Conversion of Non-Recyclable Plastic Waste into Electricity along with Carbon Ink and Eco-Bricks production

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***Abstract*—Plastic waste has become one of the most pressing environmental issues globally, with millions of tons of plastic ending up in landfills, oceans, and other ecosystems each year. Traditional methods of waste disposal, such as landfills and incineration, often contribute to pollution and environmental degradation. The growing demand for energy, paired with the environmental crisis, calls for sustainable and innovative solutions. This project aims to tackle both of these challenges by converting waste plastic into useful energy. By utilizing waste plastic as a resource, we can generate electricity and reduce pollution, showcasing a novel approach to waste-to-energy technology.**

The proposed system operates by using heating panels to burn plastic waste, generating heat that is then converted into electricity. This electricity is stored in batteries, which can then be used to power devices such as light bulbs. This method allows for an efficient conversion of waste into usable energy. A key aspect of this project is addressing the pollution generated from burning plastic. Instead of releasing harmful gases directly into the atmosphere, the system employs a pollution filter that captures the emissions, such as carbon particles and other toxic gases. These harmful substances are not discarded but rather collected and repurposed. The carbon collected from the filter is transformed into ink, which can be used for painting and other creative applications, demonstrating the recycling potential of waste in multiple forms. It can also be used to make concrete, bricks and cement. This system not only produces energy but also minimizes harmful environmental effects by recycling and repurposing waste materials.

***Index Terms*—Electricity Generation, Non-Recyclable plastic, Carbon-ink production, Eco-bricks production, pollution control.**

I. INTRODUCTION

.Plastic waste has emerged as one of the most urgent environmental challenges of the twenty first century. With global plastic production surpassing 400 million lots annually, a enormous percentage finally ends up in landfills, oceans, or is incinerated without right control, contributing to good sized environmental degradation. unmarried use plastics, specially, dominate this waste move due to their non-biodegradable nature and fast intake quotes. The unsuitable disposal of plastic waste consequences in land and marine pollution, ingestion by way of animals, micro plastic contamination, and elevated greenhouse gas emissions, posing extreme threats to ecosystems and public fitness.

Conventional waste control solutions including open burning, landfilling, and restrained recycling have established ineffective or dangerous over the years. Open burning releases toxic gases like dioxins and furans, while landfills eat precious land and leach harmful chemicals into the soil and groundwater. Recycling costs continue to be low globally because of infection troubles and the financial challenges of processing complex plastics.

In response to those shortcomings, this venture gives a “holistic and progressive waste-to-power solution” that not simplest mitigates the impact of plastic waste however additionally generates useful by products for sustainable applications. The centre of the system entails the managed thermal processing of plastic waste the usage of specialized “heating panels”

designed to transform the released warmth electricity into usable “electric power”. unlike photovoltaic sun panels that depend upon sunlight, those panels are optimized for heat recuperation from combustion, making them powerful in strength harvesting from high-temperature waste streams.
To deal with the inevitable by products of combustion, a “carbon filtration gadget” is integrated into the setup. This device captures particulate matter and carbon emissions, considerably reducing the release of dangerous pollution into the surroundings. The trapped carbon is not discarded; rather, it's far repurposed into “carbon ink”, demonstrating an innovative upcycling technique that adds financial and environmental value.

Furthermore, the “ash residue” produced after plastic combustion regularly considered waste is accrued and examined for its suitability in construction applications. Early research recommend that this ash can serve as a partial alternative within the formulation of concrete bricks, imparting structural energy at the same time as minimizing the need for virgin raw materials such as sand and cement.

The multi-dimensional project exemplifies the standards of the round economy, in which waste isn't merely disposed of but transformed into energy and reusable substances. It offers a strategic method to handling plastic waste whilst simultaneously addressing energy shortages and promoting aid performance. through integrating power recovery, pollutants manipulate, and cloth repurposing, this model serves as a scalable and adaptable framework for sustainable development.

