



Fraunhofer Institut
Grenzflächen- und
Bioverfahrenstechnik

New concepts for the de-centralised supply of drinking water

by

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3



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Context:

The development of the technologies mentioned in this presentation is in accordance to technological philosophy of the Fraunhofer alliance **SYWA**.

The supply and treatment of water should be:

- Sustainable
- Operated by renewable sources (water and energy)
- Environmental friendly
- Based on a management of use and re-use

Potential sources for drinking water:

Source	Problems or requirements (a selection)
Ground water:	<ul style="list-style-type: none">• <i>Typically requires treatment</i>• <i>No general availability</i>
Surface water:	<ul style="list-style-type: none">• <i>High risk of contamination requires safety barriers</i>• <i>In some areas: high salinity</i>• <i>Typically requires high efforts for treatment</i>
Rain water:	<ul style="list-style-type: none">• <i>Legal and psychological barriers for use as technical water</i>• <i>No regular availability requires management</i>
Air humidity:	<ul style="list-style-type: none">• <i>Energy need requires a sustainable technical solution</i>

New concepts for regenerative drinking water sources:

Source

Problems or requirements

Ground water:

- *Typically requires treatment*
- *No general availability*

Surface water:

DeSol

- *Contamination requires safety barriers*
- *Issues: high salinity*
- *Typically requires high efforts for treatment*

Rain water:

- *Legal and psychological barriers for use as technical water*
- *No regular availability requires management*

Air humidity:

- *Energy need requires a sustainable technical solution*
-



The DeSol-Concept:

Objectives:

In municipal applications

- *de-centralised treatment of sea water*
- *or brackish water*

by use of regenerative energy sources like solar heat.

In industrial applications

- *desalination of process water*
- *thickening / concentrating up of highly contaminated liquid waste*

by use of low temperature waste heat.

High life cycle cost efficiency by combining cost efficient investment at a efficient performance



The DeSol-Concept:

Idea:

Low temperature vacuum evaporation

where

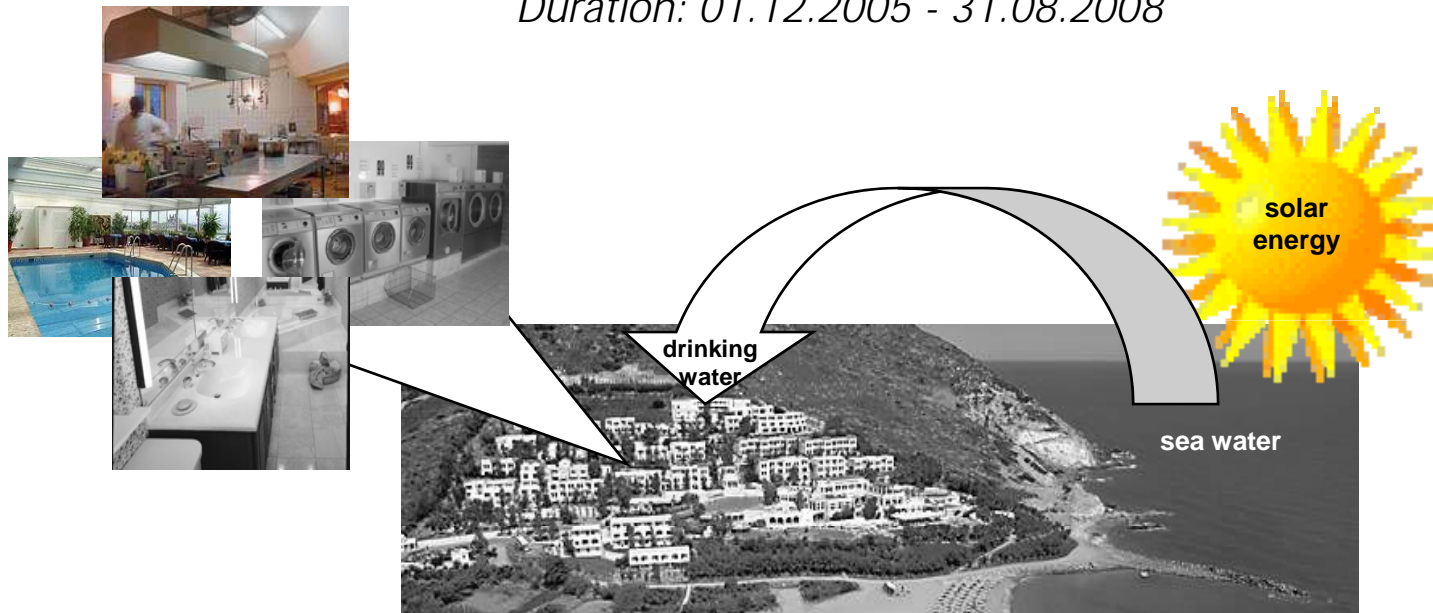
The vacuum is continuously generated by the falling water column of the condensate.



