

An Investigation into the Potential of Industrial Low Grade Heat in Membrane Distillation for Freshwater Production

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Abstract : Membrane distillation is an emerging technology which has been used to produce freshwater and purify different types of aqueous mixtures. Qatar is an arid country where almost 100% of its freshwater demand is supplied through the energy-intensive thermal desalination process. The country's need for water has reached an all-time high which stipulates finding an alternative way to augment freshwater without adding any drastic affect to the environment. The objective of this paper was to investigate the potential of using the industrial low grade waste heat to produce freshwater using membrane distillation. The main part of this work was conducting a heat audit on selected Qatari chemical industries to estimate the amounts of freshwater produced if such industrial waste heat were to be recovered. By the end of this work, the main objective was met and the heat audit conducted on the Qatari chemical industries enabled us to estimate both the amounts of waste heat which can be potentially recovered in addition to the amounts of freshwater which can be produced if such waste heat were to be recovered. By the end, the heat audit showed that around 605 Mega Watts of waste heat can be recovered from the studied Qatari chemical industries which resulted in a total daily production of 5078.7 cubic meter of freshwater. This water can be used in a wide variety of applications such as human consumption or industry. The amount of produced freshwater may look small when compared to that produced through thermal desalination plants; however, one must bear in mind that this water comes from waste and can be used to supply water for small cities or remote areas which are not connected to the water grid. The idea of producing freshwater from the two widely-available wastes (thermal rejected brine and waste heat) seems promising as less environmental and economic impacts will be associated with freshwater production which may in the near future augment the conventional way of producing freshwater currently being thermal desalination. This work has shown that low grade waste heat in the chemical industries in Qatar and perhaps the rest of the world can contribute to additional production of freshwater using membrane distillation without significantly adding to the environmental impact.

Keywords : membrane distillation, desalination, heat recovery, environment

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