

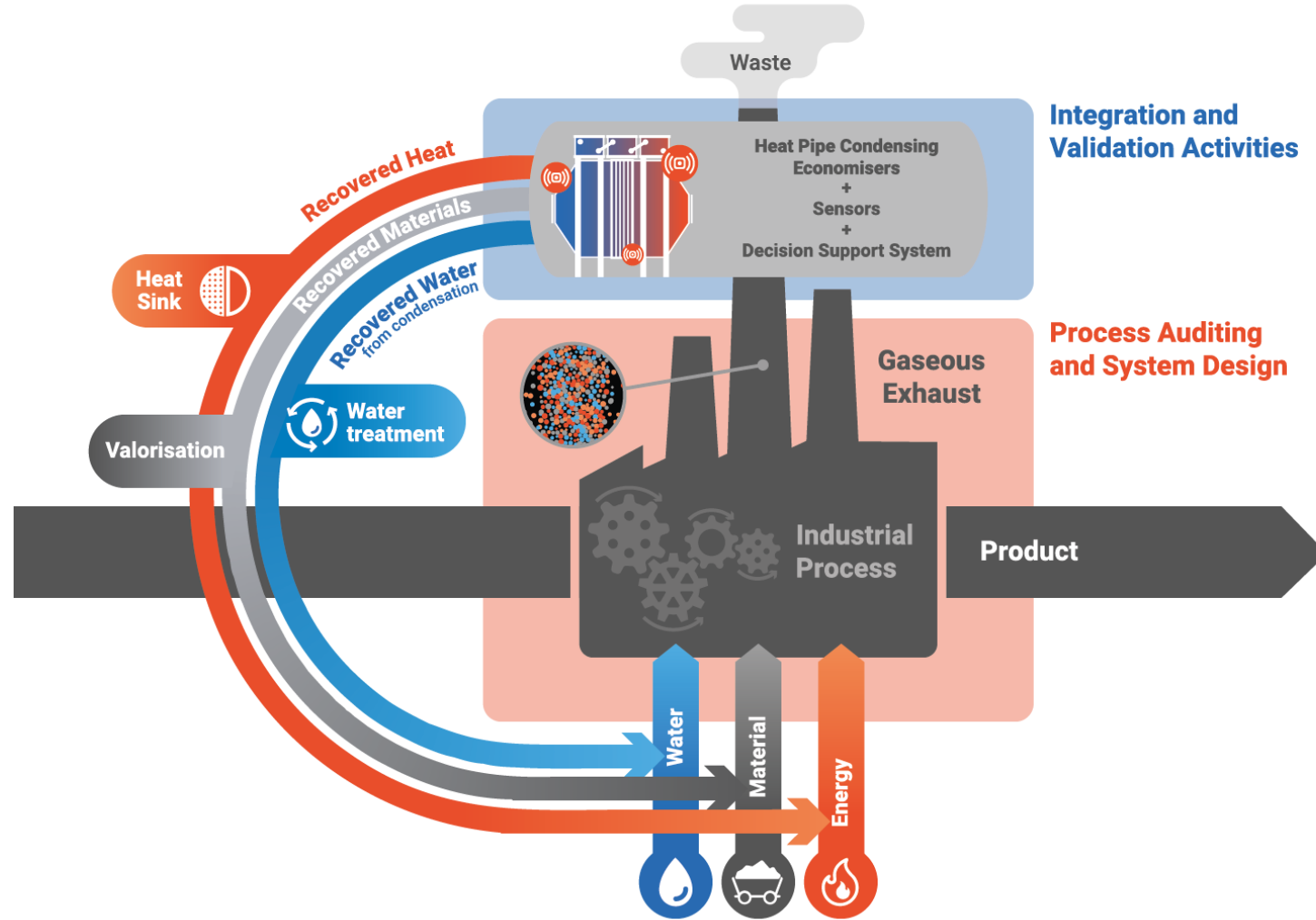


What is iWAYS?

