Realization 2 MW PEM PP project Ynnovate and EU

Jan ten Have
Project partners

Realisation project partners

- Ynnovate (CN) - Principal, utilities, operation of the system
- Nedstack (NL) - Development and realization of the fuel cells (stacks)
- MTSA (NL) - Design and construction of the installation (excluding fuel cells), project management realization
- AkzoNobel (NL and China) – contract, project support
Project partners

Development project, financially supported by the European Union

Development project partners EU project
- AkzoNobel (NL) - Project management
- Nedstack (NL) – Stack development
- MTSA Technopower - Balance of Plant development
- Johnson Matthey (UK) – Optimized MEA production development
- Polimi (I) - Process model development

Project acronym: DEMCOPEM
http://www.demcopem-2mw.eu/

This project is co-funded by the 7th FP (Seventh Framework Programme) – Fuel Cells and Hydrogen Joint Undertaking
Project description

- Production of electricity
- Specification 2 MW-e
- Use hydrogen as energy source
- Hydrogen is a by-product of production
- Integration in existing production facility
- Use of produced thermal energy
- By-product water to be used
Ynnovate site in Yingkou (Province Liaoning, China)
MTSA Technopower designs, builds and maintains customer specific equipment, installations and machines.
History

• 1994: Establishment MTSA Technopower from Shell Industrial Services
• 2003: Acquisition KEMA Techniek
• 2004: Incorporation of expertise and personnel AkzoNobel RST department
• Autonomous Growth
Lines of Business

Projects
- Equipment
- Installations
- Pilot plants
- Production plants
- Machines
- Test & measuring equipment

Products
- High power equipment
- Borescope
- Mist fire extinguishing system: Coolcloud®

Supply
- System supply
- Parts
- Modules
- Co-design
- Supply chain management

Service
- Maintenance
- (Dis)assembly
- Renovation
- Installation
- System integration
- Fault clearing service
## Markets

<table>
<thead>
<tr>
<th>Energy</th>
<th>Process</th>
<th>Food</th>
<th>Pharma</th>
<th>Mechatronics</th>
<th>R&amp;D</th>
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<tbody>
<tr>
<td>Oil &amp; Gas</td>
<td>Chemistry</td>
<td>Food</td>
<td>Pharma</td>
<td>Medical</td>
<td>R&amp;D</td>
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<tr>
<td>High Power</td>
<td>Metallurgy</td>
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<td>Semi conductors</td>
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<td>Nuclear energy</td>
<td>Graphic</td>
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<td>Analytical</td>
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<tr>
<td>Solar energy</td>
<td>Polymers</td>
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<td>Special machines</td>
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<td>Fuel cell systems</td>
<td>Industrial yarns</td>
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<td>Biomass</td>
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</table>
Project phases

- Concept
- Definition
- Basic Engineering
- Detail Engineering
- Procurement
- Manufacturing
- Assembly & Testing
- Commissioning
- Maintenance Service

MTSA

Customer
References

- Many reputable companies and government institutions have meanwhile employed services from MTSA Technopower
- Approximately 60% of sales is being exported
- Customer satisfaction is high, resulting in long-term relationships
- New customers often reach us via satisfied references
- Experienced in fuel cell projects
Contract signing

Start date 1-1-2015
Time Schedule
MTSA: Overview activities

Design
- Process
- Mechanical
- Electrical
- Software
- Safety

Construction
- Mechanical
- Electrical

Testing and commissioning
- Tests at MTSA
- Factory Acceptance Test
- Test at Ynnovate
- Site Acceptance Test
Lay-out
Stack schematic
Principle flowscheme
P & ID Example
### Specification of main parts