II. METHODOLOGY

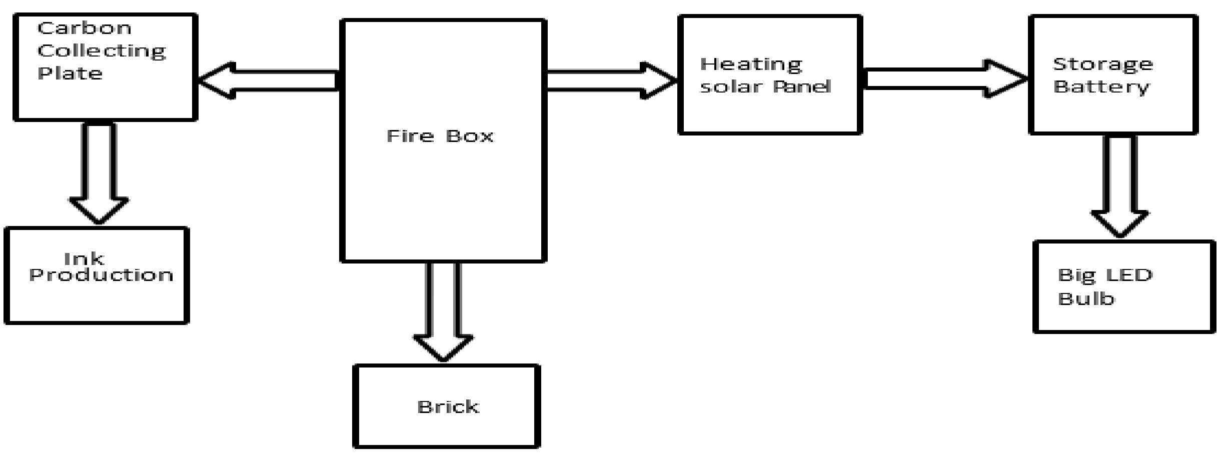

Figure 1. Block-Diagram

The materials used are:
1.Heating Panel (1.5V) – 2 nos.
2.Heating Sensor (Tube light starter)
3.Capacitors (25 volts,1000 microfarads) – 16 nos.
4.LED Bulb(10W)
5. Resistor (100 Ohm,5W)
6.PCB
7.Rechargable Battery(4V)
8.Switch
9. IN4007 Diode
10.Jack Machine
11.Wires (12m approx.)
12.DC Motor

Method:
1. Non-recyclable plastic waste is placed inside a protective iron box designed to contain heat and minimize the escape of harmful emissions.
2. When the plastic is burned, a lot of heat energy is generated. Heating panels placed at strategic positions around the jar box absorb this heat.
3. The thermal energy from the heating panels is converted into electrical energy based on thermoelectric principles.
4. The produced electricity is then stored in a rechargeable 4-volt battery, which energizes a DC

LED bulb, showing the practical aspect of utilizing the energy.

5. Smoke produced in the process of burning is directed, via PVC pipes, to a carbon filtration unit.
6. The carbon filter traps harmful particles and gases, converting the smoke into solid carbon residue.
7. The collected carbon residue is processed into high-quality ink, which may be used for writing, printing, or any other means which shows the practical value of repurposed waste.
8. The resultant ash from burnt plastic is analysed and reused in concrete materials, such as blocks or road construction materials, that can be an environmentally friendly alternative to traditional building resources.

III. RESULTS AND DISCUSSION

1)Electricity generation:

i. Heat from burning plastic waste was successfully converted into electricity using heating panels.
ii. The generated power was stored in a 4V rechargeable battery.
iii. The stored energy was used to light a DC LED bulb, demonstrating practical utilization.
iv. Proved the feasibility of producing renewable electricity from plastic waste.

Table 1. Electrical Energy Output:

Parameter	Result for 1 kg Plastic
Total burning time	38–45 minutes
Average temperature in chamber	520–650°C
Measured output voltage	4-4.5v
Measured charging output to 4V battery	3.8–4.1 V

2)Carbon ink production:

i. Smoke filtration to capture harmful emissions as carbon residue.
ii. Residue can be processed into usable ink for writing, printing, or industrial use.

