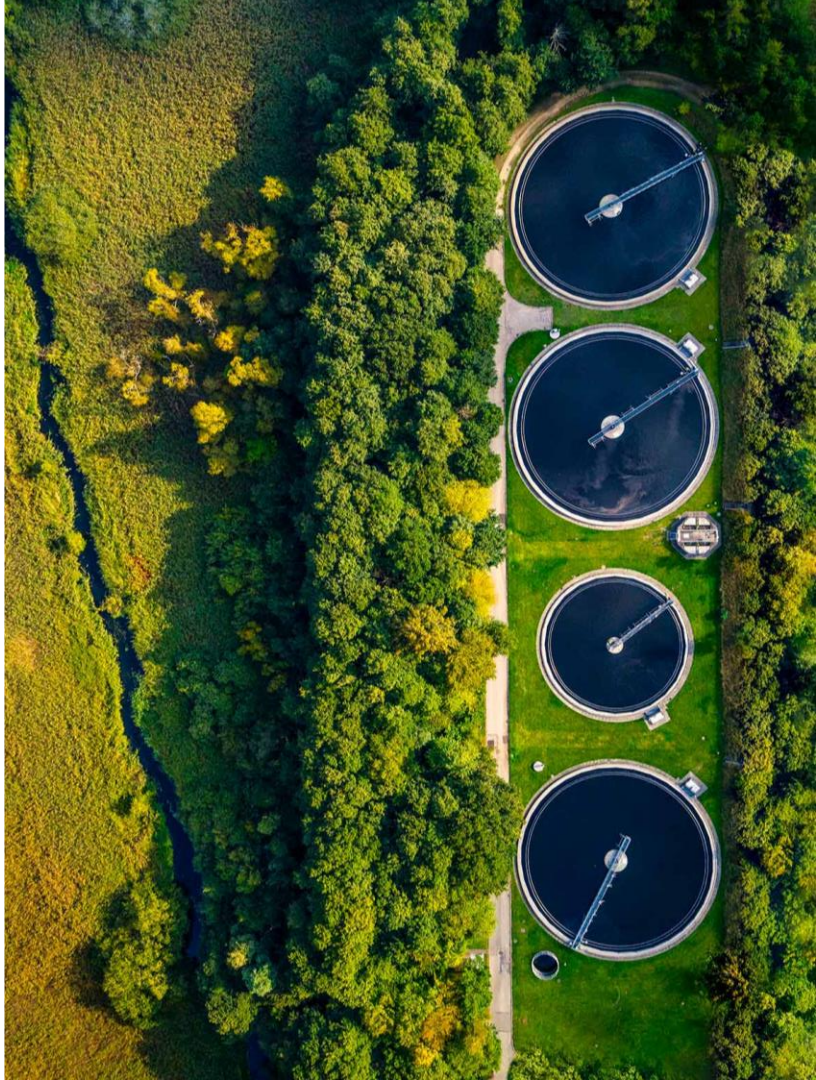
EMPYRIO

Sustainable sewage sludge utilization in small cities

ON-SITE
CIRCULAR
COST-EFFECTIVE

7th December, 2023



Investment Highlights

A significant portion of generated sewage sludge – rich in nutrients but usually heavily contaminated biomass – ends up in agricultural land, posing an environmental and food risk.

The problem is especially significant for small and medium municipalities which do not have affordable alternatives.

Empyrio has developed a small-scale, effective solution based on an innovative and energy-positive mono-incineration process with pending patent protection.

