

# HTW<sup>®</sup> - Proven Experience in Unlocking the Value of Waste to Sustainable Fuels and Circular Chemicals

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**GIDARA<sup>®</sup>**  
**ENERGY**

# Content



**Who is  
GIDARA Energy**



**HTW<sup>®</sup> Operationally  
Proven Gasification**



**New Feedstocks  
Validation**



**Key Take  
Aways**



**GIDARA**<sup>®</sup>  
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Investment partner



**Ara Partners**

Technology Investment

600 Million Euro

Licensing & BEDP Packages

HTW<sup>®</sup> Syngas Islands

Advanced Biofuels and  
Biochemical Facilities



HTW<sup>®</sup> Gasification Technology



# Unlocking The Potential Of Waste To High Value Products

## Feedstock

- Wood Waste 
- Sewage Sludge 
- Municipal Solid Waste 
- Non-Recyclable Plastics 
- Waste Paper 
- Agricultural Residue 
- Construction & Demolition Waste 

## High Temperature Winkler® Gasification



## Sustainable Fuels & Circular Chemicals

Road  
Transport  
Fuels



Sustainable  
Aviation  
Fuels



Sustainable  
Maritime  
Fuels



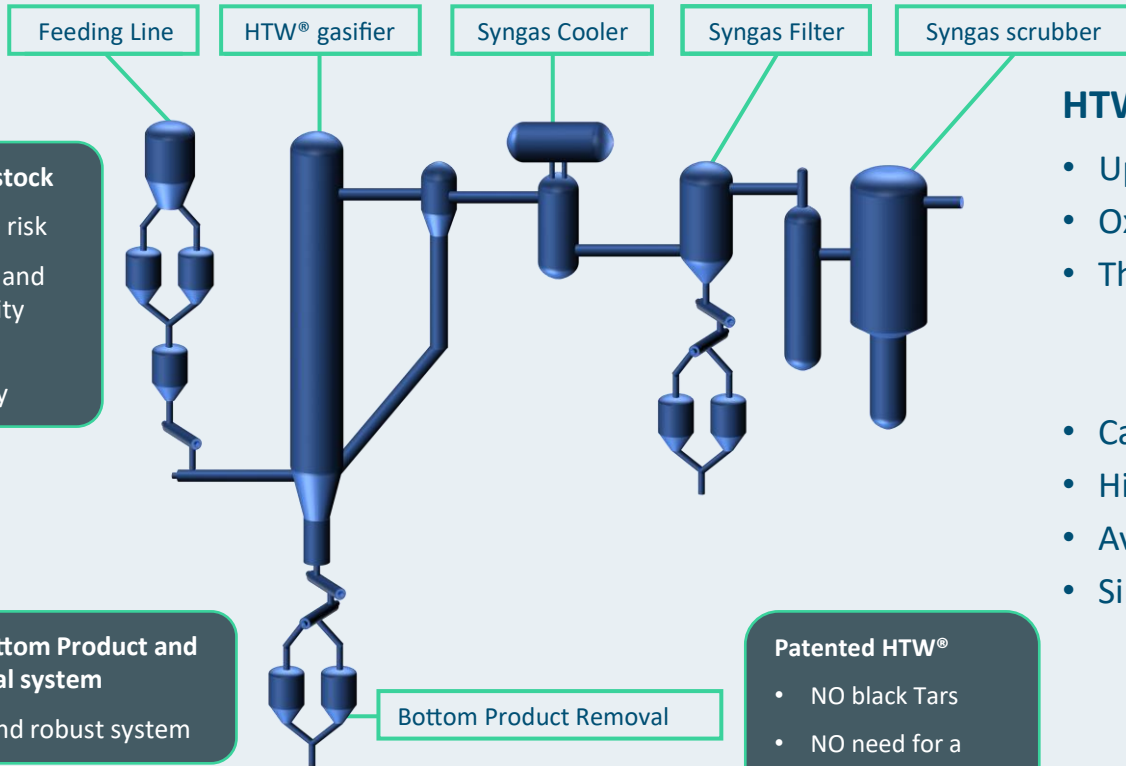
Renewable  
Chemicals



Renewable  
Steel  
Production



# High-Temperature Winkler (HTW<sup>®</sup>) Gasification Island



## Pelletized feedstock

- NO blockage risk
- Higher mass and energy density
- Enhance homogeneity

## Feeding, Bottom Product and Dust removal system

- Proven and robust system

## Patented HTW<sup>®</sup>

- NO black Tars
- NO need for a POX unit

## HTW<sup>®</sup> Fluidized Bed Gasifier

- Up to 30 bar
- Oxy-blown
- Thermal zones:
  - Fluidized Bed: 750 - 1000°C
  - Freeboard: 900 - 1200°C
- Carbon Conversion: over 95%
- High Cold Gas Efficiency: over 85%
- Availability >91%
- Single train capacity up to 1000 TPD

# HTW® - 10+ years of Operationally Proven Technology at Commercial Scale

Effective Syngas (CO+H<sub>2</sub>) production: 38000 Nm<sup>3</sup>/h

Cold gas efficiency: 85%

Carbon Conversion 95%

Total operation: 76,000 h

Pure plastics & RDF\*: 15195 h

## 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 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 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

2015 - 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

Improved to current technological and environmental standards