Innovative WAter recoverY Solutions through recycling of heat, materials and water across multiple sectors is a project that will develop a set of technologies and systems for industrial processes in order to recover **water** and **heat**, and in some cases **materials**, from exhaust streams



iWAYS: concept and methodology



Why is this approach different?

Currently, there are no significant studies, demos, or real applications, to condensate and reuse industrial streams

By using Heat Pipe Condensing Economisers with new materials and special designs capable of operating in peak conditions, iWAYS will withstand better the **corrosive and high particle loaded exhaust**



iWAYS in numbers

19 partners

9 countries

3 demo cases

4 technology providers

48 months

> 10M€
EU funding



UK
Brunel University London
Econotherm Limited
IAMAS Technologies

SPAIN
Asociación de Investigación
de las Industrias Cerámicas
Innovación y Consulting
Tecnológico de Barcelona SL
Fundació Eurecat
Catalan Institute for
Water Research (ICRA)
Krean, S. Coop
LKS Ingenieria
Tubacex Tubos Inoxidables SA

SWEDEN
Alufluor AB

GERMANY
European Science
Communication Institute


BELGIUM
Water Europe

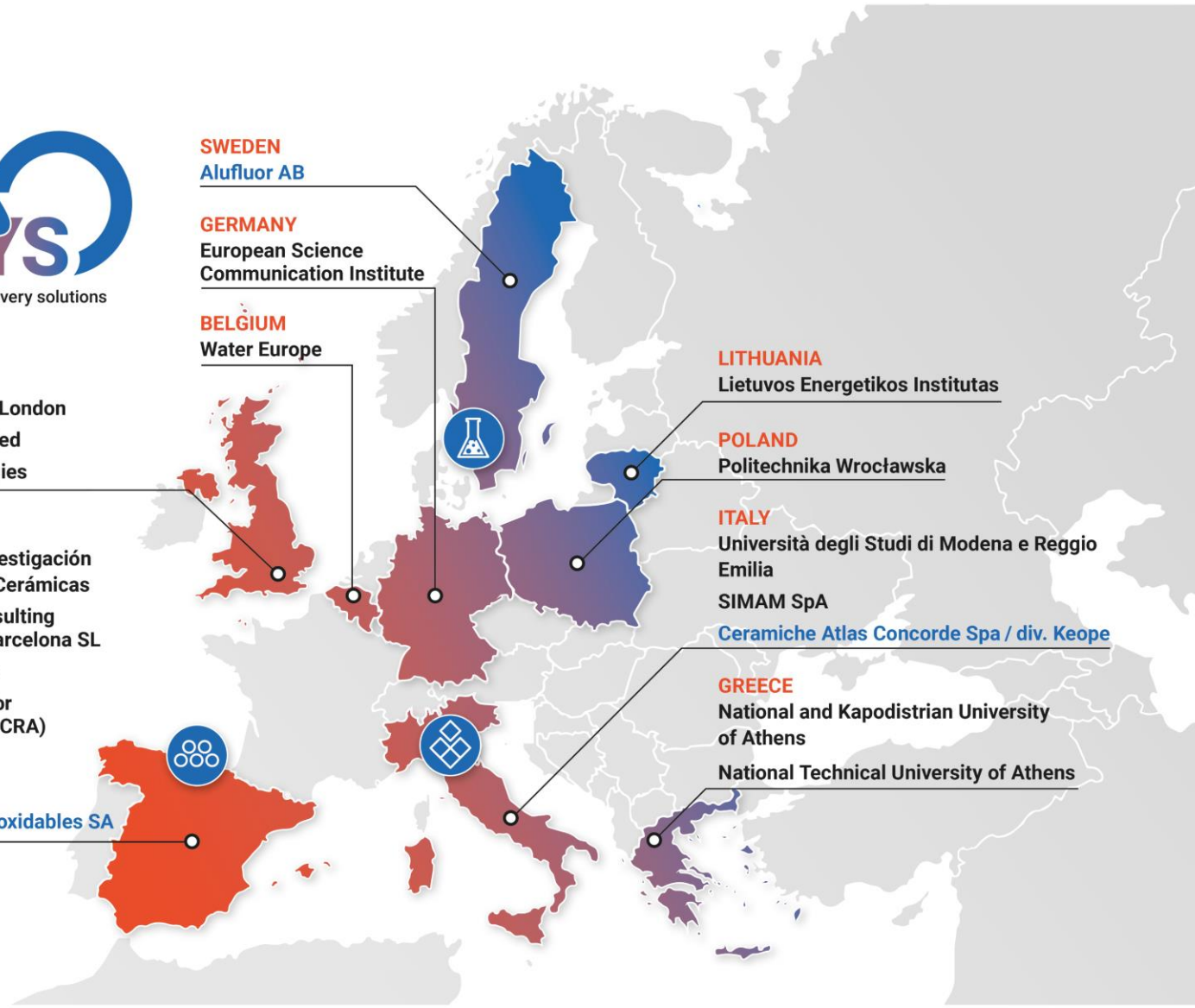
LITHUANIA
Lietuvos Energetikos Institutas