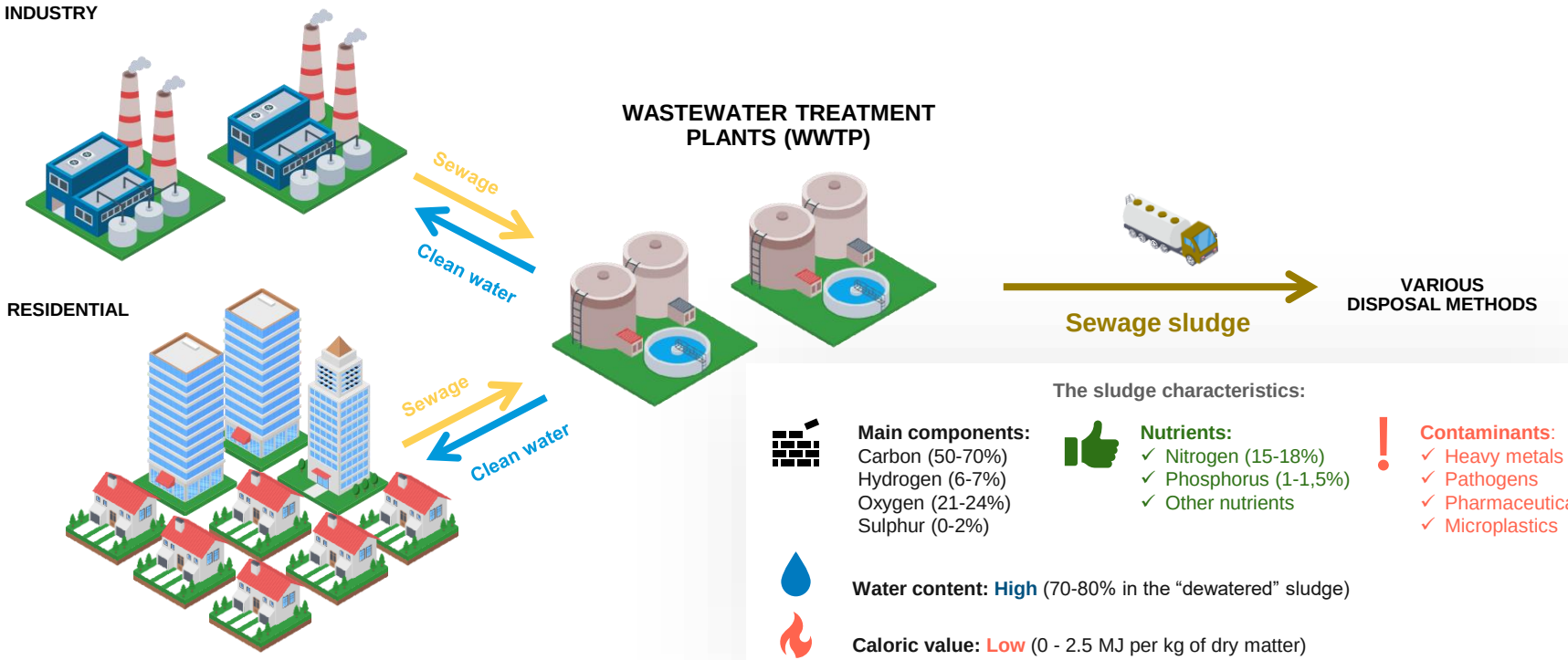
The business model is CAPEX-lite as it is based on selling the equipment manufactured by subcontractors via local distributors.

An attractive growth plan and pragmatic go-to-market approach will drive fast market adoption and scale-up

Empyrio is currently raising a round to build the first full-scale commercial plant.

Attractive investment opportunity to tackle the multidimensional circularity challenge

Wastewater treatment plants produce sewage sludge - nutritious but usually heavily contaminated biomass



The sludge characteristics:

Main components:
Carbon (50-70%)
Hydrogen (6-7%)
Oxygen (21-24%)
Sulphur (0-2%)