Implemented advanced design for feeding line, BOP, dust removal system & raw gas cooling system

Higher operational efficiency, optimum heat integration and reduced emissions

Adapted with 100% non-recyclables as feedstock



Fossil fuels (coal, lignite)



Biomass (incl. waste wood)



Waste

## 1970s

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

# Testing Facility: Feedstock Testing & Validation

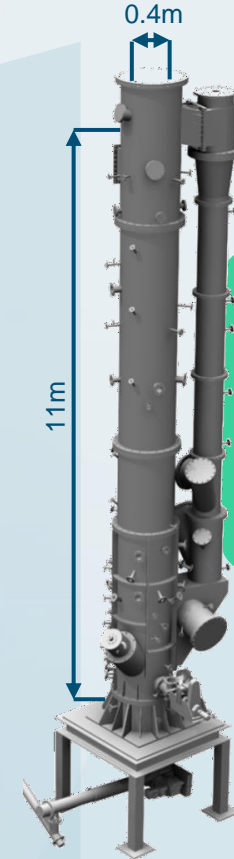
Long term operation feedstocks:

Mono gasification:

- Waste wood
- RDF
- Sewage sludge

Co gasification:

- RDF + waste Wood
- Lignite + RDF



Thermal Input:  
0,5 MWth

Operation mood:  
Oxy-blown

Operational hours:  
>2000 hrs

# Testing Facility: Feedstock Testing & Validation

LEG – lignite; WTA – lignite

No.	Year	Project	Feedstock	Thermal Load [kW]	Duration	Product	Publication
C0	May 2015	Thyssen Krupp	Renish lignite		24 h	Syngas	Herdel et al. 2017
C1	June 2015	Thyssen Krupp	Renish lignite	390 – 410	170 h	Syngas	
C2	July 2015	Shandong Shengxing Group	High Vol. Bituminous Coal	415 – 565	120 h	Syngas	Krause et al. 2019
C3	Jan. 2019	FABIENE	WTA	477 – 520	36 h	Syngas	Heinze et al. 2023
C4	April 2019	FABIENE	LEG	610 – 690	80 h	Syngas	
C5	March 2020	Lig2Liq	LEG + 20% SRF	400 – 420	58 h	Syngas	Langner et al. 2023
C6	May 2020	GIDARA (on behalf)	Waste wood + 25% to 100% SRF	205 – 235	125 h (13 h 100% SRF)	Syngas	Report not available to public
C7	Sep. 2020	Lig2Liq	LEG + 20 to 100% SRF	350 – 430	140 h (18 h 100% SRF)	Syngas	Langner et al. 2023
C8	Feb. 2021	FABIENE	LEG	460	155 h	Clean syngas	Heinze et al. 2023
C9	April 2021	FABIENE	LEG	365	230 h	Methanol	
		Lig2Liq	LEG + 25% SRF	367	65 h		Langner et al. 2023
C10	May 2021	GIDARA (on behalf)	blend waste wood + SRF	368	110 h	Syngas	Report not available to public
C11	June 2021	Lig2Liq	LEG + 25 to 50 % SRF	315 – 360	240 h	FT	Langner et al. 2023
C12	Nov. 2022	GIDARA (on behalf)	Fresh/waste wood + 20% SRF	355 – 430	120 h	Syngas	Report not available to public
C13	May 2023	VERENA	Pine forest residue	340 – 460	100 h	Methanol	Freiburg Gasification Conf. 23
C14	Aug. 2023	GIDARA (on behalf)	Waste wood + 20% SRF	430	65 h	Syngas	Report not public
C15	Aug. 2023	VERENA	Sewage sludge	430	48 h	Syngas	Freiburg Gasification Conf. 23
C16	Sep. 2023	VERENA	SRF	440	165 h	Syngas	Freiburg Gasification Conf.
C17	July 2024	GIDARA (on behalf)	Yellow pine; RDF+FW	430	200 h	Syngas	Report not public



