Seminar on the Joint Crediting Mechanism (JCM) Implementation in Indonesia 2019
21-October-2019, in Jakarta
“City-to-city Collaboration Programme, Rokan-Hulu Regency and Kawasaki City”.
Introducing EFB (Empty Fruit Bunch) 100% Fuel Biomass Power Plant & Co-Generating
By PT. Fuji Furukawa E&C Indonesia

A Subsidiary Company of Fuji Furukawa Engineering and Construction Co, Ltd.
the “City-to-city Collaboration Programme, Rokan-Hulu Regency and Kawasaki City”.

Jakarta – Pekanbaru
1 Hr & 45 Min by Air Flight

Pekanbaru – Pasir pengaraian
4 Hr by Car
“City-to-city Collaboration Programme, Rokan-Hulu Regency and Kawasaki City”.

About Kawasaki City: Location

Population: 1,501,697 per.
(As of Jun. 1, 2017)

Area: 144.35 km²

Gross production: 5.3 trillion JPY
(50 billion USD)
Introducing Fuji Furukawa Engineering and Construction Co, Ltd. (FFEC)

Website: https://www.ffec.co.jp/en/

Representative: Takashi Kusaka, President
Capital stock: 1,970 million yen (As of March 31, 2018)
Number of Employees: 1,473 (consolidated) (As of March 31, 2018)

Head office: Solid Square West Tower, 580 Horiwaka-cho, Saiwaiku, Kawasaki, 212-0013 Japan
TEL +81-44-548-4322
FAX +81-44-548-4545

Establishment: October 1, 1923
Introducing FFEC Global Network
Project EPC by FFEC and PT. Fuji Furukawa E&C Indonesia

Subsidiaries in ASIA

MYANMAR
VIETNAM
THAILAND
PHILIPPINES
CAMBODIA
MALAYSIA
INDONESIA

PT. FUJI FURUKAWA E&C INDONESIA

Jakarta [本社]
SUJACO Building 4th floor JL Kebon Sirih No.71, Jakarta 10340 - Indonesia
Tel. +62-21-3100-509 Fax. +62-21-3983-6434
Structure of the “City-to-city Collaboration Programme, Rokan-Hulu Regency and Kawasaki City”.

Kawasaki City

Support for promoting circular economy for palm oil industry in Riau Province region

PT. Fuji Furukawa E&C Indonesia
F/S on EFB co-generation Consortium preparation

Tokyo Century Corporation
Consortium preparation

IGES
Study on circular economy

Facilitation of permissions

Rokan Hulu Regency

Candidate 2 of IPP
Other palm oil mill

Project formulation support

<Potential partner participant for JCM model project>

Project Management

JCM model project promotion

Information sharing

NIPPON KOEI
Overview of the “City-to-city Collaboration Programme, Rokan-Hulu Regency and Kawasaki City”.

Rokan Hulu as the Best Model of Circular Economy in Palm Industry

- Kabupaten Rokan Hulu
  - Needs
  - Potential projects

- Kawasaki City
  - Experiences
  - Technologies

Model Project in Rohul

Projects in Riau Province

Projects in Sumatera

Projects in Indonesia

Projects in Malaysia and World
<table>
<thead>
<tr>
<th>序号</th>
<th>種類</th>
<th>設備</th>
<th>発電に向けた可能性</th>
<th>略号の説明</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FFB</td>
<td>100</td>
<td>29.1</td>
<td>FFB: Fresh Fruit Bunch</td>
</tr>
<tr>
<td>2</td>
<td>CPO</td>
<td>24</td>
<td></td>
<td>EFB: Empty Fruit Bunch</td>
</tr>
<tr>
<td>3</td>
<td>EFB</td>
<td>21</td>
<td></td>
<td>CPO: Crude Palm Oil</td>
</tr>
<tr>
<td>4</td>
<td>MF</td>
<td>14.4</td>
<td></td>
<td>MF: Mesocarp Fiber</td>
</tr>
<tr>
<td>5</td>
<td>PKS</td>
<td>6.4</td>
<td></td>
<td>PKS: Palm Kernel Shell</td>
</tr>
<tr>
<td>6</td>
<td>PK</td>
<td>5.0</td>
<td></td>
<td>POME: Palm Oil Mill Effluent</td>
</tr>
<tr>
<td>7</td>
<td>POME</td>
<td>58.3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