Nutrients:
✓ Nitrogen (15-18%)
✓ Phosphorus (1-1,5%)
✓ Other nutrients

Contaminants:
✓ Heavy metals
✓ Pathogens
✓ Pharmaceuticals
✓ Microplastics

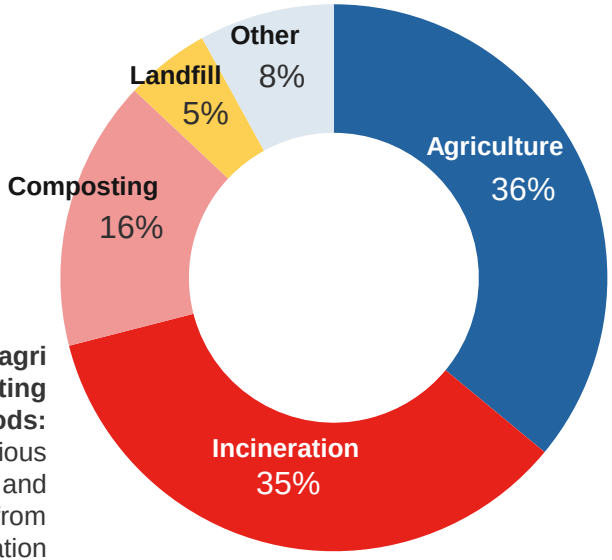
Water content: High (70-80% in the “dewatered” sludge)

Caloric value: Low (0 - 2.5 MJ per kg of dry matter)

Source: Lenntech, European Commission

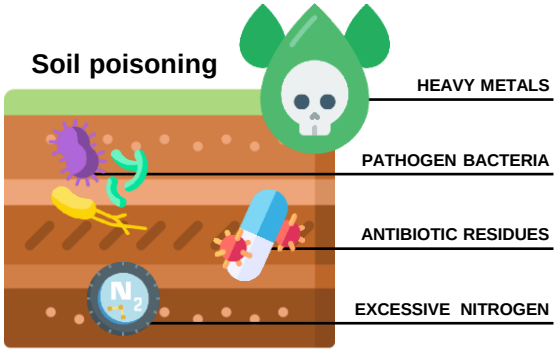
Agriculture is the leading disposal route in the EU with several environmental issues

Sewage sludge disposal routes in Europe[1)]

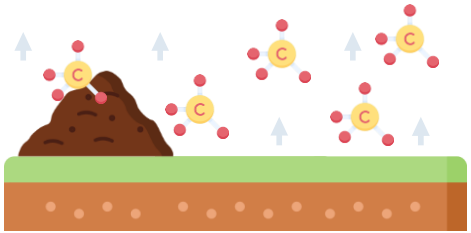


All outside-agri and composting methods: Losing precious phosphorus and nitrogen from circulation

