Mediras

Membrane
Distillation
In Remote Areas

www.mediras.eu

MEMBRANE DISTILLATION IN REMOTE AREAS

MEDIRAS is an R&D project funded by the European Commission through the 7th Framework Programme. Its overall objective is to optimise the innovative membrane distillation technology.

Membrane distillation desalinates sea or brackish water and converts it to safe drinking water, powered by solar thermal energy or waste heat.

The technology is particularly suitable for small distributed applications with capacities up to 20 m^3/day. The project started on the 1st of September 2008 and it will run for 3 years. www.mediras.eu

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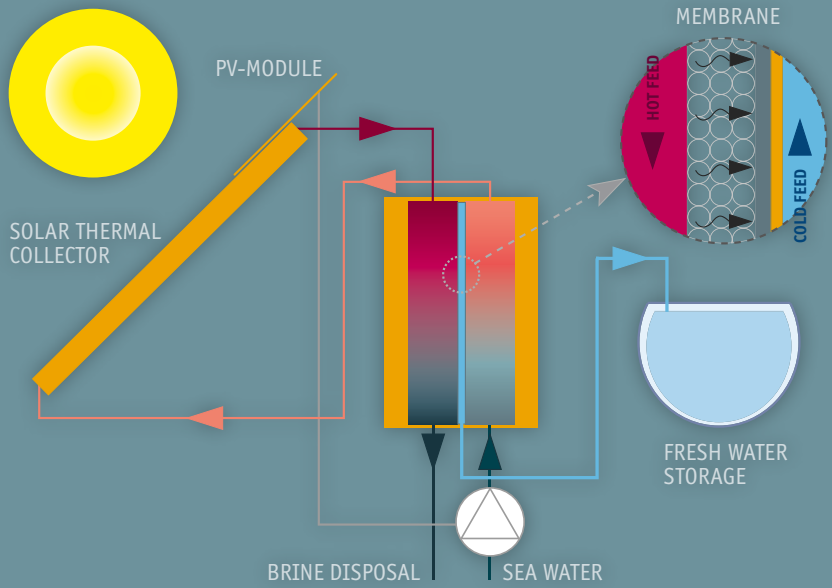
CONTENT

TECHNOLOGY DESCRIPTION

Membrane distillation (MD) is a thermal process in which pure water vapour, driven by a difference in temperature, passes through a hydrophobic membrane and condenses on the opposite side. The separation effect of these polymer membranes is based on their hydrophobic nature. This means that up to a certain pressure, the surface tension retains liquid water from entering the pores, but molecular water in the phase of vapour can pass through the membrane.

The figure on the right illustrates the operating principle of membrane distillation. On the one side of the membrane there is salt water, for example at a temperature of 80°C (hot feed). When there is a lower temperature on the other side of the membrane e.g. by cooling the condenser foil to 75°C a vapour pressure difference for water vapour across the membrane exists. This is the driving force that makes the vapour pass through. The water vapour condenses on the low-temperature side and distillate is formed.

DESALINATION UNIT WITH HEAT RECOVERY



PICTURE:

1| Multi-module system installed in Gran Canaria

IMPORTANT ADVANTAGES OF MD

MD offers important advantages for the construction of solar-driven or waste-heat driven, stand-alone desalination systems.

THE MOST IMPORTANT ADVANTAGES OF THE MD DESALINATION TECHNOLOGY ARE:

- The operating temperature of the MD process is in the range of 60 - 85°C. This is a temperature level where solar thermal collectors perform well
- High efficiency in rejecting non volatile compounds
- Costly chemical pre-treatment of the water supply is in most cases not necessary. This would depend on the quality of feed water. Please, consider that if surfactants are present into the water, this could lead to a loss of the membrane hydrophobicity if no pre-treatments are made
- Good operation of the MD module with intermittent energy supply with or without heat storage
- Robust and easy-to-use technology


1|


2|


3|

PROJECT RESULTS

The MEDIRAS work is focused on the cost reduction of the produced water making the technology suitable for a wider spectrum of end-users. Systems that monitor and maintain the quality of the produced water have been integrated and a strategy has been developed for bringing the product to the market. The main results of the different phases of the project are presented below:

COMPONENT DEVELOPMENT → SYSTEM INTEGRATION → TECHNOLOGY DEMONSTRATION → MARKET INTRODUCTION

COMPONENT DEVELOPMENT

The first phase of the project focused on development and improvement of critical system components. First the MD modules have been improved. The module production method has been optimised with the prospect of becoming automated by the end of the project. A control mechanism has been developed, to ensure that the system will operate well in changing ambient conditions and feed water qualities. The integration of a cooling unit has enabled the recirculation of brine, increasing the recovery ratio. For the disposal of the remaining brine various concepts have been elaborated. Finally, different post-treatment methods have been evaluated for the disinfection and remineralisation of the product water. Their integration potential to the MD systems and their compatibility with photovoltaic (PV) power supply have been assessed.

SYSTEM INTEGRATION

In the second phase of the project the improved components have been integrated in an optimised system. The connections between the different possible energy systems and the desalination unit have been optimised and standardised.

The newly developed components have been integrated. Detailed design of the systems for the demonstration installations has been performed, including a compact unit and a larger, two-loop system.

TECHNOLOGY DEMONSTRATION

In total, 3 compact MD systems and 2 multi-module two-loop MD systems have been installed and are operating successfully.

Compact systems, with nominal capacity 150l/day each, have been installed in a private house and in a health center in Tunisia. The compact system in the health center is fed with sea water and the compact system in the private house is fed with brackish water. The third compact system has a nominal capacity of 300l/day and has been installed in a private house in Tenerife.

In Gran Canaria a two-loop system powered by a solar thermal field has been installed. The nominal daily production is 3m^3. The second two-loop system has been installed on the Italian island of Pantelleria and it is powered by solar energy and waste heat from the local power plant, thus also demonstrating the suitability of the developed technology for the energetic optimisation of industrial processes such as small power plants. The 24-hour operation results in daily production of about 5m^3.

* PICTURES:

1| Compact system in a private house in Tunis
2| Compact system installed in the health center from the small rural village of Jedaria
3| Compact system installed in Tenerife
4| Multi-module system installed in Pantelleria

MARKET INTRODUCTION

In a preliminary study suitable markets and target user-groups for the technology were identified. A closer examination of the most promising users clarified their specific requirements and framework conditions.

The results of this analysis were used in the system development process, helping to adapt it to the consumer requirements. A strategy has been developed for the steps needed after the successful completion of the project for bringing the technology to the market. In particular an assessment of the requirements for know-how on the local and regional level for the installation, operation and maintenance of the system has been performed.

Also the need for a network that provides basic maintenance work and access to spare parts has been examined.

Finally, as part of phase 4, dissemination work has made the results of this project widely known among target audiences, like researchers, decision-makers and end-users.

PICTURE:
1| Multi-module system installed in Gran Canaria

PROJECT CONSORTIUM

For achieving the ambitious objectives, a consortium with ten experienced partners has been put together to implement the carefully designed work-programme.

More details about the role of each partner is available on the project website.
www.mediras.eu

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www.ise.fhg.de

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COOPERATION

THE SEVENTH FRAMEWORK PROGRAMME OF
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ABOUT THIS LEAFLET

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FOR MORE INFORMATION

about the project and its activities you can get in touch with the project coordinator:

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