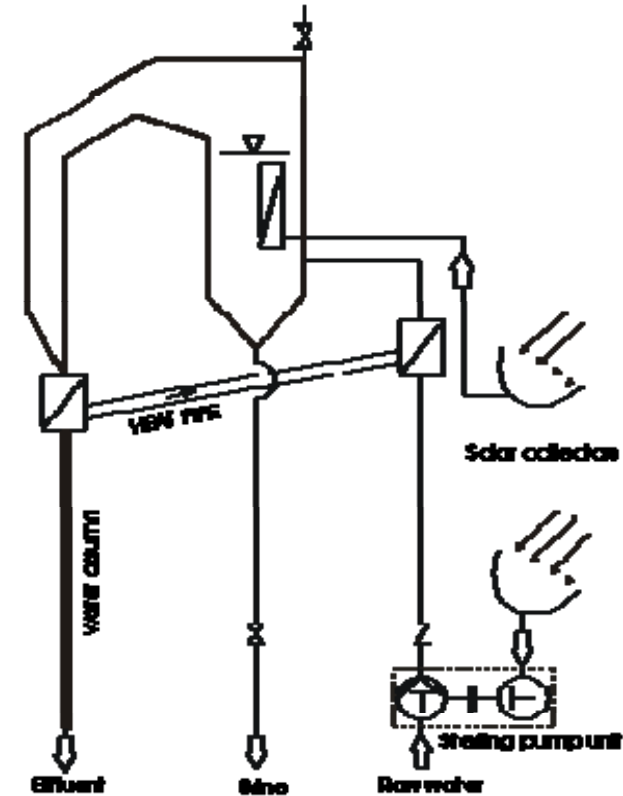
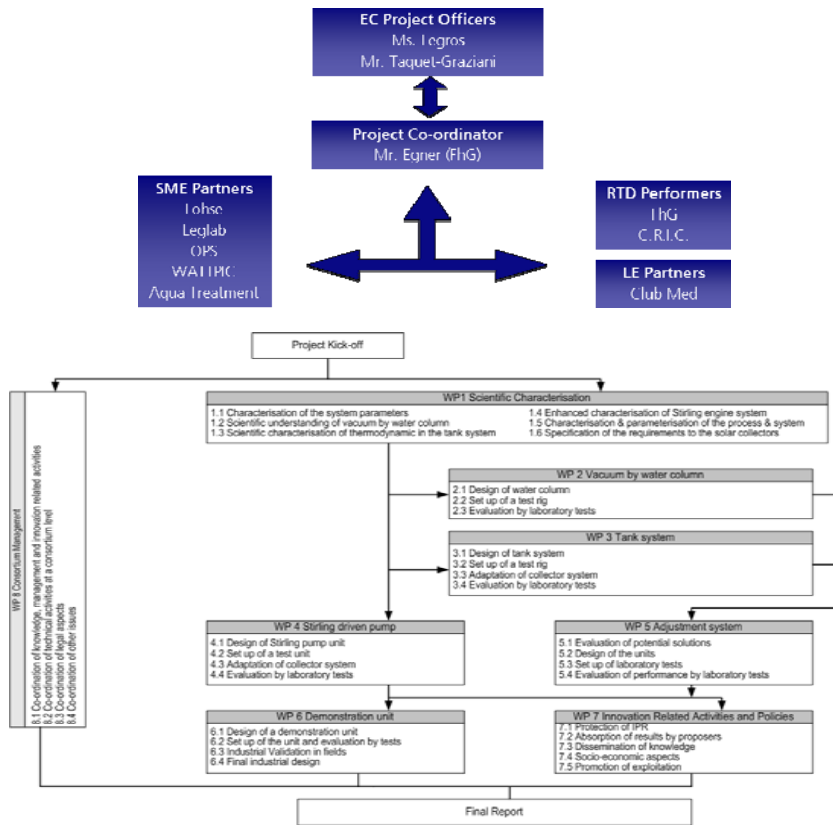
The DeSol-Concept: Apply for EC-funding

