Experimental evaluation of enthalpy efficiency and gas-phase contaminant transfer in an enthalpy recovery unit with polymer membrane foils - DTU Orbit (08/11/2017)

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Experimental studies were conducted in a laboratory setting to investigate the enthalpy efficiency and gas-phase contaminant transfer in a polymer membrane enthalpy recovery unit. One commercially available polymer membrane enthalpy recovery unit was used as a reference unit. Simulated indoor air and outdoor air by twin chambers was connected to the unit. Three chemical gases were dosed to the indoor exhaust air to mimic indoor air contaminants. Based on the measurements of temperature, humidity ratio, and contaminant concentrations of the indoor exhaust air and outdoor air supply upstream and downstream of the unit, the temperature efficiencies, humidity efficiencies, enthalpy efficiencies, and contaminant transfer ratios were calculated. The results showed that over 60% of enthalpy recovery efficiency could be achieved and that the contaminant transfer ratios were in the range of 5.4% to 9.0%. The enthalpy efficiency in cold-dry climate conditions was slightly higher than in hot-humid climate conditions. The contaminant transfer ratio were independent of any hygrothermal difference between indoor and outdoor air and was unrelated to its molecule size or water solubility. The conclusion indicated that the polymer membrane enthalpy recovery unit may be a viable choice for energy recovery in ventilation systems.

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