A STUDY PERFORMANCE OF SPLIT TYPE AIR-CONDITION SYSTEM USING CLOSE LOOP OSCILLATION THERMOSYPHON HEAT PIPE WITH WATER OF AIR-CONDITION AND ULTRASONIC WAVE SYSTEM

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ABSTRACT

In this study, split type air-conditions system modular size 12,000 BTU/hr., R-407C refrigerant by using the looped oscillation thermosyphon with water of air-condition system and ultrasonic wave system. Inside the pipe uses R-134a refrigerant. The project used the looped oscillation thermosyphon and ultrasonic wave system by using the latent heat of chemical work to decrease temperature in system before to capillary tube and compare the coefficient of performance (COP) and the energy efficiency ratio (EER) have 1 case, install CLOHP+water and ultrasonic wave system by test temperature of the room in air-condition at 21ºC, 23ºC, 25ºC and 27ºC. Finally, the result is show COP and EER more than normal system calculate 10.66% and 10.31% to study and provide information to practice and save energy.

Keywords: Coefficient of Performance (COP); Energy Efficiency Ratio (EER); CLOHP; Ultrasonic Wave System.

1. Introduction

Current global temperatures rise significantly. Since the destruction of the ozone layer in the atmosphere. And greenhouse gas emissions. Heat from the sun to come up. And to slow down the global temperature increase of 0.5 °F in 10 years. If greenhouse gases continue to rise today, scientists estimate that the increase in temperature on the surface is in the range between 2.7-8.1°F Thailand and is located in the climate is hot and humid throughout all year [1-2] It makes the temperature even more. As a result, the demand for air conditioning refrigerant to feel comfortable. He lived in a villa in a large city. According to the suburbs, or more significantly. Thus, the invention provides a device for cooling the refrigerant more. From the original air-cooled condenser alone. It is added to the cooled Thermosiphon loop with water of air-condition system and ultrasonic wave system added.

2. Methodology

The methodology is separated into 4 main parts. The purpose of this project is to study the efficiency of air conditioning systems with thermosiphon loop heat pipe with water of air-condition and ultrasonic wave system. By comparing the results of the pre-installation and post-installation. By comparison, the coefficient of performance and efficiency.

A. Information systems theory, Thermosiphon loop heat pipe with water of air-condition, the air conditioning system and ultrasonic wave system.

The refrigerant vapor compression system. designed and built upon the fundamental principle of thermodynamics [2-5]. The liquid absorbs heat when changing from a liquid to a vapor and allow the heat from the vapor to a liquid state. During the change of status, but the temperature is maintained at this temperature change with pressure. The constant pressure of the vaporization takes place at temperatures that are associated with it [6]. However, the temperature of the vapor pressure, one would be different. For refrigerants differ. Heat flows from high temperature to a low temperature source. Select metal condenser must be a metal with high thermal conductivity [7-8].

The working principle of thermosiphon pipe heat pipe with water of air-condition has lived latent heat of the working fluid inside the pipe.

When the heating of the evaporator is located below the gas or hot water at high temperature. The working fluid is boiling and evaporation rises to the condenser. The lower temperatures caused heat transfer occurred after the ice had drifted to the condensation is condensed into a fluid flow back down the tube on the inside of the pipe. By the acceleration due to gravity of the world. Then the liquid flows down the evaporator at the bottom of the pipe, it will vaporize to cause heat transfer and work as a cycle [7,9].

The working principle of ultrasonic wave system.

Refers to sound waves at a frequency too high for human ears to hear. In general, the average human ear can hear sounds up to about 15 kHz only just. Why is bringing the ultra-sonic waves used because the waves have direction, allowing us to focus sound waves to target specific needs. This property is one of a wave and It's even higher frequency wavelengths shorter. The noise frequency is not diffracted by the edges so forth as narrow or as we call it a direction [10-13]

B. Planning, design and installation of the evaporator and ultrasonic wave system

Research from the last version of Wah Wong Sai Health and Science University Fertility Veera sky [14-15]. The amount of work that fills the pipe Thermosiphon around 75% by volume, to give the best performance and the relationship of the heat exchanger. The rate of heat transfer is more. If space is very exposed to the heat source as well which total volume of thermosiphon loop heat pipe with water of air-condition formula.

$$V = \frac{\pi d^2 L}{4} \tag{1}$$

Where V is the volume of thermosiphon pipe vibrating loop, d is the diameter of the pipe Thermosiphon vibrating loop and L is the length of the pipeline Thermosiphon vibrating loop.
A mass of work, 75% by volume to fill the Thermosiphon pipe formula.

$$\mathbf{m}75\% = 0.75\mathbf{V} \tag{2}$$

where **m**75% is the mass of the working fluid 75% by volume to fill the Thermosiphon pipe, **V** is the volume of thermosiphon pipe and is the density of the material.

