CHAPTER I

INTRODUCTION

Rationale for the study

Solar radiation is a clean form of energy, which is required for almost all natural processes on earth. Demand for energy in the world is rapidly growing. People are pressed to face energy shortages. Peaks in electricity demand occur more frequently during the summer period in recent years in most developed countries, because of the increasing use of air-conditioning.

Absorption cooling is based on the principle that some refrigerants combine with an absorbent to release heat during absorption. The system uses thermal energy to produce cooling and thus solar energy, waste heat and other forms of low grate heat can be employed. As no CFCs are used, absorption systems are friendlier to the environment. Absorption air-conditioning systems are similar to vapor compression air-conditioning systems, but differ in the pressurization stages. In general an absorbent in the low-pressure side absorbs an evaporating refrigerant (H_2O). The most usual combinations of chemical fluids used include lithium bromide–water ($LiBr–H_2O$), where water vapor is the refrigerant.

Further on new markets with high need for building conditioning emerge permanently, especially in countries with hot and tropic climate. As an example the need for air conditioning in Thailand eyed on energy requirements exceeds demands in Germany more than 50 times. Otherwise rising energy cost, enforced environmental consciousness and as a consequence thereof strengthened laws have pushed the developments at the solar energy market. Declining prices, higher efficiency and new applications have obviously enlarged the field of practical use.

Finally, solar refrigeration appears to be a promising alternative to the conventional electrical driven air-conditioning units also from an environmental point of view, since it results in decreased CO_2 emissions and, in the elimination of CFCs.

Statement of the Problem

Solar energy can also be used for cooling. Solar cooling appears to be an attractive proposition due to the fact that when the cooling demand is more, the sun shine is strongest. This, along with the necessity for providing thermal comfortable for people in hot areas of the world, may be the motivating factor in continuing research and development in the field of solar cooling systems. Although, due to its complexity, both in concept and in construction, the utilization and commercialization of solar cooling is not as widespread as other solar energy applications like solar water heating and solar space heating.

The performance of a cooling process is judged from its COP (coefficient of performance), which is the ratio of the amount of cooling produced to the energy input, which is very much depends on the solar collector efficiency. A single-stage water/lithium bromide absorption chiller driven by hot water was selected as reference case for this study. Single-stage absorption cooler produce about 0.6-0.7 KW of cold per KW of assigned amount of heat (coefficient of performance COP=0.6-0.7).

Thus, the main problems are how efficiently can solar radiation realistically be converted into cooling power? With recent advances in the solar and chiller fields, net coefficients of performance (COP) of 100% and above should be attainable (i.e. 1 kW of incident solar radiation yielding 1 kW or more of cooling power) with existing technologies. What is the COP tends towards under the climate conditions? And how about the economic performances are the actual solar absorption cooling system.

Purpose of the study

1. To analyses the energy of each components and evaluate the technical performance of solar absorption cooling system at SERT.

2. To analyses the economic performance of the solar absorption cooling system.

Scopes of work

In this thesis, meteorological data are based on the climatic conditions in Phitsanulok, Thailand.

Limitation of the study

1. Use the collected data on the solar absorption cooling system of testing building which has been installed in School of Renewable Energy Technology (SERT) Naresuan University, Thailand.
2. Analyze the coefficients of performance of the solar absorption cooling system.
3. Analyze the factors of economic performances of the system.