

UHTH[®]

Ultra High Temperature Hydrolysis

The innovative solution

Clean energy recovery from **waste**
A reasonable way to an environmental clean future

www.exoy.ch
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Added value through a thermal conversion

The patented, single-stage UHTH® process is emission-free, does not produce any noise and offers maximum flexibility in terms of possible applications.

Wide range of applications:

The variety of waste types that can be treated with the UHTH® systems includes virtually all organic substances, including toxic, non-toxic, infectious and hazardous substances.

These range from plastics to industrial, forestry and agricultural waste, household waste, sewage sludge, toxic liquids, hospital and other infectious waste, end-of-life cycle products, etc.

Simple material specifications:

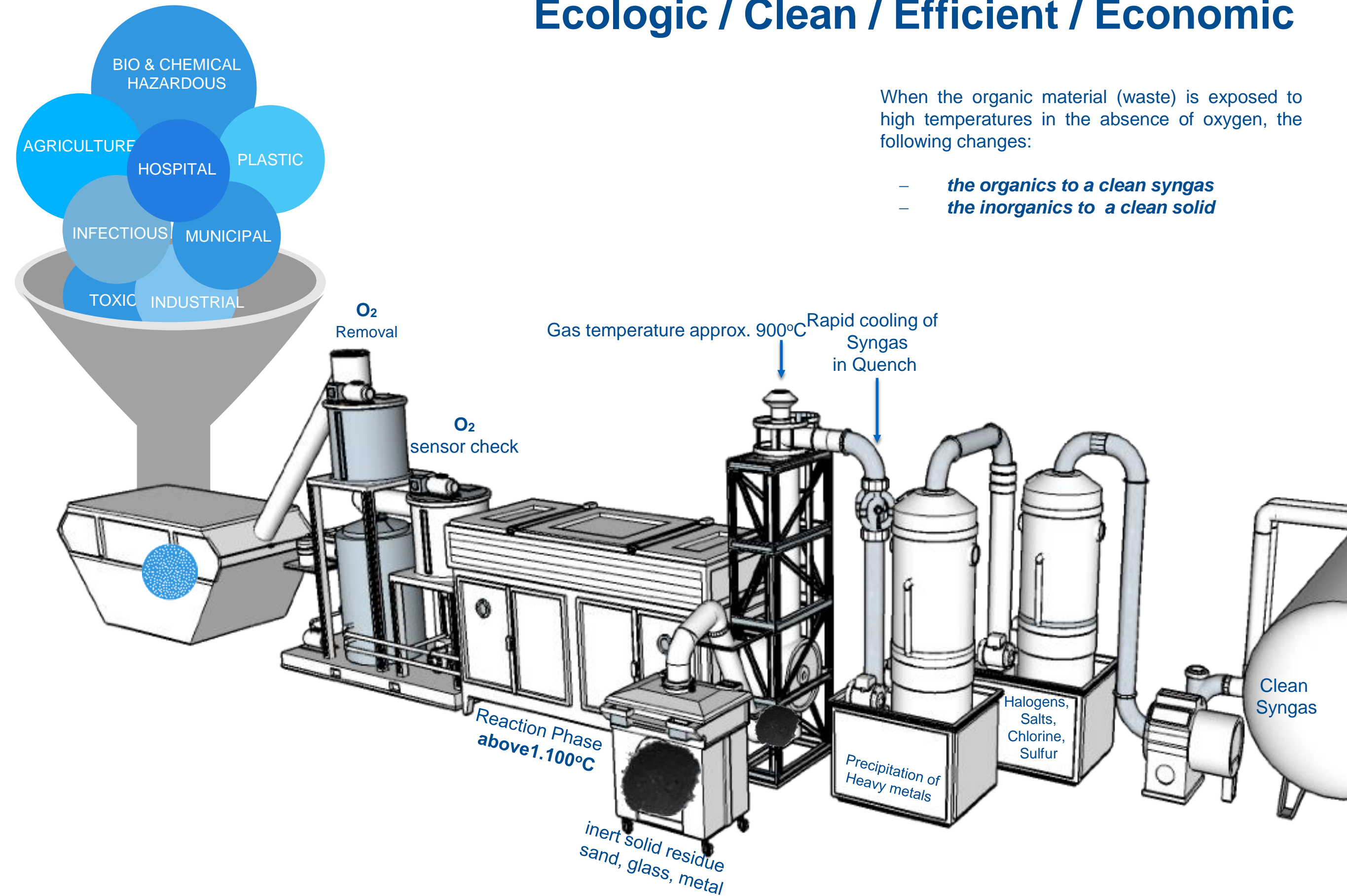
The UHTH plant can treat the material with a moisture content of ideally 20-30% and a piece size 1.5cm³ to 2.5cm³.



