

# NEWSLETTER

Nº 5 - May 2024

## An innovative application based on neural networks controls the Life Desirows plant

One of the scientific contributions to the Life Desirows project, financed with funds from the European Union's Life programme, is the research article 'Cooling tower modeling based on machine learning approaches: Application to Zero Liquid Discharge in desalination processes'.

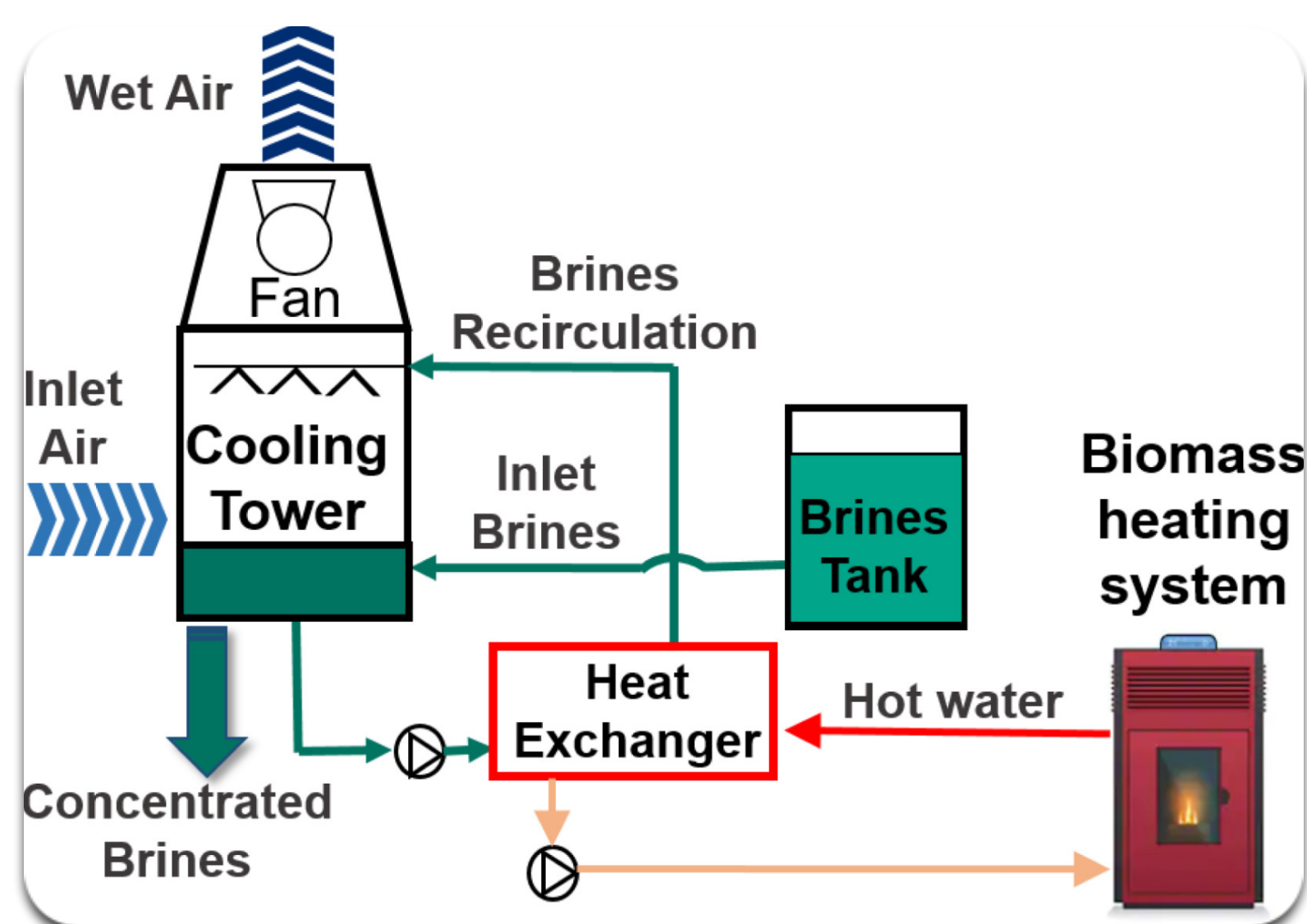
The work was published on April 1 in ScienceDirect and can be accessed at this link: [See article in ScienceDirect](#)

The article is signed by the professors of the Polytechnic University of Cartagena - Life Desirows partner - Francisco Vera García, Ángel Molina García and María Bueso, as well as Amanda Prado de Nicolás.