Low cost low energy technology to desalinate water to potable water

*EC Contract COOP-CT-2005-017928
Duration: 01.12.2005 - 31.08.2008*



The DeSol-Concept: EC-funded project



OPTICAL
PRODUCTS



Fraunhofer
Technologie-
Entwicklungsgruppe



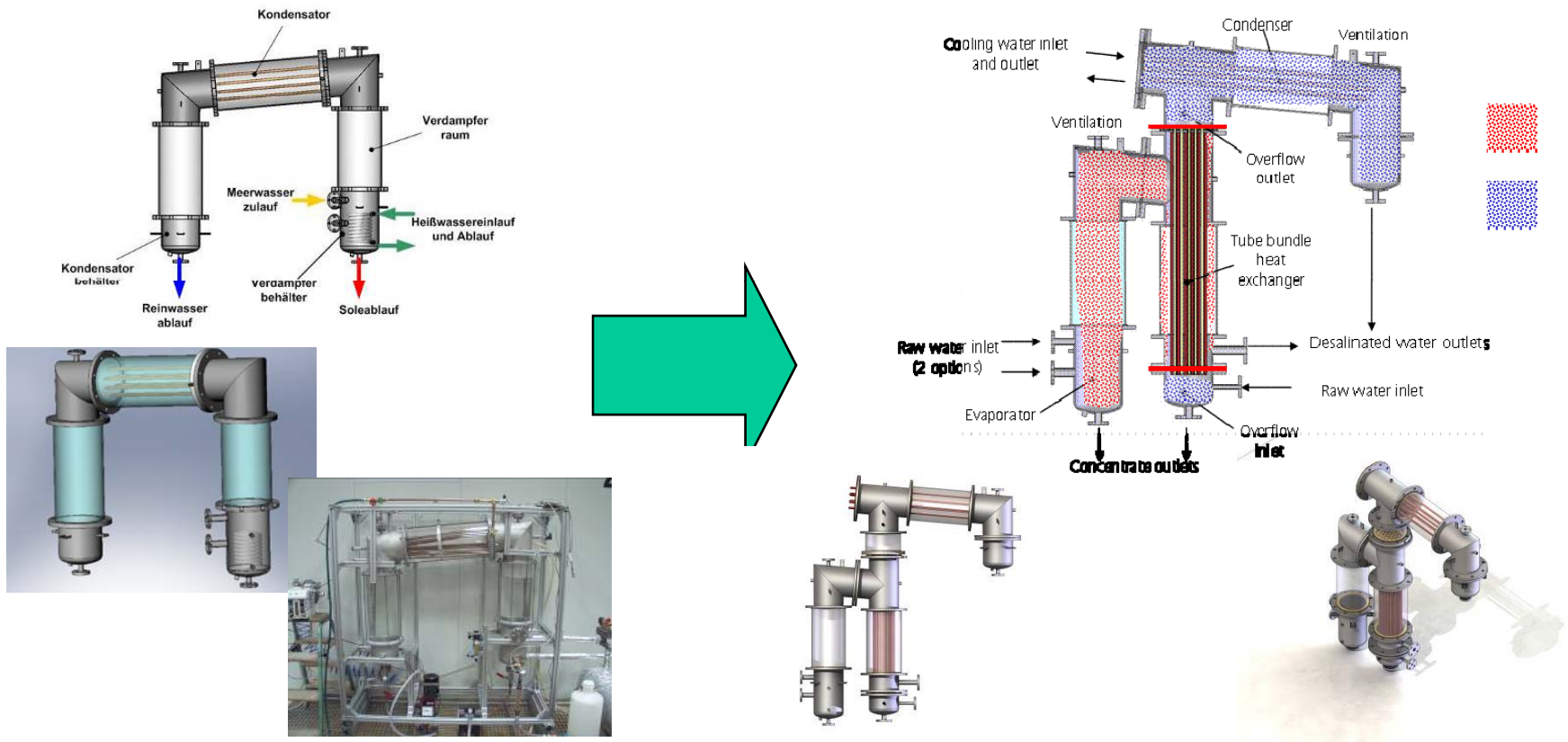
CRIC
CENTRE DE
RECERCA I
INVESTIGACIÓ
DE CATALUNYA

Legelab



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The DeSol-Concept: Proof of principle and development



The DeSol-Concept: demonstration and validation



standard components

New concepts for regenerative drinking water sources:

