

# HTW<sup>®</sup>2.0 Gasification: A proven path towards Advanced Biofuels

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**GIDARA**<sup>®</sup>  
ENERGY



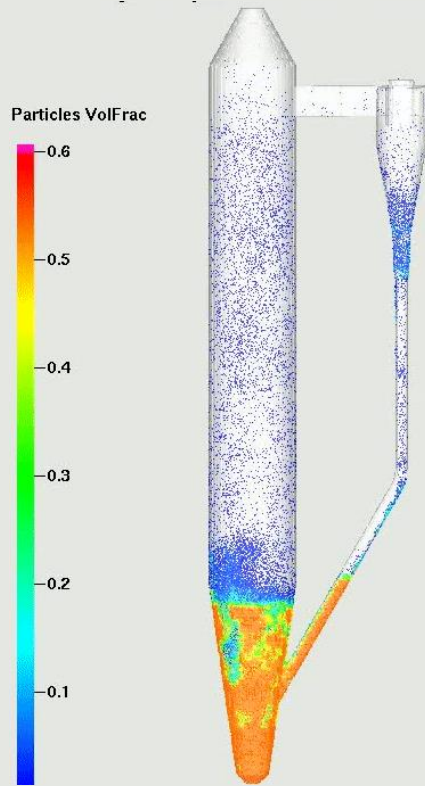
Who we are

HTW<sup>®</sup> Technology

Simulation & Experiment  
for HTW<sup>®</sup>2.0 Design

Advanced Methanol  
Amsterdam Plant

**GIDARA<sup>®</sup>**  
ENERGY



GIDARA is jointly founded by **Ara Partners**, US private equity firm, and **G.I. Dynamics**, Dutch engineering and project development firm, for the sole purpose of taking on today's waste and climate challenges



Ara Partners

**GIDARA**<sup>®</sup>  
ENERGY

Investment Partner



Ara Partners

Employees

88

HTW® Technology

+91%

average availability  
in 10 years

HTW® Development

+500 Mio  
Euro

investment

Advanced Methanol  
Facilities

Amsterdam  
Rotterdam

Production capability

180KTA

advanced methanol

# Our drivers: de-carbonization

Producing  
Advanced Biofuels from  
non-recyclable  
(biomass) waste



Non-Recyclable  
Waste



Syngas



Advanced  
Biofuels

Utilizing only  
Commercially  
Proven & Applied  
Technologies



Patented HTW<sup>®</sup>  
Gasification  
Technology

- **Over 40 years of experience** in fluidized bed
- **+500 Mio Euro investment** in development
- **3 commercial facilities** successfully built and operated
- **+12 years** operational time of a single plant.
- **+91% average availability** in 10 years
- Existing active **testing facility**



Growth inevitably generates waste

# Ability to Convert Wide Range of Feedstock into High Value Products

## Material Feedstock Flexibility

Wood Waste



Sewage Sludge



Municipal Solid Waste



Non-Recyclable Plastics



Waste Paper



Agricultural Residue



Construction & Demolition Waste



## Adaptable and Cost-Effective Gasification Technology



GIDARA Energy's process and highly flexible HTW<sup>®</sup>2.0 technology plus adapted purification design allow a broad range of feedstocks (with minor to no incremental CAPEX)

## Multiple End Product Applications

### Road Transport Fuels

- Green Gasoline
- Biomethanol
- Renewable Diesel
- Green Hydrogen
- Renewable Natural Gas (CNG, LNG)
- Bio-mmtpa



### Marine Fuels

- Biomethanol
- Bio-Ammonia
- Bio-DME
- Renewable Natural Gas (CNG, LNG)



### Sustainable Aviation Fuels



### High Growth End Markets (e.g. Chemicals)



# Technology proven and applied for more than 10 yrs and with mixed feedstock

- ✓ +500 Mio Euro: - Investment in development of HTW
- ✓ 3 commercial facilities: - Successfully built and operated
- ✓ +10 years: - Operational time of a single plant.
- ✓ +91% Availability: - Average availability in 10 year
- ✓ +5% Extra availability: - Can be increased by process improvements
- ✓ Existing Testing facility: - Recent successful test on all mixtures of RDF and biomass waste

