The Desalination Technology Race

Several technologies are used to desalinate seawater; active R&D work has improved the competitive nature of desalination techniques.

This article summarizes existing technologies and global R&D trends (p1)**, it then presents R&D projects in the EU** (p2) **and emerging competitors in Asia** (p3).

Three main categories of equipment defined by the industry compete today:

- Thermal desalination plants, comprising multi stage flash (MSF) and multiple effect distillation (MED)
- Membrane desalination plants comprising reverse osmosis (RO) and electrodialysis (in which membranes are used to separate salts from fresh water)
- Vapour compression desalination plants. Ion exchange involves passing saline water over resins which exchange more desirable for less desirable ions

R&D worldwide is thus focused on increasing energy efficiency and reducing running costs.
The technology that has traditionally dominated, MSF (Multiple Stage Flash), is continuing to lose its share to RO (Reverse Osmosis) and MED (Multi-effect Distillation), due to the improvement of membrane technologies and the cost advantages. Other innovations, mainly focused on reducing the costs and raising the efficiency, are also entering the market at a fast pace.

The main areas of R&D for desalination by reverse osmosis are the pre-treatment of seawater to limit membrane clogging and the effort to reduce energy consumption which will further cut the cost of desalination, already reduced by a factor of four in the past decade, to help contribute to sustainable development through improved environmental outcomes.

In addition, the technologies are often associated. For example, in 2004, Degremont, a subsidiary of Suez, completed a Reverse Osmosis desalination plant in Fujairah (Abu Dhabi) with a desalination capacity of 160 million m^3 per year, of which 62 million are produced by reverse osmosis. This station is part of a larger complex that includes a 630-megawatt generating plant. The United Arabian Emirates is the second largest producer of desalinated water after Saudi Arabia.

More Research & Innovation in Desalination

In a very competitive international context, the EU maintains active programmes in the field of water technologies, within the "EU Water Initiative" (in particular within the 6th Community Research Framework Programme 2002-2006). Scientific and technological cooperation activities mobilising competence from around the world, aim at innovative thinking to find cost-effective and sustainable solutions.

In the portfolio, several projects deal with desalination, exploring and combining technologies such as solar energy and terrestrial heat, the advances of nanotechnology and molecular technologies, aiming at elevating the outcome efficiency while limiting the environmental impacts.
Two innovative projects on desalination are presented here below:

EasyMED: Improved Plate Multi-effect Evaporator for Seawater Desalination

A qualified workforce has been established to promote research and development of an innovative desalination process, based on plate Multi-Effect Distillation, which focuses on four attractive points:

- Low investment and running costs
- Construction-friendliness
- High modularity
- Low-level energy requirements

The R&D objectives of the project are mainly based on thermal engineering, hydraulic, and material issues to optimise the process on both the theoretical and experimental level. Water management and desalination policies have to be considered on a regional, social and economic scale. A user-oriented market analysis will enhance the pertinence of the dissemination phase leading to industrialisation

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AQUASOL: Hybrid Solar Seawater Desalination

Innovative development of environmentally-friendly seawater desalination with zero discharge brine.

Scientific and technological developments are focusing on increasing the current performance of conventional Multiple Effect Distillation desalination systems. They include a double heat pump process for energy recovery from brine, the use of brine in the commercial production of salt, avoiding any discharge; and also coupling a hybrid-solar/gas-fired cost-efficient thermal energy system. The final developed system is expected to have remarkable environmental features with relevant aspects in energy efficiency and water production cost, when compared with a conventional MED-system.

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http://europe.eu.int/comm/research/water-initiative/results_en.cfm?country=FR
http://europe.eu.int/comm/research/water-initiative/projects/evk1_ct_2001_00102_en.htm

SINGAPORE: Developing New Desalination Technologies to Boost Water Supply

Singapore is looking into new desalination methods hat could potentially increase its water catchment areas by 90 percent. It is also building a plant to further test a technology that turns water from the sea, rivers, streams, or even drains into usable water.

The Public Utilities Board is looking at ways to stop Singaporeans from flushing away water unnecessarily. It may soon become compulsory to install dual-flush cisterns in all new buildings, and those undergoing renovations, by 2009.

The Membrane Bio-Reactor, The Membrane Distillation and the Variable Salinity Plant are just 3 examples of recent technological advances which have the potential to drive down the cost of water production, enhance water sources, and provide Singapore with a leading edge in the global water industry.

A pilot project is being conducted at the Membrane Distillation Plant which boils seawater and collects the water vapour. This technology is powered by waste heat released by an Incineration Plant. This plant consumes less energy as compared to reverse osmosis that is used in the production of NEWater (high-grade reclaimed water) and desalinated water. As such, PUB hopes that in the long run, the water produced in this way will be cheaper than desalinated water.

The two m^3 of water produced by this method has its salt content reduced 1,000 times. The energy used is also 3 times less than that used in reverse osmosis. A demonstration plant is to be built after the pilot trial ends its run next year.

Another project - the Variable Salinity Plant - produces potable water from rainwater and seawater as well as smaller streams. PUB says this project can potentially increase Singapore's water catchment area from 67 percent to 90 percent. A demonstration plant at Sungei Tampines will be ready by the year end. The plant from the pilot project has been donated to the Maldives to desalinate water from the sea for potable use.

Source: http://www.wildsingapore.com/news/20060304/060307-4.htm