Organization of Hitachi Zosen Corporation

**Environmental Systems**
- Energy-from-Waste plants
- Material recycling systems
- Methane fermentation systems
- Eco-agriculture systems
- Water treatment systems
- AOM business (after-sales service, operation control, and chemical supply)
- Long-term operations and management
- System of producing fuel from sewage sludge

**Industrial Plants**
- Machinery & Process Equipment

**Machinery & Process Equipment**
- Machinery & Process Equipment

**Infrastructure**
- Long-term operations and management

**Precision Machinery**

**Japan**
- 2 Head Offices
- 10 Domestic Offices

**Japan**
- 9 Factories

**Japan**
- 70 Subsidiaries

**Total 12 Overseas Offices, i.e.**
- Abu Dhabi: Overseas Office
- Taiwan: Overseas Office
- China: Overseas Office
- Thailand: Overseas Office
- Korea: Overseas Office
- Vietnam: Overseas Office
- Singapore: Overseas Office
- USA: Overseas Office
- India: Overseas Office

**Total 25 Overseas Subsidiaries and Affiliates, i.e.**
- China: Overseas Subsidiary
- UK: Overseas Subsidiary
- India: Overseas Subsidiary
- USA: Overseas Subsidiary
- Switzerland: Overseas Subsidiary
- Taiwan: Overseas Subsidiary
- Malaysia: Overseas Subsidiary
- Vietnam: Overseas Subsidiary
- Korea: Overseas Subsidiary

**Total 76 consolidated subsidiaries, 9,039 employees**
Company Profile

- HZI BioMethan is specialized in biogas upgrading and other gas related technologies
- More than 65 employees in Germany, Switzerland & France
- More than 60 European reference projects
Organization of HZI BioMethan

- **Biogas Upgrading**
  - Planning & Engineering
  - Biogas Pre-treatment
  - Chemical Process - Amine
  - Physical Process - Membrane
  - Service & Maintenance (after-sales service, remote control, and consumable supply)

- **Carbon Capture**

- **Stainless Steel Gas Equipment**

- **Gas Grid Injection**

- **CNG**

- **Germany**
  - Head Office

- **Germany**
  - Manufacturing facility

- **European Service Network**
HZI BioMethan – Reference Projects
History

- 2008: Pilot plant with amine upgrading technology
- 2009: 1st industrial amine based upgrading plant in operation
- 2010: Start of serial production for amine upgrading system
- 2012: 1st upgrading system using membrane technology
- 2013: Start of international expansion
- 2015: Integration into Hitachi Zosen Inova AG
- 2016: Upgrading plants in operation for all sources of biogas
Biogas Upgrading Systems by

Hitachi Zosen Inova BioMethan
HZI BioMethan - Upgrading Technologies

The A-Series

Amine Scrubbing

The M-Series

Membrane Separation
## HZI BioMethan - Upgrading Technologies

<table>
<thead>
<tr>
<th></th>
<th>A-Series</th>
<th>M-Series</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Process</strong></td>
<td>Chemical Adsorption (Amine)</td>
<td>Physical Permeation (Membrane)</td>
</tr>
<tr>
<td><strong>Electrical Demand</strong></td>
<td>0.1 kWh&lt;sub&gt;e&lt;/sub&gt;/Nm&lt;sup&gt;3&lt;/sup&gt;</td>
<td>0.24 kWh&lt;sub&gt;e&lt;/sub&gt;/Nm&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Heat Demand</strong></td>
<td>0.6 kWh&lt;sub&gt;th&lt;/sub&gt;/Nm&lt;sup&gt;3&lt;/sup&gt;</td>
<td>-</td>
</tr>
<tr>
<td><strong>Purity of Biomethane</strong></td>
<td>&gt; 99%</td>
<td>&gt; 97%</td>
</tr>
<tr>
<td><strong>Methane Slip</strong></td>
<td>&lt; 0.1%</td>
<td>&lt; 0.5%</td>
</tr>
<tr>
<td><strong>Outlet Pressure after Upgrading process</strong></td>
<td>0.1 – 0.15 bar</td>
<td>&lt; 16 bar</td>
</tr>
<tr>
<td><strong>Standard Sizes (Nm&lt;sup&gt;3&lt;/sup&gt;/h biogas)</strong></td>
<td>From 250 to 2.500</td>
<td>From 30 to 2.000</td>
</tr>
</tbody>
</table>
| **Decision Factors for Technology Choice** | • Availability of inexpensive heat source  
• Requirement of high biomethane or CO<sub>2</sub> purity  
• Very low methane slip | • Low & predictable electricity costs  
• Small and fluctuating biogas flow  
• Requirement of high outlet pressure  
• Easy to operate |
| **Additional System Modules for further CH<sub>4</sub> Use** | +GRID- and +CNG-Module |                                     |
| **Additional System Modules for further CO<sub>2</sub> Use** | +CO<sub>2</sub>-Module, Methanation |                                      |
What can you expect from us when planning an upgrading plant:

• Competent consultancy for the right choice of technology
• Quality components for low life-cycle costs
• In-house manufacturing & engineering
• Strong track record of references
• Sound and solid corporate background
Thank you for your attention

Jan.Ludeloff@hz-inova.com