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Electricity Generation from Dry Waste Materials with Automatic Solar Tracking System

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Generally, day by day the generation of dry waste is increasing every day in everywhere. The landfill sites are increasing. The generation of drywasteis increasing along with the increasing of the population. we are making this project in which we have been making this for to generating electricity by heating process from waste materials. In this Project we are producing the energy with Burning the dry waste materials with the Automatic solar tracking system to make it more efficient in the day time. the automatic solar tracking system helps optimize solar panel efficiency by following the sun's movement throughout the day. we avoided glass, petroleum products which effects the heating process. In day time with using the Automatic solar tracking system it will drag the light from the sun and converts into power and in night time we can make electricity by burning the waste. While heating the solid waste the heating panels takes observes that and converts heat energy into electrical energy and storing energy for the purpose of charging the battery which used for the supply that energy for further purpose.
Keywords: Dry Waste, Waste to Electricity.

1. Introduction

To limit the production of dry waste and lower pollution levelswe are making this paper in which we have been making this for the purpose of the control of dry waste generation and to reduce the pollution by generating electricity by heating process. We have collected the dry waste and separated the dry waste by avoiding glass, petroleum products which effects the

heating process. While heating the dry waste the heating sensors, heating panels takes observes that and converts heat energy into electrical energy and storing energy for the purpose of charging the battery which used for the supply that energy for further purpose. In day time with using the Automatic solar tracking system it will drag the solar energy and turns it into electrical powerand in night time we can make electricity by burning the waste. It is the undesired or waste solid materials produced by human activity in homes, hotels, laboratories, farms, businesses, or any other commercial setting.Institutions in India's major cities generate 0.8 kilogram of waste per person on average per day. An estimated 68.8 million tons of municipal solid waste (MSW) are produced annually in India.MSW collection efficiency ranges from 22% to 60% on average. At least 3.3% of the 2.01 billion tonnes of municipal solid waste (MSW) produced worldwide each year are not treated in an environmentally responsible way. The average amount of garbage produced daily per person worldwide is 0.74 kilogram, although it varies greatly from 0.11 to 4.54 kg. Despite making up only 16% of the global population, developed nations produce 683 million tons, or approximately 34%, of the waste produced worldwide. Global trash is predicted to reach 3.40 billion tonnes by 2050. India Every year, 62 million tonnes of municipal solid waste (MSW) are produced. In this, roughly 11.9 million tonnes (20%) are treated and 43 million tonnes (70%) are collected. Approximately 31 million tonnes, or 50%, are disposed of in landfills.

This paper aims to reduce the environmental impact of landfills by diverting dry waste from disposal sites. Generating electricity from dry waste materials can contribute to a more sustainable energy mix. By converting waste into energy, we can also help address the issue of waste management and resource depletion. The thesis seeks to identify the advantages for the economy and the environment of utilizing dry waste for electricity generation. The findings will provide insights into the feasibility and scalability of implementing such technologies on a larger scale. Ultimately, the goal is to promote a circular economy approach by turning waste into a valuable energy resource. The objective of this paper is to explore the potential of converting dry waste materials into electricity. Dry waste materials include items such as project, cardboard, plastics, and textiles. The focus is on utilizing innovative technologies to harness energy from these materials efficiently.

2. LITERATURE REVIEW

Municipal dry waste was gasified using plasma in 2019 at N.U. for waste-to-value processing. Energy Rev. 2019, 116, 109461; Renew. Sustain.The more popular conventional gasification process turns garbage into synthetic gas, or syngas, which is then burned to provide thermal energy or, after purification, electrical energy. Temperatures range from 1000 to 2000 ◦C, depending on the gasifying agent. Plasma gasification, which is done at 3000–14,000 ◦C, is a more recent and inventive subgroup [1]. Technical and financial evaluation of waste-fired energy production in the United Mexican States in 2020. They assessed the possibility of generating electricity in the United Mexican States through the burning of garbage throughout this research.The United Mexican States' population was divided into six groups based on population size, each of which was linked to a waste generation index. The facility and energy resulting from each size category were estimated using the entire amount of waste as well as the lower hot values.The Levelized Price of Energy (LCOE), Net Present Value (NPV), and