略号の説明
- FFB: Fresh Fruit Bunch
- EFB: Empty Fruit Bunch
- CPO: Crude Palm Oil
- MF: Mesocarp Fiber
- PKS: Palm Kernel Shell
- POME: Palm Oil Mill Effluent

出所：インドネシア国におけるパームオイル工場廃液の燃料化事業　調査報告書　平成27年3月
## EFB treatment current situation of some Mill Plant at Rokan-Hulu Regency

<table>
<thead>
<tr>
<th>No.</th>
<th>ITEM</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Regional regulation for EFB disposal.</td>
<td>EFB should be treated inside of Mill Plant, prohibited dispose to outside.</td>
</tr>
<tr>
<td>II</td>
<td>Solution A</td>
<td>EFB feeds back to Palm Plantation or anyway bring EFB to out of factory. (against regional regulation.)</td>
</tr>
<tr>
<td>III</td>
<td>Solution B</td>
<td>EFB feeds to incineration, convert to ash for decreasing volume of waste.</td>
</tr>
</tbody>
</table>
**Palm oil production utility (Steam & Electricity)**

Fuel source switch from MF to EFB (Previous by MF)

**Conventional Process for CPO Production & Utilities (Steam & Electricity)**

<table>
<thead>
<tr>
<th>No.</th>
<th>Characteristics</th>
<th>EFB (Empty Fruit Bunch)</th>
<th>MF (Mesocarp Fiber)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a) Fuel advantage; b) Initial investment;</td>
<td>a) Poor than MF, high moisture &amp; potassium (clinker problem). -&gt; See 3</td>
<td>a) Higher than EFB, low moisture &amp; potassium (clinker less). -&gt; See 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) High cost than MF</td>
<td>b) Low cost than EFB</td>
</tr>
<tr>
<td>2</td>
<td>Material / Fuel long distance distribution ability;</td>
<td>No ability. (local consumption only.)</td>
<td>Ability of domestic &amp; export value (Fuel source).</td>
</tr>
<tr>
<td>3</td>
<td>Sustainability (fertilizer recycle to Plantation);</td>
<td>High fertilizer components, ash feedback to Plantation.</td>
<td>Poor fertilizer components, ash to be waste.</td>
</tr>
</tbody>
</table>
Palm oil production utility (Steam & Electricity)  
Fuel source switch from MF to EFB (Improved by EFB)

Conventional Process for CPO Production & Utilities (Steam & Electricity)

Improved Process for CPO Production & Utilities

Dry SLDG to PLANT

Dry SQ-SL to PLANT

By FFEC

ASH. To Plantation

1ST Improvement

2ND Improvement
Palm oil production process improvement with EFB 100% Biomass Co-Generation (off-grid)

Conventional Process for CPO Production & Utilities (Steam & Electricity)

- PLANTATION
- MILL PLANT
- PROCESS
- WASTE
- Dry SLDG to PLANT

Improved Process for CPO Production & Utilities

- PLANTATION
- MILL PLANT
- PROCESS
- WASTE
- Dry SQ- SL to PLANT

1st Improvement

- EFB
- Pellets
- Biogas
- Biogas Co-GEN

2nd Improvement

- Pellets
- Trunks
- SQUEEZED
CONCLUSION & PROPOSAL  
(Waste to Energy improvement, mainly off-grid)

<table>
<thead>
<tr>
<th>No.</th>
<th>AGENDA</th>
<th>SUGGESTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Palm plantation &amp; Palm oil production sustainability (Recycle):</td>
<td>Fertilizer components feedback (EFB ash, POME mad &amp; Trunk squeezed)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>Utilities (Steam &amp; Electricity) by local production for local consumption:</td>
<td>Co-generating fuel to be utilized by EFB (convert from MF) &amp; biogas from POME</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>Tightening regulation &amp; Incentive providing by the Government:</td>
<td>Regulation -&gt; Recycle &amp; Waste minimize Incentive -&gt; Tax reduce</td>
</tr>
</tbody>
</table>

Governments of both countries cooperate with the private sector to build a model plant.

