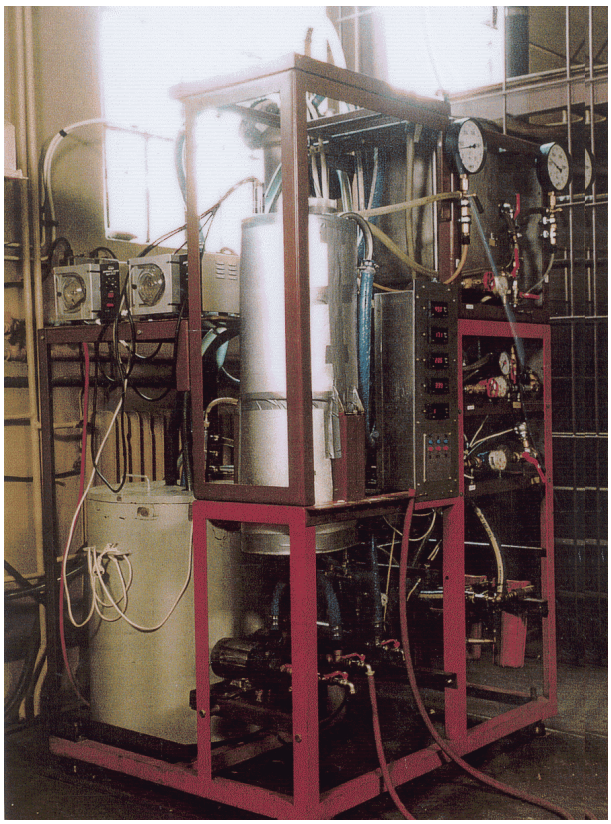
Liquid radioactive waste treatment by membrane processes

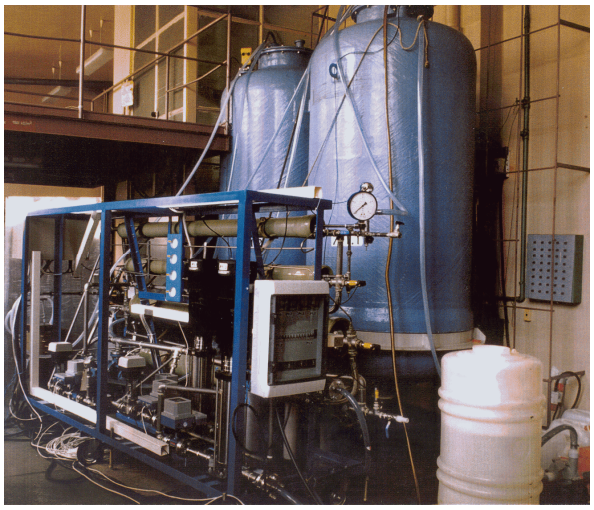
Radioactive waste is generated in nuclear fuel cycle, during production and application of radioisotopes, as well as during processing of raw materials containing naturally occurring radioactive isotopes. The waste has to be processed before safe storage or disposal to protect the human health and natural environment. The management of radioactive wastes has to be reached with reasonable cost by implementation of appropriate technologies. The treatment requirements depend on the radioactivity level and chemical and physical properties of the waste streams. Number of methods are used to treat aqueous radioactive wastes, including chemical precipitation, evaporation and ion exchange, as well as less developed solvent extraction, biotechnological processes and membrane methods. Although membrane processes are still considered as novel technologies in this field, many applications in nuclear centres exist.