Ecologic / Clean / Efficient / Economic

When the organic material (waste) is exposed to high temperatures in the absence of oxygen, the following changes:





- *the organics to a clean syngas*
- *the inorganics to a clean solid*



Waste as optimally
used resource

UP TO 99%

The highest possible
Energy recovery
in a form of **clean,**
tar-free syngas

-  (H₂) Hydrogen
-  (CO) Carbon monoxide
-  (CH₄) Methane
-  (CO₂) Carbon dioxide
- other trace elements



Composition			Natural Gas	UHTH [®] Syngas
Methane	CH ₄	Vol. %	80-88	2-35
Ethan	C ₂ H ₆	Vol. %	2-6	0-2
Propane	C ₃ H ₈	Vol. %	0.5-2	-
Nitrogen	N ₂	Vol. %	2-14	0-5
Carbon monoxide	CO	Vol. %	0,5-1	10-45
Carbon dioxide	CO ₂	Vol. %	-	1-2
Hydrogen	H ₂	Vol. %	-	40-75
Calorific value	MJ/Nm ³		30-35	13-22
	kcal/Nm ³		7200-8400	3100-5200

Clean Syngas

Basically, syngas, which contains about a half of the energy content of natural gas, consists mainly of hydrogen (H₂), carbon monoxide (CO), methane (CH₄) and a very little carbon dioxide (CO₂).

The UHTH[®] advantages:

Ecologic

- Emission free (no chimney)
- Clean, sterile residue
- Compliance with the strictest environmental regulations
- On-site, decentralized operation
- High quality gas over other technologies
- CO₂ neutral

Efficient

- Almost complete conversion of the organics into syngas
- Highest possible energy recovery per processed mass
- Recovery of all valuable elements possible
- Closed, one-step process
- Fully automatic operation

Clean







- Pollutant-free
- No dioxins, no furans

Economic

- Income through the generation of electricity from syngas and waste heat
- Low energy consumption
- Low investment, operating and maintenance costs
- Adaptable, modular system design with a small space requirements
- Savings in waste transport and disposal costs
- Sales of hydrogen or methanol
- Possibility for temporary energy storage

Syngas usage:

Syngas is a valuable, clean, ready-to-use fuel with high H₂ content, offering a variety of uses:

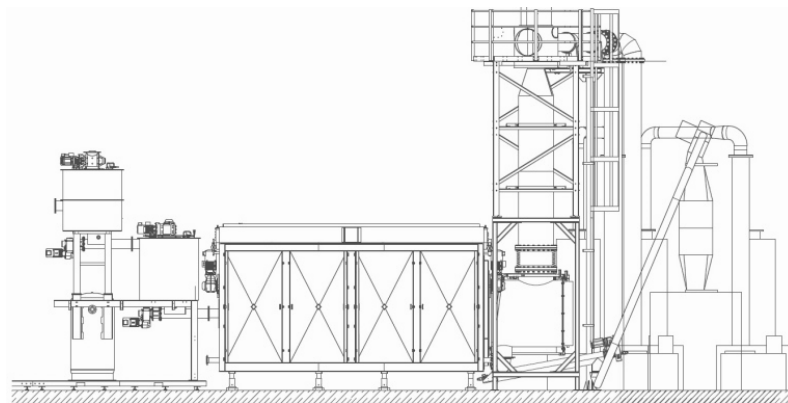
 Direct use with burner	 Electricity production	 Production of chemicals
 Liquid - fuels e.g. methanol	 Hydrogen separation	 Waste heat recovery