Soil poisoning

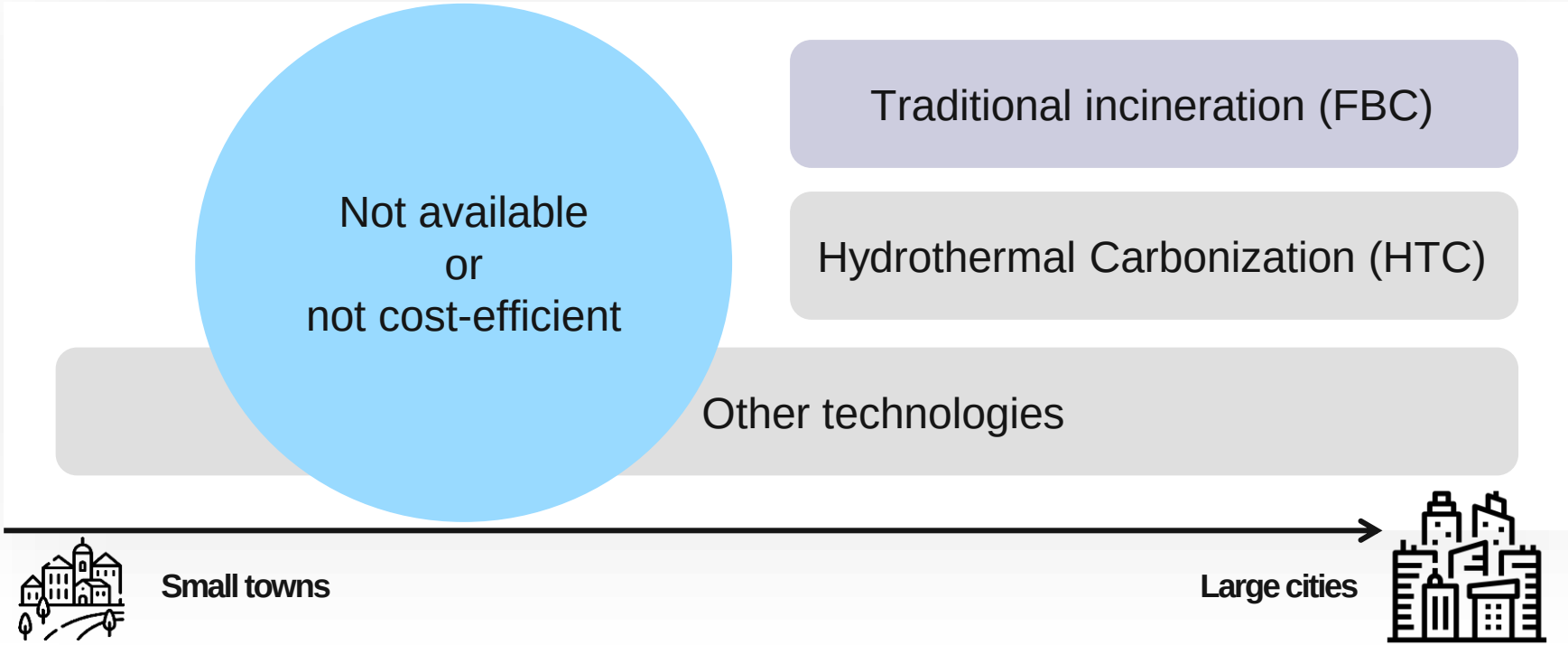


Methane emissions



1) 2020 or the latest data for 24 reporting EU countries
Source: Eurostat

The existing technological solutions don’t work for small and medium-size cities



Source: Empyrio

Empyrio has developed a small-scale and effective solution for them

