# Optimizing membrane distillation process for regeneration of high concentration liquid desiccants

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**Abstract:**

Global energy consumption has increased with population growth and the importance of indoor air quality through an increase of residence time in a building has been highlighted. Liquid desiccant (LD) is being used in the air dehumidifiers due to its high efficiency. In this study, the membrane distillation (MD) system was optimized as a regeneration process to reuse the LD that has captured indoor moisture. In the experiment, the concentration was started from the half point of the optimum moisture absorption concentration of each LDs in order to simulate the real condition to be absorbed water. Lithium chloride (LiCl) and potassium formate (HCOOK) were selected as LDs and their regeneration performances in the MD operation were evaluated in terms of water flux and membrane fouling. HCOOK regeneration flux was higher than LiCl regeneration even the concentration is higher. Scanning electron microscope image analysis showed that two LDs had different fouling patterns. Bulk crystallization occurred during the regeneration of LiCl while surface crystallization was dominant for HCOOK. To solve these problems, this study was evaluated two approaches; water flushing and membrane spacer. With two approaches, an increased flux and a reduction of concentration time were achieved. The MD process with appropriate membrane cleaning could concentrate a high concentration of LDs in a long-term. In addition, the spacer was highly effective for reducing the concentration polarization so the flux and reconcentration performance were stable. If the spacer design and water flushing condition are optimized further, the MD performance for LD regeneration can be improved.

**Keywords**: Lithium chloride, Liquid desiccant, Membrane distillation, Membrane fouling, Potassium formate