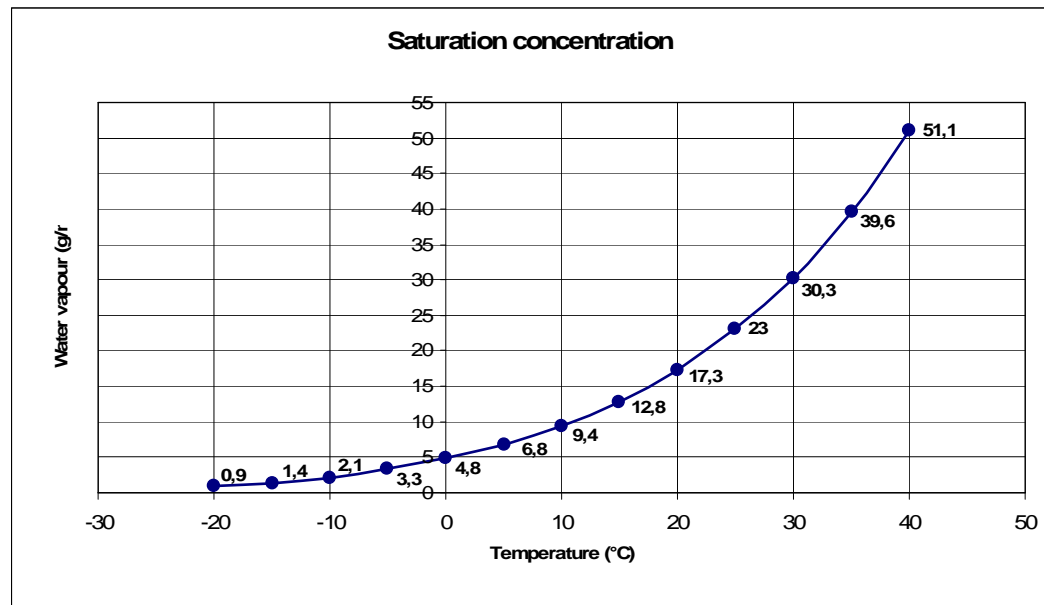
Source	Problems or requirements
Ground water:	<ul style="list-style-type: none">• <i>Typically requires treatment</i>• <i>No general availability</i>
Surface water:	<p>DeSol <i>contamination requires safety barriers</i> <i>risks: high salinity</i></p> <ul style="list-style-type: none">• <i>Typically requires high efforts for treatment</i>
Rain water:	<ul style="list-style-type: none">• <i>Legal and psychological barriers for use as technical water</i>• <i>No regular availability requires management</i>
Air humidity:	<p>Alpha Spring <i>is a sustainable technical solution</i></p>

The Alpa-Spring-Concept:

The fact:

Even at a desert situation on the ground there is water as humidity in the air.

The chart shows:
At what temperature level (in °C) what volumes of water (in grams) can at maximum be contained in one cubic metre of air (relative humidity 100%).



The Alpa-Spring-Concept:

As a mission Mr. Thielow as owner of “LOGOS-Innovationen” has been looking for a unique solution to use the air humidity as a source for drinking water.

They invented and developed the Alpa-Spring-Concept

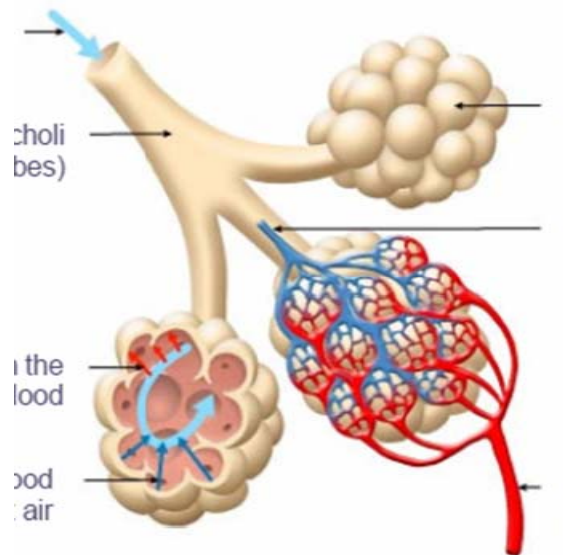


The Alpa-Spring-Concept:

Demands to the development of the Alpha Spring Technology

- generating large quantities of water from the air
- desert durability (self – purifying system e.g. from dust)
- positive environmental influence
- easy maintenance
- continuous water production

The Alpha-Spring-Concept: *Analogy to Biology*



- 1.) Inhaled air
- 2.) Broncholi (=smallest branch of the bronchial tubes)
- 3.) Oxygen from the inhaled air is dispensed into the blood
- 4.) Carbon dioxide is excreted from the blood and exhaled into the ambient air
- 5.) Alveoli (lung vesicles)
- 6.) Oxygen-poor blood from the systemic system
- 7.) Oxygen-enriched blood flows back into the systemic system

Lungs and the Alpha Spring – Technology are self – purifying systems

The alveoli correspond with the pearls of the absorption strings

The element exchange takes place via osmosis

The ventilation of the Lung is equivalent to the wind movement through the reactor

