

Press release

Defense on 01 March 2021

Waste Handling and Resource Recovery

Title of the doctoral thesis Waste Heat Driven Membrane Distillation for Industrial Wastewater Treatment

Content of the doctoral thesis Water is a fundamental commodity of many industrial processes, where it is primarily associated with product excellence, equipment performance, and economic winnings. The most competent approach in industrial effluent treatment necessitates that industries recover, reuse and release water in a manner that protects natural resources, guarantees stringent regulative assent, and ensures financial gain. In this context, membrane distillation (MD) is a promising industrial wastewater treatment technology capable of meeting these requirements while utilizing low-grade heat sources.

This thesis is focused on introducing MD technology in two water-intensive industries, including nano-electronics and co-generation with a focus on wastewater management for the purpose of water reuse in processes or release in the environment. Experimental analysis and techno-economic assessment were performed to evaluate the potential of MD technology in terms of its separation efficiency and water treatment cost. The results show that the proposed technique was proved successful for the treatment of both industries' wastewater while removing the pollutants with good to excellent separation efficiencies. The simulation results indicate that the required thermal energy for operating large scale MD systems is readily available via internal waste heat sources of the selected industries. The process economy shows that the unit water treatment cost is significantly lower than the competing technologies, in the case when the price of waste heat is considered negligible.

In summation, membrane distillation presents technical, environmental, and economic advantages for the examined applications. These findings provide a paradigm for related applications of membrane distillation in the future. Furthermore, installing such MD systems in the respective industries would lead to lower freshwater use while reducing wastewater pollution and reusing the recovered water.

Field of the doctoral thesis Chemical Engineering, Sustainable Energy Technologies

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Place of defence KTH Royal Institute of Technology, Stockholm, Sweden

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Link to electronic thesis <https://aaltodoc.aalto.fi/handle/123456789/102555>

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