Internal Rate of Return (IRR) were used to assess the economic viability. Burning garbage produced fifty-eight.9 MW for a population of up to three million. Eleven,681.64 GWh of energy were generated in total, which contributed to 4.3% of the country's consumption. A sensitivity study was carried out, focusing on particular aspects of the analysis to highlight how the project will become financially feasible by modifying investment, O&M, and sales tariff. This analysis demonstrates that the Waste-To-Energy (WTE) combustion trade is feasible in the United Mexican States and offers significant benefits, including bolstering the renewable energy sector and significantly improving the waste management system [2].M. A Comparative Analysis of Thermal Processing Techniques for Landfill Reclamation: Approaches, Outcomes, and a Hopeful Future. If processed products—which can be gaseous, liquid (tar), or solid—need to be extracted, pyrolysis is pertinent [3].A Comparative Analysis of a Causal Municipal Solid Waste Management Model for Sustainable Cities in Vietnam. source. preserved. Reuse and recycle An essential component of human activity is the management of solid municipal waste (MSW). Inadequate MSW impacts people's health and lives and causes major environmental issues. Economic progress is eventually slowed down by this; society must build thoughtful infrastructure around MSW. [4]. The problem is getting worse and needs to be addressed more quickly because trash production is rising along with earnings, consumerism, and urbanization. Global sustainable development goals (SDGs) including SDG 7 "Affordable and clean energy" and SDG 11 "Sustainable cities and communities" are supported by waste-to-energy programs [5].SDG 11 is also achieved by Osaka, Japan's recycling of municipal solid waste (MSW), according to the UN Environment Programme. Cities now have access to alternate energy sources thanks to MSW energy generation, particularly in areas with a dearth of natural energy supplies. In metropolitan areas, the growth of waste-to-energy generation networks promotes sustainable development. UN reports also express concern about MSW, and the COVID-19 pandemic has made it more difficult for municipalities that need to preserve their current waste treatment systems in addition to developing them [6].Evaluation of the Economic and Environmental Life Cycle of Incineration and Biogasification for the Treatment of Organic Waste. Does Germany Have a Justification for Biowaste Source Segregation? Mayer and associates assumed no pre-sorting or drying of MSW and averaged the grate combustion throughout Germany (Code 2119). By calculating the emissions amount per 1 MSW kg by the daily plant capacity and 365 days a year, we were able to translate the emission statistics for seven standard Canadian facilities (Code 2120) with rotary kiln technology into our scale [7].The best possible process design for Argentina's integrated municipal waste management and energy recovery. Renew. The appeal of economic and environmental technologies has been examined by Energy Research in the past, but the findings have only been applied to specific cases, such as two case studies of Argentine cities [8].An analysis of the environmental effects of burning municipal solid waste in African nations. Due to the large number of variables that must be taken into account for a strategic and comprehensive comparison, selecting the most effective of the widely used thermal MSW treatment systems frequently appears to be challenging. An enterprise's life cycle evaluation or the region's development plan is one of the fundamental trends in the efficiency study of MSW energy utilization facilities [9]. The viability of using solid municipal waste as fuel for the production of thermal and electric energy. Assessing the investment viability of electricity generation from MSW using net present value or a comparison of total capital and operational expenses is another common approach [10].Waste-to-Energy

Generation: A Comprehensive Study of Contemporary Technology Efficiency. The researchers conducted in-depth ecological and economic efficiency studies of contemporary waste-to-energy technologies for this study. Finding a balance between productivity, environment, and economics is the main problem facing today's Waste to Energy generations. Therefore, statistics from businesses were utilized to evaluate the efficacy of different heating technologies [11].

3. METHODOLOGY

The methodology for the project involves several key steps. First, a thorough review of existing literature and technologies related to waste-to-energy conversion and solar tracking systems is conducted. Next, the system architecture is designed, incorporating waste processing units, solar tracking mechanisms, energy storage systems, and control interfaces. Following this, a prototype of the integrated system is developed and subjected to extensive testing to evaluate performance and identify areas for improvement. Data collected during testing is analyzed to assess system effectiveness and guide optimization efforts. Once optimized, the system undergoes validation through real-world testing and demonstration. Throughout the process, documentation is maintained, and reports are prepared to communicate findings and outcomes effectively. This systematic approach ensures the development of a reliable and efficient solution for electricity generation from dry waste materials with an automatic solar tracking system.

This methodology outlines the steps to generate electricity from dry waste using an Automatic Solar Tracking System, which optimizes energy production by tracking the sun's movement. This innovative approach combines waste management with renewable energy production, providing a sustainable solution for both.