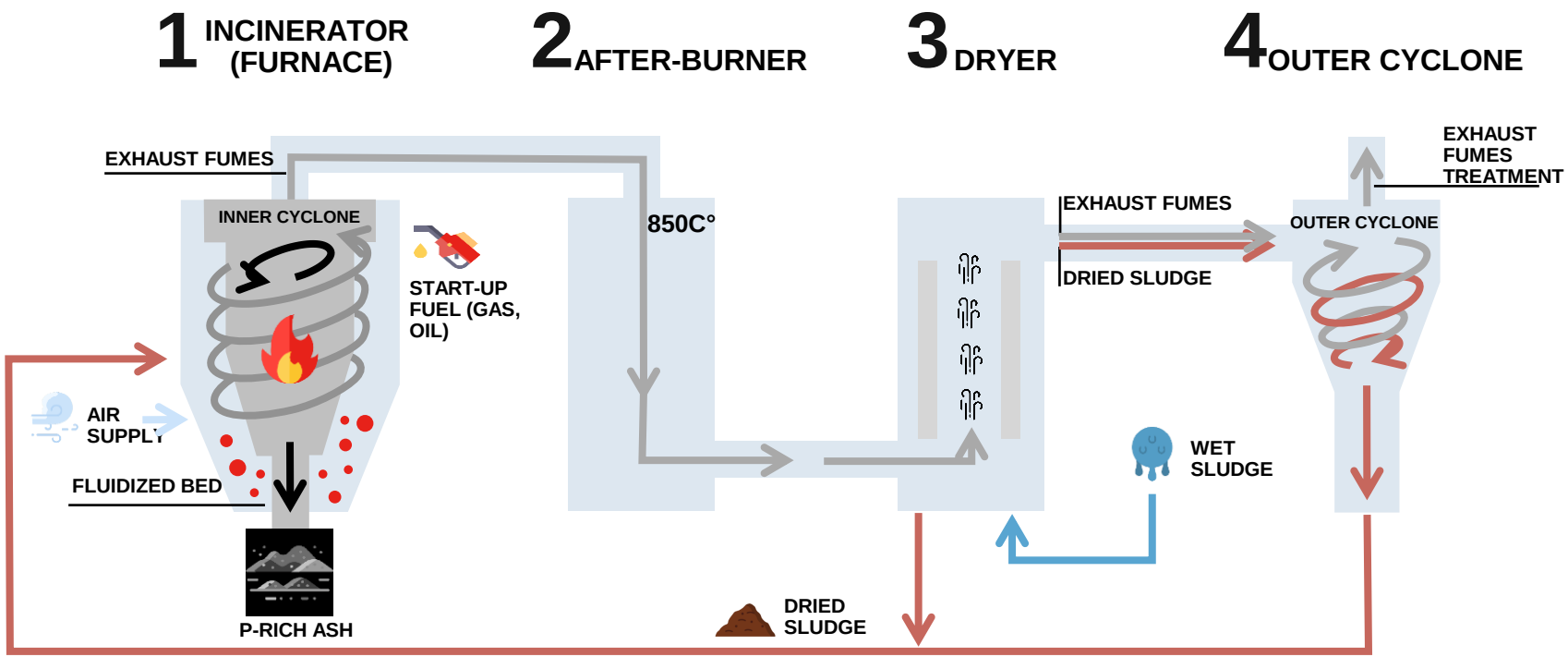
EMPYRIO

COMPETITIVE ADVANTAGES

EFFICIENT	LOW UTILIZATION COSTS FOR HIGH MOISTURE (80%) SLUDGE
AUTOMATED	NO ADDITIONAL STAFF REQUIRED TO OPERATE
COMPACT	MODULAR CONTAINERIZED SOLUTION

Source: Empyrio

It is based on an innovative and energy-positive 4-step process with pending patent protection