POLAND
Politechnika Wroclawska

ITALY
Università degli Studi di Modena e Reggio
Emilia
SIMAM SpA
Ceramiche Atlas Concorde Spa / div. Keope

GREECE
National and Kapodistrian University
of Athens
National Technical University of Athens

 = Use case



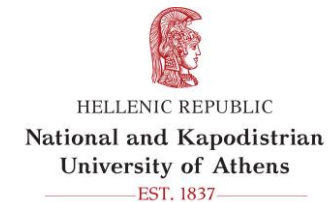
Who is part of the consortium?



UNIMORE
UNIVERSITÀ DEGLI STUDI DI
MODENA E REGGIO EMILIA



GRUPPO acea



iWAYS iWAYS: specific objectives

SO1: To create a framework streamlining the design process of iWAYS systems with regards to customized installations to condensate water from exhausts and purify the recovered water

SO2: Realizing water closed loops and a substantial reduction in freshwater

Reduction of freshwater consumption > 30 % for the industrial processes

SO3: Achieving a substantial reduction in thermal waste and process energy requirements

Payback <5 years, process or in plant heating reduction >20%,

SO4: Recovery of materials by valorising challenging exhaust streams

SO5: Reclaiming, treating and reutilizing water in industrial processes

SO6: Utilization of alternative water resources and rainwater harvesting

SO7: Real time smart monitoring of recycled water and gaseous emissions composition

SO8: Develop a methodology to select the best available synergies

SO9: Streamlining the iWAYS solutions and accelerating the commercialization process



