

ZIMBA

Zero-carbon Industrial heat production by ammonia water absorption heat transformer

PROJECT AMBITION

The ZIMBA project aims to revolutionise industrial heating systems with an innovative heat pump based on an **Absorption Heat Transformer (AHT)** using **ammonia/water refrigerant**. Designed to operate efficiently at a 15 kWth scale, this innovative technology aims to provide industrial heat production, starting at **110°C** and later scaling up to **130°C**. The heat pump system will be further optimised with an **ejector**, allowing for a wider range of operational capacities. This adaptability ensures the technology can meet the diverse heat requirements of various industrial processes, making it a key solution for **reducing industrial carbon footprints** and contributing to a **sustainable energy transition**.

PROJECT CONCEPT

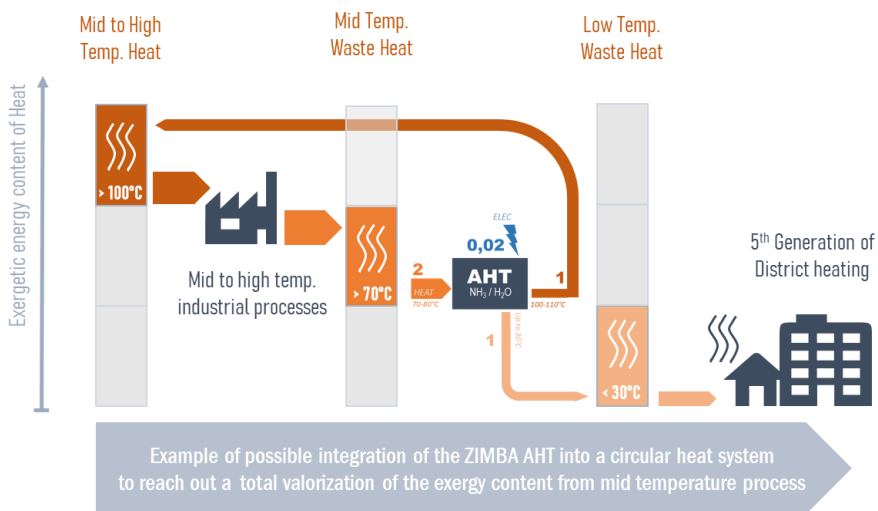


Illustration of potential integration of the ZIMBA AHT system into the energy system with a circularity approach

PROJECT FACTS

Start date: 01/12/2024

End date: 30/11/2028

Duration: 48 months

Project budget: €1.9 M

HORIZON Europe Research and Innovation Action (RIA)

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Topic: HORIZON-CL5-2023-D3-02-04

Keywords: Renewable energy sources, Decarbonising industry, Water-Ammonia Absorption Heat Transformer, Heat pump, Ejector, Industrial heat, Circularity, Sustainability.

KEY OBJECTIVES

- **First upscale of the baseline AHT system**

Developing an advanced, scalable, energy-efficient AHT system that operates on waste heat with minimal electricity, ensuring high reliability and performance.

- **Design of performance-enhancing ejector**

Developing a specialised ejector to enhance the AHT system's performance and stability under high condensation temperatures with a two-phase ammonia-water mixture.

- **Ejector integration and performance validation**

Sizing, designing, and testing the enhanced ammonia/water AHT system, optimised with a custom ejector to generate heat and steam at 110°C from a 70-80°C heat source.

- **Preparatory studies for market penetration**

Identifying optimal technological solutions, business models, and key industrial markets for commercial deployment of the AHT system.

- **Investigations for higher heat sink temperature**

Identifying AHT technological solutions and optimal sizing to achieve higher heat sink temperatures, targeting key industrial markets for 130°C heat output.

EXPECTED IMPACT

- **Improved performance of heat pumps and/or heat pump components**

ZIMBA's **AHT solution** efficiently converts waste heat into usable heat with minimal electricity, **using less material and space** than conventional systems. With **low costs and reliance on free waste heat**, it offers a sustainable solution for industrial applications.

- **Reduced environmental footprint**

The ZIMBA AHT system **uses significantly fewer critical materials**, requiring only limited copper for the liquid pump motor, with other components made from stainless steel, thereby boosting European resilience in this area.

- **Reduced greenhouse gas emissions**

ZIMBA significantly contributes to the EU's climate neutrality targets, in line with the Green Deal and the Paris Agreement. Using **ammonia with no impact on ozone depletion** or **global warming**, ZIMBA reduces emissions compared to traditional systems.

- **Enhanced energy system integration**

ZIMBA is a breakthrough in energy system integration, efficiently **harnessing ultra-low-grade waste heat**, often considered unrecoverable, and **using minimal electricity** to convert it into useful steam, thereby addressing inefficiencies in industrial processes.

CONSORTIUM

- CEA (FR)
- Politecnico di Milano (IT)
 - Clauger (FR)
 - AMIRES SRO (CZ)
- OST - Ostschweizer Fachhochschule (CH)

CONTACTS

Dr. Hai Trieu Phan, CEA
Project Coordinator
Haitrieu.PHAN@cea.fr

Cristina Dinca, AMIRES
Project & Dissemination Manager
dinca@amires.eu

Website:
www.zimba-project.eu

LinkedIn:



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