SOL-BRINE

Renewable energy driven system for brine management with water recovery

D. Xevgenos, K. Moustakas, M. Loizidou

Dr. Konstantinos Moustakas

National Technical University of Athens

konmoust@central.ntua.gr

SOL-BRINE Project

- **Area of implementation:** Tinos Island, Greece
- **Project Budget:** 1,209,689.00 €
- **EC Funding (LIFE+):** 604.844,00 € (50% of Total Budget)
- **Duration:** 39 months
- **Start date:** 01/10/2010
- **End date:** 31/12/2013

SOL-BRINE: Partners

Municipality of Tinos Island (Project Coordinator)

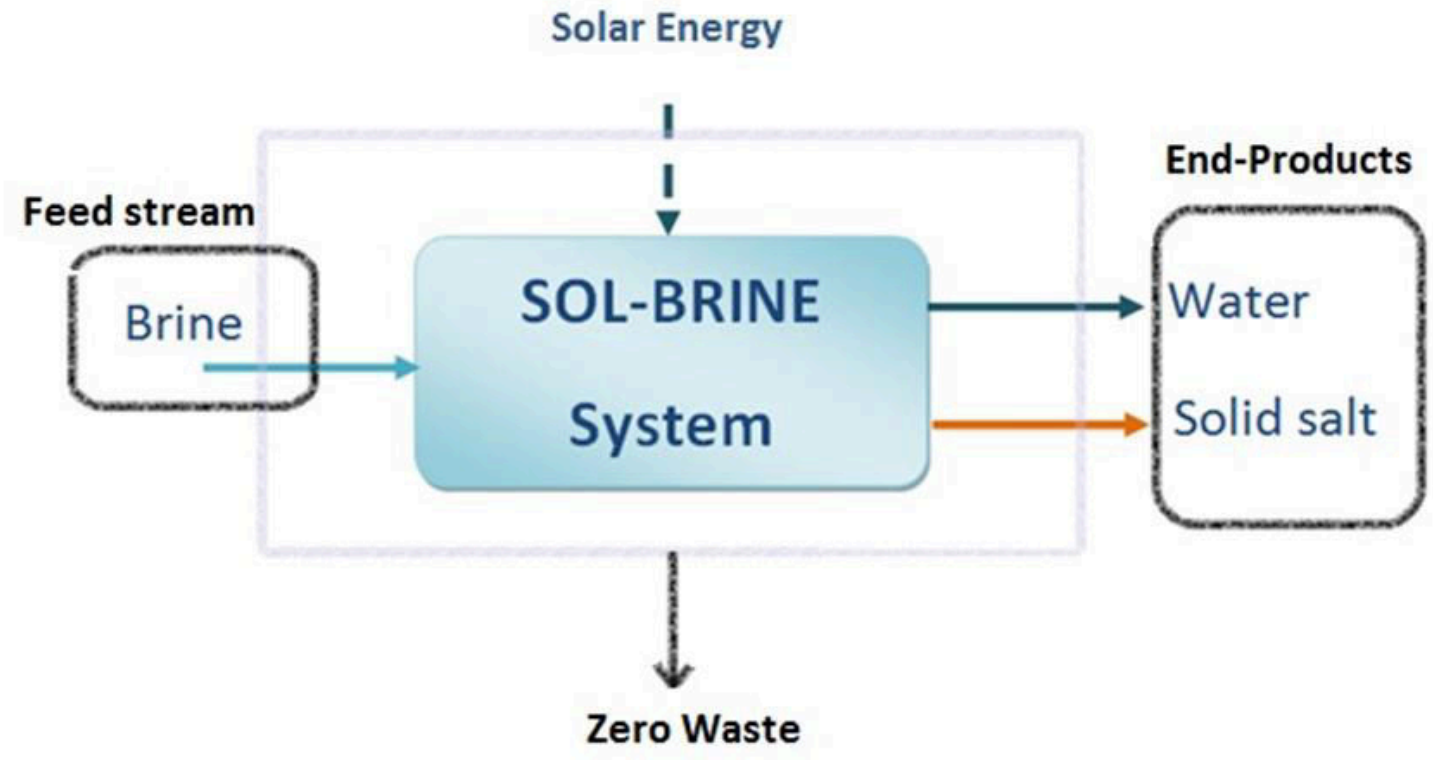
National Technical University of Athens (NTUA)
School of Chemical Engineering
Unit of Environmental Science and Technology (*UEST*)

Culligan Hellas S.A.