The UHTH[®] Solution

A Swiss Invention

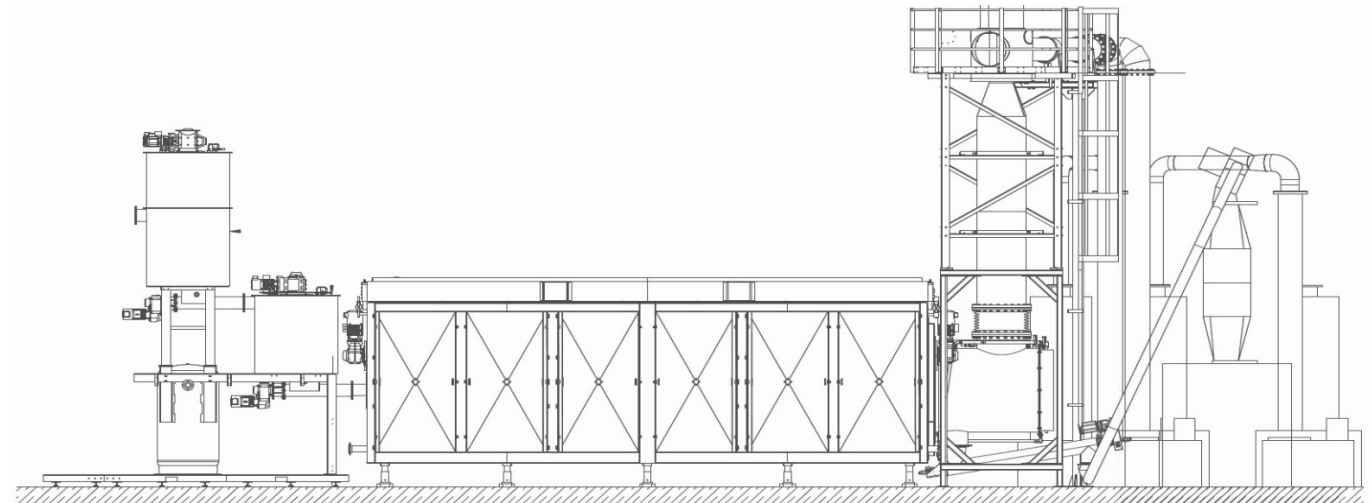
The certified UHTH modules are compact, flexible, space-saving and can be easily multiplied to cover different operating capacities.