<table>
<thead>
<tr>
<th>Indonesia (SEA Countries)</th>
<th>JAPAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Government Agencies</td>
<td>政府期間</td>
</tr>
<tr>
<td>Local Government Agencies</td>
<td>地方自治体</td>
</tr>
<tr>
<td>CPO Manufacturers</td>
<td>建設コンサルタント</td>
</tr>
<tr>
<td>Contractors</td>
<td>EPC建設事業者</td>
</tr>
<tr>
<td>Power Plant Operators</td>
<td>輸入販売事業者</td>
</tr>
<tr>
<td>Trading Companies</td>
<td>電力事業者</td>
</tr>
<tr>
<td>Logistic Companies</td>
<td>流通事業者</td>
</tr>
</tbody>
</table>
**Ongoing Project (On grid to PLN)**

**EFB 100% Fuel Biomass Power Plant Outline**

*Note; this project’s FS is undergoing restudy, subject to change.*

<table>
<thead>
<tr>
<th>Project outline for 8.5 MWe Capacity EFB 100% Biomass Power Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EFB Property</strong></td>
</tr>
<tr>
<td><strong>Counter measure</strong></td>
</tr>
<tr>
<td><strong>Effect</strong></td>
</tr>
<tr>
<td><strong>Feasibility case study; B/2018</strong></td>
</tr>
<tr>
<td><strong>Site</strong></td>
</tr>
<tr>
<td><strong>Mil Plant</strong></td>
</tr>
<tr>
<td><strong>EFB</strong></td>
</tr>
<tr>
<td><strong>CO2-e avoided</strong></td>
</tr>
<tr>
<td><strong>EPC Cost</strong></td>
</tr>
<tr>
<td><strong>w/o JCM Support</strong></td>
</tr>
<tr>
<td><strong>w/I JCM Support</strong></td>
</tr>
<tr>
<td><strong>Note</strong></td>
</tr>
<tr>
<td><strong>Note</strong></td>
</tr>
<tr>
<td><strong>Caution</strong></td>
</tr>
</tbody>
</table>
Ongoing Project (On grid to PLN)
EFB 100% Fuel Biomass Power Plant Flow Chart

1. EFB. FROM MILL PLANT
2. EFB. DELIVERY BY TRUCKING
3. SHREDDING MACHINE
4. EFB. CONDITION AFTER SHRED AND PRESS
5. EFB STORAGE
6. MOVING FLOOR
7. EFB. BELT CONVEYOR FROM EFB. STORAGE TO FURNACE
8. STEAM BOILER
9. HYDROGRATE STOKER
10. STEAM TURBINE
11. GENERATOR
12. CONTROL ROOM
13. POWER SUPPLY

Note: Cooperate with Bangkok Industrial Boilers Co. Ltd
Ongoing Project (On grid to PLN)
EFB 100% Fuel Biomass Power Plant Site Plan
Crude Palm Oil Products Volume & Share in the World / Potential Bioenergy (waste to energy) in Indonesia

Top 10 Palm Oil Producers by Country 2016
(Data: www.palmoilanalytics.com)

5 of the Largest palm oil producing provinces in Indonesia In 2017
Data: "BADAN PUSAT STATISTIK 2017" (Central Bureau of Statistics 2017-Indonesian)

<table>
<thead>
<tr>
<th>Province</th>
<th>2017</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Sumatra</td>
<td>18.2%</td>
<td>19.0%</td>
</tr>
<tr>
<td>South Sumatra</td>
<td>13.6%</td>
<td>14.0%</td>
</tr>
<tr>
<td>Riau</td>
<td>33.9%</td>
<td>35.4%</td>
</tr>
<tr>
<td>Central Kalimantan</td>
<td>22.9%</td>
<td>20.3%</td>
</tr>
<tr>
<td>East Kalimantan</td>
<td>11.4%</td>
<td>11.3%</td>
</tr>
<tr>
<td>Data Unit: Mill. Ton</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

On-grid case, estimated Potential Bioenergy (waste to energy) in Indonesia Y2017

<table>
<thead>
<tr>
<th>Waste</th>
<th>Electricity Generated</th>
<th>Power Plant Capacity</th>
<th>CO2-e avoided</th>
</tr>
</thead>
<tbody>
<tr>
<td>EFB*</td>
<td>9,578,150 (MWH)</td>
<td>1,197 (MW)</td>
<td>4,549,621 (Ton)</td>
</tr>
</tbody>
</table>

Note: EFB*: “Calculation from this presentation material page-14 “Project outline for 8.5 MWe Capacity EFB 100% Biomass Power Plant”
THANK YOU

PT. FUJI FURUKAWA E&C INDONESIA

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