The Alpa-Spring-Concept: the principle

The new concept:

Absorption of humidity with an hygroscopic salt solution

by

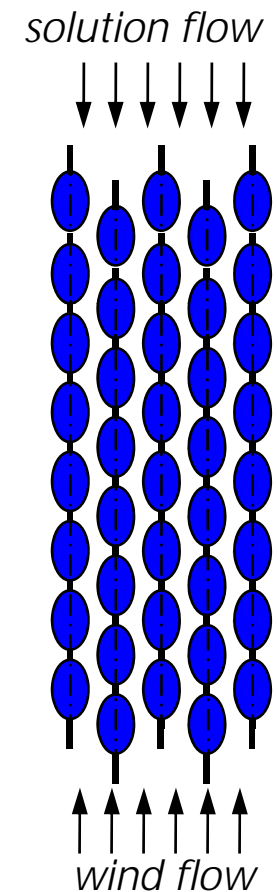
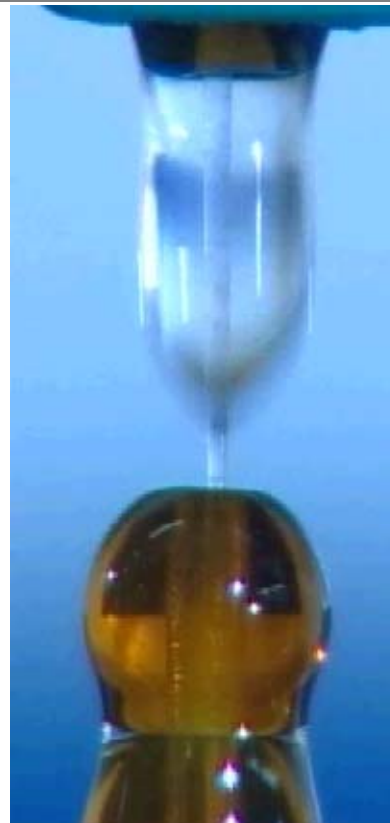
absorbent strings.



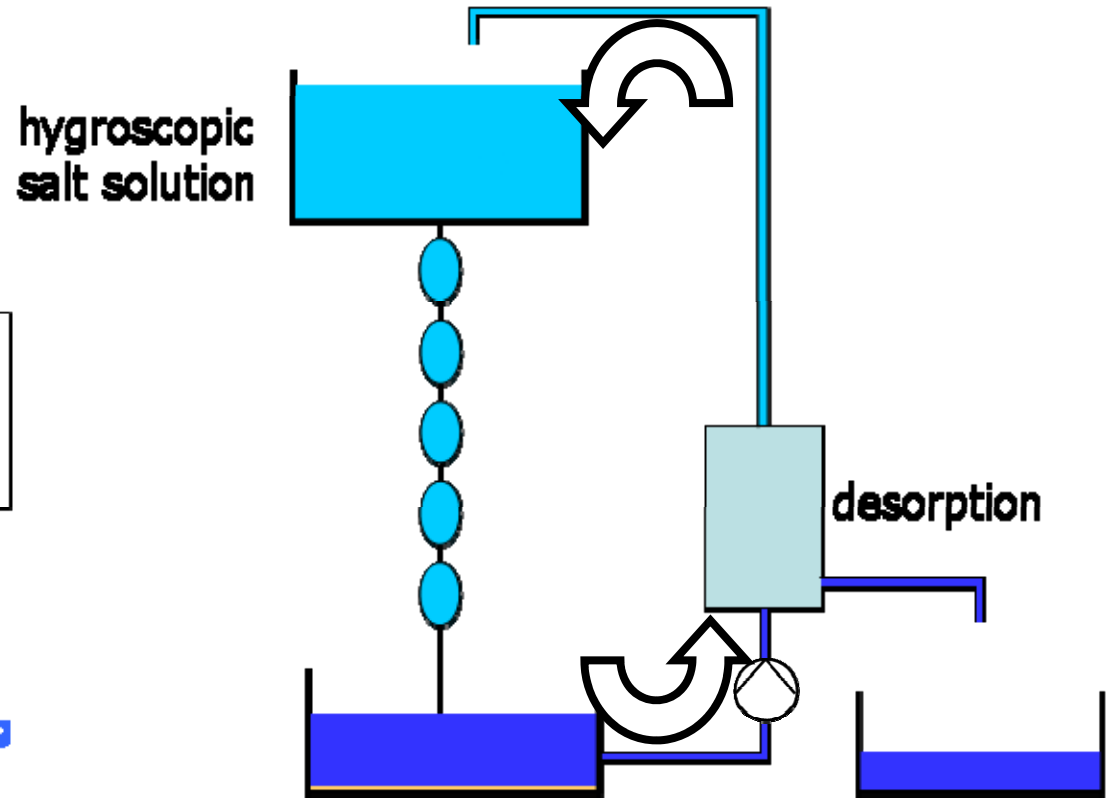
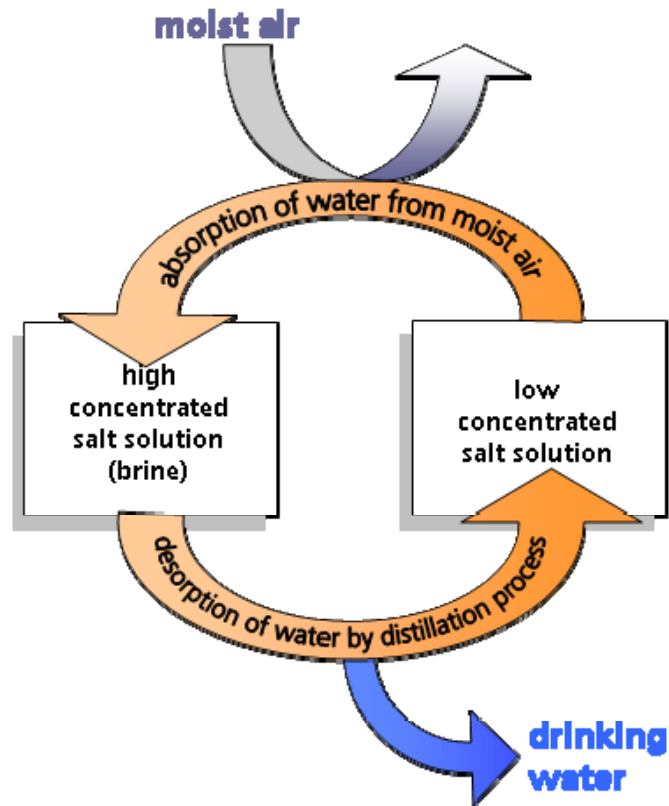
The Alpa-Spring-Concept: the principle

