How to organize a biogas project in Thailand

Torsten Fischer and Dr. Katharina Backes

Krieg & Fischer Ingenieure GmbH
Bertha-von-Suttner-Straße 9, D-37085 Göttingen, Germany
Tel.: ++49 551 900 363-0, Fax: ++49 551 900 363-29
Fischer@KriegFischer.de
www.KriegFischer.de

Bangkok, Thailand
October 29, 2014
Krieg & Fischer Ingenieure GmbH

Engineering Office, specialized in Design and Engineering of Biogas Plants

Foundation: 1999
Team: 20
Experience: > 25 Years
References: ca. 150 Biogas Plants
in: Germany, Japan, Netherlands, Austria, Switzerland, Lithuania, Italy, Slovakia, Canada, USA, Spain, France, Ireland, Russia, India, China and Argentina

Partner in: Japan, Korea, Canada, Bulgaria, France, Poland, Italy, Spain, Serbia, Greece and China
Development of Biogas in Germany

Years

©Fachverband Biogas e.V.
References worldwide

- Prince Edward Island
- Cudworth Pork
- Inland Empire
- Bekkai
- Fairyland
- Montargull
- Noyon
- Prato
Projects in China

Consultancy Contract with GIZ
Detailed Engineering
Qinhuangdao, China

Built: 2013/2014
Input: kitchen waste
Hydrolyses tank 530 m³
Digester: 2 x 3,400 m³ carbon steel tank
Upgrading of biogas
External gasholder
Pretreatment (hammer mill, hydro-cyclone, hydrolysis)
Projects in Japan

- Biogas plants K&F
- Activities (studies, optimization, detail-engineering)
  技術サービス（調査、設計、プラント改善・最適化）
Sansui-en 2, Japan

- Build: 2013/14
- Substrate: pig manure, FOG, sewage sludge, industrial food waste
- Digester: 5,000 m³ glass coated steel tank
- CHP: 2 x 370 kWel
- digester, secondary digester, mesophilic operation
- Extension and integration of an existing biogas plant
Sewage gas  Landfill gas  Biogas
Examples of possible substrates

Agricultural substrates

Agricultural wastes as straw, green cut, crop residues, food remains...

Energy crops as corn, whole plant silage, or gras
Examples of possible substrates:

- Biodegradable municipal waste
- Potato pieces
- Agricultural waste
- Banana waste
- Grape pulp
- Slaughterhouse waste
- Old bread
- Waste french fries
Components of a biogas plant

- Tanks (digester, secondary digester, storage tanks)
- Gas holder
- Stirrer
- Pumps
- Shredder
- Pretreatment
- Solis input device
- Heat exchanger
- Measurement devices
- Safety components
- Desulphurization
- CHP
- Biogas upgrading system
EPC - Contractor (turn-key)
Engineering-Procurement-Construction

- Provides all contract work sections
- Provides all construction services

→ Fixed price
→ Organization and Responsibility of the entire project

Fixed price includes EPC-surcharge of minimum 50%, abroad often more
Dream of every client, worldwide

One single, technically competent company
Taking full responsibility
Low price
No interfaces

That is not the way the world works!
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Piece-meal approach

- Ordering of contract work sections independently
- Less expensive (No surcharges between purchasing and sales)
- Cooperation of European and Thai company: Joint engineering team
- Coordination of battery limits between different suppliers
Local Thai company

- Knows about Thai regulations and laws
- Speaks local language
- Can prepare documents for administrative approval
- Knows the local suppliers
- Knows specialist companies (subsoil reports, safety aspects as hazard assessment, surveying or environment impact report…)

- Less expensive
What is missing in Thailand

- Engineering know-how for a biogas plant in accordance with the state of the art
- Certain equipment as
  - certain stirrers
  - CHP
  - biogas upgrading system
  - desulphurization
  - solid input device
  - heat exchanger
  - pumps
  - certain safety components
Organisation of a biogas plant in Thailand

- Communication
- Time difference (5 - 7 h)
- Business culture
Contract work sections

- Earthwork
- Civil engineering operations
- Construction of digester and other tanks
- Construction of halls (reception, pretreatment)
- Installation of pumps
- Electrical operations
- Pipeline and mains connection work
- ...
Central issue: installation of large tanks