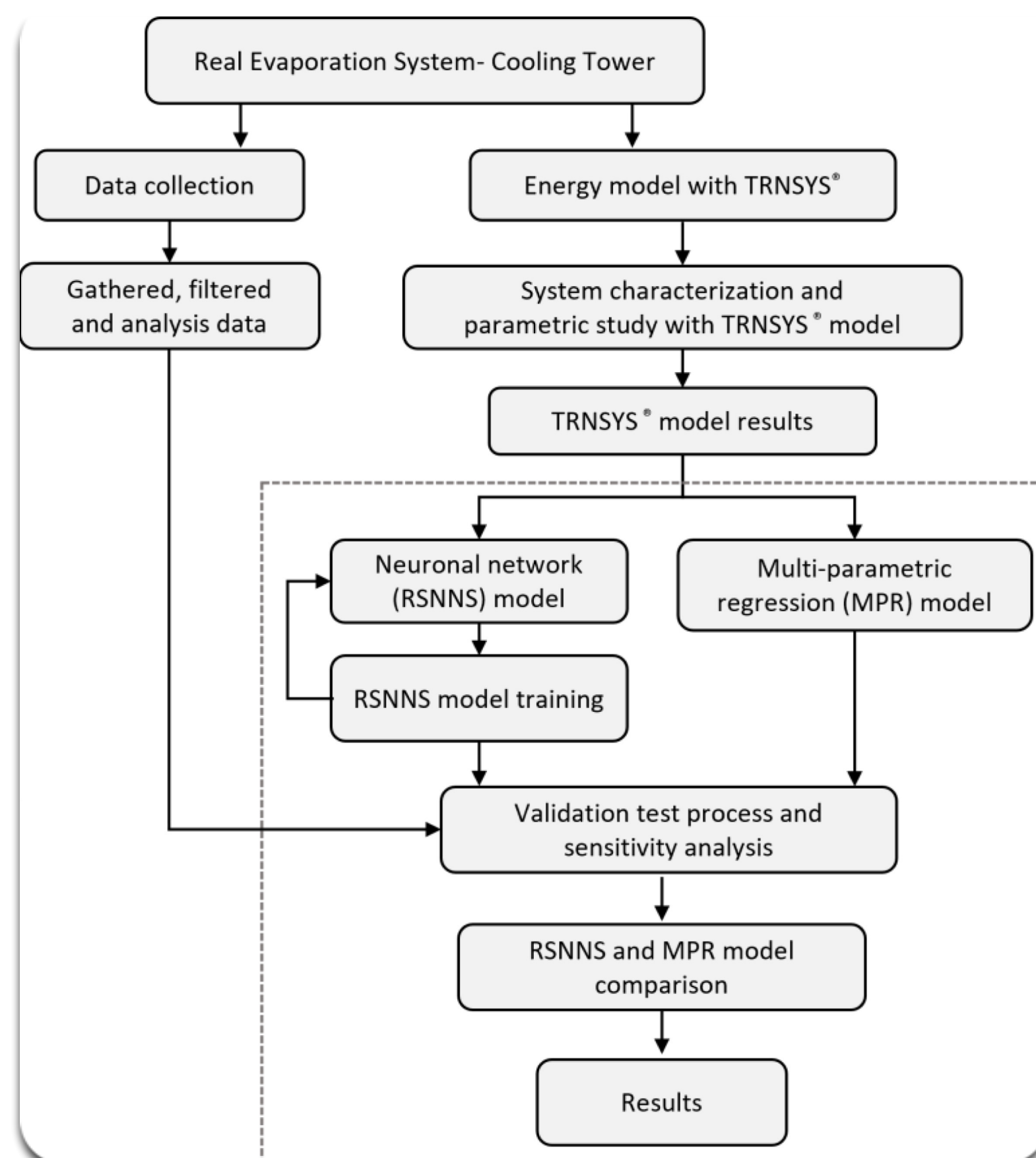
The 'abstract' of the publication explains that in recent years concern has increased over the environmental impacts of water desalination, driving the adoption of Zero Liquid Discharge (ZLD) processes. These processes allow desalination plants to minimize their ecological footprint and move towards sustainability.