## Key reference plant

1986 - 1997



**Commercial plant**  
at Berrenrath, Germany



### Purpose/learnings of the plant

- ✓ Methanol production from syngas
- ✓ Long-term use of RDF + plastic sources, feedstock flexibility
- ✓ Pressure range 10-15 bar

1988 - 1994



**Commercial plant**  
at Oulu, Finland



### Purpose/learnings of the plant

- ✓ Produce ammonia from syngas
- ✓ Utilisation of peat and waste wood as feedstock, feedstock flexibility
- ✓ Pressure range 10-15 bar

1989 - 1992



**High pressure plant**  
at Wesseling, Germany



### Purpose/learnings of the plant

- ✓ Sustainable HTW gasification operations under 25 bar

1999 - 2002



**Demonstration plant**  
at Niihama, Japan



### Purpose/learnings of the plant

- ✓ Utilizing direct municipal solid waste as feedstock to produce syngas

## Key reference plant

2020 - current



**Demonstration plant**  
at TU Darmstadt, Germany



### Purpose/learnings of the plant

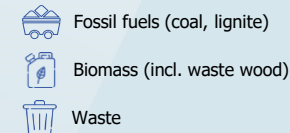
- ✓ Feedstock testing and continuous research and development on HTW technology
- ✓ Full production including methanol

## Today

Proven track record of multiple HTW projects, strong market demand and regulatory tailwinds make HTW technology an economically viable option for biofuels

## 1970s

Rheinbraun & ThyssenKrupp developed the pressurized version of the gasifier known as the High Temperature Winkler (HTW) process





## Experience from Key Reference Plant

### HTW™-to-Methanol Plant (10 bar, 720 tpd) – HTW™ Section

Feed:	30 t/h
Operating pressure:	10 bar
Syngas (CO+H <sub>2</sub> ) production:	38,000 Nm <sup>3</sup> /h
Cold gas efficiency:	85 %
Carbon conversion:	95 %
In operation:	1986 - 1998
Methanol Production:	300 tpd
Total operation:	67,000 h
RDF*:	15,195 h
Type of feedstock used:	lignite, DSD-plastic residue, sewage sludge, SRF, Waste Wood, Dioxin /furan-loaded cokes from waste incineration

\*Excluding other waste combinations such as sewage sludge, wood, peat, etc.