By following this methodology, the Automatic Solar Tracking System can optimize electricity generation from dry waste, providing a sustainable and renewable energy source. This innovative approach reduces waste disposal costs, generates clean energy, and contributes to a circular economy. Step 1: Waste Collection and Sorting:

Collect dry waste from various sources (household, industrial, agricultural) and sort it into categories (organic, inorganic, recyclable). This step ensures that only suitable waste is used for electricity generation.

Step 2: Waste Processing:

Shred or crush waste into smaller pieces, remove contaminants (metal, glass, plastic), and dry waste to optimal moisture level. This step prepares the waste for gasification.

Step 3: Solar Tracker Setup and Configuration: Install the Automatic Solar Tracking System, which tracks the sun's movement to optimize energy production. Configure system settings (tracking mode) to ensure maximum energy output.

Step 4: Gasification and Electricity Generation: Feed processed waste into the gasifier, gasify waste to produce syngas, and convert syngas into electricity using a generator. The Automatic Solar Tracking System optimizes energy production by adjusting the gasifier's temperature and pressure according to the sun's intensity.

Step 5: Electricity Output and Monitoring: Connect generated electricity to the grid or power storage and monitor system performance and electricity output. This step ensures that the electricity generated meets the required standards.

Step 6: Maintenance and Upkeep: Regularly clean and maintain the gasifier and solar tracker, and replace worn or damaged components. This step ensures the longevity and efficiency of the system.

3.1 Collection Of Municipal Dry Waste: MSW have been collected from households, surroundings and various places before that solid waste are decomposing in the landfills which are useful for our project.

3.1.1 Heating Process: The separated solid waste which is collected for the project has been taken in the heating box for the heating process. the heating sensor is connected while heating process is going on the heating sensor and the heating panel takes the heat and converts that heat energy into electrical energy. It is the first and foremost process which is the main process in which the heat energy is converted into electrical energy. While doing this process care should be taken. The energy from this process taken by the heating panels and transfers that energy into the rechargeable battery through the circuits which helps to resists the flow of the current.

3.1.2 Output Load: The energy which is stored in the battery is transferred to the externally which is used as the output load.

3.1.3 Disposal: The remaining residue which is left in the process in the form as ash is disposed and if it is used for further process then is used and the remaining waste like ash is disposed outside.

3.1.4Pollution Filter Process: The smoke which is coming from the heating box is send to the filter control which used to control the pollution.

3.1.5Automatic Solar Tracking System: This is used to maximize solar panel efficiency. It functions by autonomously repositioning the solar panels to track the sun's path throughout the day. The solar panels' ability to monitor the path of the sun allows them to receive the most sunlight possible, increasing the amount of electricity they can produce. This method increases the total efficiency of solar power generation and maximizes the use of solar energy.

4. BLOCK DIAGRAM

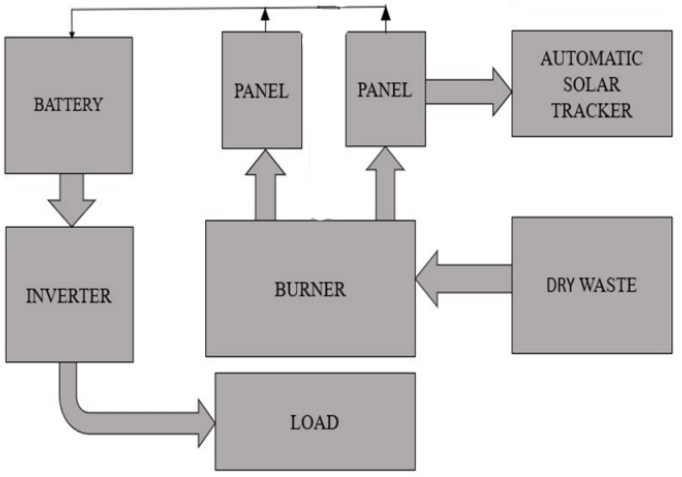

Fig.4.1 Proposed model block diagram

Hardware construction and trial for electricity generation from dry waste materials with an automatic solar tracking system is a multiplex process that involves designing, building, and integrating several components to generate a functional and efficient system. The system consists of many key components, including:

1. Dry Waste: Trash-to-energy also known as trash-to-energy plants, use non reusable dry waste to generate electricity and heat between a process called controlled combustion.