"A novel approach – adds the work – has been the use of multilayer perceptrons (MLP), a deep learning artificial neural network, to estimate the mass of evaporated water in cooling tower systems. This method has been compared with traditional linear regression models. Using TRNSYS software, more than 12,000 data points were simulated to train the neural network, which was then evaluated with real data from a ZLD desalination plant in Cartagena-Mar Menor, Spain." Specifically, the Life Desirows plant.

"The analysis revealed that the MLP model – the article continues – outperformed the linear model, with a higher precision of 0.76%. Furthermore, it demonstrated computational efficiency and robustness, highlighting the importance of brine inlet temperature in water evaporation. "These results underline the potential of MLP for diverse applications and environmental contexts, promoting its use in future studies."



Cooling tower system flowchart



Proposed methodology





In the image you can see the different components that allow the Life Desirows plant to meet its objectives

## Brine reduction tests continue successfully on the prototype

The prototype of the Life Desirows project continues in the testing phase. Thermal and membrane technologies have been implemented to achieve zero liquid discharge, thus protecting the area of the Mar Menor Coastal Lagoon, located in the Region of Murcia (Spain).

Reverse osmosis (RO) concentrates the brine by 75%. Subsequently, a denitrification process eliminates the contained nitrates.

The Cooling Tower (CT) and Mechanical Vapor Compression (MVC) operate in parallel.

The feed from the DN is heated with the biomass boiler, reaching temperatures of up to 50 °C.

In both systems, evaporation occurs and a brine reduction of 80% is achieved.

Finally, the wind-assisted intensified evaporation (WAIV) system reduces liquid waste to zero and salts are collected.

All these technologies allow us to meet the environmental objectives of the Life Desirows project:

- Maximization of regenerated water from rejected flows.
- Elimination of contaminants, preventing their discharge into aquatic ecosystems.
- Minimization of brine volume.
- Promotion and increase of Renewable Energies.



## PARTNERS

# HIDROTEC: environmentally friendly water treatments

HIDROTEC Water Treatment is a company focused on the engineering, construction, maintenance and installation of water treatment equipment using the most innovative technologies.

Due to the activity it carries out, which is the construction and maintenance of water treatment plants, HIDROTEC is clearly committed to the Environment, adapting its processes to the environmental regulations that apply to it, demonstrating that it is possible to combine technological progress with The respect to the environment. We set goals for continuous improvement and pollution prevention measures.

The company develops desalination systems with reverse osmosis, micro/ultra/nanofiltration, separation of other compounds such as sugars based on their molecular weight, gas transfer, (O<sub>2</sub>/CO<sub>2</sub> elimination-carbonation/oxygenation) using membrane contactors or elimination of selective ions using ion exchange resins such as boron or nitrates and contaminant adsorption equipment in the treatment of drinking water.

HIDROTEC provides comprehensive solutions to water problems, using the most innovative technologies and developing compact and transportable treatment plants.

HIDROTEC supplies fully assembled modular installations in compact racks that are easy to install and transport. They fit perfectly into small spaces since the sand filter module is physically separated from the osmosis frame and are designed to facilitate the actual maintenance work of the equipment and facilitate its operation.