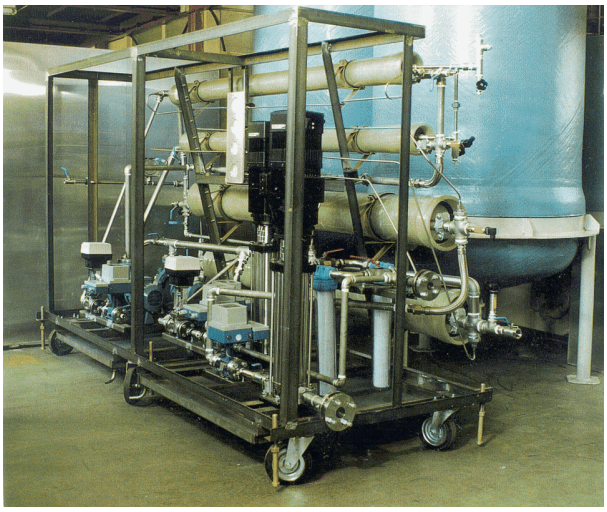
In Poland radioactive waste originates from many sources, including nuclear research reactor, isotope laboratories, and nuclear medical centers. Liquid low- and medium level radioactive wastes throughout Poland are collected in the storage tanks of Department of Radioactive Waste Processing at Institute of Atomic Energy (Swierk). The specific activity of this stored material is not higher than 10^5 kBq/m^3. All collected wastes have to be processed before disposal; the radioactive substances have to be concentrated in a small volume and the effluent should be cleaned to the limits established by respective regulations.

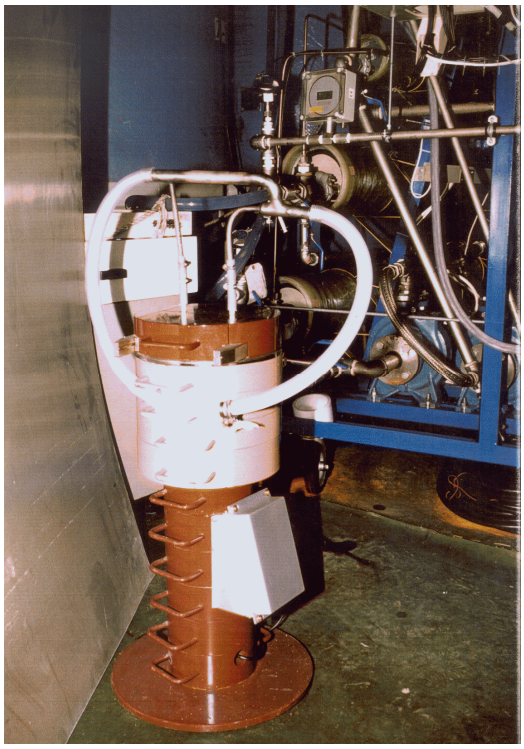
Such membrane processes like reverse osmosis, ultrafiltration, membrane distillation, applied for radioactive waste treatment are studied in Laboratory of Membrane Processes at INCT.