UHTH T5 Unit



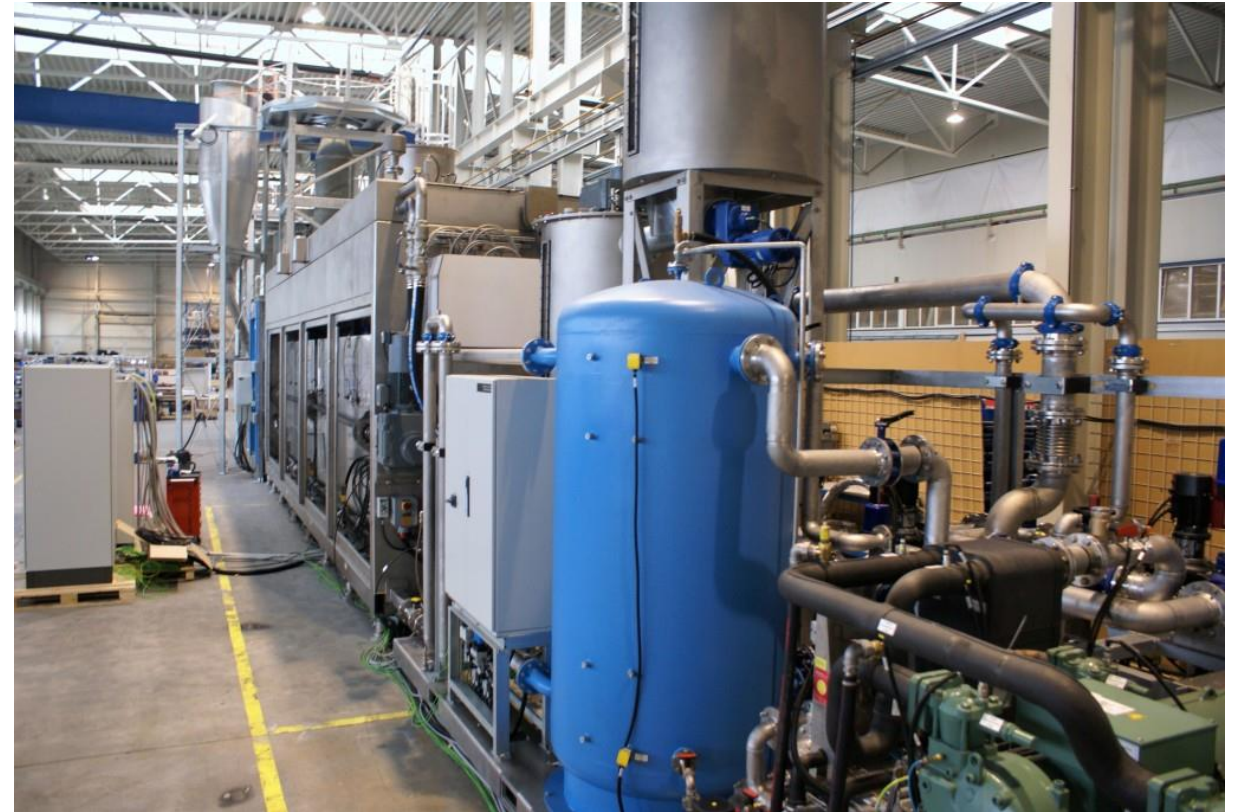
Throughput approx.: 5 mt /day
Operating temperature : > 1100°C
Operating mode: Fully automatic
Syngas: 1.4-4.8 Mio Nm³/Y
Dimensions : 13 x 3 x 5m (L / W / H)
Processing: 1.600to / Y (320 days)

UHTH T25 Unit



Throughput approx.: 25 mt /day
Operating temperature : > 1100°C
Operating mode: Fully automatic
Syngas: 7.2 - 24 Mio Nm³/Y
Dimensions : 26 x 6 x 10m (L / W / H)
Processing: 8.000 to / Jahr (320 days)

UHTH[®] T25 Unit



UHTH[®] T5 Unit



Renewable Hydrogen

**for the electromobility
with UHTH-technology**

We produce a very clean syngas, which contains a very high proportion of hydrogen (between 40-75%) depending on the input material. This hydrogen, which is produced almost free in our process, is easily separated from the produced syngas by standard techniques and made utilizable.

On the one hand, companies can use the UHTH plant to solve their disposal problem, as well as to use the available hydrogen, for an example to refuel their fuel cell trains, cars, buses and trucks.



Example calculation 1 - sewage sludge 70% H2

Input material: 8,000 t per year (residual moisture content approx. 20% or 80% dry substance)

Calorific content: 3,200 kcal/Kg

Daily hydrogen production : ca. 613 kg /day



1,9 gas stations



or



or



or



approx. 5 local trains / day

Local train: H2 consumption ca.115kg / day, ca.29kg, range about 1000 km / tank filling

approx. 1,865 cars / day

Car: H2 consumption ca.1kg / 100km, range about 500km / tank filling, average daily consumption at 12tsd.km per year = ca.0.33 kg / day

approx. 20 city buses / day

Local buses: H2 consumption about 9kg / 100km, range about 400km / tank filling,

approx. 20 trucks / day

Truck: H2 consumption ca.9kg / 100km, range ca.400km / tank filling,

Annual revenue only by selling H2

(320 days UHTH operation per year)

4,00 EUR / kg	6,00 EUR / kg
784.833 EUR	1.176.960 EUR

With the rest of the syngas, the UHTH® plant can be still provided itself with the electricity.