**HIDROTEC**  
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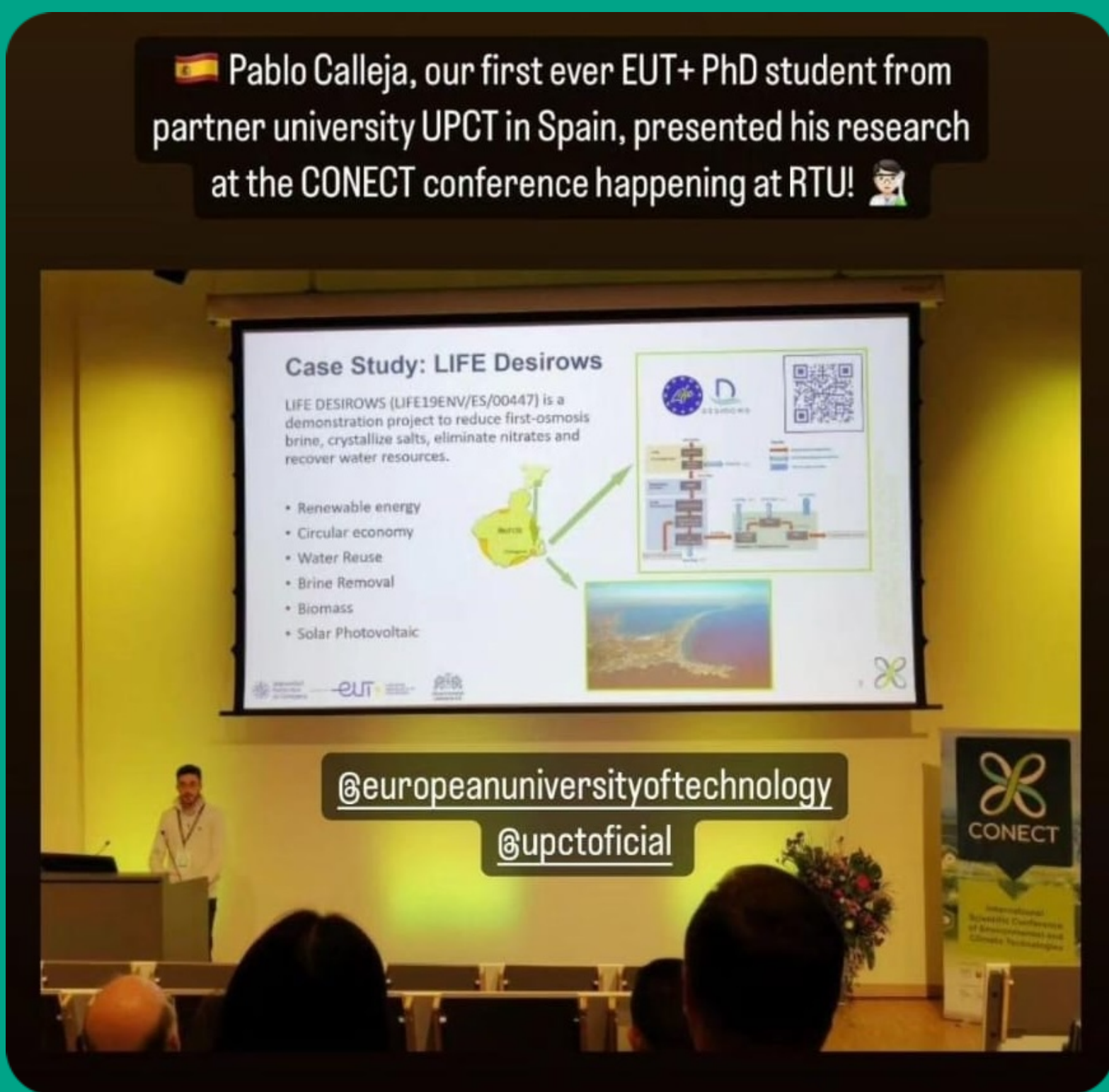
The company headquarters is located in La Palma, in Cartagena (Murcia)

The HIDROTEC maintenance team is capable of reacting and assisting quickly at the facilities where the equipment is located, in order to provide a proactive and effective service, whether locally or abroad.

HIDROTEC staff is trained to face all the challenges that may arise in this type of installations. By working remotely with the engineering team, they can troubleshoot and repair all issues in the field, from mechanical or hydraulic to electronic or control.

HIDROTEC contributes its knowledge and experience in the design and construction of the Life Desirows plant.





Pablo Calleja, a doctoral student at the European University of Technology, a consortium of which the Polytechnic University of Cartagena, a partner of Life Desirows, is a member, has used as an example the technologies implemented in the project's pilot plant. The presentation as a case study was made within the framework of the CONECT conference, which took place between May 15 and 17 in Riga, capital of Lithuania.

The research work is signed, in addition to Pablo Calleja, by the UPCT professor and member of the Department of Thermal and Fluid Engineering, Francisco Vera García.

The presentation is titled 'Mechanical vapor compression desalination process: approaches to optimize compressor's consumption for brine valorization'

In it, it uses as a case study the Life Desirows demonstration project, designed to reduce first osmosis brines, crystallize salts, eliminate nitrates and recover water resources. And its objective is the use of renewable energies, the Circular Economy and the reuse of water. The project uses biomass and solar photovoltaic energy.

## New Life call

As the EU's flagship initiative to finance environmental and climate actions, the LIFE Program is an opportunity to turn your ideas into reality. In this year's call, 571 million euros are distributed.

How can I obtain more information?

