieringer, et.al., in their study about the production of biofuels conducted in Germany in June 2020, it states that the average volatile combustible matter for a biomass such as wood pellet is 85.1% while the fixed carbon is 14.2%.

4. Conclusion

The European and international standard EN ISO 17225-1 serve as a guide in having the standard for the production of biomass such as wood pellet that can be used in industrial and residential purposes. It also stated that the lower the percentage value specifically in the approximate chemical analysis – the good condition the wood pellet is. And from the results obtained in the testing analysis of Department of Science and Technology – Forest Products Research and Development Institute (DOST-FPRDI), it shows that the wood pellet produced by the Dicksaw Woodworks and Furniture Trading possess of higher quality of content based from standard. This conclusion is significant opportunity for the Dicksaw Woodworks and Furniture Trading to have an action plan for the development of utilization of energy wood for wood pellet such as using the remnants of the production of woodworks and furniture by converting it to saw dust and turning out to wood pellet that can be used in the industry, specifically the companies or businesses that are using biomass as source of fuel. This research study also emphasizes the contribution of wood pellet in helping save our environment, the same with the global campaign of the European Green Deal in addressing the climate emergency.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

References

[1] Ali Abdoli, M., Hosseini A., Golzary A., Sadeghi P. (2018). Wood Pellet as a Renewable Source of Energy, University of Tehran Science and Humanities Series, Springer International Publishing AG

[2] Balat M. & Ayar G. (2005) Biomass Energy in the World, Use of Biomass and Potential Trends, Energy Sources, 27:10

[3] Capareda, SC. (2014) Introduction to Biomass Energy Conversions. Taylor & Francis Group CRC Press, New York, https://books.google.com.ph/books?id=eFLOBQAAQBAJ&printsec=frontcover&sourc e=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

[4] Dieringer P., Alobaid F., Marx F., Ströhle J., (2020) Process Control Strategies in Chemical Looping Gasification-A Novel Process for the Production of Biofuels Allowing for Net Negative CO 2 Emissions, Darmstadt, Germany

[5] Kerone Engineering Solutions Limited, A/4,Marudhar Industrial Estate, Goddev Fatak road, Bhayander(E), Mumbai-401105, www.kerone.com |

[6] Malmgren, G., Riley (2012) Biomass and Biofuel Production, in Comprehensive Renewable Energy

[7] Matsumoto T., Kayo, C. (2014). Evaluation of Biomass Production and Utilization Systems, in Research Approaches to Sustainable Biomass Systems

[8] Rakos, C. (2023) Biomass Magazine, Issue 1. It's Time to Accelerate Biomass,Not Slam the Breaks

[9] Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels,

[10] Y. Xia, V. Bex and P.M. Midgley (2021). Climate Change 2021: Technical Summary.

[11] The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change