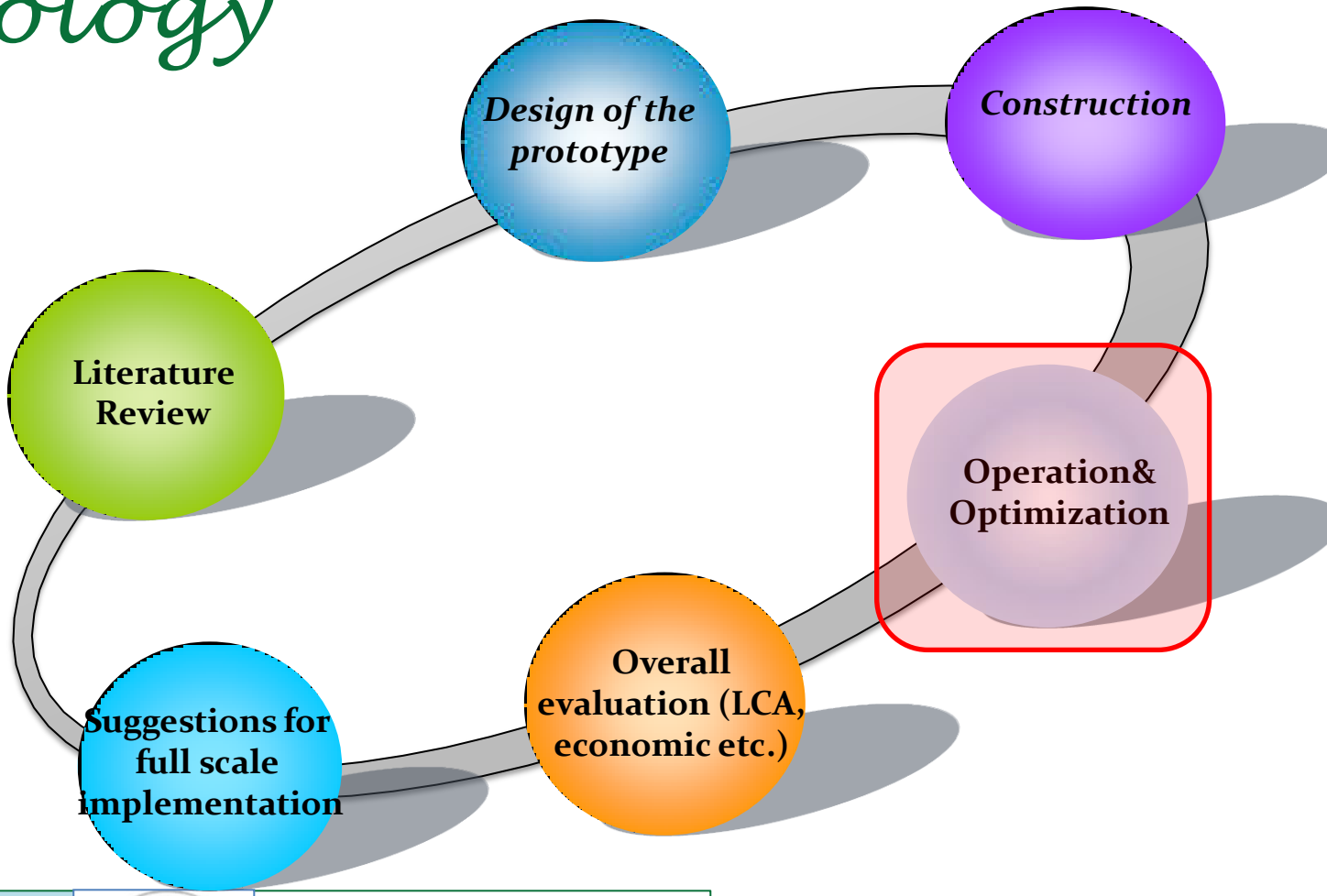
SOL-BRINE: Main aim

"The main objective of this project is the development of an innovative, energy autonomous system for the treatment of brine from seawater desalination plants"

SOL-BRINE: Concept



Methodology



Innovative aspects of the project

- **Total brine elimination.** The system has been designed in line with the Zero Liquid Discharge principle
- **Water Recovery** (>90%)
- **Production of useful end-products.** Through the operation of the prototype system the following two products are produced: (a) distilled water of high quality and (b) dry salt. These products have potential market opportunities.