Example calculation 2 - non-recyclable plastics 90% H2

Input material: 8,000 t per year (residual moisture content approx. 20% -30%)

Calorific value: 5.500 kcal /kg

Daily hydrogen production: ca. 1.281 kg /day



4,0 gas stations



approx. 3.900 cars / day

or



approx. 43 city busses / day

or



approx. 43 trucks / day

or



approx. 11 local trains / day

Annual revenue only by selling H2

(320 days UHTH operation per year)

4,00 EUR / kg	6,00 EUR / kg
1.639.741 EUR	2.459.520 EUR

With the rest of the syngas, the UHTH® plant can be still provided itself with the electricity.

Example calculation 2 - scrap tires 90% H2

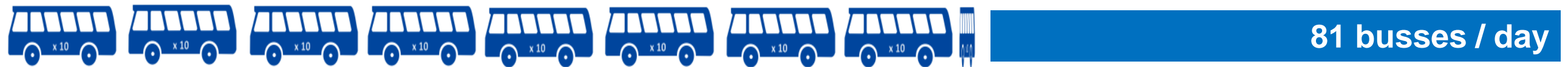
Input material: 8.000 t per year (residual moisture content approx. 20-30%)

Calorific value: 8.690 kcal /Kg

Daily hydrogen production: approx. 2.410 kg / day



oder



oder



oder



Annual revenue only by selling H2
(320 days UHTH operation per year)

4,00 EUR / kg	6,00 EUR / kg
3.082.791 EUR	4.627.200 EUR

With the rest of the syngas, the UHTH® plant can be still provided itself with the electricity.

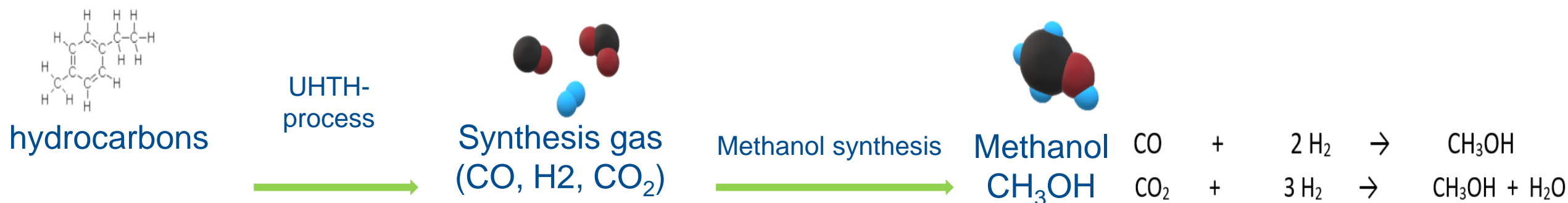
Conclusion

- The currently produced hydrogen is recovered to **99%** from ***non-renewable sources*** (natural gas reforming).
- ***Decentralized*** UHTH technology can provide hydrogen in relatively large quantities for electric mobility at ***competitive prices***.
- The energy consumption of the UHTH system can be covered after the separation of the hydrogen by the energy content of the remaining gases.
- With the UHTH technology ***the buffering of excess energy*** can be used to make ***the balancing energy*** available when needed.
- If the used waste materials are removed from the classic waste incineration process, the provision of ***hydrogen*** with UHTH technology is ***completely CO₂-neutral*** and is considered as regenerative or blue hydrogen.
- The UHTH technology significantly reduces disposal costs and allows long-term planning.