Concrete tanks
Europe

Welded steel tanks
China

Glass coated steel tanks
Europe and Japan
### Experience of K&F in North America

#### Organization and Supplier

<table>
<thead>
<tr>
<th></th>
<th>Saskatoon</th>
<th>Chino</th>
<th>Kensington</th>
<th>London</th>
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</thead>
<tbody>
<tr>
<td><strong>construction period</strong></td>
<td>2003</td>
<td>2005</td>
<td>2008</td>
<td>2009/2010</td>
</tr>
<tr>
<td><strong>organisation</strong></td>
<td>Piecemeal (directly K&amp;F)</td>
<td>(Piecemeal/Assembly) ('Americanising')</td>
<td>Piecemeal ('Canadianising')</td>
<td>Piecemeal Approach ('Canadianising')</td>
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<tr>
<td><strong>digester tanks</strong></td>
<td>Steel Tank Europe</td>
<td>Steel Tanks North America</td>
<td>Steel Tanks Europe</td>
<td>Steel Tanks North American</td>
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<tr>
<td><strong>top mounted mixer</strong></td>
<td>North America</td>
<td>Europe</td>
<td>Europe</td>
<td>Europe</td>
</tr>
<tr>
<td><strong>heat exchanger</strong></td>
<td>Europe</td>
<td>Europe</td>
<td>North America</td>
<td>North America</td>
</tr>
<tr>
<td><strong>CHP / gas user</strong></td>
<td>Gas Turbine North America</td>
<td>Biogas Grid</td>
<td>Gas Burner North America</td>
<td>CHP North America</td>
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<tr>
<td><strong>other tanks</strong></td>
<td>Concrete Tank North America</td>
<td>(-)</td>
<td>Steel Tanks Europe</td>
<td>Steel Tanks North America</td>
</tr>
<tr>
<td><strong>gas holder</strong></td>
<td>Europe</td>
<td>(-)</td>
<td>Europe</td>
<td>Europe</td>
</tr>
</tbody>
</table>
Supplier:

At the beginning the origin of the supplier is uncertain

25%  50%  25%
## Contract work sections

<table>
<thead>
<tr>
<th>Import Germany/Europe</th>
<th>Unknown</th>
<th>Thai company</th>
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</thead>
<tbody>
<tr>
<td>- Engineering of the biogas plant</td>
<td>- Civil engineering operations</td>
<td>- Earthwork</td>
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<tr>
<td>- Certain stirrers</td>
<td>- Construction of digester and other tanks</td>
<td>- Subsoil reports</td>
</tr>
<tr>
<td>- Heat exchanger</td>
<td>- Installation of pumps</td>
<td>- Hazard assessment</td>
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<tr>
<td>- Special pumps</td>
<td>- Electrical operations</td>
<td>- Surveying or environmental impact reports</td>
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<tr>
<td>- Safety components</td>
<td>- ...</td>
<td>- Civil engineering operations</td>
</tr>
<tr>
<td>- CHP</td>
<td>- ...</td>
<td>- Construction of halls (reception, pretreatment)</td>
</tr>
<tr>
<td>- ...</td>
<td>- ...</td>
<td>- Installation of pumps</td>
</tr>
<tr>
<td></td>
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<td>- Electrical operations</td>
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<tr>
<td></td>
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<td>- Pipeline and mains connection work</td>
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<td>- ...</td>
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</tbody>
</table>
Local, national or regional products

- Generally less expensive from Thailand
- Organization of spare parts is easier
- Documentation in national language
- Less problems with warranty

As many deliveries by local manufacturers as possible
- Earthwork
- Subsoil reports
- Hazard assessment
- Surveying or environmental impact reports
- Civil engineering operations
- Construction of halls (reception, pretreatment)
- Installation of pumps
- Electrical operations
- Pipeline and mains connection work
Imported products

• Imported from „biogas countries“: Denmark, Germany, Austria and Switzerland
• All projects around the world are supplied from there
• For example:
  – Special pumps and valves
  – Central stirrer
  – Heat exchanger for highly viscous substrates
  – Special measuring equipment
  – Special safety equipment
Piece-meal

- simple to organize different suppliers from Thailand and Europe
- interfaces management
- responsibility
- different business ‘cultures’
- different legal backgrounds
- National building Code
- ‘Thailandianising’ of European equipment
Conclusions / Summary

• German EPC-contractors construct standardized biogas plants

→ This does not work in Thailand:
  o Local regulations must be considered
  o Local suppliers must provide many of the components

• Thai EPC-contractors do not yet have sufficient experience

  Cooperation
  between a Thai and a German company
  and individual (piece-meal) awarding
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