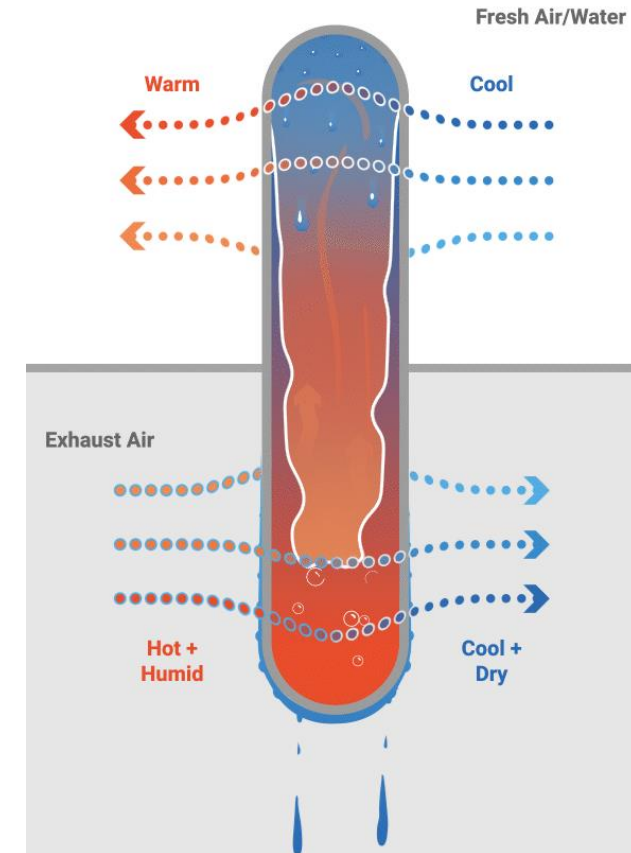
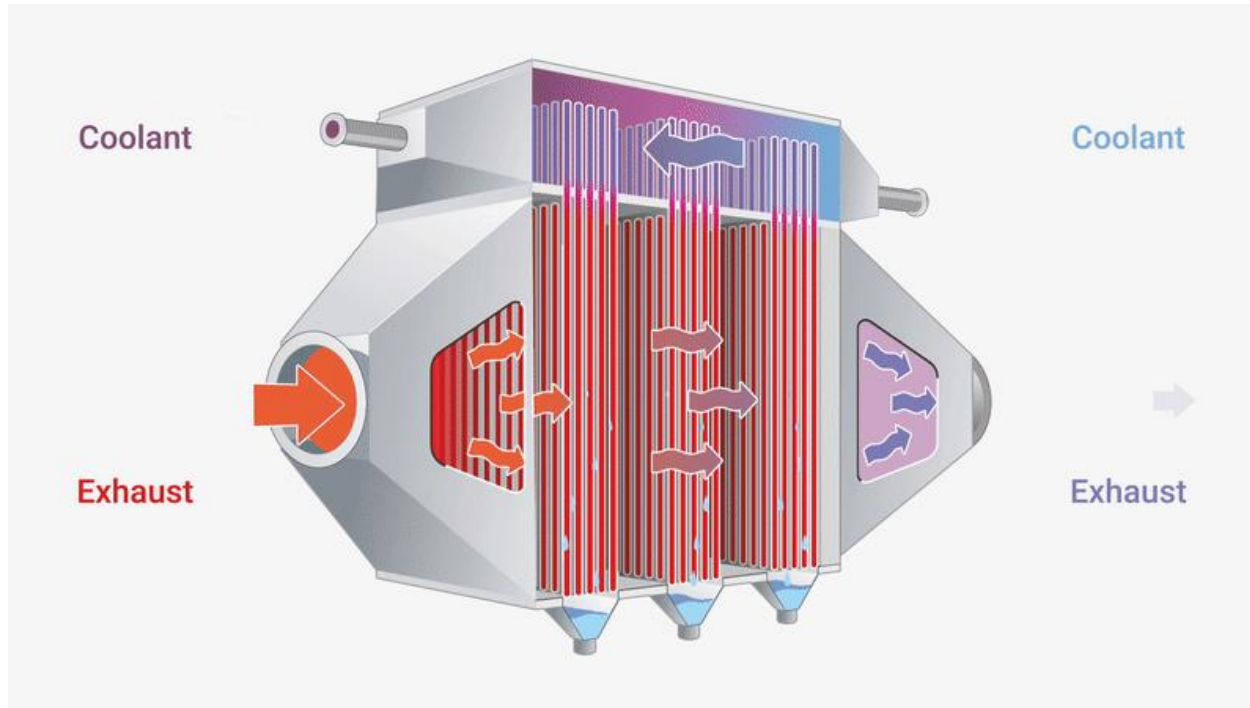
Technology components

