MHG Systems Oy

- Agile Green ICT Services for end-to-end automation of entire biomass/timber acquisition process
- Globally unique service linking novel technologies resulting in situation view for various decision makers
- Developed together with bioenergy players & researchers
- Strong forestry and bioenergy background
- Green ICT Winner 2011
- Top25 Scand.

Cleantech 2010, Logica ICT Innovation Winner 2010
Major Problems in Energy Supply Chains

1. Not transparent; no trust => not real business (for producers and contractors)
2. Inefficient operations; low productivity
3. No accurate information; quality, quantity (ha, i-m³, m³, kg), no real-time
4. Not tracked down to plot/storage/load level; costs and profits not understood,
5. **Energy business should be business in MWhs not tons!**
6. No trustworthy measurements; sampling at mills inaccurate
7. Material is forgotten and spoilt
8. Presence of unsustainable material within supply chain; boilers; shorter life cycle
Solution – MHG Feedstock Platform Service

- Service package covering the following services: Biomass Mapper, Power Plant Optimizer, Biomass Supply Manager and Consultation services
- Screenshot about one service – Biomass Manager below

Real time information about ongoing activities available already on landing site
Power Plant Optimizer Service for Pre-feasibility Analysis

- One of the tools in the MHG Feedstock Platform
- Main outcome: the analysis whether the power plant has sufficient biomass in the vicinity and can be operated sustainably over the investment planning period, given the
  - Chosen energy conversion technology based on multifuel
  - Chosen economical parameters for the investment
  - Supply and demand for the feedstock
- Analysis is spatial; i.e. everything is analysed with located resources, hence the need for the baseline mapping
Power Plant Optimizer Service; Different Components

- Background maps, baseline inventory
- Baseline inventory
- Field survey
- Freely controlled by the analyst

Map:
- Infrastructure
- Biomass production
- Competing uses for the biomass
- Power plant placement
- Financing options
- Bioenergy technology options

Pre-feasibility analysis
Power Plant Optimizer Service; Main Processess

• If needed, the initial step is a baseline inventory that maps the land use and available biomass resources for the target region using satellite images and field observations.

• In the service this baseline information is converted into a fuel availability estimate for the power plant site under analysis.

• Given the sourcing distance and percentage, and the sourcing costs, we have the fuel availability and cost at the plant site as well as the energy content in the fuel.

### Trigeneration Multifuel Power Plant (electricity, heat, cold)

#### 1. Fuel availability

<table>
<thead>
<tr>
<th>Material</th>
<th>Productivity (t/year per ha)</th>
<th>Sourcing percentage (%)</th>
<th>Cost at source (million rupiah/t)</th>
<th>Cost at mill gate (million rupiah/t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice Husk</td>
<td></td>
<td></td>
<td>0.48</td>
<td>0.48</td>
</tr>
<tr>
<td>Elephant Grass/Miscanthus</td>
<td></td>
<td></td>
<td>0.48</td>
<td>0.48</td>
</tr>
<tr>
<td>Oil Palm Empty Fruit Bunch/EFB</td>
<td>0.3</td>
<td>75</td>
<td>0.16</td>
<td>0.16</td>
</tr>
<tr>
<td>Oil Palm Fiber</td>
<td>0.05</td>
<td>50</td>
<td>0.24</td>
<td>0.24</td>
</tr>
<tr>
<td>Oil Palm Tree Trunk</td>
<td></td>
<td></td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Oil Palm Kernel Shell</td>
<td>0.1</td>
<td>75</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>Rubberwood</td>
<td></td>
<td></td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>Bagasse</td>
<td></td>
<td></td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Coconut Shell</td>
<td></td>
<td></td>
<td>0.4</td>
<td>0.4</td>
</tr>
</tbody>
</table>

**Estimate fuel availability**

<table>
<thead>
<tr>
<th>Material</th>
<th>Fuel availability (t/year)</th>
<th>Total energy content (GWh/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil Palm Empty Fruit Bunch/EFB</td>
<td>18932</td>
<td>38</td>
</tr>
<tr>
<td>Oil Palm Fiber</td>
<td>2092</td>
<td>5</td>
</tr>
<tr>
<td>Oil Palm Kernel Shell</td>
<td>6277</td>
<td>30</td>
</tr>
</tbody>
</table>
The next step is to determine technical and financial parameters for the power plant investment itself (a trigeneration plant in the example).

Both the fuel availability analysis and the investment specification are put together as economic indicators for the potential power plant investment.

The analysis can be repeated for several potential sites to evaluate their suitability.

- 1. Fuel availability
- 2. Boiler's Fuel and Thermal Effect
- 3. Flue Gas Cleaning, Sand Consumption
- 4. Boiler Plant Operational Personnel
- 5. Variable and Fixed Costs of Boiler Plant Operation
- 6. Boiler Plant Energy Production
- 7. Financing Structure for the Boiler Plant
- 8. Economic Indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Rate of Return (%)</td>
<td>26.4%</td>
</tr>
<tr>
<td>Average Return on Invested Capital (%)</td>
<td>51.6%</td>
</tr>
<tr>
<td>Average Return on Own Capital (%)</td>
<td>114.3%</td>
</tr>
<tr>
<td>Investment Present Value (million rupiah)</td>
<td>187,500</td>
</tr>
<tr>
<td>Pay Back Time based on Operating Margin (years)</td>
<td>2.8 years</td>
</tr>
<tr>
<td>Pay Back Time based on Net Present Value (years)</td>
<td>6.7 years</td>
</tr>
<tr>
<td>Pay Back Time based on Cash Flow (years)</td>
<td>14.1 years</td>
</tr>
<tr>
<td>Write Offs in Total (million rupiah)</td>
<td>387,933</td>
</tr>
<tr>
<td>Paid Interest In Total (million rupiah)</td>
<td>195,000</td>
</tr>
<tr>
<td>Annuity of the Loan (million rupiah)</td>
<td>290,144</td>
</tr>
<tr>
<td>Operating Margin (%/year one)</td>
<td>72.3%</td>
</tr>
</tbody>
</table>
Storage and field work management through Android application. Map data is also transferred to the application for easy navigation to the spot.

Depending on the business model, either contractor or supervisor/manager does the documentation of biomass storage (positioning, photos, x,y, moisture %, weight, etc).

MHG Feedstock Platform Service
Calendar Feature Makes Multiple Deliveries Easy to Manage and Plan

Calendar view enables look-up and planning of resource reservations, work orders and important delivery deadlines for different end-users.
Map view is a good way to get a situation view about all activities in the field. You can view, for example, your organization’s all storages in the same view.
MHG Feedstock Portal Platform is a Service Package which Enables

1) Step by step approach for a new bioenergy project resulting in overall risk control of the project;
2) Economical feasibility of a planned project
3) Service package consists of the following services:
   1) Biomass Mapper,
   2) Power Plant Optimizer
   3) Biomass Supply Manager,
   4) Maintenance Manager and
   5) Consultation Services
4) New business models based on outsourcing and information sharing in real-time operations
5) Networking of small producers to become trustworthy to end-users
6) Biomass quality, quantity and energy content control through all stages of supply chain
7) Securing economical sustainability while tracking expenses and profits of all operations process by process
Risk Free Trials available!

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Thank you.