See full details of the different types of LIFE project grants, application deadlines and much more on the LIFE 2024 calls for proposals page: [https://cinea.ec.europa.eu/programmes/life/life-calls-proposals-2024\\_en](https://cinea.ec.europa.eu/programmes/life/life-calls-proposals-2024_en)

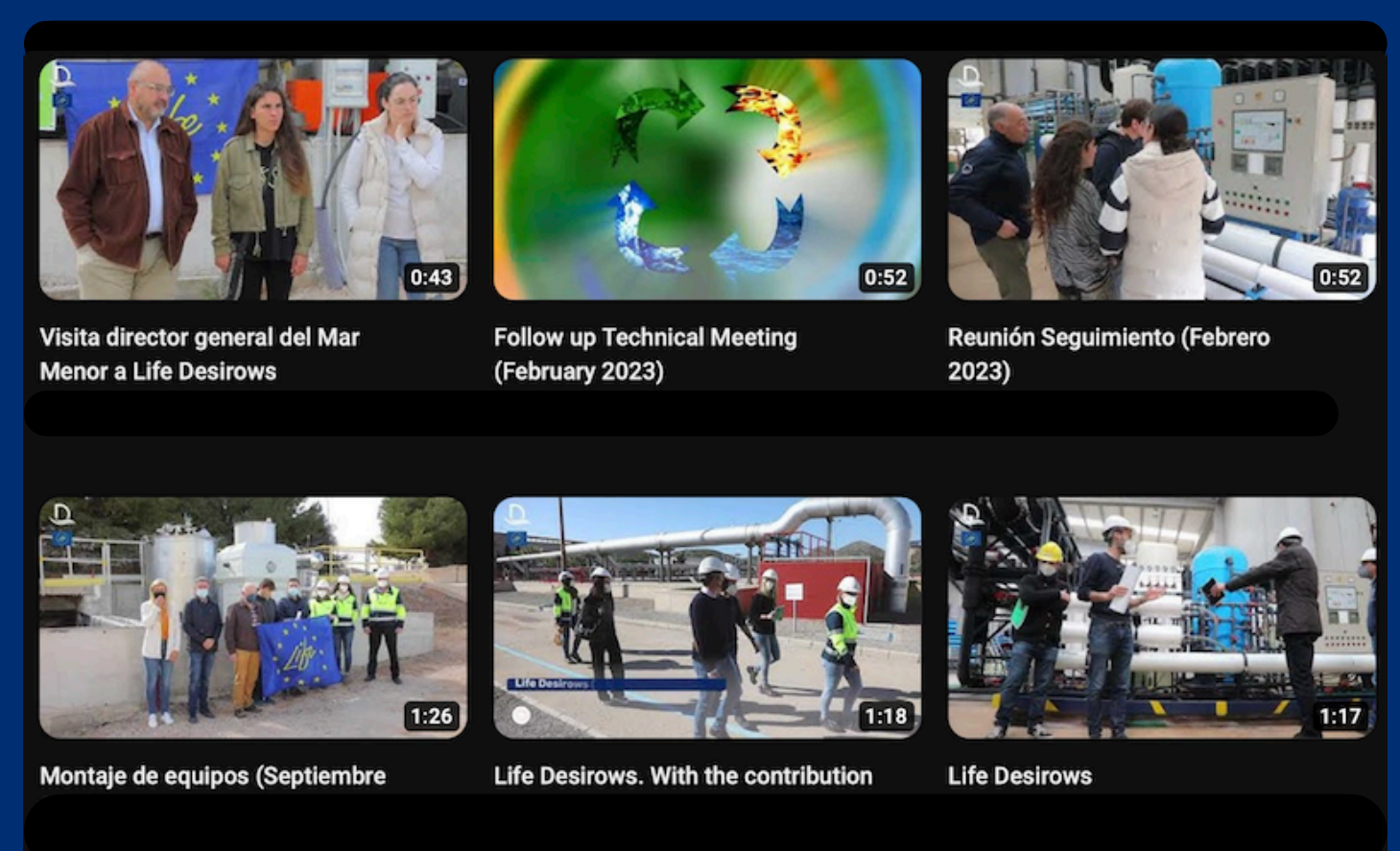
The LIFE Program is the EU's funding instrument for the environment and climate action. It has been bringing green ideas to life since 1992 and to date has co-financed more than 5,500 projects across the EU and in third countries.

## Follow us on X and Youtube

If you want to be up-to-date with the project, you can follow us on our website:

<https://lifedesirows.eu/>

As well as on X and YouTube:



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