2. Burner: This Components is used to converting dry waste into heat and light.

3. Automatic Solar Tracking System: This component makes sure maximum energy immersion by adjust the solar panels to track the sun's movement. The solar tracking system is equippedwith sensors and motors to improve energy generation.

4. Solar Panels: The solar panels converting sunlight into electricity, supplementing the electricity generated from the light.

The construction process requires designing and fabricating each component, followed by gathering and installing. The system is then integrating, and testing and commission are carried out to makes sureideal performance.

Testing and commissioning involve functional testing of each component and the whole system, showing testing to makes sure efficient electricity generation, safety testing to warranty safe operation, calibration of the solar tracking system and final commissioning and handover to the end-user.

Challenges in this project includes efficientgasifier of dry waste materials, definitive and Exact solar tracking and continuity, power quality and firmness, and system maintenance and balance.

The benefits of this system include:

- Continuous energy source from waste materials

- Increased energy efficiency

- Minimal waste disposal

- Productive and acceptable energy solution

In opinion, hardware construction and testing for electricity generation from dry waste materials with an automatic solar tracking system require careful design, construction, and testing to makes sure a functional and efficient system. Overcoming challenges and improving performance are critical to control the benefits of this innovational and acceptable energy solution.

5. COMPONENTS

5.1 HARDWARE REQUIREMENTS:

1. Dry waste
2. Burner
3. Solar panels
4. Automatic solar tracking system
5. Battery
6. Inverter
7. Load

5.2 COMPONENTS DESCRIPTION

5.2.1 Dry Waste

Dry Waste materials such as project, cardboard, wood, or agricultural residues serves as the source material for the waste-to-energy conversion process, providing a livable source of energy for electricity generation.

These components work jointly to form an integrated system for electricity generation from dry waste materials with an automatic solar tracking system, assuring, efficiency, reliability, and acceptable.

5.2.2Burner

The burner is used in waste-to-energy conversion processes such as gasifier or combustion to produce heat energy from dry waste materials, which can then be used to generate electricity or heat.

5.3 Solar panels

1. Photovoltaic cells in solar panels absorb sunlight and transform it into electrical power. They are the system's primary renewable energy source.

2.The solar panel style 9v3w is a 9-volt, 3-watt polycrystalline silicon panel.

3.It is designed to efficiently converting sunlight into electricity for several applications.

4.This model is known for its longevity and high energy conversion efficiency.

5.3The features of this solar panel include:

9Volts, 3Watts Output:Supply a steady 9 volts and 3 watts of power.

Polycrystalline Silicon Cells:Employ efficient polycrystalline silicon cells for solar energy regeneration.

Compact Dimensions:Calculate 14 x 1.8 x 23 cm, it's compact and suitable for several applications.

Output Wire: Comes with a 10-foot output wire for suitable connectivity.

Battery Charging: Designed specially to charge batteries within the 5V-6V range.

STC Performance: Performs optimallyunder Standard Test Conditions with specific irradiance, temperature, and solar spectrum conditions.

5.4 Automatic solar tracking system

The position of the sun is never constant, as you are aware. It shifts from east to west. Therefore, it is insufficient to install a solar panel at the angle of the sun's energy. This is because, as the sun's angle changes, it will eventually stop receiving sunlight. Many solar panels have a solar tracker fitted in order to solve this issue. By rotating your panels to follow the sun throughout the day and maximizing the angle at which your panels receive solar radiation, a solar tracking system—also known as a sun tracker or sun tracking system—maximizes the amount of electricity your solar system can produce. Single axis and dual axis solar tracker projects are the two varieties of solar tracker projects. A single axis solar tracker can only rotate in two dimensions because it only has one motor. therefore the dual axis has four rotational orientations.

5.5Inverter

In order to power household appliances and other electrical loads, the inverter transforms the direct current (DC) electricity produced by the solar panels and stored in the battery into alternating current (AC) electricity.

5.6Battery

An example of a storage battery that converts chemical energy into electrical power is a lead acid battery. Lead peroxide and sponge lead are used.

Construction:Glass, lead-lined wood, ebonite, hard bituminous compound rubber, ceramic materials, or molded plastics make up the lead acid battery's container, which is seated at the top to prevent electrolyte discharge. The plates assist transform the chemical energy stored in the container into electrical energy.