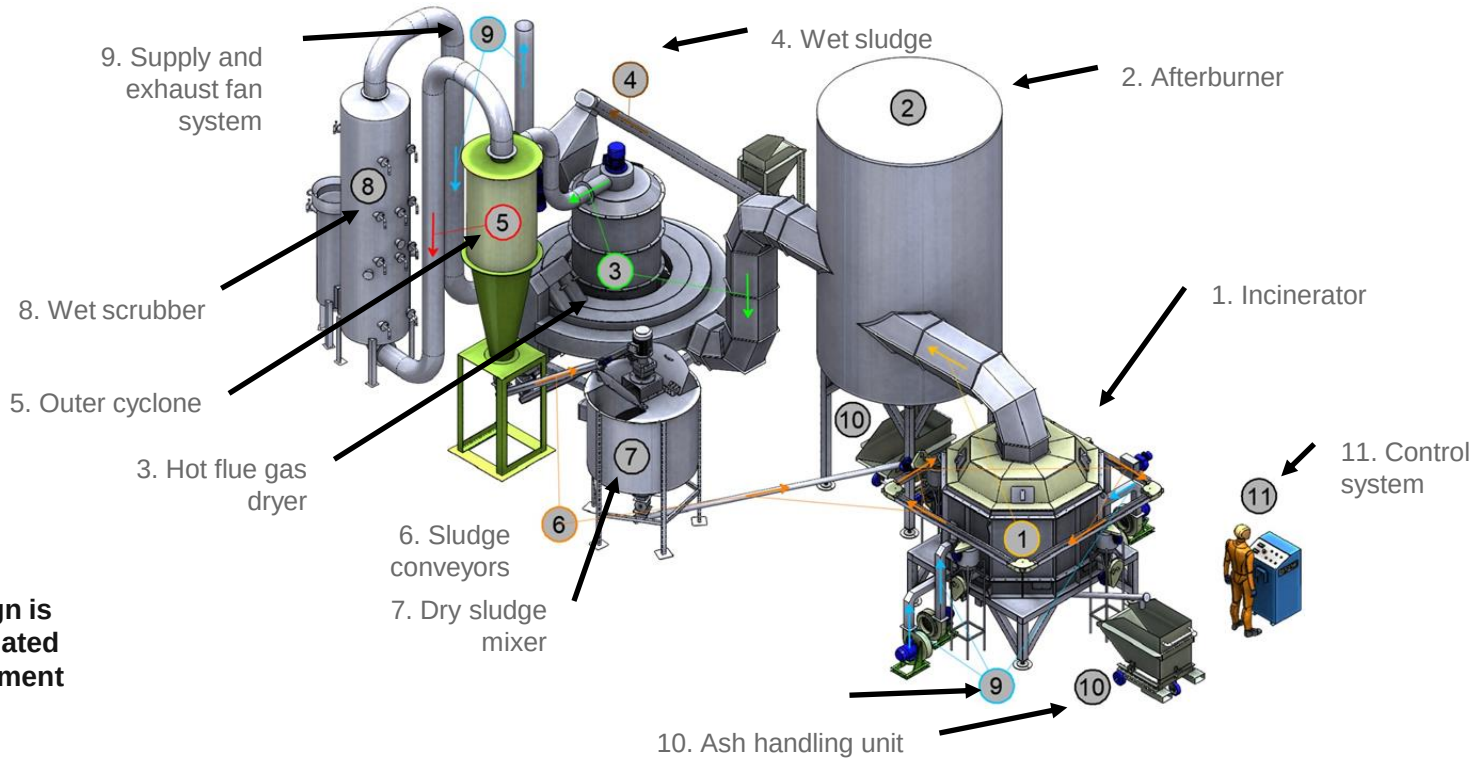


Source: Empyrio

We sell the equipment which is manufactured by subcontractors and installed by distributors under Empyrio's supervision

€ 1M
STARTING UNIT SALES PRICE

30-60%
GROSS PROFIT MARGIN[1)]



The system's design is expected to be updated during the development of the system

Source: Empyrio

Selling sludge incineration equipment to small and medium wastewater treatment plants is a multi-billion € opportunity

Total value of equipment sold to small and medium WWTPs:

€ 5,9 Billion

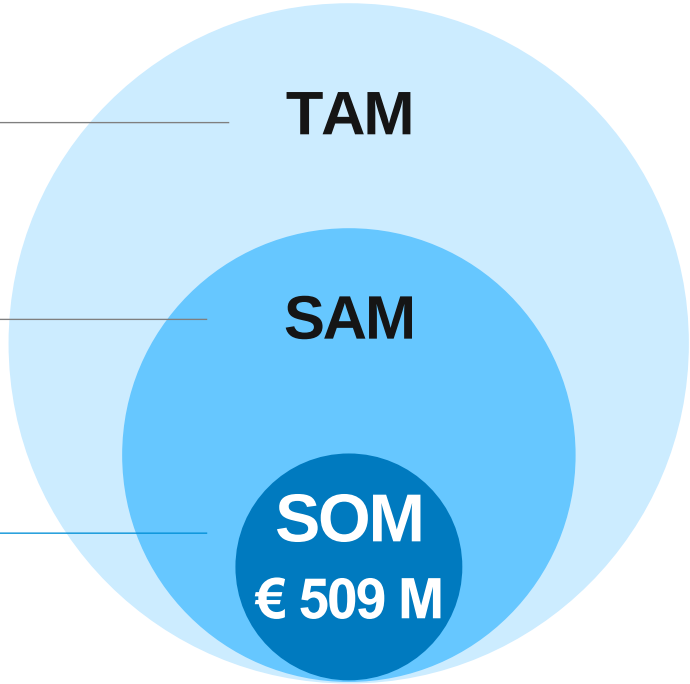
Worldwide market

€ 2,2 Billion

Europe (EU+) and North America

€ 0,5 Billion

Central Europe

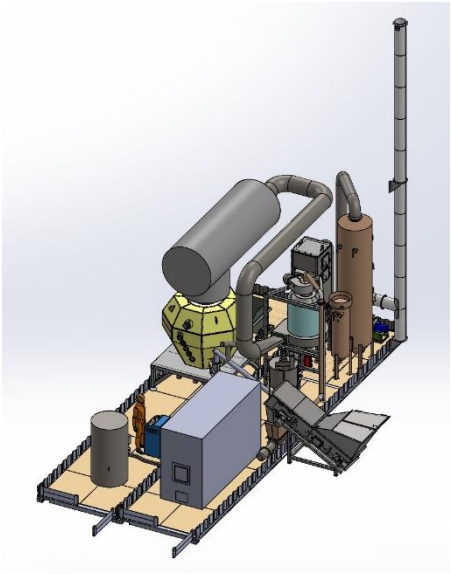


Source: HydroWASTE, Empyrio

Empyrio's technology is currently at TRL 7 with the objective to achieve the TRL 9 in the next two years