1. Heat Pipe Condensing Economisers
2. Decision support system and sensors
3. Water treatment



Technology components

Heat Pipe Condensing Economiser

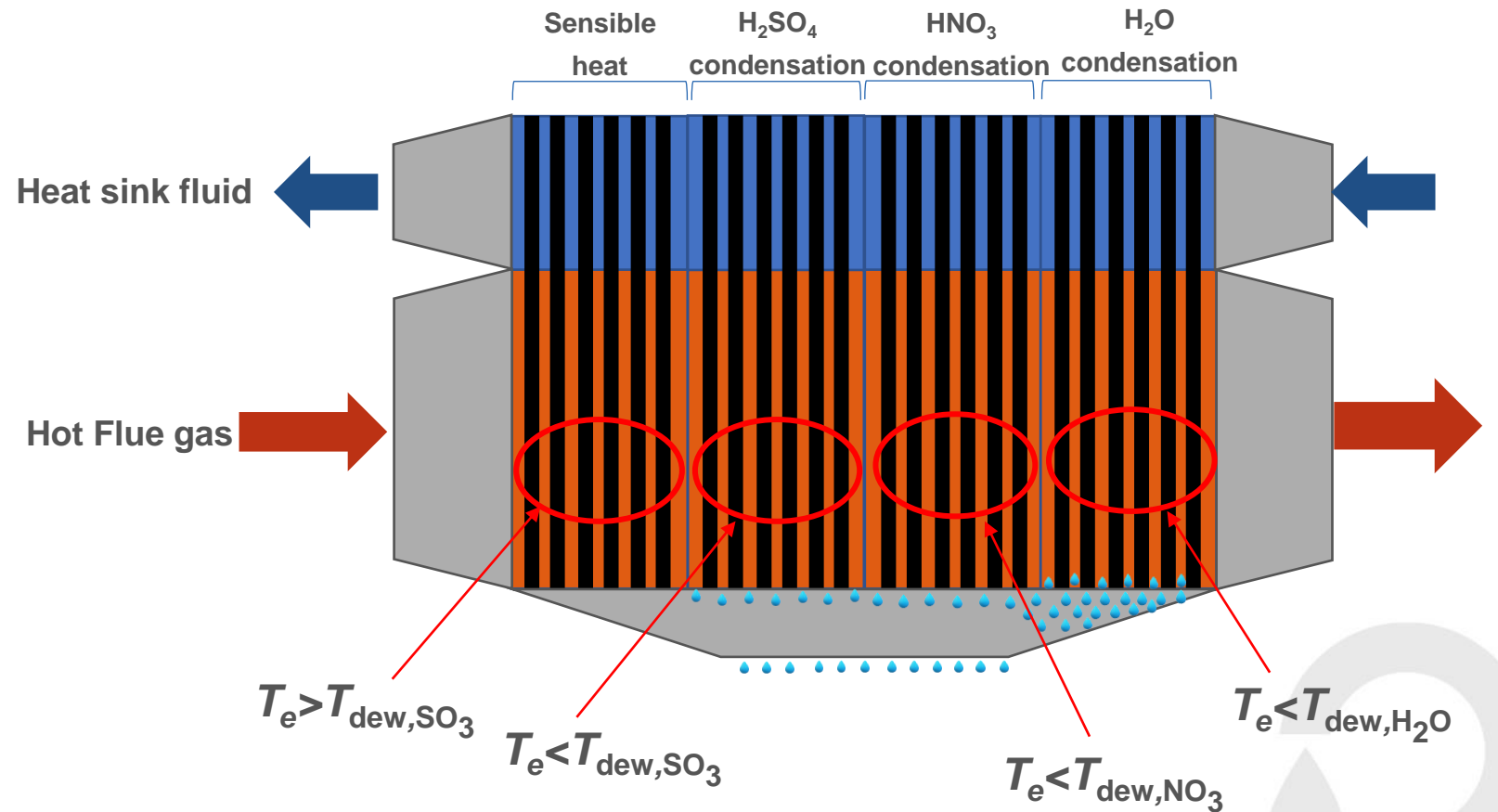


Technology components

Heat Pipe Condensing Economiser

Condensation occurs when the heat pipe surface temperature T_e is lower than the dew point of the composition