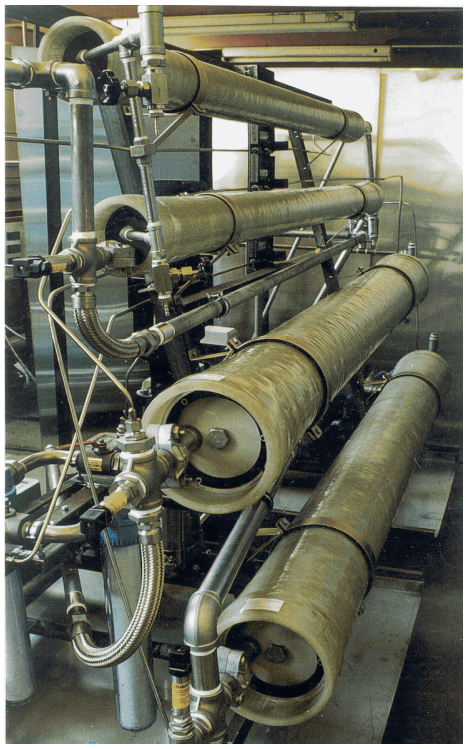


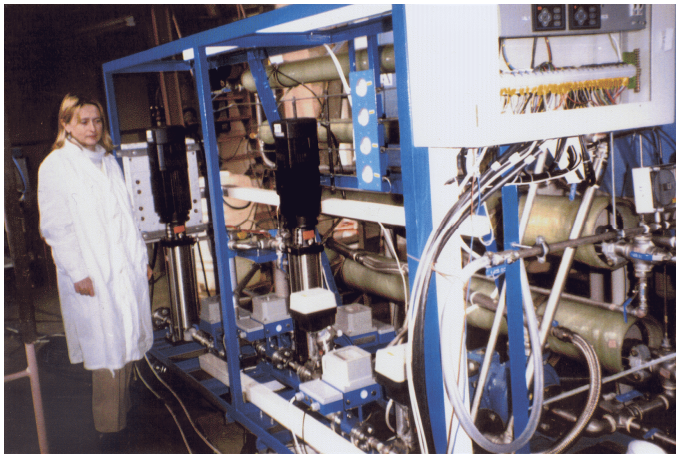
Pilot plant for membrane distillation
at Department of Nuclear Methods of Process Engineering



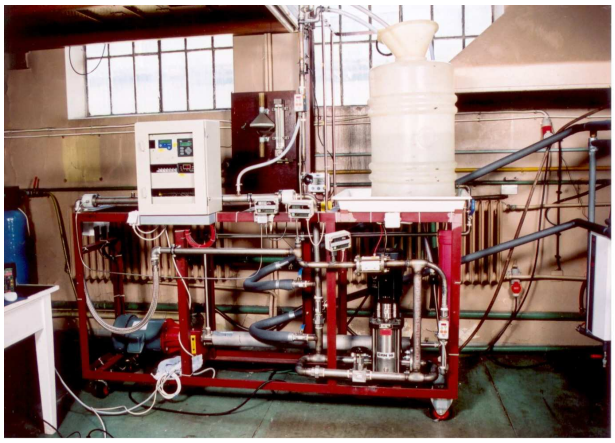




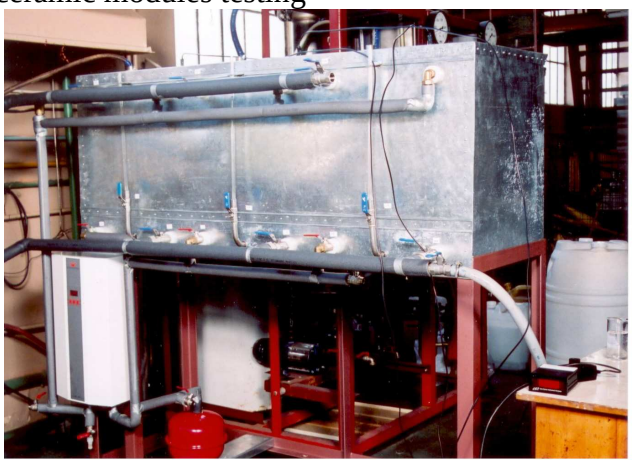




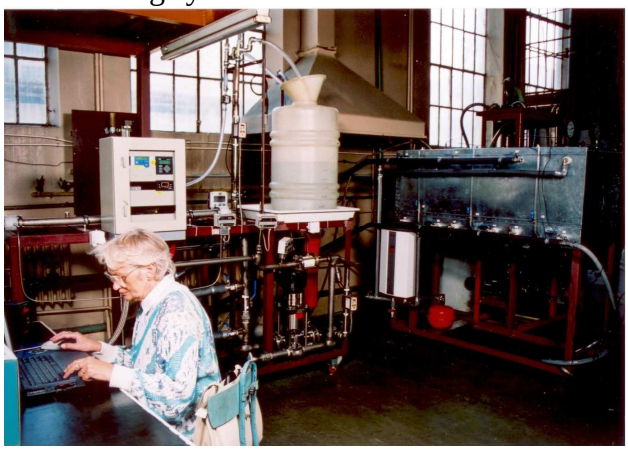
Reverse osmosis plant at Institute of Nuclear Chemistry and Technology – pilot experiments preceding industrial implementation




Ultrafiltration plant for ceramic modules testing

Ultrafiltration plant with washing system

Experiments with ultrafiltration plant

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