Working:When sulfuric acid dissolves, its molecules separate into sulphate negative ions and positive hydrogen ions, which are then free to travel. The hydrogen ions will be positively charged, pushed toward the electrodes, and connected to the negative terminal of the DC supply if the two electrodes are submerged in solutions.The negatively charged SO4 ions

gravitated toward the electrodes attached to the supply main's positive terminal, or anode. Each sulphate ion gets two negative ions from the anodes and reacts with water to generate hydrogen and sulfuric acid, while each hydrogen ion takes one electron from the cathode.

6. RESULTS

Coming to the Results of this Project of Electricity Generation from Dry Waste Materials with Automatic Solar Tracking System.

There are different ways for producing electricity from the day time our result with using the Solar panels we can directly drag the Energy from the sun and then we can convert it into Electrical Energy.

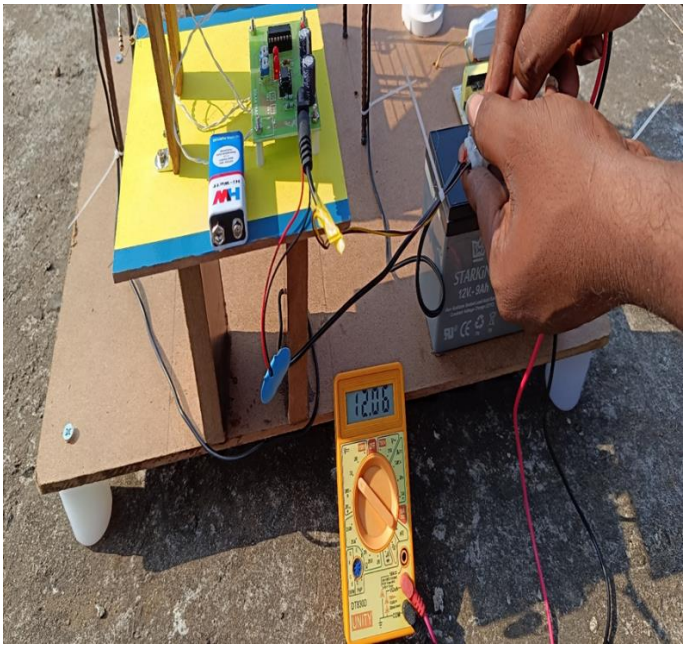

Fig 6.1 Output Voltage at Daytime (12 PM)

The First output from the Sun at the Day time of 12 PM is shown in the Fig 6.1 and the solar panel's direction is South East direction with the help of the Automatic solar tracking system we can get the maximum Output by adjusting the solar panels according to the Automatic solar tracking system output respectively.

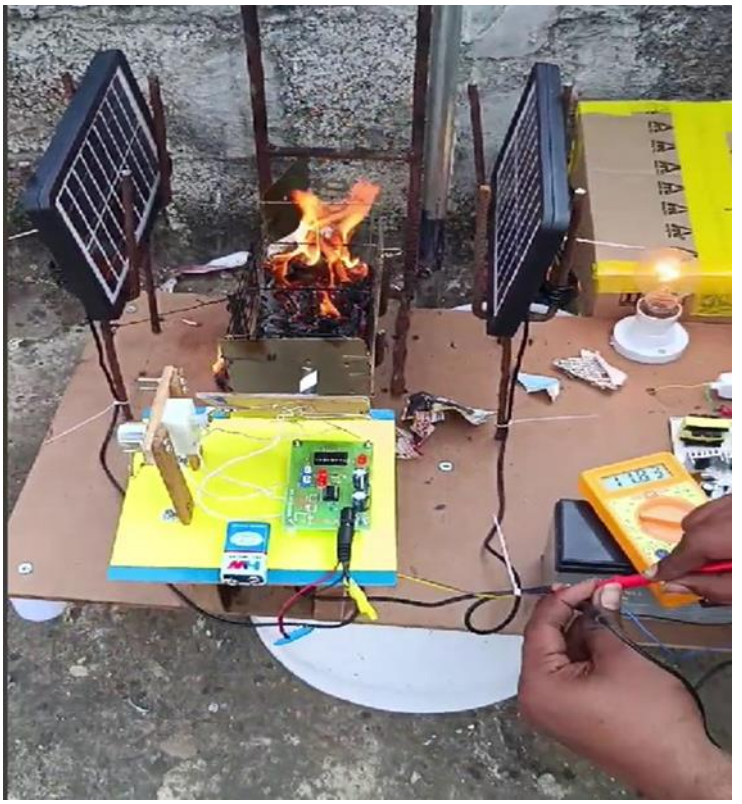

Fig 6.2 Burning Output in the Day Time

As we can see in the Fig of 6.2 the output may vary due to the inconsistency of the fire and we are Depositing the waste in Intermediate manner to avoid a dangerous fire.

