FABRICATION OF PYROLYSIS EQUIPMENT FOR CONVERTING PLASTIC WASTE TO FUEL
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Outline

Introduction

Marketing of product

Process of manufacturing

Schematic representation

Components used

Products obtained

Results & Analysis

Conclusion
Introduction

- Pyrolysis is the thermal degradation of waste in an oxygen-starved environment.

- Due to the fossil fuel crisis in past decade, mankind has to focus on developing the alternate energy sources such as biomass, hydropower, geothermal energy, wind energy, solar energy, and nuclear energy.

- Pyro Oil, Pyro Gas, Carbon char and electricity is been generated.

- On the other hand, appropriate waste management strategy is another important aspect of sustainable development since waste problem is concerned in every city.

- The economic analysis shows that the pyrolysis oil is able to replace diesel in terms of engine performance and energy output if the price of pyrolysis oil is not greater than 85% of diesel oil.
Introduction

- Central Pollution Control Board (CPCB) informed it that, India generates 56 lakh tones of plastic waste annually.
- About 300 million tons of plastic is produced globally
Marketing of product

- Under pyrolysis process three products are extracted from the waste plastic in which Industrial Fuel Oil is used as a Substitute of Pyrolysis Oil, Pyrolysis gas and Carbon Char.

- It’s more economical compare to Carbon Black produced primarily from petroleum and more price efficient.

- In the industries it’s used as ingredients listed as: Electric Cable, Jacketing Conveyor, Band Hose and doormat, Rubber Additive, Plastic Pipes, Fire Fighting.
We can manufacture Pyrolysis plant in two ways
- Domestic Plant
- Industrial Plant

The unit will generate employment for more than 20 persons directly and indirectly.

The unit will employ to the staff available in the local village area in the maximum places of skilled worker.

The cost of transportation will be saved as the main industries are in and around Indore, which will result in the economic availability of the product to the consumers.
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Construction of Polymer (Plastics) Coated Bitumen Road

- Plastic waste collection, segregation & storage.
- Cleaning & drying of Plastic waste.
- Shredding plastic waste into required size (2 to 4 mm).
- The coated aggregate is mixed with hot bitumen at temperature ranges from 155°C-163°C.
- Shredded polymer waste (5-10% w/w) is added to heated stone aggregate for 30-40 sec and mixed for uniform coating at surface of aggregate.
- Stone aggregate (granite, ceramic) heated to around 160°C-170°C.

The mix (composite) known as waste plastic-aggregate bitumen mix (130°C-140°C). This composite used for road laying at temperature between 110°C-130°C.

Fig.2 Plastic waste uses
Fig. 3 Plastic waste uses
✓ Pyrolysis technology is the industrial process of breaking down large molecules of plastic into smaller molecules of oil, gas and carbon black.

✓ Pyrolysis of waste plastic takes place in the absence of oxygen at about 350 – 550 degree C.

✓ Pyrolysis of waste plastic takes place in the presence of oxygen at about 400 – 700 degree C.

✓ Reaction time is about 15-90 minutes.
Fig. 4. Auto card drawing PYROLYSIS PLANT (Domestic Plant)
FABRICATION OF PYROLYSIS EQUIPMENT FOR CONVERTING PLASTIC WASTE TO FUEL

Components Used

- Reactor
- Catalytic Cracker
- Condenser
- ½” BR. Tap
- ½” BR. Valve
- Stove
- G.I. Stand
- Hose
- G.I. Pipe
- Copper Tubes
- G.I. Joints

Fig. 15. Pyrolysis Equipment
Products Obtained

- Pyro Oil
- Pyro Gas
- Carbon Char
- Electricity

Fig. 6 Pyrolysis Oil And Gas
## Results and Analysis

<table>
<thead>
<tr>
<th>Property</th>
<th>Tire Pyrolysis oil</th>
<th>Plastic Pyrolysis Oil</th>
<th>Diesel Oil</th>
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</thead>
<tbody>
<tr>
<td>Heating Value (kJ/kg)</td>
<td>43225.9</td>
<td>46199.12</td>
<td>45814.74</td>
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<tr>
<td>C (%)</td>
<td>84.67</td>
<td>83.79</td>
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<tr>
<td>H (%)</td>
<td>10.44</td>
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<tr>
<td>O (%)</td>
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<tr>
<td>Cl (%)</td>
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<td>n.a</td>
</tr>
<tr>
<td>S (%)</td>
<td>≤1</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Density @ 30°C (g/cc)</td>
<td>0.924</td>
<td>0.8147</td>
<td>0.7994</td>
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<td>Viscosity @ 40°C (μ)</td>
<td>2.64</td>
<td>2.49</td>
<td>1 – 4.11</td>
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<tr>
<td>Flash Point (°C)</td>
<td>38</td>
<td>31</td>
<td>70</td>
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</table>
Conclusion

- Domestic plants can be built at a cheaper rate compared to conventional ecofriendly power plants. (Rs. 1500 - 2000)

- The use of plastic pyrolysis oil in diesel engine in the aspect of technical and economical is compared and found that oils are able to replace the diesel oil.

- From 1kg of plastic waste we generate 600 – 750 ml of pyro oil, 60 – 100 gms of carbon char and 200 – 250 kj of pyro gas.

- Turning waste to energy is not only financial profitable but it also environmental friendly business which the government should offer a strong policy to encourage the entrepreneur to invest in the waste to energy business.
Questions & Discussions