A.H.T. Syngas Technology N.V.

Gas, Heat and Power Generation from Biomass
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A.H.T. at a Glance

AHT provides state-of-the-art technologies for the gasification process of fossil or biomass feedstocks to generate raw or clean gas.

AHT offers outstanding experience in decentralised, medium sized power plants.

AHT covers the entire value chain from project development to full turn-key solutions and after-sales services.

AHT is a family-founded and owner-run business with a strong commitment to excellence and profitable growth.

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Our Portfolio – Company History

1864 Foundation of KHD as Deutz AG by N.A. Otto

1867 N.A. Otto builds the first gas-driven combustion engine

1945 Approx. 1 million vehicles operate on wood gas

1963 Already approx. 15,000 gas generation plants are delivered by KHD

1967 The Engineering Dynasty Ferges and entrepreneur McDevitt found A.H.T. and improve the original KHD twin-fire technology

2006 The first commercial large-scale power plants are sold world-wide

2000 Improving market conditions due to German and European Renewable Energy Sources Acts

2010 Spin-out from the preceding company by today’s CEO Gero Ferges, system update and improvements

2014 Acquiring of a Dutch shell company, rebranding to A.H.T. Syngas Technology N.V.

1. July 2016 Approval for stock trading at the stock exchange Frankfurt am Main – Entry Standard

TOMORROW: Positioning as EPC

Fossil fuels dominate the world market
Our Portfolio - Products & Services

<table>
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<th>COMPACT POWER PLANTS (CPP)</th>
<th>HOT GAS for Industrial Applications</th>
<th>CLEAN GAS for Decentralised Power Plants</th>
<th>SERVICES</th>
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<td>Renewable feedstock</td>
<td>Fossil and renewable feedstock</td>
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<td>• Project planning</td>
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<tr>
<td>50 – 200 kW_{el}</td>
<td>600 kW_{th}</td>
<td>250 kW_{el}</td>
<td>• Project management</td>
</tr>
<tr>
<td></td>
<td>- 50 MW_{th}</td>
<td>- 12 MW_{el}</td>
<td>• Spare-parts &amp; maintenance</td>
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Process Overview

- Feedstock
- Preparation
- Gas Generation
- Gas Conditioning
- Heat & Power Generation
- Ash removal
- Gasifier
- Gas cleaning
- Water treatment
- Gen set / CHP
Core Technology Gasifier

The twin-fire gasification principle

- Two oxidation and reduction zones in the upper and lower part of the gasifier
- Combination of counter-current and co-current gasification and gas flow
- The generated syngas forms the basis for a clean process gas. Tar and other undesired by-products are cracked in the high-temperature zones, generating a clean synthesis product gas.

- Combination of the advantages of classic co- AND counter-current gasification principle by integration of both gasifier principles:
  - Avoidance of disadvantages of a counter-current gasification:
    - High tar content
  - Avoidance of disadvantages of co-current gasification:
    - High dust load, high syngas temperature, high ash and charcoal discharge
  - Low tar- and ash quantities already during gas generation
The synthesis gas generated in the gasifier contains smaller amounts of ash and tar as long-chain hydrocarbons in gaseous form saturated in the gas.

- Ultra-fine and more coarse particles are isolated by the cyclone, gas scrubber and electro-filter unit.
- Remaining heavy and volatile particles (tar, sulphur compounds, compounds and heavy metal compounds remain in the flotate).

- After conditioning, the synthesis gas contains almost no solids, particle size less than 1 µm.
- Temperature of the syngas after the gas-conditioning is below the water-absorption point, so that water cannot condensate.
- The gas-cleaning process ensures a closed circulation, so that no ecologically damaging substances are released and are not able to cause environmental pollution.

Gas volume per array: approx. 820 Nm²
Core Technology

Types of fixed-bed gasifiers

**Updraft (counter-current)**
- Drying
- Pyrolysis
- Reduction
- Oxidation

**Downdraft (co-current)**
- Drying
- Pyrolysis
- Oxidation
- Reduction

**Twin-fire (co- & counter-current)**
- Drying
- Pyrolysis
- Oxidation
- Reduction

**Characteristics**
- **Updraft (counter-current)**: High tar content, low ash content. Usually incomplete gasification (charcoal remaining in ash).
- **Downdraft (co-current)**: Low tar content, high ash content. Almost complete gasification.
- **Twin-fire (co- & counter-current)**: Low tar content, low ash content. Almost complete gasification.
Feedstock Types

Broad range of original or briquetted feedstock: wood chips, saw dust, empty fruit bunches, straw, Miscanthus, (low grade) coal, etc.
Feedstock: Carbonised Hydrochar

- Mixed biomass residues (e.g., manure, digestates, sludge)
- HTC/VTC
- Process water
- Hydrochar fertiliser
- Gas generation & treatment
- Heat/steam refeeding to HTC / VTC process
- Hydrogen
- Fertiliser
- Electricity
- Heat/cold
References

Location:
Tayan, Kalimantan / INDONESIA

Application:
Clean Gas to Power

Feedstock:
Coal

Output:
6 MW_{el}
References

Location: 
*Basantpur, Odisha / INDIA*

Application: 
*Hot gas for iron ore production*

Feedstock: 
*Coal*

Output: 
*40 MW*<sub>th</sub>
Location:
*Chur / SWITZERLAND*

Application:
*Clean gas, heat & power*

Feedstock:
*Hydrochar from sludge*

Output:
\[200 \text{ kW}_{el} / 185 \text{ kW}_{th}\]

- Commissioning
- Can be used for trials
References

Location: *Surakarta, Java / INDONESIA*

Application: *Clean gas, power*

Feedstock: *Hydrochar from MSW*

Output: *10,000 kW_{el} in phases*

- Detail engineering in execution
- Pilot plant (150 kW_{el}) installed
- Trial campaigns possible
Location: Kesennnuma / JAPAN

Application: Clean gas, heat and power

Feedstock: Woodchips

Output: $800 \text{ kW}_{el}$
Contact

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