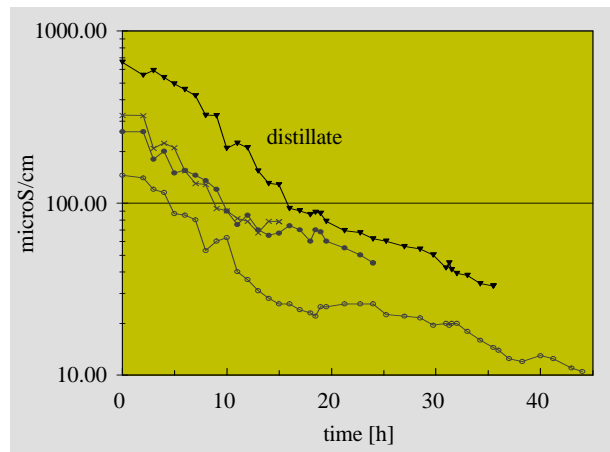
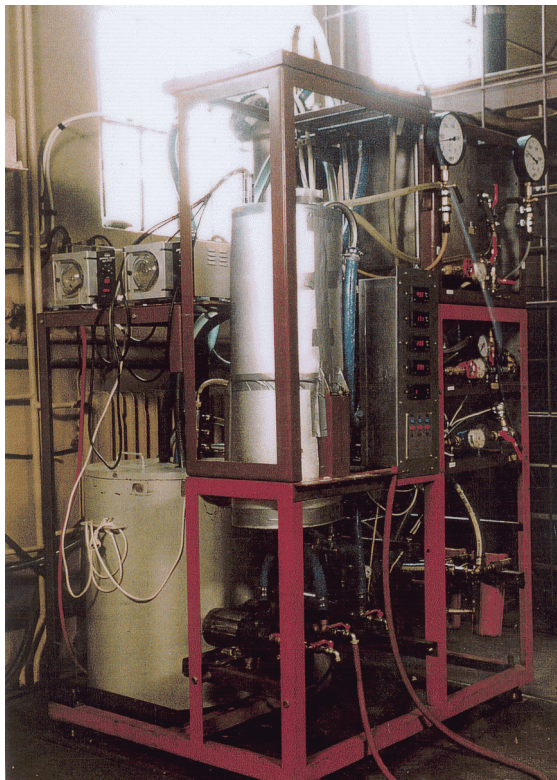


Water desalination and production of ultrapure water

Desalination is energy-consuming process, utilising large quantities of electric energy, produced mainly from fossil fuels, but also from low-temperature sources as solar energy and waste heat. The processes used for desalination include distillation, crystallisation and ion exchange. At present the majority of fresh water is produced by evaporation techniques and their more economic modifications: MSF - multi-stage flash evaporation, MED - multiple effect distillation and VC- vapour compression. Recently the alternative for these methods is reverse osmosis and for brine water - reverse osmosis, electrodialysis or reverse electrolysis. Hybrid systems combining two different processes, acting synergistically and improving the economics, e.g. MSF-RO, MED-RO, VC-RO, ME-VC (*Multi-effect vapour compression*) or MSF/ME-VC are also considered. Coupling RO with distillation methods in hybrid systems allows not only improving the economics of the process, but also regulating the salt concentration by mixing the streams of different composition. Desalination with membrane processes has many advantages: the lowest energy to product ratio, high retention coefficient and easiness of operation of the installations.

The technology utilising the energy from nuclear reactor for production of drinking water from sea water, called “nuclear desalination” developed last years has already its technical realisations. The use of nuclear reactor in desalination process seem feasible and economic in many regions in the world, that suffer from water shortage. Reverse osmosis combined with nuclear reactor may be considered commercial desalination technology. Membrane distillation studied for desalination of sea water can be also alternative for the processes used in nuclear desalination [1-4].



Pilot plant for production of pure water and water desalination by membrane distillation at Department of Nuclear Methods of Process Engineering

Membrane distillation is also useful technique for production of pure water that can be used for special applications like boiler water for electropower stations [5].

References

1. Grażyna Zakrzewska-Trznadel, Procesy membranowe w technologiach jądrowych, Raporty IChTJ. Seria A nr1/2006, ISSN 1425-7343, 191s.
2. Khayet M., Mengual J.I, Zakrzewska-Trznadel G., Direct contact membrane distillation for nuclear desalination:, Part II- Experiments with radioactive solutions, Journal of Nuclear Desalination, Vol. 2, No1, 2006, p. 56-73.
3. Khayet M., Mengual J.I, Zakrzewska-Trznadel G., Direct contact membrane distillation for nuclear desalination Part I - Review of membranes used in membrane distillation and methods for their characterization, International Journal of Nuclear Desalination, Vol.1, No. 4, 2005.
4. Grażyna Zakrzewska-Trznadel, Mohaemed Khayet, Juan Mengual, The concept of application of membrane distillation for nuclear desalination, ICOM2005, August 21-26, 2005, Seoul, Korea, Final Program and Abstracts, p.97, Extended abstracts CD-ROM.
5. G. Zakrzewska-Trznadel, M. Harasimowicz, A. G. Chmielewski, Uzdatnianie wody do celów kotłowych metodą destylacji membranowej, Przemysł Chemiczny 78/5 (1999), s. 181-184.