Currently developed pilot plant in Jurmala, Latvia

Design of the pilot



Container-based installation of the pilot
(actual photo of the Jurmala pilot, as of 6th Nov)

R&D Roadmap

Next maturity levels	Empyrio's milestones
TRL 7 System prototype demonstration in operational environment	**Q1 2024** Pilot plant at Jurmala WWTP
TRL 8 System complete and qualified for commercial operation	**2025** Commercial plant development
TRL 9 Actual system proven in operational environment	**2026** Successful launch of the 1st commercial plant

Source: Empyrio

Our team covers both business and engineering experience

Alexander Belskis

CEO

20 years of experience in international sales and marketing of industrial equipment. Management, financial and entrepreneurship skills with experience in several start-ups. Master degree in business administration.

Uldis Kalnins

CTO

Ph.D. in Thermal Physics with more than 30+ years of experience in the engineering of equipment and automation for wastewater and sludge treatment industry.

Sergey Vilcek

CRO

Ph.D.in Mechanical Engineering, development and production of non- standard equipment, work experience - more than 30 years. Co-author of multiple patents.

Christian Kabbe

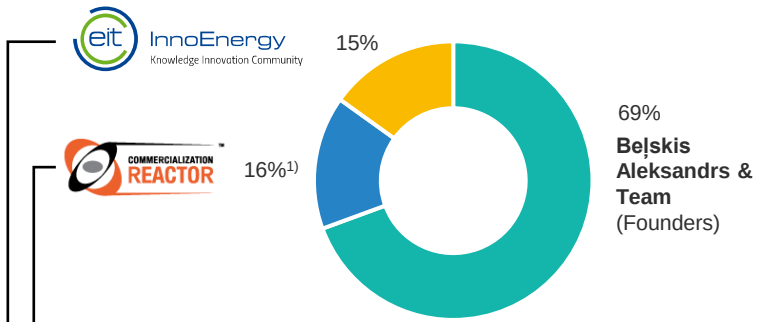
Market expert

Ph.D., sewage sludge treatment experienced market expert. Member of DWA (German Water Association) committees. Wide market contacts' network in Germany and EU.

Source: Empyrio

The ownership is mostly founders with significant support from EIT InnoEnergy and Commercialization Reactor

Empyrio Ownership Structure



- The founders **own the majority of the company's shares** and are **actively engaged in the management** (CEO)
- Commercialization Reactor is a platform focused on **commercializing science and deep-tech solutions**. The team has over 10 years of experience in creating, pre-incubating and accelerating startups which resulted in over 100 fully-formed science-based companies.
- EIT InnoEnergy is a Knowledge and Innovation Community that has become the **world's largest sustainable energy innovation ecosystem**.

EIT InnoEnergy

- The most active sustainable energy investor globally (by Pitchbook 2022)
- The portfolio companies span a wide range of sectors and geographies, covering the entire strategic value chain of sustainable technologies, minimising the execution risk
- InnoEnergy provides value-added services to its portfolio companies, including market intelligence, access to key players and commercially viable technologies, support with product enhancement, etc.
- The EIT InnoEnergy network includes 23 shareholders, as well as 500+ project partners.

Key InnoEnergy's Shareholders and Partners

1) Commercialization Reactor Pre-Seed Fund owns 6,1% and Commercialization Reactor Seed Fund 9,4% of Empyrio's shares
Source: Empyrio, EIT InnoEnergy, Commercialization Reactor

We are now finalizing the pilot plant and preparing for the first commercial order in 2024 preceded by the late seed round

Pilot phase

2023/2024

PILOT AT JURMALA WWTP

Norway grants

eit InnoEnergy Knowledge Innovation Community

COMMERCIALIZATION REACTOR

Jūrmalas ūdens

Late Seed Round

1,5-2,5 MEUR

(flexible on timing and staging)

Commercial phase

2024/2025

1st COMMERCIAL ORDER

PROSPECT CUSTOMERS

VEOLIA

Zakład Gospodarki Komunalnej w Szamotułach Sp. z o.o.

Source: Empyrio

For more information, please contact:

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