STEM SAS

Société Technologique d'Echangeurs Membranaires

JUNE 2024

STEM

A Greentech disrupting the race for energy savings

STEM has designed 2 groundbreaking technological innovations in **air and water treatment**.

STEM replaces electrical energy consumption with heat from **waste heat sources**.

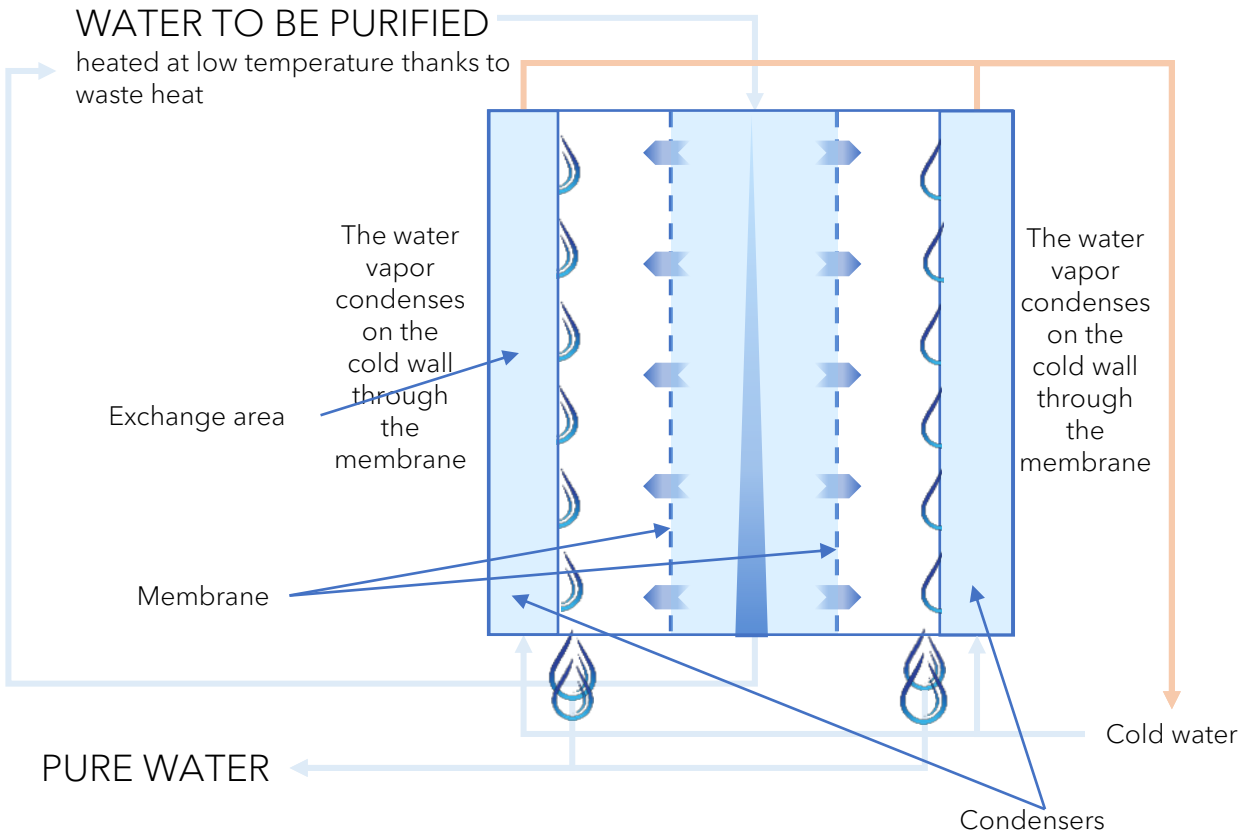
The latter is, by definition, free, which allows **considerable energy savings**.