**Parts list**

<table>
<thead>
<tr>
<th>No.</th>
<th>Tag nr.</th>
<th>Description</th>
<th>Type</th>
<th>Medium</th>
<th>Max.op. temp. °C</th>
<th>Max. op. pressure barg</th>
<th>Min./max. capacity</th>
<th>Material</th>
<th>Remarks</th>
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<tbody>
<tr>
<td>E-101</td>
<td>cooler</td>
<td>plate heat exchanger</td>
<td>plate heat exchanger</td>
<td>desti water/desti water</td>
<td>70</td>
<td>6</td>
<td>hot side: 350 m³/h; cold side: 60 m³/h</td>
<td>AISI-316/EPDM</td>
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<tr>
<td>E-102</td>
<td>heater</td>
<td>plate heat exchanger</td>
<td>plate heat exchanger</td>
<td>desti water/demin water</td>
<td>70</td>
<td>6</td>
<td>hot side: 350 m³/h; cold side: 180 m³/h</td>
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<td>plate heat exchanger</td>
<td>plate heat exchanger</td>
<td>cooling water/desti water</td>
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<td>6</td>
<td>hot side: 350 m³/h; cold side: 140 m³/h</td>
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<td>6</td>
<td>hot side: 2.5 m³/h; cold side: 3 m³/h</td>
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<td>plate heat exchanger</td>
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<td>70</td>
<td>6</td>
<td>hot side: 60 m³/h; cold side: 35 m³/h</td>
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<td>E-301</td>
<td>condensor</td>
<td>plate heat exchanger</td>
<td>plate heat exchanger</td>
<td>air/cooling water</td>
<td>70</td>
<td>6</td>
<td>0 / 9,300 m³/h with water saturated air / approx. 35 m³/h cooling water</td>
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<td>E-302</td>
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<td>electric</td>
<td>air</td>
<td>na</td>
<td>183</td>
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<td>approx. 35 kW</td>
<td>Incoloy heating element / AISI-316 housing</td>
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<td>E-305</td>
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<td>E-310</td>
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<td>ventilation/cooling/ operating compartment</td>
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<td>TBD</td>
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<td>1 x 230 V excluding fans and heater (operating room)</td>
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<td>Incoloy heating element / AISI-316 housing</td>
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<td>E/I-401</td>
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<td>400 kVA</td>
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<td>E/I-402</td>
<td>inverter</td>
<td>0 - 340 kVA</td>
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<td>4 mA = 0 kW; 20 mA = 350 kW</td>
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<td>No.</td>
<td>Description</td>
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<td>Unit</td>
<td>Min. / Norm. / Max.</td>
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<td>Pressure (barg)</td>
<td>Quality / Specification</td>
<td>Dimensions / Connections</td>
<td>Remarks</td>
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<td>01</td>
<td>Hydrogen in</td>
<td>0 / 1300 / 1440</td>
<td>Nm³/h</td>
<td>appr. 38</td>
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<td>ambient air</td>
<td>0 / 1000 / 4000</td>
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<td>0.7 / 0.7 / 0.7</td>
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<td>200</td>
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<td>m³/h</td>
<td>500</td>
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<td>heating water out</td>
<td>1 / 150 / 500</td>
<td>m³/h</td>
<td>500</td>
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<td>30</td>
<td>2.5 / 2.5 / 2.5</td>
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<td>m³/h</td>
<td>30</td>
<td>2.5 / 2.5 / 2.5</td>
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<td>0.5 / 1 / 1.5</td>
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<td>Nm³/h</td>
<td>4000</td>
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<td>drain</td>
<td>0 / 1 / 450</td>
<td>m³/h</td>
<td>450</td>
<td>65 / 65 / 65</td>
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<td>To be defined</td>
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<td>electrical connection (production)</td>
<td>6.4 / 6.0 / 6.0</td>
<td>kW</td>
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<td>6.0 / 6.0 / 6.0</td>
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</table>

**Utility list**

**Project name:** 2 MW PEM Power plant  
**Doc. nr.:**  
**Client:** Ynnovate  
**Rev.:** E 
**ID. nr.:**  
**Related documents:** P & ID 1479-1-001

**Project nr.:** 1400660P  
**By:** J.H. ten Have  
**Date first issue:** 21-6-2013  
**Status:** DRAFT

**Remark:**

- Hydrogen will be calculated with water pressure variations smaller than 0.05 barg; To be discussed between client and MTSA.
- Temperature difference between in - out minimally approximately 15 K, Final opportunities for heat recovery to be defined in basic design phase. Lower or higher temperatures than defined to be agreed with MTSA.
- Pressure according to Utility Network Harmonics GB/T 14549-1993 or equivalent. Contribution of the 2 MW PEM Power plant to the short circuit power: 1.2 x P-max. Set-up to be discussed between client and MTSA.
OSBL specifications / utilities
OSBL specifications / utilities
HAZOP Study

Hazard And Operability Study

Attendance of Designers and users

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Guideword</th>
<th>Deviation</th>
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<tbody>
<tr>
<td>FLOW</td>
<td>None, Less, More, Reverse Other, Also</td>
<td>No flow, Less flow, More flow, Reverse flow, Other flow, Contamination</td>
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<tr>
<td>PRESSURE</td>
<td>More, Less</td>
<td>More pressure, Less pressure</td>
</tr>
<tr>
<td>TEMPERATURE</td>
<td>More, Less</td>
<td>Higher temperature, Lower temperature</td>
</tr>
<tr>
<td>VISCOSITY</td>
<td>More, Less</td>
<td>More viscosity, Less viscosity</td>
</tr>
<tr>
<td>REACTION</td>
<td>None, Less, More</td>
<td>No reaction, Reaction incomplete, Intense reaction</td>
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</tbody>
</table>

Source: AUTHORS, based upon Chemical Industries Association
Mechanical design
Assembly drawing Process container
Electrical design
Construction at MTSA
Construction at MTSA
Operating system
Construction utilities at Ynnovate
Testing at MTSA
Testing at MTSA
Instruction and FAT at MTSA
Transport to site
Ynnovate, Yingkou province Liaoning

2 MW PEM Power Plant project Ynnovate and EU
Utilities connection
Commissioning and start-up, SAT
Commissioning and start-up, SAT
Thank you for your attention!
谢谢您的关注！

2 MW PEM Power Plant project Ynnovate and EU

October 2016