$$T_{\text{dew}} = T_e < T_{\text{dew}}$$

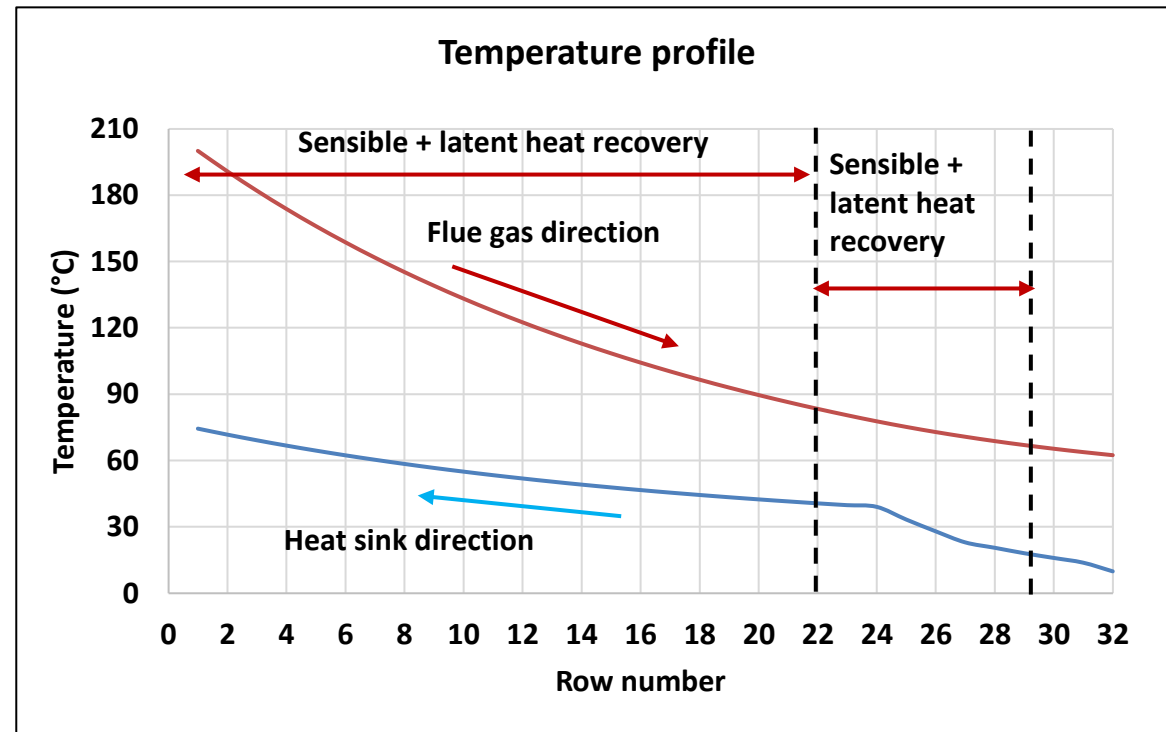


Technology components

Heat Pipe Condensing Economiser

Composition	Volume fraction (%)
N2	76.2
O2	3
CO2	10.4
H2O- vapour	9.8
SO2	0.3
NO2	0.29

Moisture Dew points	
H2SO4 dew point	150 (°C)
HNO3 dew point	57.6 (°C)
H2O dew point	46 (°C)



Technology components

Decision support system and sensors for real time monitoring system

- 3D visualisation and data analytics
- Integration of forecasting and decision-making in **real-time**
- Flexible monitoring process, control and optimisation dashboard supporting an end-to-end process of data collection, harmonization, processing and visualization



Technology components

Water treatments

- Photocatalytic Nanofiltration (current TRL 5)
- Membrane Distillation (current TRL 4-5)
- Ultrafiltration * (current TRL 6)
- Reverse Osmosis * (current TRL 6)
- Evaporation-Crystallisation * (current TRL 6)

