BIOGAS COMPRESSED NATURAL GAS (BioCNG) DISTRIBUTION BUSINESS IN MALAYSIA

BIOMALAYSIA & ASEAN BIOECONOMY CONFERENCE 2015

18TH AUGUST 2015
Biogas Production

POME

Anaerobic Digestion

Tank Anaerobic Digester

Lagoon Anaerobic Digester

Digestate

Biogas
Biogas Production

5 million hectares
439 Mills

Natural Gas
1.9 billion cubic meter
182 MMScfd

Source: MPOB as at June 2015

Source: Malaysian Biotech Corp Sdn Bhd (2013)
BioCNG Value Chain

BioGas Production | Purified & Compressed | Distribution | Application
--- | --- | --- | ---
PLANTATION
- Biogas Production
- BioCNG System (Full Package)
- H₂S Removal (1st & 2nd Stage)
- License/Authority

CUSTOMER (BUYER)
- 10ft to 40ft Trailers
- Prime Movers
- Drivers/Operators
- License/Authority
- Metering Stations

Anaerobic Digester → Biogas → BioCNG → TRAILERS → METERING/REGULATING STATION → Boiler
Partnership

Sime Darby Offshore Engineering

Gas Malaysia Berhad

Sime Darby Gas Malaysia BioCNG Sdn Bhd

BioCNG Distribution
BioCNG Quality

**Raw Biogas**

- 500 Sm\(^3\)/hr
- CH\(_4\) – 60 to 65%
- CO\(_2\) – 30 to 35%
- H\(_2\)S - 250 ppm to 500 ppm
- Pressure – 2.9 psig to 15 psig
- Contain other residuals

**Bio - Compressed Natural Gas for Industrial**

- 300 Sm\(^3\)/hr
- Heating Value – 35.95 MJ/Sm\(^3\) (HHV)
- Application – Boiler/Dryer/Melter
  - CH\(_4\) – >95%
  - CO\(_2\) – 4%
  - H\(_2\)S – 8 ppm
- Dispenser Pressure – 250 bar.g
- No other residual
Gas Composition Comparison

<table>
<thead>
<tr>
<th></th>
<th>Biogas</th>
<th>BioCNG</th>
<th>Natural Gas</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CO₂  - 30%</td>
<td>H₂, O₂,</td>
<td>CO₂  - 2%</td>
</tr>
<tr>
<td></td>
<td>H₂, O₂, Siloxane, etc</td>
<td>H₂, O₂,</td>
<td>Propane, Butane – 6%</td>
</tr>
<tr>
<td></td>
<td>Methane - 60%</td>
<td>Methane - 95%</td>
<td>CO₂  - 4%</td>
</tr>
<tr>
<td></td>
<td>23.66 MJ/Sm³</td>
<td>35.95 MJ/Sm³</td>
<td>Methane – 92%</td>
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</tbody>
</table>

BioCNG ≈ Pipeline Natural Gas
Biogas Capture & Upgrading Plant

Anaerobic Digester (Lagoon Type)  H₂S Bio-Scrubber
Biogas Capture & Upgrading Plant

- H₂O Removal
- H₂S Removal
- Compressor
- Gas Separation - Membrane
- Odorizer
- Filling to Trailer
BioCNG Transportation

BioCNG Trailer Truck
(Pressurized at 250 bar.g)
## BioCNG Storage (Type 4)

<table>
<thead>
<tr>
<th>TYPE 4 CNG Trailer</th>
<th>40ft TITAN™</th>
<th>20ft SMARTSTORE™</th>
<th>10ft SMARTSTORE™</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cylinder Type and Quantity</strong></td>
<td>TYPE IV – 8500 @ Liter Water Capacity (LWC)* 4 pcs</td>
<td>TYPE IV – 450 @ Liter Water Capacity (LWC)* 40 pcs</td>
<td>TYPE IV – 450 @ Liter Water Capacity (LWC)* 20 pcs</td>
</tr>
<tr>
<td><strong>Total Gas Mass @ 250barG</strong></td>
<td>7,350 Kg*</td>
<td>3,900 Kg*</td>
<td>1,950 Kg*</td>
</tr>
<tr>
<td><strong>Total Gas Volume @ 250 barG</strong></td>
<td>9,440 Sm3*</td>
<td>5,000 Sm3*</td>
<td>2,500 Sm3*</td>
</tr>
<tr>
<td><strong>Energy Content</strong></td>
<td>323MMBTU</td>
<td>176MMBTU</td>
<td>76MMBTU</td>
</tr>
</tbody>
</table>

*www.gasmalaysia.com*
BioCNG Storage – Layout Plan
BioCNG Storage – Layout Plan

To Customer supply
- 500 – 1000 Sm³/hr
- 1.5 to 3 bar
- 25 to 30 degree C
- SCADA capable
# Alternative Fuel Price - 2015

## Average Fuel Price Data - 2015

<table>
<thead>
<tr>
<th></th>
<th>Month</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>June</th>
<th>July</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average Crude Oil Price (Brent)</strong></td>
<td><strong>USD/barrel</strong></td>
<td>48.42</td>
<td>57.93</td>
<td>55.79</td>
<td>59.39</td>
<td>64.56</td>
<td>62.35</td>
<td>55.87</td>
</tr>
<tr>
<td><strong>Medium Fuel Oil (MFO)</strong></td>
<td><strong>RM/MMBtu</strong></td>
<td>55.27</td>
<td>47.13</td>
<td>44.56</td>
<td>46.27</td>
<td>56.13</td>
<td>54.84</td>
<td>51.41</td>
</tr>
<tr>
<td></td>
<td><strong>RM/litre</strong></td>
<td>2.15</td>
<td>1.83</td>
<td>1.73</td>
<td>1.80</td>
<td>2.18</td>
<td>2.13</td>
<td>2.00</td>
</tr>
<tr>
<td><strong>Diesel</strong></td>
<td><strong>RM/MMBtu</strong></td>
<td>59.36</td>
<td>53.88</td>
<td>56.62</td>
<td>58.45</td>
<td>57.35</td>
<td>62.10</td>
<td>60.73</td>
</tr>
<tr>
<td></td>
<td><strong>RM/litre</strong></td>
<td>2.14</td>
<td>1.94</td>
<td>2.04</td>
<td>2.10</td>
<td>2.06</td>
<td>2.24</td>
<td>2.19</td>
</tr>
<tr>
<td><strong>LPG</strong></td>
<td><strong>RM/MMBtu</strong></td>
<td>69.80</td>
<td>62.68</td>
<td>61.97</td>
<td>61.61</td>
<td>65.46</td>
<td>71.23</td>
<td>68.38</td>
</tr>
<tr>
<td></td>
<td><strong>RM/kg</strong></td>
<td>3.27</td>
<td>2.93</td>
<td>2.90</td>
<td>2.88</td>
<td>3.06</td>
<td>3.33</td>
<td>3.20</td>
</tr>
</tbody>
</table>
BioCNG Price: Discounted Rate

- The BioCNG price is at discounted rate from the alternative fuel price.
Our Offer

Distribution
- BioCNG @ 35.9 MJ/Sm³
- Lower Price than Current Alternative Fuel

Integration
- Transport Plug and Play
- Metering

Solution
- Light hydrocarbon – CH₄ (clean fuel)
- Saving on fuel utilization
- Ease of maintenance – no fuel spillage, clean burn & higher efficiency

Contract
- 5 years supply contract
Thank You

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