Table 2. Carbon ink Output:

Material	Per 1 kg Plastic
Carbon residue collected	6.8 g
Carbon used for ink	6.2 g
Total carbon ink produced	28 g

3)Bricks production:

Materials Used:

The experimental brick sample was made using the following materials in predetermined proportions:

i.Burnt plastic residue: 0.019 g/mg ≈ 19 g
ii.M-Sand: 38 g
iii.Cement (53 Grade):19 g
iv.Plasticizer: 20 mL

These quantities were chosen in order to determine the viability of using plastic residues in brick production.

Experimental Procedure Outcomes:

The experiment was carried out by weighing, mixing, moulding, and finally drying the composite material. The following results were obtained :

i. Material Preparation: All the materials were weighed successfully, according to the required proportions.
ii. Mixing Results:
a. Dry mixed material: burnt plastic residue, M-sand, and cement.
b. The addition of 20 mL plasticizer improved workability, with the resulting mixture being homogenous.
iii. Moulding Result:
a. The mixture was transferred into a cube mould.
b. The material settled well without any apparent air gaps.
iv. Drying Results:
a. The moulded sample was allowed to dry at room temperature for 24 hours.
b. It served to remove the moisture effectively, and the cube did not crack or deform.

Visual Observations:

The last brick sample had a smooth surface finish as a result of the plasticizer.

1. Colour: Slightly darker due to burnt plastic residue.
2. Texture: Compact and uniform.
3. Structural Integrity: The dried sample retained its shape firmly and was ready for further mechanical testing, like compressive strength.

Compressive Strength Calculation:
Given:
1. Maximum Load (P) = 3.7 (I will assume kN, i.e., 3.7 kN = 3700 N)
2. Length (L) = 5 cm
3. Width (W) = 4 cm

Step 1: Convert area to m²

$$A = L \times W = 5\ \text{cm} \times 4\ \text{cm} = 20\ \text{cm}^2$$

Convert to m²:

$$20\ \text{cm}^2 = 20 \times 10^{-4} = 0.002\ \text{m}^2$$

Step 2: Apply compressive strength formula

$$\text{Compressive Strength} = \frac{P}{A}$$

$$= \frac{3700}{0.002}$$

=1.85MPa

Compressive Strength of the Brick = 1.85 MPa

IMAGES:

