Energy Recovery from Oil Soaked Cotton Waste

Yugandhara Gujar¹ & Dipti Ankalgi²
¹²Savitribai Phule Pune University, India.

Abstract: Oil Soaked Cotton waste is considered as hazardous waste, hence cautious disposal is very important for any industry or organization that is generating it. Thus its minimization is necessary which is in turn achieved by energy recovery from oil soaked cotton waste. Pelleting technology is one such technology which can help by producing pellets and can be used as a fuel. Its application can be found as use in industries as fuel for boilers, etc.

Keywords: Oil soaked cotton waste, energy recovery, pellets.

1. Introduction

Fossil fuels are used for burning on a large scale in industries. Fossil fuel like coal being a conventional energy source is undergoing depletion and thus an alternative to it is essential in near future.[1] One such alternative to coal can be oil soaked cotton waste which is generated in large quantities in industries. Energy recovery of oil soaked cotton waste can be made in form of pellets. Pelleting technology is process of compressing a material in form of a pellet. The pellets formed from oil soaked cotton waste can be used for burning in different applications like burning in boilers and help reduce the consumption of coal. In this paper pellets were formed and proximate analysis was carried out.

2. Materials and Methods

- Materials used in this work: Oil soaked cotton waste, Pelleting Machine, Moisture Meter, Temperature Recorder, Waste Shredder, Muffle Furnace, crucibles etc.

- Sample Collection: Oil soaked cotton waste was collected from automobile industries and workshops of Pune. Flour was collected from a flour mill. Saw dust was collected from a nearby furniture shop.

- Methodology adopted: Oil soaked cotton waste was made free from metal pieces, metal springs, etc. and was shredded using a waste shredder into fine pieces of approx. 3-4 mm size. A mixture of known amount of cotton waste with flour and saw dust was prepared. Flour was used as binder whereas saw dust was used as filler.

- The mixture was placed in pelleting machine and pellets were formed.

Then the pellets were sun dried for 2 days and were used for further analysis.
3. Results and Discussion

I. Percentage Moisture Content:
It is calculated by taking the difference between initial weight and final weight of the sample.

II. Percentage Volatile matter:-
In the already weighed crucible, sample is taken. The crucible is covered with lid and placed in muffle furnace at 960°C for 7-8 minutes.

\[ \text{Percentage Volatile Matter} = \left[ \frac{(A-B)}{A} \right] \times 100 \]

Where A = weight of oven dried sample and B = weight of sample after 7-8 mins in the furnace at 960°C.

III. Percentage Ash content:-
In the already weighed crucible, sample is taken. The crucible is placed in muffle furnace at 550°C for 8 hours.

\[ \text{Percentage Ash Content} = \left[ \frac{B}{A} \right] \times 100 \]

Where A = weight of oven dried sample and B = weight of ash

IV. Percentage Organic Matter:-
\[ \text{POM} = 100 - \text{PAC} \]

V. Percentage Fixed Carbon:-
\[ \text{PFC} = 100 - [\text{PVM} + \text{PAC}] \]

Where PVM = percentage volatile matter
And PAC = percentage ash content

VI. Heating value:-
\[ \text{HV} = 2.326 (147.6C + 144V) \]

Where C = percentage fixed carbon and V = percentage volatile matter

Table 1. Proximate Analysis

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Parameters</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Percentage Moisture Content</td>
<td>5.4 %</td>
</tr>
<tr>
<td>2.</td>
<td>Percentage Volatile matter</td>
<td>81.5 %</td>
</tr>
<tr>
<td>3.</td>
<td>Percentage Ash content</td>
<td>5 %</td>
</tr>
<tr>
<td>4.</td>
<td>Percentage Organic Matter</td>
<td>95 %</td>
</tr>
<tr>
<td>5.</td>
<td>Percentage Fixed Carbon</td>
<td>13.5 %</td>
</tr>
<tr>
<td>6.</td>
<td>Heating value</td>
<td>31932.72 Kcal/kg</td>
</tr>
</tbody>
</table>

VII. Calorific Value:-
Calorific value is the quantity of heat produced by unit mass of fuel on its complete combustion, expressed in Joules/kg. Or Kcal/Kg. If more is the calorific value, more is the amount of energy available from that fuel.

Table 2. Calorific Value

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Sample</th>
<th>Calorific Value (Kcal/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Cotton Waste</td>
<td>4925</td>
</tr>
<tr>
<td>2.</td>
<td>Pellets</td>
<td>5119</td>
</tr>
</tbody>
</table>

4. Conclusions
The disposal of oil soaked cotton waste can be overcome by producing pellets from it. Calorific value of pellets being high, it can easily replace coal for its application in boilers.

5. References