

Besler, M., Skrzycki, M. Analyzing the Operating Efficiency of Heat Energy Recovery from Outlet Air. *Ochrona Srodowiska* 2009, Vol. 31, No. 1, pp. 41–47.

Abstract: The advantages of heat recovery from the outlet air in ventilation and air conditioning systems were analyzed in terms of energy savings and related benefits. The paper also includes theoretical explanations for the basic phenomena and processes dealt with in heat recovery, and describes (in the form of charts) the changes that occur in the state of the air during heat and mass transfer processes in heat exchangers. The study covered the time span of 1998 to 2007, where each year was divided into two thermal seasons: the cold season (temperatures $\leq 5^{\circ}\text{C}$) and the warm season (temperatures $> 15^{\circ}\text{C}$). Using the real parameter values obtained from many years' external air measurements conducted in the city of Wroclaw, the operating efficiencies were compared for the following devices: rotary heat exchangers, cross-flow heat exchangers, regenerative nonrotary heat exchangers and heat pipes. The operation of the devices was compared with the operation of a system with no heat recovery. The devices were analyzed according to the parameters of the system's operation throughout the year, as well as according to the type of the fuel used for generating the heat supplied to the system. The comparison of the costs of the original energy consumed and the capital costs for the devices of the ventilation/air-conditioning systems examined has revealed that in every instance the application of devices providing energy recovery from outlet air has to be regarded as advantageous in terms of the overall operating costs of the ventilation systems.

Keywords: Energy recovery, ventilation/air-conditioning system, heat exchanger, heat and mass transfer.