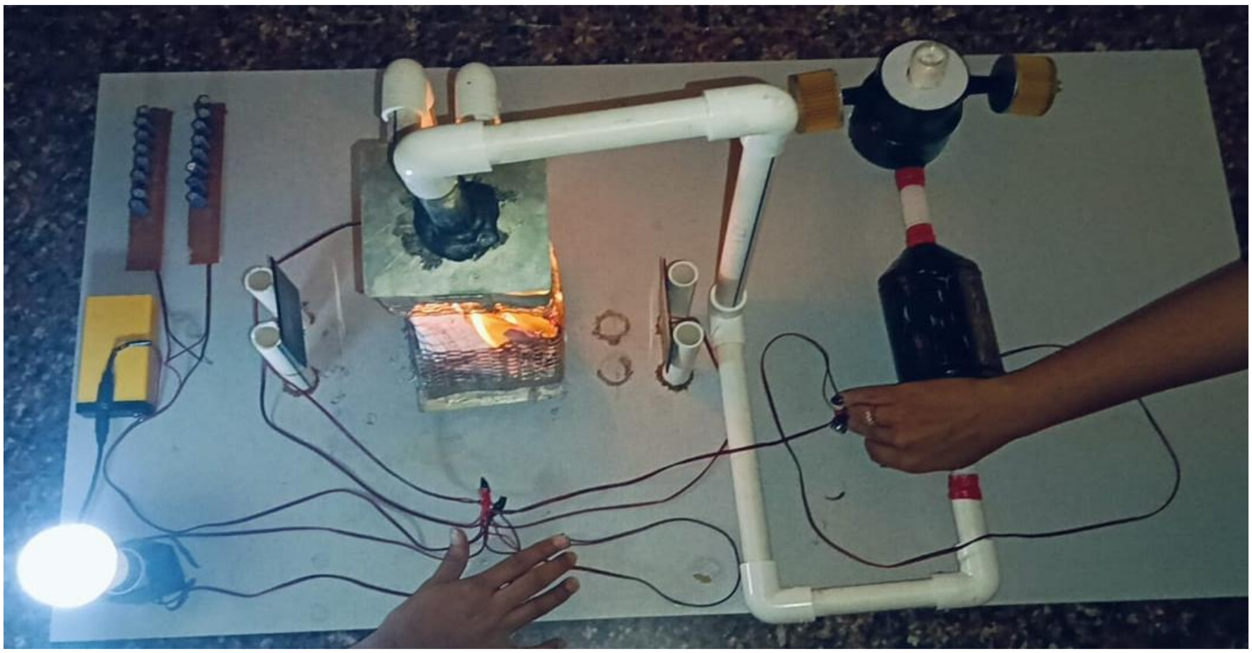

Figure 2. Working of the model

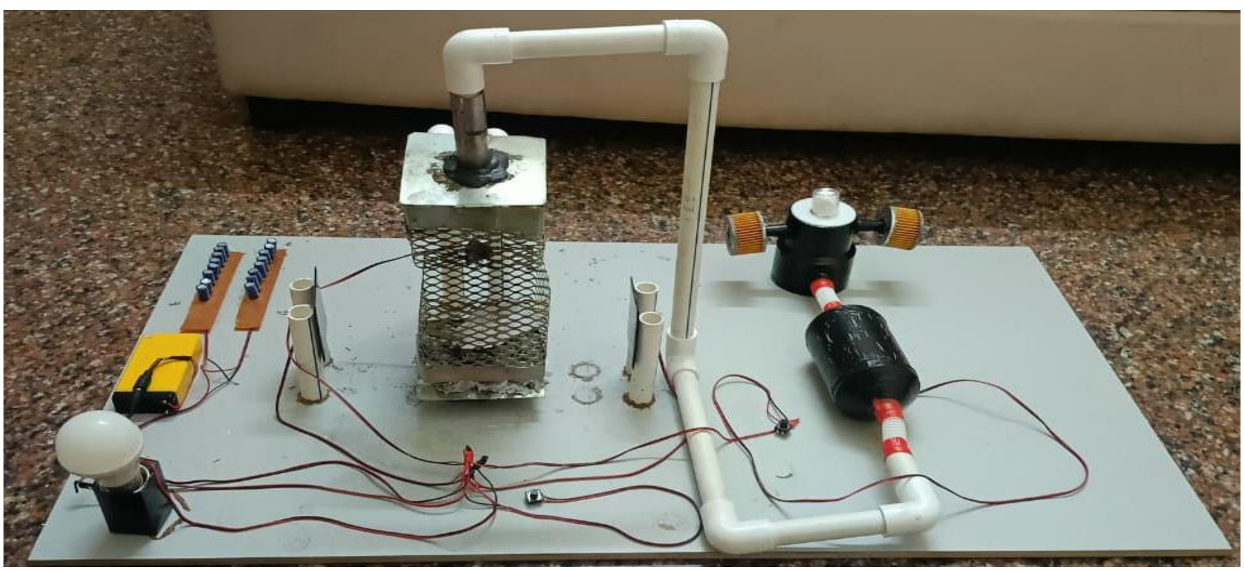

Figure 3. Front View of the project model

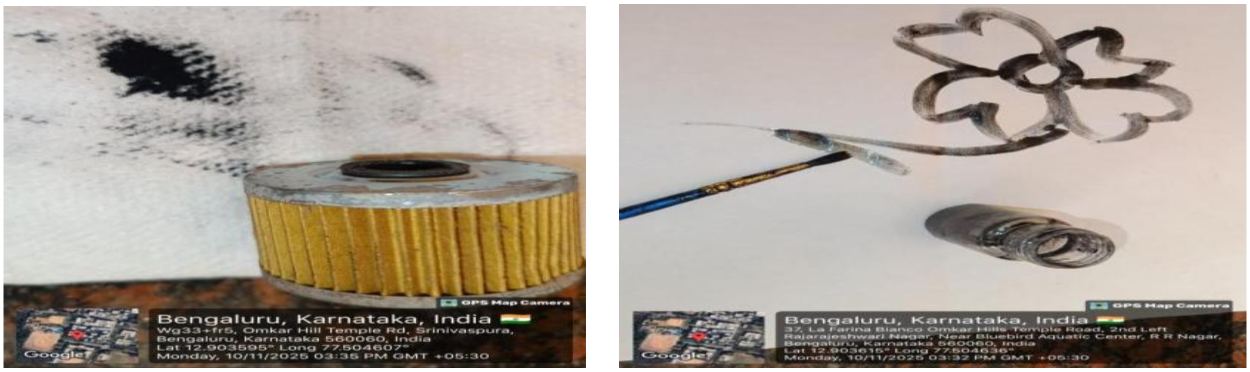

Figure 4. Ink obtained from the carbon filter(left) and the drawing done from the Carbon Ink(right)

Figure 5. Plastic ash residue(left) and the brick made from the ash(right)

IV. CONCLUSION

The Conversion of Non-Recyclable Plastic into Electricity with Carbon Ink and Eco-Bricks venture serves as a promising example of the way technological innovation can cope with the twin crises of plastic pollution and strength scarcity. The ever developing accumulation of plastic waste has turn out to be a vast environmental threat, threatening ecosystems, natural world, and public health. traditional waste management strategies together with landfilling and incineration have proven to be unsustainable, both because of land overuse or the discharge of dangerous emissions. In reaction, this venture introduces a sustainable solution with the aid of converting non-biodegradable plastic waste into usable energy thru thermal processing the use of particularly designed heating panels.

Unlike conventional waste-to-power systems, this version integrates a carbon filtration unit that substantially reduces toxic emissions. The smoke produced for the duration of the heating procedure is filtered, and the extracted carbon is reused as raw cloth for carbon ink adding an and economically viable by-product. This innovation now not most effective allows to reduce air pollutants however additionally supports the concept of commercial symbiosis via turning waste into a beneficial commodity.

Furthermore, the inclusion of ash recycling for the manufacturing of production substances together with concrete blocks adds another layer of environmental and financial benefit. in place of producing secondary waste, this gadget guarantees that each by-product is harnessed for some functional motive, promoting a circular financial system. This holistic method proves that waste cannot