Characteristics of Pellet from Oil Palm and Jatropha Residues

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Abstract

To utilize residue from oil palm and Jatropha processing, pellet making was performed and the pellets obtained were characterized in this study.

Oil palm mesocarp fiber and Jatorpha press cake (residue after squeezing seed) were employed as feedstocks. Pellet making was conducted using two pelletizers (flat-dye and ring-die types). The state of the pellet was soft compared to the conventional softwood pellet, because of their oily properties. The increase of bulk density before and after pellet making was larger for oil palm mesocarp fiber and smaller for Jatorpha press cake. The gross caloric value was 19 and 21MJ/kg-dry for oil palm mesocarp fiber and Jatorpha press cake pellets, respectively. In the workshop, the energy consumption during pellet making will be presented.

Keywords | pellet, oil palm, Jatropha, characteristics, caloric value
Characteristics of pellet from oil palm, Jatropha, and rice residues
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Advantage of Pelletization

1. High energy density
   Pellet has higher energy density (per volume) than chip.

2. Constant heating value
   Moisture controlling is one of important factors to produce good pellet. Because of low and constant moisture content (~15%), pellet has constant heating value.

3. Easy handling
   Pellet is round-shape, so that it is easy to handle.

Feedstock & Pellet Production

Feedstock

- Oil palm trunk
- Oil palm mesocarp fiber
- Jatropha press cake
- Rice Husk

Production

Pelletizer

(Flat-die type, Kikukawa Iron Works)
Diameter: 6.2mm  Thickness: 28 or 35mm  Temperature 50-90 ºC

- For jatropha (Jatropha curcas) press cake, initial moisture content was around 10%. In this study, pellet can be produced by adding water up to 20-25% of moisture content and increasing feeding rate.
- For jatropha press cake and rice husk, pellet can be produced with no further grinding.
- Production rate: 130kg/h for jatropha press cake, 10kg/h for others.

Characteristics of pellets

<table>
<thead>
<tr>
<th>Feedstock</th>
<th>Elemental analysis (wt%, daf)</th>
<th>Ash (wt%,db)</th>
<th>Bulk density (g/cm³)</th>
<th>Caloric value (MJ/kg)</th>
<th>Energy consumption on pelletalization</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C</td>
<td>H</td>
<td>N</td>
<td>S</td>
<td>O</td>
</tr>
<tr>
<td>Oil palm trunk</td>
<td>45.7</td>
<td>6.1</td>
<td>0.2</td>
<td>0.06</td>
<td>48.0</td>
</tr>
<tr>
<td>Oil palm mesocarp fiber</td>
<td>53.1</td>
<td>6.5</td>
<td>2.2</td>
<td>0.08</td>
<td>38.1</td>
</tr>
<tr>
<td>Jatropha press cake</td>
<td>54.8</td>
<td>7.2</td>
<td>6.8</td>
<td>0.23</td>
<td>31.0</td>
</tr>
<tr>
<td>Rice husk</td>
<td>–</td>
<td>–</td>
<td>–</td>
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<td>–</td>
</tr>
</tbody>
</table>

a) By difference  b) Under investigation  c) Values in parenthesis are calculated on primary energy basis (power efficiency = 0.36)

- Bulk density is greatly increased (around 4.7-6.6 times) by pelletalization except jatropha press cake.
- Since jatropha press cake is already "pressed" state of feedstock, improvement of bulk density was small.
- Caloric values were 15-17MJ/kg, that were slightly smaller than those of wood pellet (18.6 MJ, average value from commercial pellet in Japan)
- The energy consumptions of pelletalizer were 0.56-2.6% of caloric values of the feedstocks.

Future plan

- Development of drying process for wet feedstock in lower energy.
- Application of the pellets to utilization equipment such as cooker, boiler etc.
- Ash utilization as fertilizer for agriculture and forestry

Acknowledgement: We thank Mr. Haruaki Ono of BDF Japan Corp. for supply of test sample and valuable advice.

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