Countercurrent flow of hygroscopic salt solution and air (wind)

Salt solution is trickling down along the pearl strings while they are exposed to the wind flow from the bottom.

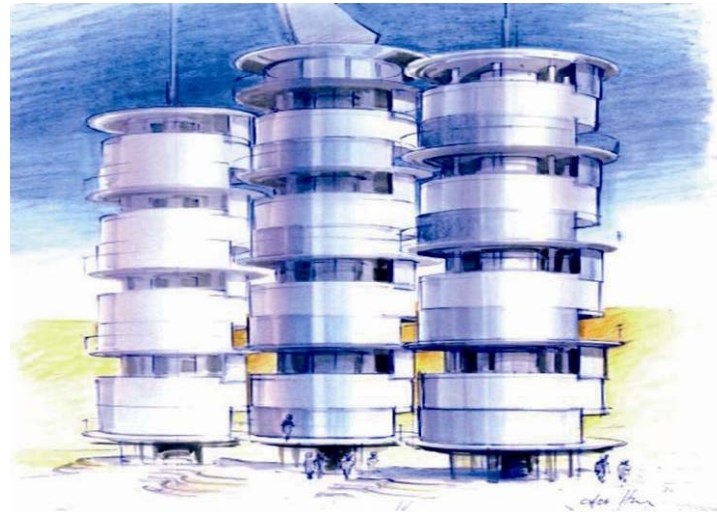


The Alpa-Spring-Concept: the system



2:

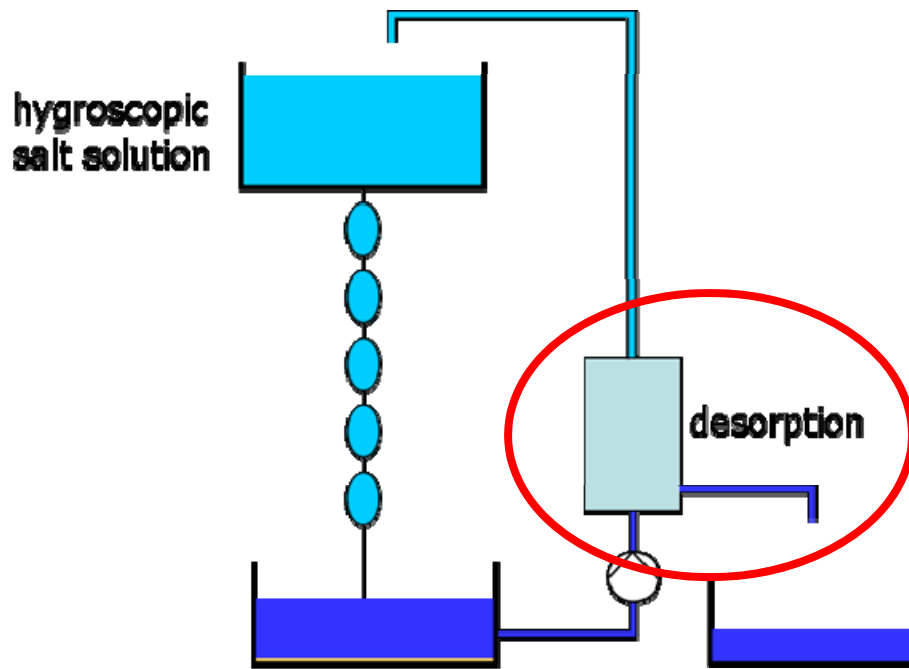
The Alpa-Spring-Concept: demonstration and design



Design studies



The Alpa-Spring-Concept: system improvement

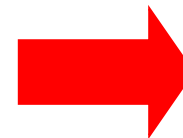


Critical part in the concept of LOGOS:

Works sustainable according to our requirements, if electric power for a standard desorption process is provided e.g. by wind power.

Desorption process has to be sustainable and regenerative too!

Desorption is a distillation process!

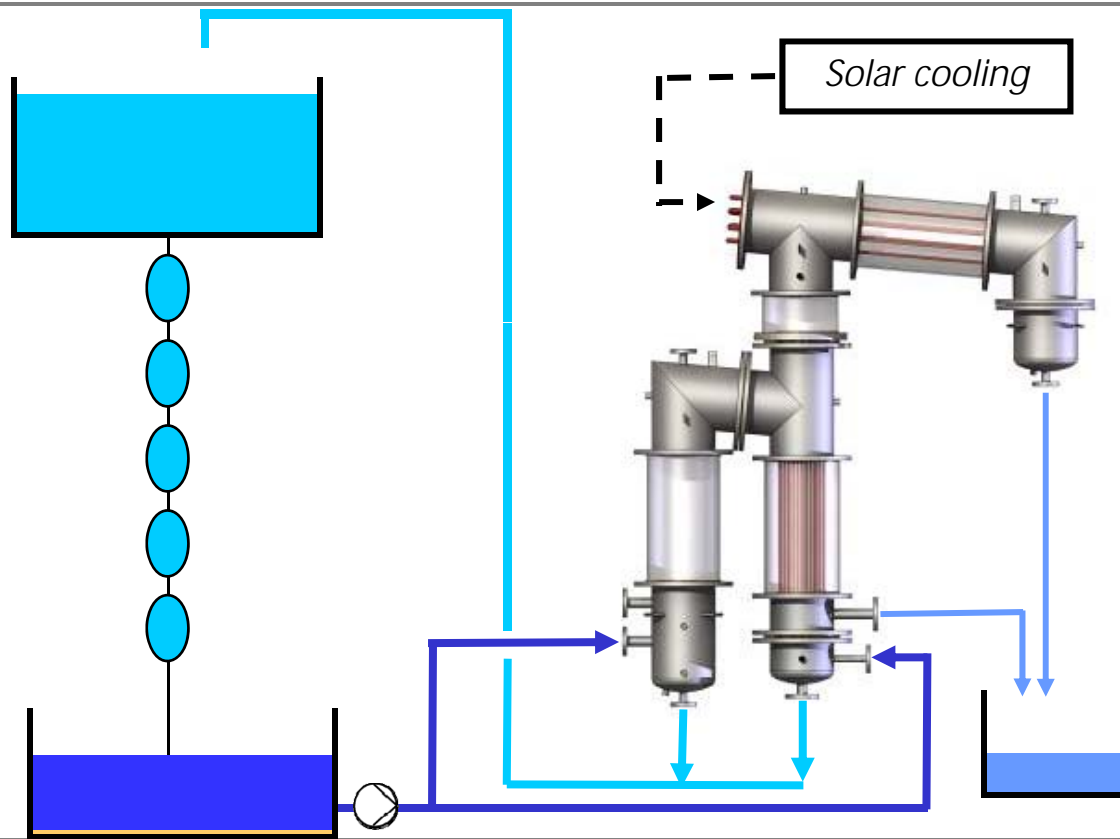


DeSol process

New concepts for regenerative drinking water sources:

Source	Problems or requirements
Ground water:	<ul style="list-style-type: none"> • Typically requires treatment • No general availability
Surface water:	<p>DeSol contamination requires safety barriers</p> <p>Issues: high salinity</p> <ul style="list-style-type: none"> • Typically requires high efforts for treatment
Rain water:	<p>Combination</p> <ul style="list-style-type: none"> • Legal and psychological barriers for use as technical water • No regular availability requires management
Air humidity:	<p>Alpha Spring is a sustainable technical solution</p>

The Combination-Concept: the combined process



The Combination-Concept: demonstration prototype

Upper section:

- *The desorption module*
- *The water columns needed to produce and maintain the vacuum are placed in a conduit that is going down to the tanks on the base floor of the container.*

Middle section:

- *Two absorption modules*
- *The middle part also contains stairs and platforms for maintenance.*

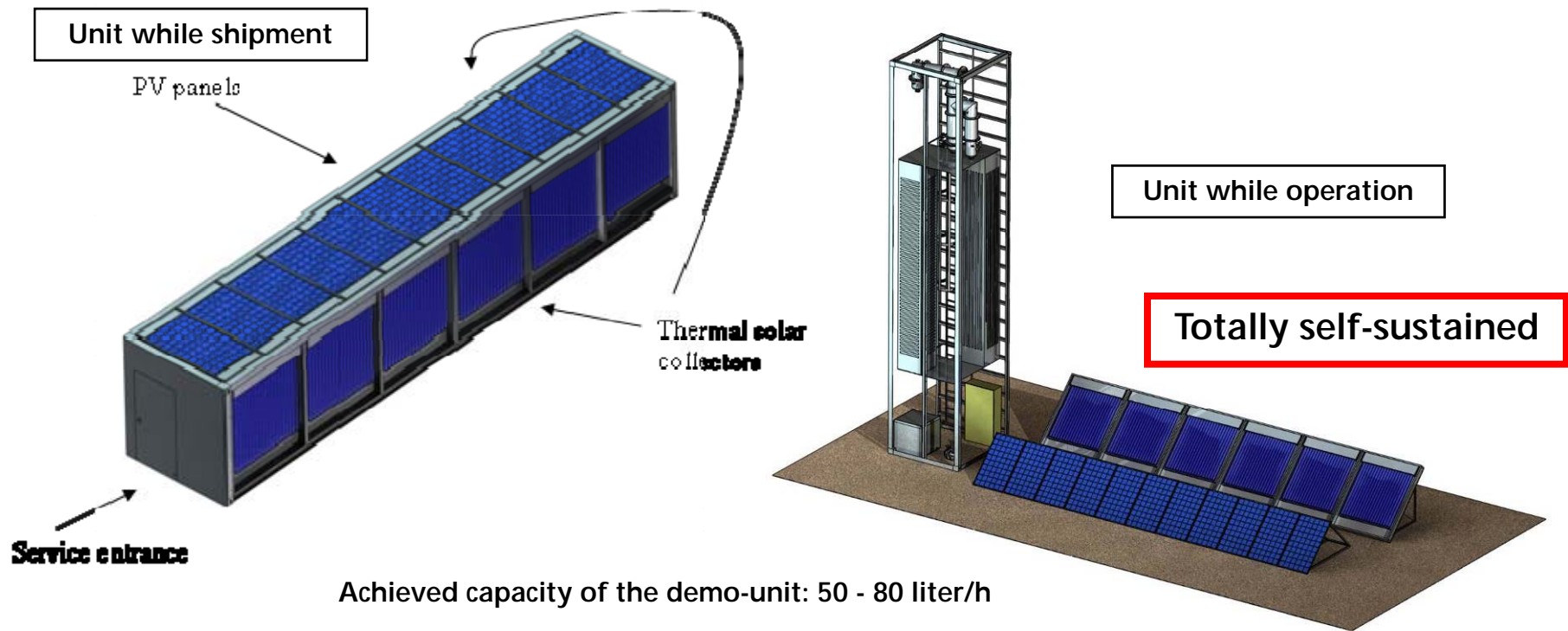
Base section:

- *reservoir tanks for produced water, the concentrated and the diluted salt solution*
- *switchboard and control cabinet to monitor and control the unit from the ground*
- *Pumps and valves*

40'-container-frame



The Combination-Concept: design of demonstration prototype



The Combination-Concept: **future developments**

Development of a Zeolith-based heat energy management system, to achieve:

- 24h-operation (through the night time)
- Lower condensation temperatures by discharging heat energy during night time to:
 - lower ambient temperatures
 - radiation of solar panels (discharge) to black (heat absorbing) night-sky

**Thank You
for
Your Attention!**