

Heat Loss Evaluation of Magnetic Heat Pump System for On-board Air Conditioner

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Present air conditioner systems are based on traditional vapor compression technology with usage of HCFC (Hydro Chloro Fluoro Carbon). The Kyoto Protocol has designated HCFC as one of the gases whose emissions are to be reduced. This requires the development of HCFC free systems or the usage of substances which have little greenhouse effect. Under those situations, magnetic heat pump (MHP) technology which has the potential for high efficiency without Freon gases is the focus of attention. A prototype MHP has been developed, which consists of fixed active magnetic regenerator (AMR) beds and Halbach arrayed NdFeB magnets with a peak field of 1.5 Tesla. The system has a maximum cooling capacity of 1.4 kW. As for the MHP, it is an important function how to transfer the heat phenomenon of the magnetic materials the outside. However its cooling capacity and temperature span seem not to reach their potential performance because the MHP system has some heat losses. In this paper, we categorized those heat losses and some experiment and numerical analysis were performed in order to evaluate those losses of the MHP.