**Methanol production
with the
UHTH technology**

Methanol production with the UHTH technology



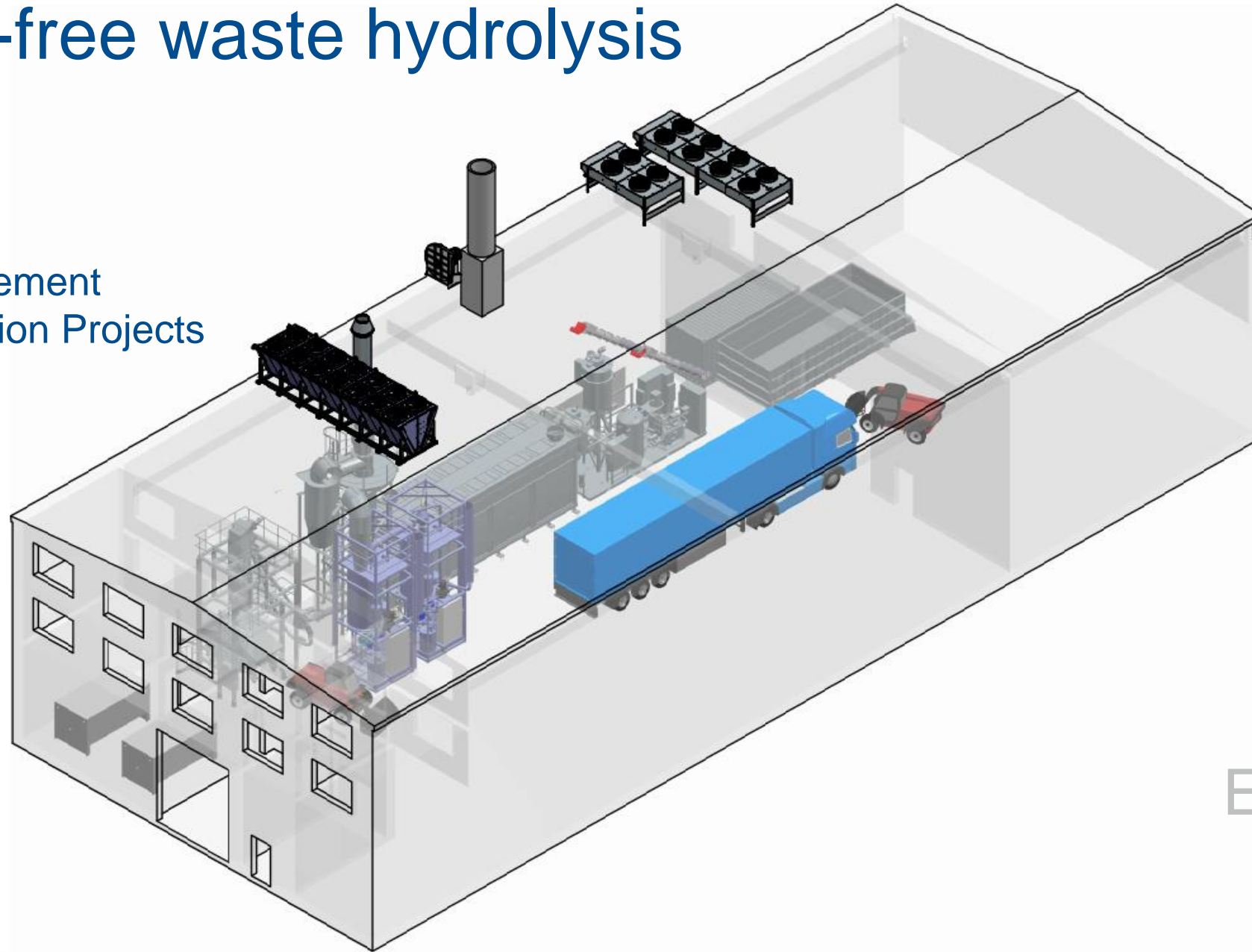
Description	Unit	UHTH [®] input material (organic waste)		
		Low calorific	Middle calorific	High calorific
Caloric value input material	approx. kcal	3.200	5.500	8.690
UHTH [®] input quantity	t /day	25	25	25
UHTH [®] input quantity	t/Y	8.000	8.000	8.000
CH ₃ OH production from synthesis gas	t/day	7	12	19
CH ₃ OH production from synthesis gas	t/Y 320 days per year	2.230	3.835	6.060
Potential annual revenue	Euro (0,40/kg) Methanol-retail price	0,89 Mio.€	1,53 Mio.€	2,42 Mio.€

*) at a middle synthesis gas composition of 22% by volume of CH₄, 22% by volume of CO, 46% by volume of H₂ and about 2% by volume of CO₂

Exoy - Your general contractor for the CO₂-free waste hydrolysis



- Consulting
- Engineering
- Project Management
- Turn Key Solution Projects



Clean
Economic
Ecologic
Efficient

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