



ZELDA
Zero ● Liquid ♦ Discharge ► Desalination

| Layman's Report



Project Information

Project Ref.: LIFE12 ENV/ES/000901
Start Date: July 2013
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Contact: infor@ctm.com.es

Project Coordination



Project Partners

FUJIFILM

ABENGOA



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Introduction

The environmental problem targeted

Water stress and water scarcity are critical issues in many regions all over the world, including Europe. According to the available information, at least 10.4 % of the EU territory and 14.3 % of the EU population have been affected so far by water scarcity situations. Currently, the seawater and brackish water desalination are one of the best options to face up the water scarcity problem. However, this technology generates high amounts of brine that must be managed.

In coastal desalination plants, brine is discharged to the sea while in the inland desalination plants deep well injection and surface water or groundwater discharge are the most common options. Brine management has a high environmental impact, especially in the case of inland desalination plants hampering the implementation of desalination technologies.

ZELDA project

Responding to the need of a brine management strategy that makes desalination a sustainable technology at environmental, economical and social level, ZELDA project proposes an innovative brine treatment system that has low environmental cost and a favourable social effect in the

communities! ZELDA project is here to demonstrate the sustainability at all levels of a new brine treatment system decreasing the environmental impact associated to desalination processes.



Objectives

The main objective of the ZELDA project is to demonstrate and disseminate the technical and economical feasibility of decreasing the overall environmental impact of desalination systems by adopting brine management strategies based on the use of electrodiagnosis metathesis (EDM) and valuable compound recovery processes with the final aim of reaching a zero liquid discharge (ZLD) process.

Electrodiagnosis metathesis (EDM) is the intermediate stage that allows to concentrate the brine and recover water, increasing the overall recovery of the desalination systems.

To reach a Zero Liquid Discharge (ZLD) desalination, and to make the brine management more economically feasible, the concentrate stream from EDM is treated to recover valuable compounds, as well as additional pure water.

Strategy



Pilots plant & Installation

- Pilot plant installed at Almeria seawater desalination plant.
- Evaluation of seawater brine and brackish water brine.



Almeria



EDM - Pilot Plant



EDM Stack



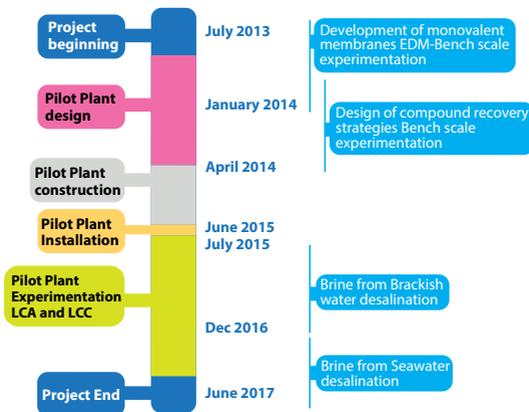
Concentration Plant



Evaporation Ponds



ZELDA Project: 4 years at a glance



Which are ZELDA's Results?

➤ **Versatile ZLD process based on EDM and physical-chemical treatments for recovering valuable chemical compounds:**

ZELDA project has demonstrated that this technology can be applied to treat brines from both brackish water and seawater desalination.

➤ **New monovalent membranes** developed by FUJIFILM allow increasing brine treatment capacity and avoiding the use of NaCl.

➤ **High water recovery:**

EDM allows achieving more than 80% of water recovery for brackish water and seawater brines. This makes possible increasing the overall water recovery of the existing desalination plants.

➤ **Valuable compound recovery.**

ZELDA process allows to recover high quality $Mg(OH)_2$. Depending of brine composition other compounds such Na_2SO_4 or NaCl can be recovered. This contributes to make ZELDA process economical feasible and decreasing the environmental impact of obtaining valuable compounds recovered via conventional mining activities.

➤ **Advanced solar evaporation allows increasing the evaporation rate in 20% in comparison with conventional evaporation ponds.**

➤ **Reduction or elimination of brine disposal cost for inland desalination plants.**

➤ **Decrease the brine discharge into water bodies.**

➤ **Increase the public awareness on the environmental impact of current brine discharge strategies.**

	Brine treated	
	Brackish water desalination	Seawater desalination plant
Water recovery of ZELDA process	>80%	>80%
Mg(OH) ₂ recovered (kg/m ³ brine)	0.2	2.2
Na ₂ SO ₄ recovered (kg/m ³ brine)	1.7	-
NaCl recovered (kg/m ³ brine)	17	45
Mixed Salt (NaCl+Na ₂ SO ₄) (kg/m ³ brine)	2.7	-

What does ZELDA mean for society at large?

ZELDA project is expected to have a huge positive socio-economic impact not only at the south of Spain region where it got tested and implemented, but also in other parts of Europe facing the same problems related to water scarcity. Having achieved its objectives, ZELDA project will offer a clear benefit in the whole European territory and especially to those zones, as the Mediterranean region, with severe water stress, fighting against the impacts of the climate change without being a threat to the environment but also being in agreement with the current and future European, national and regional water legislation. ZELDA project will contribute to:

- >Reducing water scarcity.
- >Having freshwater at lower costs and achieving lower environmental impact.
- >Having water bodies at a better quality.
- >Stimulating new productive activities based on recovery of valuable compounds.
- >Educating and making citizens aware of this innovative technology.



Salt recovered from evaporation ponds



Valuable compounds recovered: Mg(OH)₂ and Na₂SO₄

Dissemination Activities

Dissemination activities were at the core of ZELDA Project throughout its duration. Numerous activities were carried out, aiming to raise awareness about the project's results among

scientists, technology developers, utility representatives, large water users, policy makers, finance experts, citizens and students.



*ZELDA Open Day, 21st June 2016
Brussels, Belgium*

*Workshop LIFE Projects Day,
8 November 2016
Manresa, Spain*





*ZELDA at EUROMED 2017
 'Desalination from Clean Water and Energy: Cooperation around the World'
 Tel Aviv, Israel*



Visits to Almeria's Desalination Point



Presence in Social Media and Internet

ZELDA

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