
Motoyasu Takenaka
Manager of General Affairs and Public Relations
JAPAN RPF ASSOCIATION(JRPF)
2nd Fl. Tsujiya Bldg.
1-5-32, Chuo Kuki, Saitama 346-0003 Japan
Tel: +(81)-480-23-5558 Fax: +(81)-480-24-1440
URL  http://www.jrpf.gr.jp

What’s RPF?

• Abbreviation of Refuse Paper & Plastic Fuel
• High quality solid fuel using non-reclaimable used paper and plastic waste as raw materials
• RPF provides with much superior fuel performance than RDF, due to strict material control by using industrially record traceable waste plastic and thoroughly-selected non-industrial waste plastic
• In high demand from the dying, paper and lime industries as an alternative to fossil fuels such as coal, coke and oil
RPF (Refuse Paper & Plastic Fuel)

Figure 1 RPF samples

- Diameter
  - 40mm Φ
  - 20mm Φ
  - 8mm Φ

What advantages does RPF have?

A. Stable quality
B. Availability to control calorific value
C. Handling easiness (High-densified pelletized form)
D. Easy emission gas control at incineration process in a boiler etc. (Emits almost no chlorine gas or dioxins)
E. Economical thriftiness compared with other fuels
F. Contribution to reduce CO₂ gas emission by curtailing fossil fuel use
Table.1 Comparison of Carbon Dioxide (CO₂) emission RPF vs Coal (Imported)

<table>
<thead>
<tr>
<th>Fuels</th>
<th>Calorific Value(^\circ) GJ/t</th>
<th>Calorific Value (ass. v. 11,000 KJ/kg)</th>
<th>CO₂ emission coefficient (^\circ)</th>
<th>CO₂ emission amount per t</th>
<th>CO₂ emission rate RPF vs Coal</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPF</td>
<td>26.6 GJ/t</td>
<td>8,834 kcal/kg</td>
<td>1.57 t/CO₂/t</td>
<td>1.57 t/CO₂/t</td>
<td>65.15 %</td>
</tr>
<tr>
<td>Coal (Imported)</td>
<td>26.6 GJ/t</td>
<td>8,834 kcal/kg</td>
<td>0.221 t/CO₂/t</td>
<td>2.41 t/CO₂/t</td>
<td>100.00 %</td>
</tr>
</tbody>
</table>

*Reference* Denmaner, Fletcher(RF) to estimate base

\(^\circ\) CO₂ emission amount per t for the Coal (Imported), described as 0.221 t/CO₂/t, should multiply 3.677441(1/18MWt/CO₂/t,emat) to convert 1 t/CO₂/t

**Note**
G.J/t = 10000000×0.185/41868J/K

How much can RPF reduce CO₂ emission?

How does RPF get manufactured?

**Figure 2** Raw materials selection process
How does RPF get manufactured?

![RPF manufacturing process diagram]

**Figure 3** RPF manufacturing process

**QC standards**

**Table 2.** RPF QC (voluntary) standards

<table>
<thead>
<tr>
<th>Item Extracted</th>
<th>RPF equiv. to coal</th>
<th>RPF equiv. to coke</th>
<th>Analysis method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher Caloric Value</td>
<td>&gt;8,000 kJ/kg</td>
<td>&gt;8,000 kJ/kg</td>
<td>BS 77802-2</td>
</tr>
<tr>
<td>Moisture</td>
<td>&lt;0.5%</td>
<td>&lt;0.8%</td>
<td>BS 77802-3</td>
</tr>
<tr>
<td>Ash content</td>
<td>&lt;0.5%</td>
<td>&lt;0.5%</td>
<td>BS 77802-4</td>
</tr>
<tr>
<td>Total chlorine</td>
<td>&lt;0.5%</td>
<td>&lt;0.2%</td>
<td>BS 77802-5</td>
</tr>
<tr>
<td>Sulfur</td>
<td>&lt;0.2%</td>
<td>&lt;0.2%</td>
<td>BS 77802-7</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>&lt;0.5%</td>
<td>&lt;0.5%</td>
<td>BS 77802-8</td>
</tr>
</tbody>
</table>

*Note: Adopted by JRPF on March 31, 2004*
How much is RPF demanded for?

Figure 4 Annual change of domestic RPF demand, researched by JRPF as of April 2009, summed up annual RPF demand for 31 pulp, 5 lime and 6 other industrial manufacturing sites

C-RPF: The next generation technology

C-RPF is the latest fueling technology, manufactured through the following A to C process.

A. Carbonizing all combustible non-industrial waste including kitchen garbage to get char
B. Removing inappropriate portion out of the char and rinsing and drying it for dechlorination
C. Mixing crushed waste plastic into the char to adjust calorific values and to form pellets

C-RPF is one of the ideal recycling technology, converting combustible waste produced from local governments into high-quality solid fuel and is a biomass fuel developed jointly by IHI Corporation and Seki-Shouten Co., Ltd.

C-RPF Profiles
- Diameter: Ø40mm
- Calorific value: 6,000kcal/kg app.
- Chlorine Conc.: 0.2% app.

Merits:
A. Stable quality
B. Fuel proportion (nonvolatile fixed carbon/volatile portion) adjustability of char
C. Low chlorine contents
D. Taking advantage of self-generated thermal cracking gas at carbonizing process as its heat source
E. Reducing the cost of the installation and the maintenance
F. Economically superior to other fuels
Thank you for your attention

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