The analysis is installed before the condenser outlet expansion value.

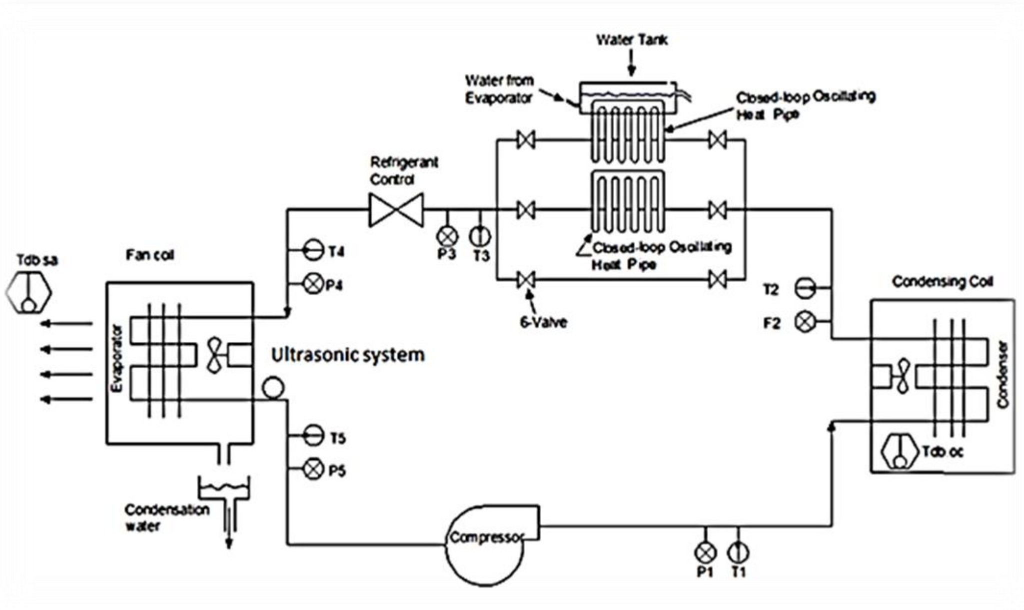

Figure 1. Design installation of the evaporator and ultrasonic wave system.

The system uses ultrasonic style piano Paso Electric. Because that is used today, which has been developed over a certain level. Ultrasonic system comprises three parts: (1) head to the ultra-sonic waves. Sealy silicone glue to hold the head can withstand vibrations transmit waves of the Ultrasonic (2) the seizure of the transmission. Acrylic sheets tempting to 1 cm thick to withstand vibration and can study the function of the transmission waves. Including ventilation equipment for cooling off from the ultra-sonic waves. (3) the adhesion between the anchor head against the wall. Steel anchor for stability and resistance to vibration.

C. Testing and revision.

The trial will compare the performance of air conditioners modular size. 12,000 BTU/hr. using refrigerant R-407c as a refrigerant in the system. By analyzing the air conditioning is working the case with the air conditioning has been installed close loop oscillation thermosyphon heat pipe with water of air-condition system and ultrasonic wave system by test room temperature is 21ºC, 23ºC, 25ºC and 27ºC, keep up the pressure and temperature of all five points, five points and in a test of 12.09 m^2.

In experiments conducted in a regular sequence. Air conditioning works fine with the fan speed on high speed. Recording pressure refrigerant from the compressor, pressure refrigerant from the condenser, pressure refrigerant pressure off the tongue and pressure refrigerant from the evaporator. Recording the temperature of the refrigerant compressor, temperature refrigerant from the condenser, Temperature refrigerant pressure off the tongue, Temperature refrigerant from the evaporator, Outside temperature and the electricity voltage.

The air conditioning was installed close loop oscillation thermosyphon heat pipe with water of air-condition system and ultrasonic wave system. The air conditioning worked fine with speed fan at high speed and open ball valve refrigerant install the close loop oscillation thermosyphon heat pipe with water of air-condition system and open ultrasonic wave system. Recording pressure refrigerant from the compressor, pressure refrigerant from the condenser, pressure refrigerant pressure off the tongue and pressure refrigerant from the evaporator. Recording the temperature of the refrigerant compressor, temperature refrigerant from the condenser, Temperature refrigerant pressure off the tongue, Temperature refrigerant from the evaporator, Outside temperature and the electricity voltage.

D. Assess performance.

Experimental performance of air conditioners modular size 12,000 BTU/hr. using refrigerant R-407c [12] by comparing the coefficient of performance. And energy efficiency During normal operation, the air conditioning is the case with the installation close loop oscillation thermosyphon heat pipe with water of air-condition system.