# HTW<sup>®</sup> Overcoming the Waste Feeding Challenge

## Compact & Efficient Gasifier

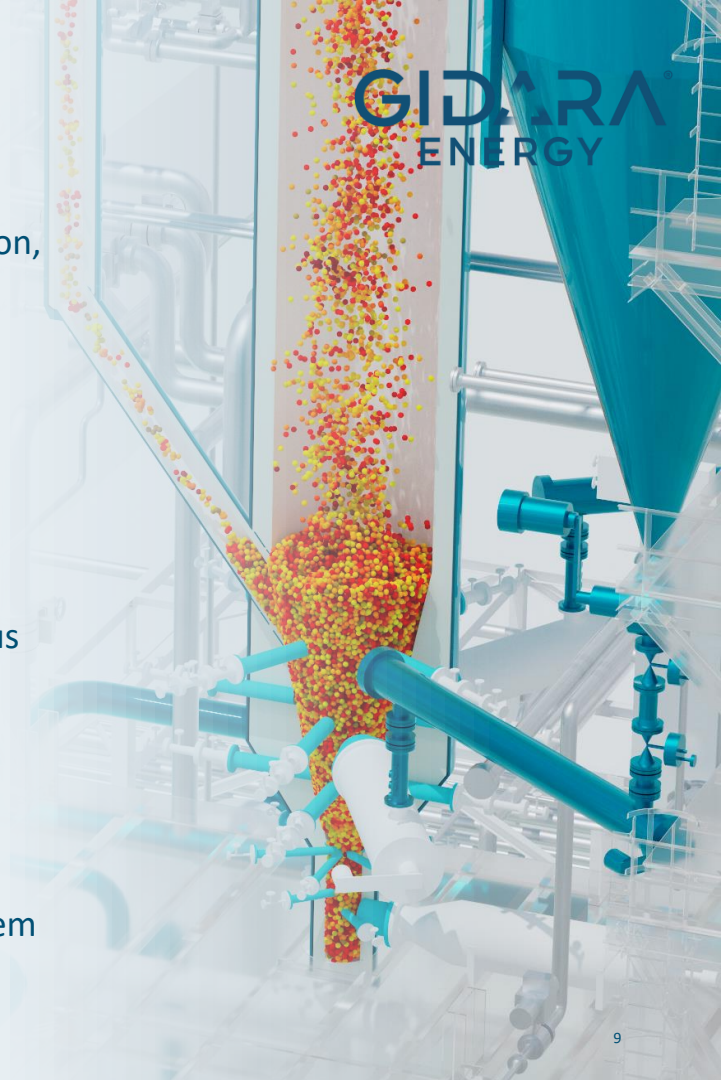
- **Small Volume:** The compact design allows for efficient energy conversion, reducing space and material costs.
- **Streamlined Process:** Minimizes the need for compression steps in downstream units.

## Reliable Feedstock System

- **Lock Hopper Technology:** Leak-proof, stepwise pressurization ensures system reliability and reduces leakage risks.
- **Feeding Screw Mechanism:** Precise dosing provides smooth, continuous feedstock supply for stable operation.

