ABSTRACT

TITLE	:	DEVELOPMENT OF EJECTOR REFRIGERATION FOR AIR CONDITIONING APPLICATION
HEAD OF PROJECT	:	ASSOC. PROF. DR. KULACHATE PIANTHONG
CO-RESEARCHERS	:	ASST. PROF. DR. PRACHASANTI THAIYASUIT DR. WIRAPAN SEEHANAM, MR.PAIBOON SATIANRAM, MR.CHAYANON SEANGMANEE
IN FINANCE YEAR	:	2551
BUDGETS	:	629,600 BATHS
KEYWORDS	:	EJECTOR EJECTOR REFRIGERATION SYSTEM COMPUTATIONAL FLUID DYNAMICS COOLING SYSTEM

This study investigates the possibility of using the ejector refrigeration system for air conditioning application. The study of engineering and economics are presented. For the engineering, the performances of the system are investigated. The prototype of the ejector refrigeration system is designed and evaluated. In addition, the influent of operating conditions on the system performances and sizing are analyzed using the engineering mathematical model. For the economics, the comparison of production and operation costs of the prototype with the conventional air conditioning is presented.

The design conditions of the prototype including the refrigeration capacity as 3.5 kW, generator, condenser and evaporator pressure as 550, 7.5 and 1.23 kPa, respectively. And the refrigerant of this system is water. For the ejector design, the ESDU design method that co-operating with the computational fluid dynamic (CFD) is used as the tool to determine the optimum CPM ejector type geometries. The shell and tube heat exchanger is used as the condenser and evaporator for this system. And the both heat exchanger are designed using the engineering equations.

Before the prototype is constructed and evaluated, the influence of operating conditions on the ejector, condenser and evaporator sizing are analyzed using the engineering mathematical

model. It was found that the operating condition is the most importance parameter that influences on the sizing of those devices. The generator, condenser and evaporator pressure are the importance parameters which influent on the ejector performances and geometries. The condenser sizing depends on the condenser and cooling water temperature. The refrigeration capacity and evaporator temperature are the importance parameters which influent on the evaporator sizing.

The results of this study can be directly applied to the design or to select the system that works in similar ranges of initial conditions as this specific case. Otherwise, for different conditions, the associated equations, which are presented in this study, can be used to estimate the component sizes and the system performance.

From the experimental results, it was found that when the generator pressure increases, the condenser pressure increases but evaporator pressure remains constant. The maximum entrainment ratio (*Rm*), coefficient of performance (*COP*) and energy efficiency ratio (*EER*) as 1.66, 0.16 and 0.54, respectively, are found at the operating condition which generator pressure as 4.0 bars. While the maximum refrigeration capacity as 3.44 kW is found at the operating condition which generator pressure as 4.5 bars.

The production cost of the prototype as 401,785 baths. It seems very expensive compare with the conventional air conditioner that has equal refrigeration capacity (average price around 20,000 baths). However the electric consumption of the prototype is lower than that of conventional air conditioner. Amount of electric consumption of the prototype is 571 watt. There is a 43.3% reduce in the electric consumption compare with that of conventional air conditioner. And it can save the electricity cost as 48% per month.