Innovative aspects of the project

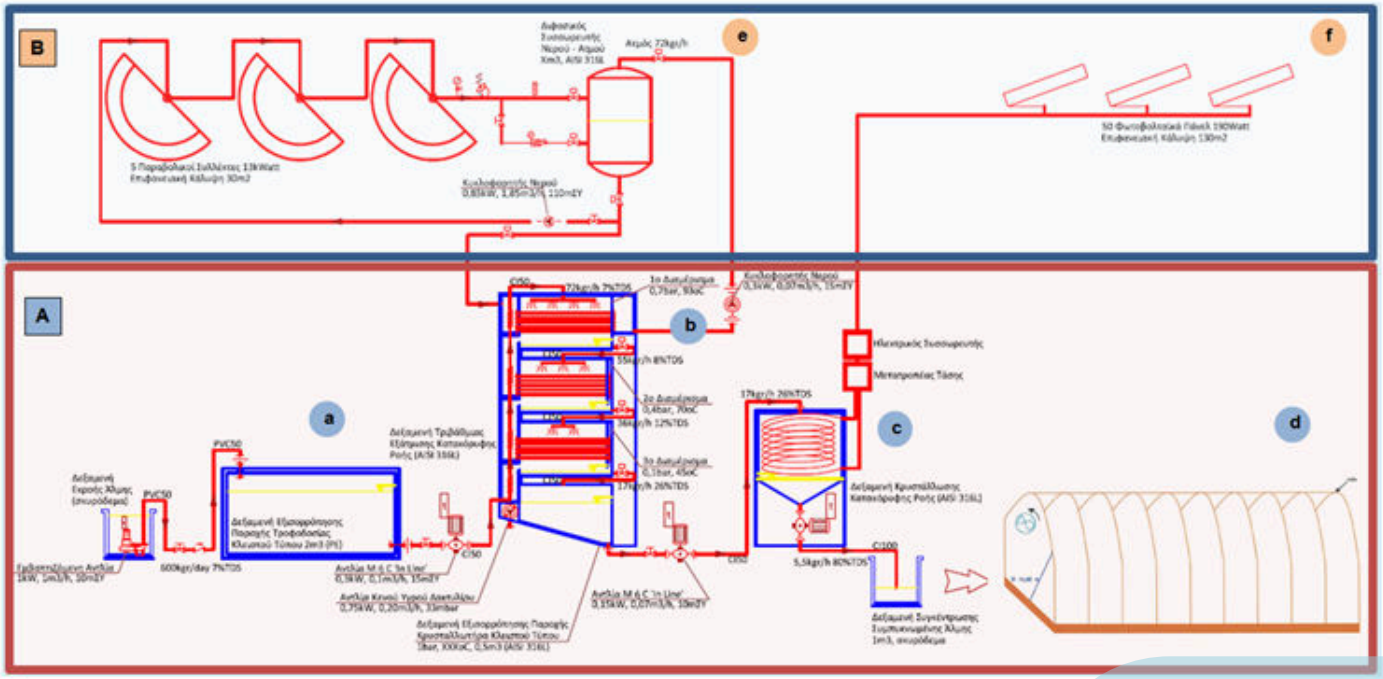
- **Energy autonomous operation**. Solar thermal collectors are used for delivering hot water (10 KW_{th} at approximately 70°C) and a photovoltaic generator (10 kW_{el}) for electricity. All energy requirements are covered exclusively through the use of solar energy

- **Use of state-of the art technology**: the evaporation of water is realized through custom designed vacuum evaporation technology (evaporator and crystallizer) and solar dryer

The innovative SOL-BRINE system comprises:

(a) the energy supply system and

(b) the brine treatment system



Legend

A	Brine Treatment System	B	Energy supply system
a	Feed water tank	e	Solar thermal collectors
b	MED Evaporator	f	Photovoltaic generator
c	Crystallizer		
d	Dryer		

Single line diagram

Energy supply system

Brine treatment system

The brine treatment system is consisted of the following units:

(a) Evaporator

(b) Crystallizer

(c) Solar Dryer

Evaporator unit

Figure: View of the interior (1st Effect)

Figure: Transportation of the evaporator unit from the manufacturer's facilities

Evaporator unit

Figure: View of the evaporator (installed on site)

Crystallizer unit (installation)

Transportation (JCB vehicle, photos on the top) and placement (chain pulley block, photo on the left) of the crystallizer unit – *16/10/2012*

[Video 1]

Crystallizer unit

Figure: View of the crystallizer (installed on site)