be visible simply as a burden however instead as a resource waiting to be reclaimed. From an engineering angle, the device incorporates an expansion of critical additives which includes heating sensors, capacitors, filters, and switching structures that work collectively to make sure dependable and efficient performance. The mixture of mechanical, electric, and chemical principles underlines the multidisciplinary nature of the mission and its potential for real-world deployment.

In the long run, this venture gives a replicable model for sustainable waste management. It is not the handiest contributes to cleaner environments and power era but also opens up avenues for entrepreneurship, activity introduction, and awareness in environmental sustainability. by means of empowering groups to manage waste regionally while producing their very own energy, this approach could be scaled up in each city and rural contexts. The fulfilment of this gadget signifies a breakthrough in achieving global sustainability dreams and offers a significant contribution closer to a cleaner, greener, and extra energy efficient international.

V. APPENDIX

Table 3. Components and their description

Component	Description
Heating Panel	Converts heat from burning plastic into electrical power. Typically based on thermoelectric conversion.
Heating Sensor	Measures temperature to ensure efficient burning and energy conversion.
Capacitor (25V/1000uF)	Stores electrical charge; helps in voltage regulation and filtering.
LED Bulb	Demonstrates the output usage of generated electricity.
Resistor	Controls current flow to protect components.
Air Filter	Filters harmful emissions and captures carbon particles for ink production.
Battery (4.5V)	Stores generated energy for consistent power supply.
PCB	Connects all electrical components for compact functioning.
Jack System	Allows external connection for energy output or charging.
IN4007 Diode	Manages power on/off state of the system. Prevents reverse current flow, protecting the circuit.

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