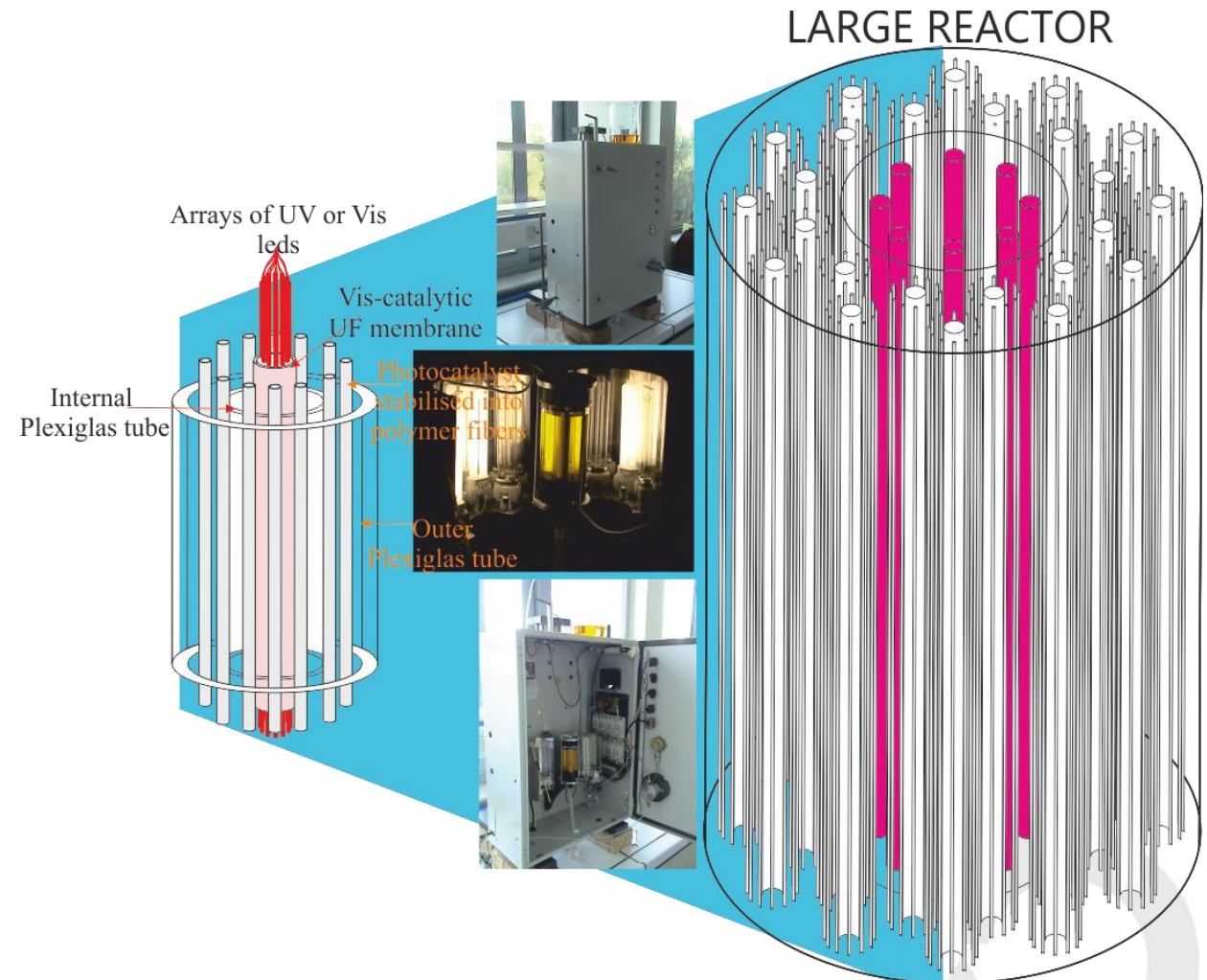
* The water treatment technologies are used in relevant and operational environment, but not yet for the treatment of the specific streams considered in this project