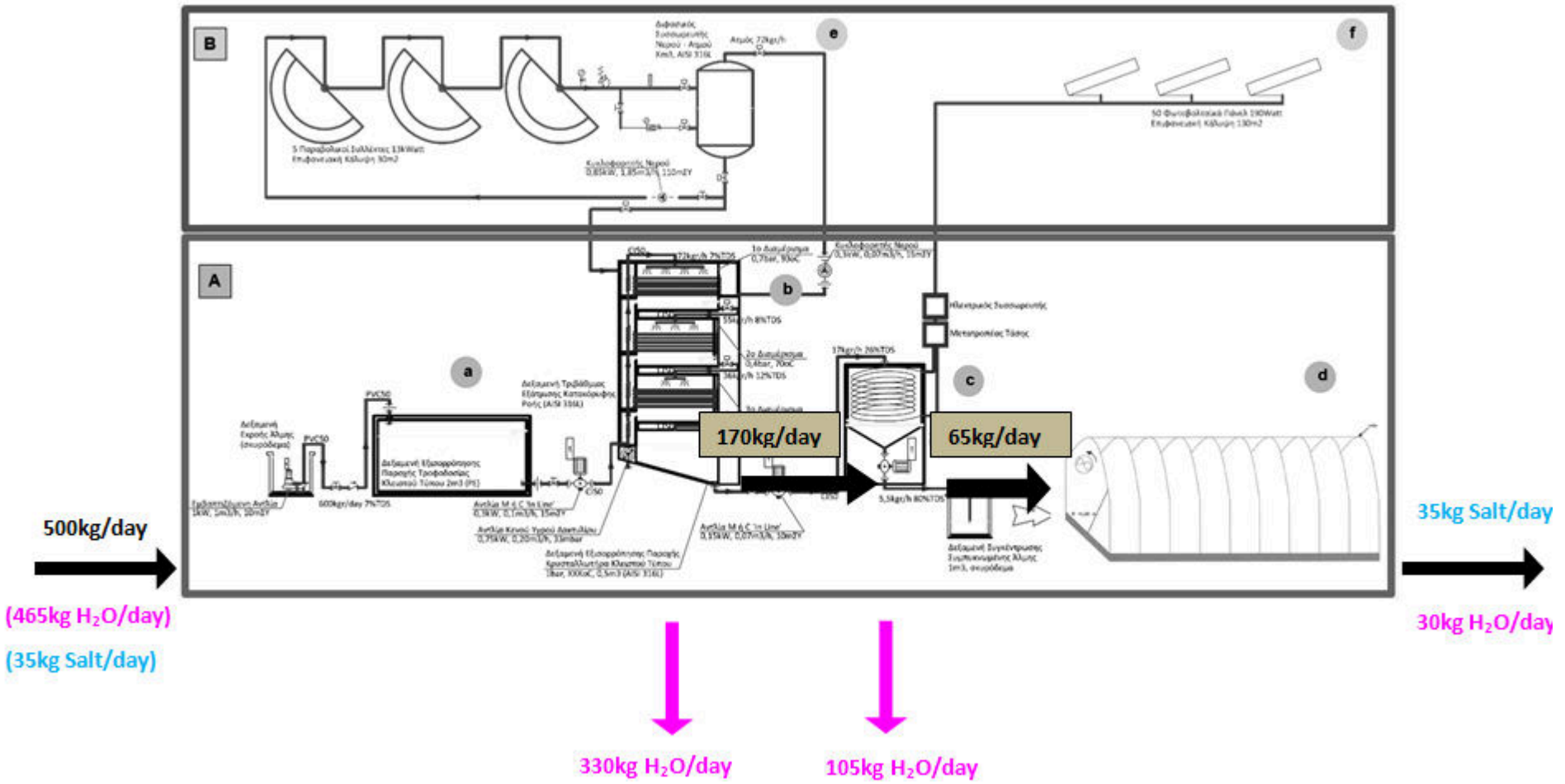
Solar Dryer (installation)

Installation of the dryer – *12-13/10/2012*

Dryer unit

Figure: View of the dryer (installed on site)

Mass Balance



SOL-BRINE: Next steps

- The system will operate throughout a whole year in order to test its performance under different climatic conditions
- A software tool is being developed for the simulation of the prototype's performance. The simulator will be validated through the use of real experimental data
- The system's performance will be evaluated in economic and environmental terms (LCA)

Conference invitation

- Please be informed that in the context of the SOL-BRINE project an International Conference will be held in Tinos Island, Greece from 19th to 21st **September 2013**.
- More information available at: http://win4life.uest.gr

Papers on these topics are welcome:

- Water resources: challenges and management
- Industrial wastewater management and reuse
- Integration of wastewater reuse in the overall water resources management
- Zero Liquid Discharge Applications and Best Available Techniques (*BAT*)
- Role of desalination in addressing water challenges
- Advanced Desalination Techniques
- Desalination powered by Renewable Energy Sources (RES)
- Solar Desalination applications
- Environmental pressures associated with brine production
- Success stories on brine management within EU (cases for islands will be favored)
- Materials and corrosion resistance considerations
- Chemical free desalination
- Barriers and suggestions for full-scale implementation of ZLD approaches

- Authors wishing to submit a paper should send an Abstract to the konmoust@central.ntua.gr by 15th May 2013.
- A number of papers will be published in a special volume of Desalination and Water Treatment journal.

Photo from the constructed prototype brine treatment system!

Thank you for your attention!