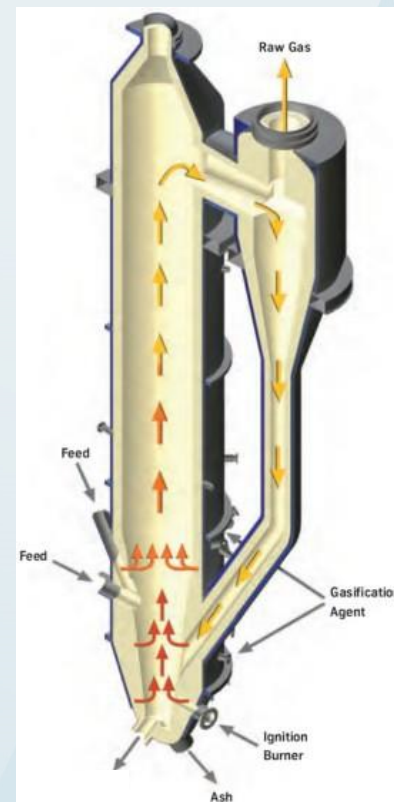


HTW Demonstration  
Plant Berrenrath

# The HTW™2.0 Fluidized Bed Technology

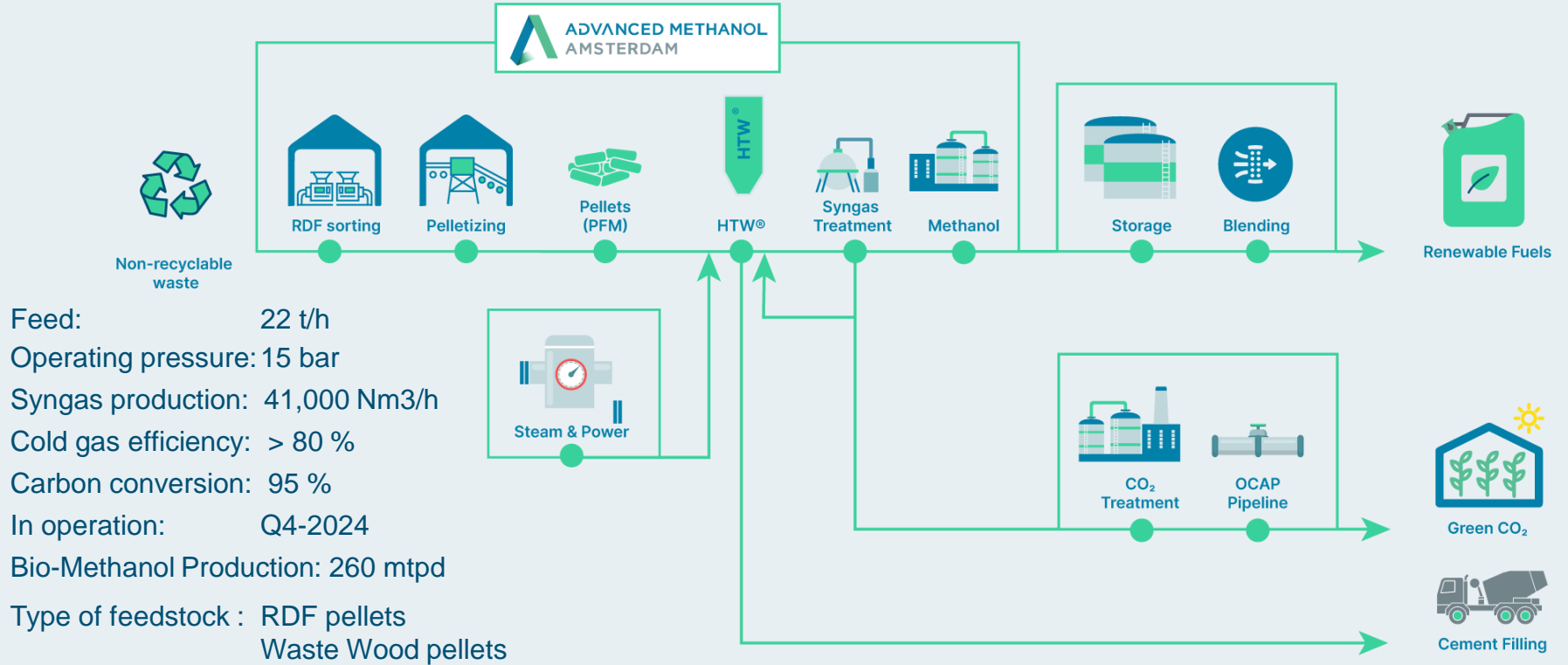
## The HTW™2.0 Gasifier Today

- Low oxygen consumption due to moderate temperatures;
- Optional use of air or pure oxygen as an oxidant;
- Simple feedstock preparation;
- Good partial load behavior over a wide range of operating conditions;
- Simple start-up and shut-down procedures;
- High operational availability;
- No by-products in the syngas, such as tars, phenols and liquid hydrocarbons; low waste-water discharge, easy to treat
- Proven and robust sub-systems such as: dry dust removal and Waste heat recovery;
- High cold gas efficiency (over 85 %);
- Great variety of feedstock (lignite, coal, peat, biomass, MSW, RDF etc)



# Flagship Facility “Advanced Methanol Amsterdam (AMA)”

## HTW™ 2.0-to-BioMethanol Plant: Process Flow Diagram





# Twin facilities

Amsterdam



ADVANCED METHANOL



Rotterdam

# Future for GIDARA Energy

- **Future-Proof Technology**
  - Road Transport fuels
  - Marine fuels
  - Aviation fuels
  - Chemicals
- **Roll out of multiple facilities in Europe, UK and USA**

An aerial photograph of a paved road winding through a dense green forest. In the background, several large lakes are visible under a cloudy sky. The image is overlaid with a semi-transparent green gradient on the left side.

# Thank you

We make sure  
our waste isn't wasted

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