ABSTRACT

A study of a Diffusion Absorption Refrigerator

by

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A diffusion absorption refrigeration (DAR) system is a type of vapor absorption refrigeration system. It is a truly heat operated refrigeration system which requires only heat for its operation. Its working fluid contains a working fluid pair; ammonia as refrigerant, water as absorbent and an auxiliary gas. Hydrogen is normally used as an auxiliary gas. However, in this study, helium is used as the auxiliary gas for a reason of safety. Its operating performance is quite low compared with a simple absorption system. It can be easily used and requires less maintenance since no moving part is contained in the system. Its operation is quiet too.

In this study, the DAR was studied both in theoretical and experimental aspects. An experimental refrigerator was designed and fabricated. Its configuration was arranged in a manner that the operating parameters of the system could be separated. Heat input at the generator, rectification temperature, condensation temperature, and auxiliary gas charge pressure could be varied individually. A mathematical model was also constructed as a primary tool for system analysis. To calculate the model, some operating conditions are required. The model is simple which could be calculated manually. It can be used to identify location of heat loss occurring in the system components. It helps to improve the system performance more pertinent. Comparisons of the actual tested results and the calculation results are presented. Operating characteristic of the DAR was dependent on the bubble pump characteristics. However, its performance relied on the absorption and evaporation capability of the absorber and the evaporator respectively. System improvement options were recommended for implementation of a modified system in the future.