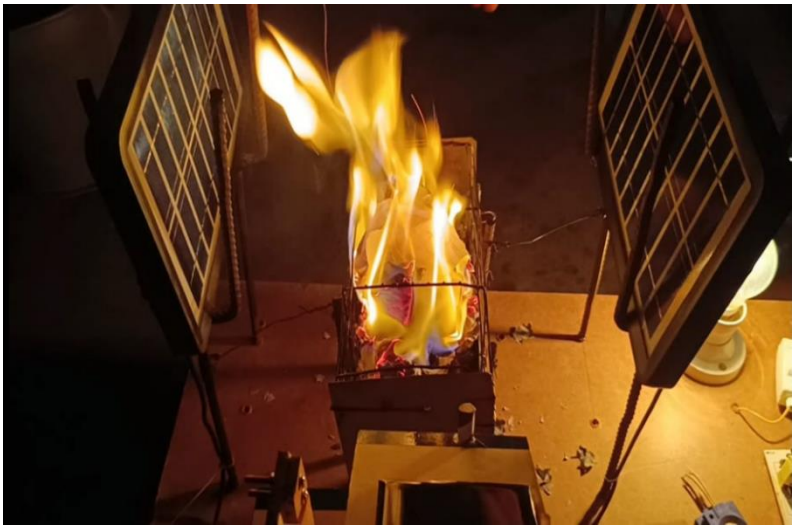

Fig 6.3 Burning Output in the Night Time

Another way for producing the electricity from the night time with using the Solar panels we can directly drag the Energy with the Depositing of dry waste into the Burner Intermediately we can burn it and the solar panels going to drag the heat energy and it will be converted into Electrical energy as shown in the Fig 6.3.

Whatever the energy is dragged it going to store in the battery and then the converter is going to Convert it into DC to AC and the load is connected here for the showing purpose we connected a bulb.

6.1 EQUATIONS

1Kilogram of dry waste can produce light and heat energy up to 1 hour.

Project Capacity is 100W

Day Time: 8hrs*100W=800 Watts on day time.

Night Time:16hrs*100=1600 Watts on night time.

Total energy generated through this project = Day time generated energy + Night time produced energy.

Total energy 800+1600=2400W.

This Project can generate 100W/Hr.

6.2 OUTPUT ANALYSIS

Resource	Time (Minutes)	Temperature (Degree)	Generating Voltage (Volts)	Electricity Generating Minimum Temperature (Degree)
1Kg of papers	45	200-300	230	100
1Kg of plastic	60	250-300	230	100
1Kg of mixed waste	50	250-300	230	100
Sun light	60	25	230	25

Fig 6.4 Output Analysis

6.3 RESULT VIDEO LINKS

BURNING PROCESS AT DAY TIME VIDEO LINK

https://drive.google.com/file/d/1A2DrP59bEbG1ZJ99rQNX6_6XJkQwjiwn/view?usp=drivesdk

SOLAR ENERGY DRAGING VIDEO LINK AT AFTERNOON

https://drive.google.com/file/d/1A0ZGemGcJbVIfbowROV1PMEn3hX5oiwQ/view?usp=drivesdk

BURNING VIDEO DURING NIGHT TIME LINK

https://drive.google.com/drive/folders/1AgxMt6sWURonnBKO1WQ6hX9a8uTLNXgX

7. CONCLUSION

In this project the generation of electricity from the dry waste by the heating process. These materials have been used for the generation of electricity by heating process by controlling the pollution by using the pollution filter and also the automatic solar tracking system. The filter has been setup in order to control the pollution while heating process has been going on. The results obtained after doing this process is analyzed and its efficiency for generating electricity.

In the world the dry waste generation is increasing day by day everywhere. In order to control that solid waste generation by controlling the pollution for the purpose of generation of electricity. In this project we show that how to generate electricity from dry waste successfully by the process of heating. We cannot control the pollution completely but we can control the pollution for up to some extent. We can generate electricity from dry waste by the process of heating and we can supply that electricity for the use. In this project there are two ways of generation of electricity is explained.