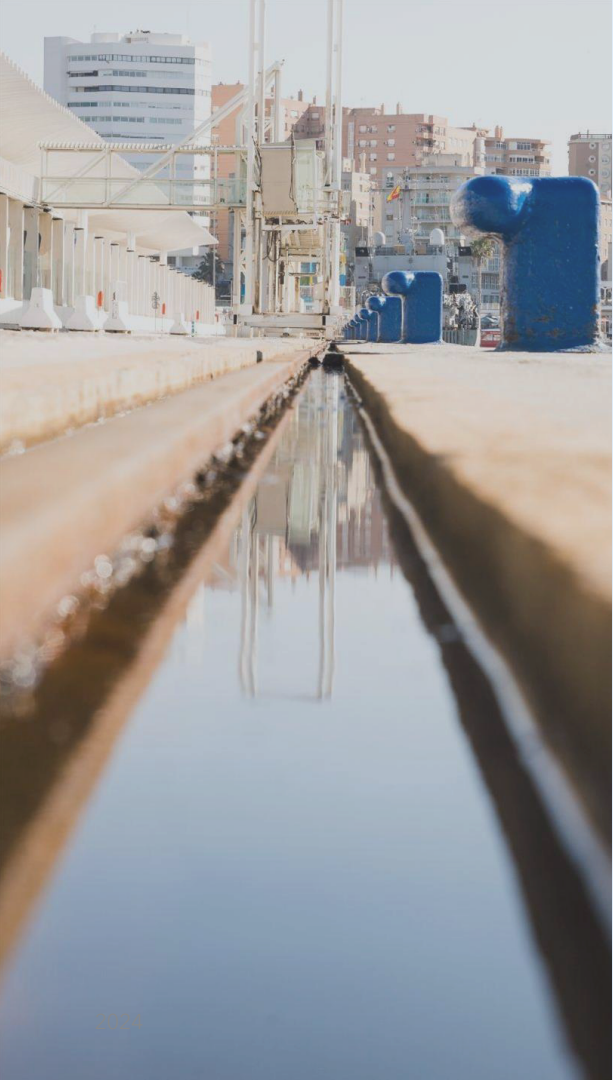

AQUAHIVE

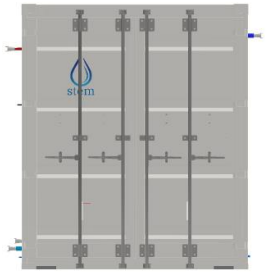
TECHNICAL PRINCIPLE

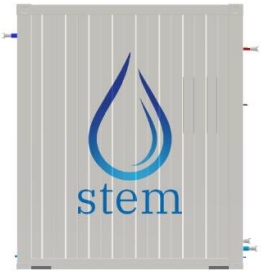
Water

Water Treatment

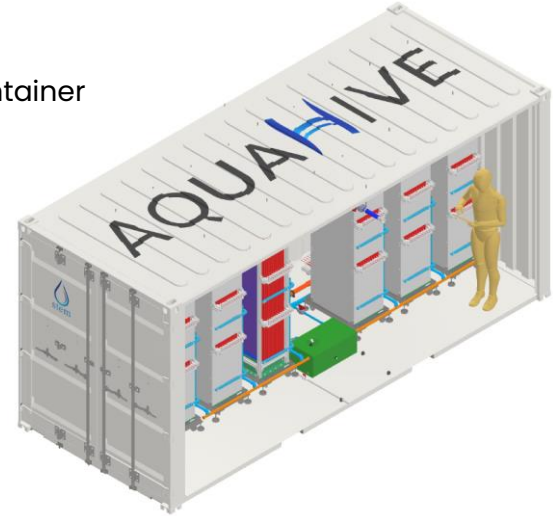








1 Container



THE PRODUCT

The product

AQUAHIVE

Water Treatment

Characteristics – What is it ?

AI-powered, energy-efficient pure water production system

Advantages – What makes it unique ?

- Low grade heat valorisation
- Low grade water valorisation
- Low maintenance costs (no high-cost membrane replacement)
- Very low electricity consumption
- AI-powered

Benefits – What is the value for the customer ?

- Significant energy savings when purifying water – 65 to 90% for 1m3
- Significant decarbonization – 65 to 90% less carbon emission depending on the country and previous energy source
- Upstream water savings
- Reduction in downstream processing costs
- Real time optimisation for maximising savings
- Predictive maintenance for operational cost reduction

AQUAHIVE

Water
Treatment

The value

Benefits – What customers can expect ?

Savings depend on treated water source. Waste heat is required.

MARKET	Industrial demineralized water		Drinking water
TREATED WATER	Surface water	Waste water Brackish/Sea water	Brackish/Sea water
REFERENCE TECHNOLOGY	Reverse Osmosis		
ENERGY SAVINGS	**65 to 75%**	**70 to 90%**	**75 to 90%**
UPSTREAM SAVINGS	**-**	**YES**	**YES**
DOWNSTREAM SAVINGS	**-**	**YES**	**YES**

Advantages over reverse osmosis

AQUAHIVE

Water Treatment

Decisive advantages in OPEX

With the same CAPEX, AQUAHIVE provides energy efficiency and adaptability by recovering waste heat from the surrounding environment.

	Reverse Osmosis	AQUAHIVE
CAPEX	800 Eur/m3	=
ELECTRICITY CONSUMPTION	3.5 to 5 kWh/m3	0,8 kWh/m3
PRE-TREATMENT (Chemical)	Estimated at 12% of the OPEX	No
MAINTENANCE (Membranes)	Estimated at 10% of the OPEX	Negligible
WATER PURITY LEVEL	13 µS	7 µS
TREATMENT OF HIGHLY CONTAMINATED WATER	Difficult	Yes

Business case

Desalination of sea water

Case Hypotheses:

- Production of 30 m^3/day
- Waste heat recovered at 90°C

Reference Technology : Reverse Osmosis

	Reverse Osmosis	AQUAHIVE
WASTE HEAT CONSUMPTION	-	350 to 600 kWh/m3**
ELECTRICAL CONSUMPTION	8 kWh/m3*	1 kWh/m3
ENERGY SAVINGS		**87.5%**

*Based on literature (Gopi et al., 2019). Sea water is the most energy-consuming water to process for reverse osmosis

** Depends on the on-site constraints

Business case

Water treatment for electrolysis prior to EDI (Electrodesionization)

Case Hypotheses:

- 5 MW electrolyzer with 65% efficiency (100 kg/h H2)
- Waste heat recovery from stack at 75°C (1.75 MWh available)
- Distilled water required @4 µS/cm

Reference technology: 2-phase reverse osmosis

	Reverse Osmosis	AQUAHIVE
WASTE HEAT CONSUMPTION	-	350 to 600 kWh/m3
ELECTRICAL CONSUMPTION	6 kWh/m3*	1 kWh/m3
ENERGY SAVINGS		**83%**

* Industrial water intake

THANK YOU

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