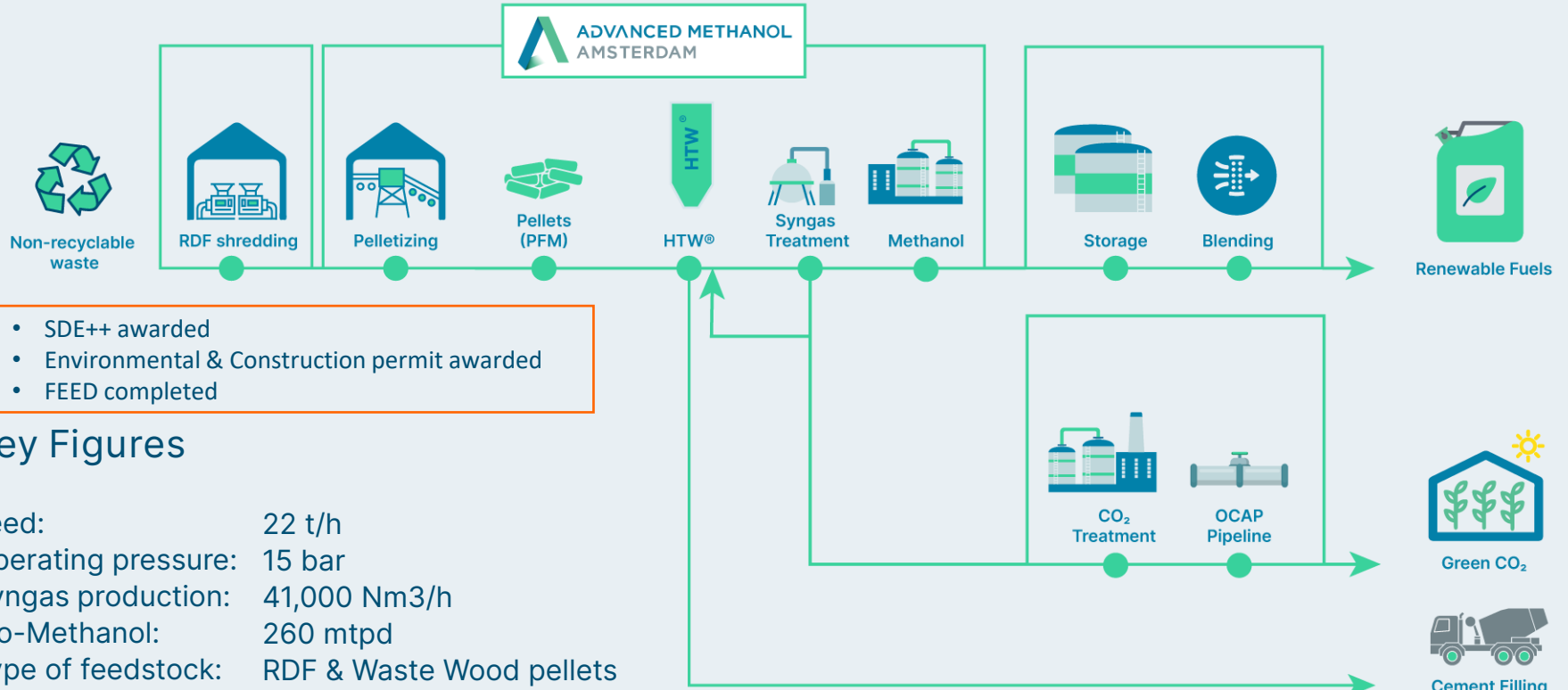
## Pelletized Feedstock Material (PFM)

- **Efficient Material Handling:** PFM has good flowing properties, offering high-density, uniform feedstock for consistent gasification.
- **Operational Flexibility:** Suitable for various feedstocks, enhancing system adaptability and efficiency.



# Integrated Value Chain: HTW<sup>®</sup> to Advanced Methanol Plant

GIDARA Facility “Advanced Methanol Amsterdam (AMA)”







# Advanced Methanol Amsterdam

**GIDARA**<sup>®</sup>  
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# Interested in working with us?



Licensing & BEDP Packages



HTW® Syngas Islands



Advanced Biofuels and  
Biochemical Facilities

Contact us via:  
[info@gidara-energy.com](mailto:info@gidara-energy.com)  
[gidara-energy.com](http://gidara-energy.com)

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