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## Detection of crystallization fouling in a liquid-to-air membrane energy exchanger

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### Abstract

A liquid-to-air membrane energy exchanger (LAMEE) is a new development for air-conditioning that facilitates the exchange of heat and moisture between air and liquid streams, through a semi-permeable membrane. However, fouling may occur in the membrane and severely lower the performance of a LAMEE.

The primary aim of this study is to develop a test facility that can be used to detect crystallization fouling in membranes. Fouling detection methods are applied to confirm or reject the occurrence of fouling in a LAMEE, for several tests in which  $\text{MgCl}_2(\text{aq})$  desiccant solution is dehydrated for approximately 12 hours. The fouling detection methods consist of an uncertainty analysis and a statistical test which are both online and non-invasive.

The results indicate that crystallization fouling can be detected in a LAMEE with the methods presented. Crystallization fouling was found to reduce the rate of moisture transfer through the membrane by up to 60%. Furthermore, a major contribution of this paper is that reducing the rate of moisture transfer through a membrane can delay crystallization fouling in a LAMEE.

### Keywords

Crystallization fouling. Supersaturation. Moisture transfer. Non-invasive. Membrane. Uncertainty.

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