In day time with using the Automatic solar tracking system it will drag the light from the sun and converts into power and in night time we can make electricity by burning the waste. We are reducing the dry waste and without decomposing in the landfill sites. Thus, we can say that we completely show that generation of electricity from dry waste by the heating process

FutureScope

The future scope of Electricity Generation from Dry Waste Materials with Automatic Solar Tracking System ispromising and vast, with potential developments and applications in:

1.Scaling up: Large-scale implementation

industries, cities, and communities, reducing

waste disposal costs and greenhouse gas emissions.

2.Technological advancements:

Improvements in gasification, solar tracking,

and energy storage technologies, increasing

efficiency and reducing costs.

3.Integration with other renewables:

Combining with wind, hydro, or geothermal

energy for a hybrid renewable energy system.

4.Decentralized energy production:

Empowering local communities to generate

their own energy, reducing reliance on grid electricity.

5.Waste-to-energy for transportation:

Transform waste into dry or solid waste for conveying, reducing fuel dependence.

6.Smart cities and urban planning:

Incorporate waste-to-energy and solar energy systems into urban structure and planning.

7.Agricultural applications:

Utilize the agricultural waste for energy encourage,lessen waste disposal costs, and generate new revenue streams.

8. Rural electrification:

Bringing electricityto remote areas, further economic development, and improving living quality.

9.Carbon capture and utilization:

Mergecarbon capture technology to convert CO_2 into precious products like biofuels or chemicals.

10.Global deployment:

Execute thistechnology in developing countries,addressing energy penury and promotingsustainable development.

11.Research and development:

Constantlyimproving efficiency, reducing costs, and survey new applications and technologies.

12.Policy and regulatory support:

Improving the government policies reasons to promote universal adoption and investment.

References

1.MunirM.T, Mardon I, Al-Zuhair,SShawabkehA, Saqib, N.U, " Plasma Gasification of Municipal Solid Waste for Waste-toValue Processing, "Renewable and Sustainable Energy,16,109461, 2019.

2.Pablo Emilio Escamilla-García, Raúl Horacio Camarillo-López, R. Carrasco Hernandez, E. Fernandez,"Technical and economic analysis of energy generation from waste incineration in Mexico, " Energy Strategy Reviews31, 100542, 2020.

3.Madadian, EHaelssigJ.B, PeggM, "A Comparison of Thermal Processing Strategies for Landfill Reclamation: methods, Products, and a Promising Path Forward," Resource. Conserved. Recycle,160,104876, 2020.

4.TsaiF.M, Bui, T.D, Tseng, M.L, Wu, K.J, "A Causal Municipal Solid Waste Management Model for Sustainable Cities in Vietnam under Uncertainty: A Comparison. Resource, ". Conserved. Recycle,154,104599, 2020.

5.Sustainable Development Goals. Available online: (accessed on 29 September 2022). https://www.un.org/sustainabledevelopment/.

6.Ternald, D. International Environmental Technology Centre. In Annual Report 2020; United Nations Environment Programmed: Osaka Japan, 2020.

7.MayerF, BhandariR, GäthS.A, Himanshu H, Stobernack, N,"Economic and Environmental Life Cycle Assessment of Organic Waste Treatment by Means of Incineration and Bio gasification. Is Source Segregation of Biowaste Justified in Germany," Sci. Total Environ, 721, 137731, 2020.

8. MoreroB, MontagnaA.F, CampanellaE.A, Cafaro, D.C, "Optimal Process Design for Integrated Municipal Waste Management with Energy Recovery in Argentina, ".Renew. Energy, vol. 146, pp. 2626–2636, 2020.

9. CudjoeD, Acquah P.M, "Environmental Impact Analysis of Municipal Solid Waste Incineration in African Countries, ",Chemosphere, 265, 129186, 2021.

10.ShunkoK.A, BolshakovaI.V, "Economic Feasibility of Using Solid Municipal Waste as Fuel for Electric and Thermal Energy Production, ". In Trends of Economic Development in the XXI Century; Koroleva, A.A., Ed.; Belarusian State University: Minsk, Belarus, pp. 368–371, 2021.

11. Natalia Vukovic, Evgenia Makogon, "Waste-to-Energy Generation: Complex Efficiency Analysis of Modern Technologies."Sustainability, 14,13814,2022