Technology components

Water treatment

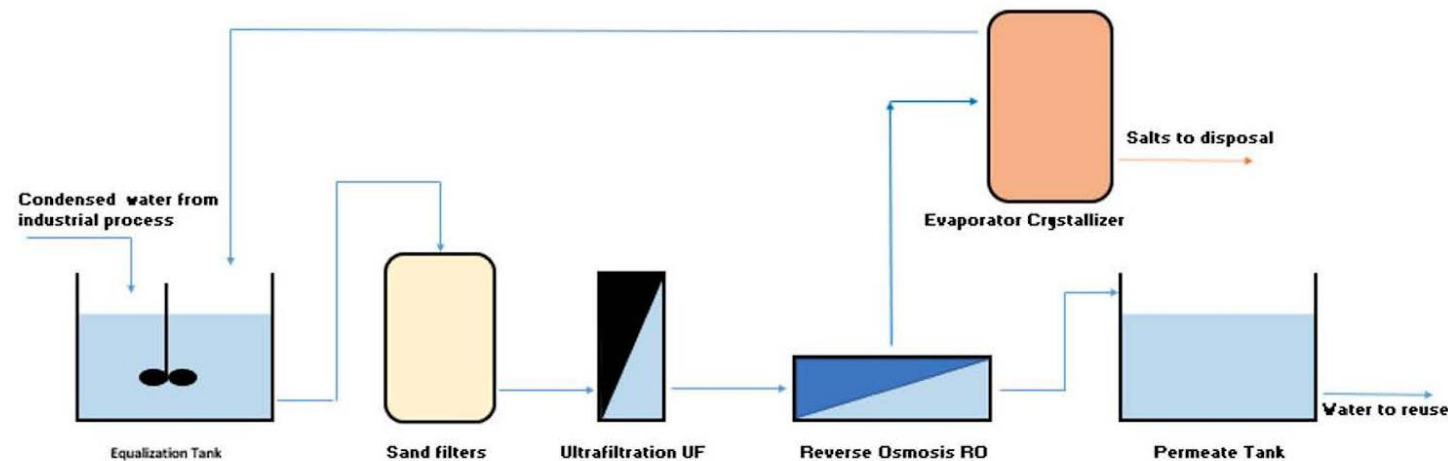
- Photocatalytic Nanofiltration reactor (PNFR)
- Applied to steel industry to produce high quality permeate water
- Recycle of the retentate water within the PNFR process is made possible by oxidative removal of pollutants by photocatalysts on the membrane surface



Technology components

Water treatment. General layout of the proposed process

- An equalisation tank is operated, followed by sand filter and ultrafiltration to reduce RO membrane fouling
- Evaporative crystallisation is applied to the RO retentate to further recover water



iWAYS Industrial demo sites



Application to ceramic,
chemical and steel industries





Ceramich Atlas Concorde

- Recovery of a substantial amount of the water discharged through the spray dryer exhaust
- Available freshwater to be recovered
- Suspension of the particles in the stream



Objectives:

- Reduction of about 50% the freshwater directly used in grinding
- 1,5t/h or 10,000t/y per system, or 50% of the clean freshwater used in grinding to be recovered



iWAYS Demo Site 2 – chemical industry



Alufluor AB

- Aluminium fluoride production: extremely corrosive exhausts
- Potential heat recovery

Objectives:

- Recover water vapour
- Recover corrosive acid such as hydrofluoric acid. 70 tonnes of acid per year
- Recover heat from the streams
- Install 500kW thermal of heat recovery delivering 5.18 Gwh
- Recover up to 33% of the production line water demand



iWAYS Demo Site 3 - steel industry



Tubacex Tubos Inoxidables (steel tubes manufacturer)

- Waste heat recovery
- Water condensation potential
- Reducing the contaminant content of wastewater before reuse in the process



Objectives:

- Waste heat to be recovered
- Water to be condensed
- Providing high quality decontaminated water for the process



How is the project organised?

WP Leaders



Project Coordinator:
Prof Luca Montorsi



University of Modena and Reggio Emilia

Scientific and Technical Director:
Prof. Hussam Jouhara



Brunel University London

Dissemination, Exploitation and Communication Manager:

Elmar Bartlmae



European Science Communication Institute (ESCI)



University of Modena and Reggio Emilia



Fundacio Eurecat



Econotherm



Asociación de investigación de las industrias cerámicas ITC-AICE



Brunel University London



Simam Spa



LKS Ingeniería



European Science Communication Institute (ESCI)





Thank you for your kind attention!



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