Coefficient of performance (COP) is used to demonstrate the effectiveness of the cooling is comparison of the effects of a cold that had to work the system. The equation of is follows.

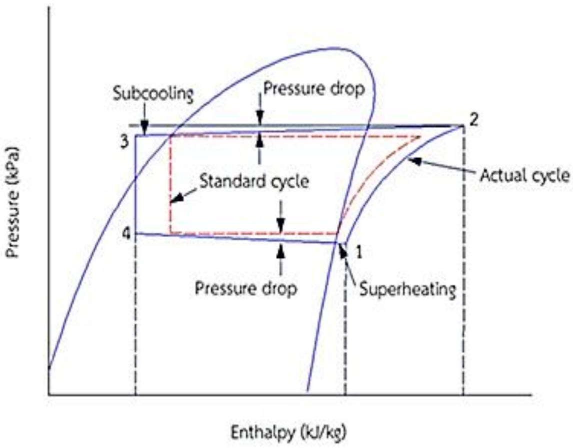

Figure 2. P-h chart cooling

$$COP = \frac{Q_{evap}}{W_{comp}} \tag{3}$$

$$COP = \frac{h_1 - h_4}{h_2 - h_1} \tag{4}$$

COP is the coefficient of performance, Q_{evap} is the cold air from the evaporator, W_{comp} is the work on the compressor, h1 is the enthalpy Specifications issued by the evaporator, h2 is the enthalpy Specifications issued by the compressor, h4 is the specific enthalpy of expansion value.

Energy efficiency ratio (EER) is a value that represents the ratio of energy efficiency freezer the reference to compare the energy consumption of refrigeration and air conditioning. The equation of is follow.

$$EER = \frac{Q_{all}}{P_{input}} \tag{5}$$

3. Results and Discussions

Experimental performance of air conditioners modular size 12,000 BTU / hr. using refrigerant R-407c by comparing the air conditioning is working on the case with the installation of close loop oscillation thermosyphon heat pipe and ultrasonic wave system. The experiments at room temperature 21^{o}C, 23^{o}C, 25^{o}C and 27^{o}C analyzed by comparing the cooling evaporator coefficient of Performance The cooling performance. AS the experiment shows that the room temperature up to 21^{o}C maximum cooling. And a temperature of 27^{o}C to the cooling at a minimum. Compared with the normal case, the installation of close loop oscillation thermosyphon heat pipe with water of air-condition system and ultrasonic wave system. Shows that The cooling to the more noticeable. From The pipe installation close loop oscillation thermosyphon heat pipe with water of air-condition system and ultrasonic wave system to the coefficient of performance (COP) higher compared to the normal (not installed), and the results also showed that the conditions at room temperature 21°C. it provides a coefficient of performance and the maximum temperature of 27°C to a coefficient of performance minimum and the installation of thermosiphon pipe with water of air condition system. It provides the performance cooling (EER) higher compared to the normal case and trial results also showed that the conditions at room temperature 21°C gives the cooling efficiency and maximum state temperature 27°C. it provides the performance cooling minimum.

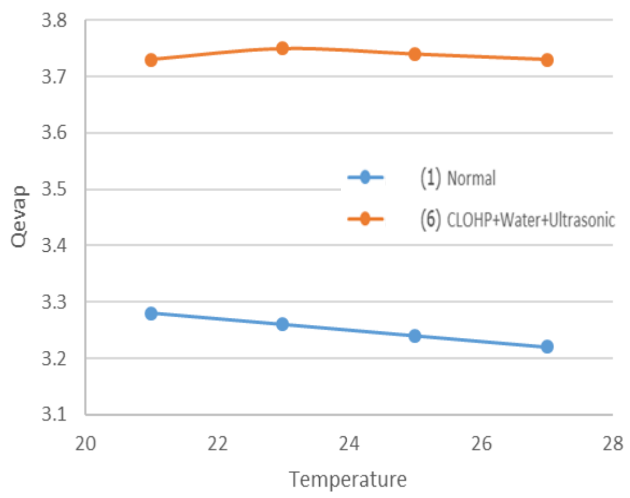

Figure 3. Graph compare Q_{evap}-Temperature

The graph illustration information compares Q_{evap}-Temperature between (1) Normal and (2) CLOHP+Water+Ultrasonic wave at temperature 21°C, 23°C, 25°C, 27°C show that (2) CLOHP+Water+Ultrasonic wave give Q_{evap} over than (1) Normal Obviously. At temperature 21°C is the highest and at temperature 27°C is the lowest Q_{evap}.

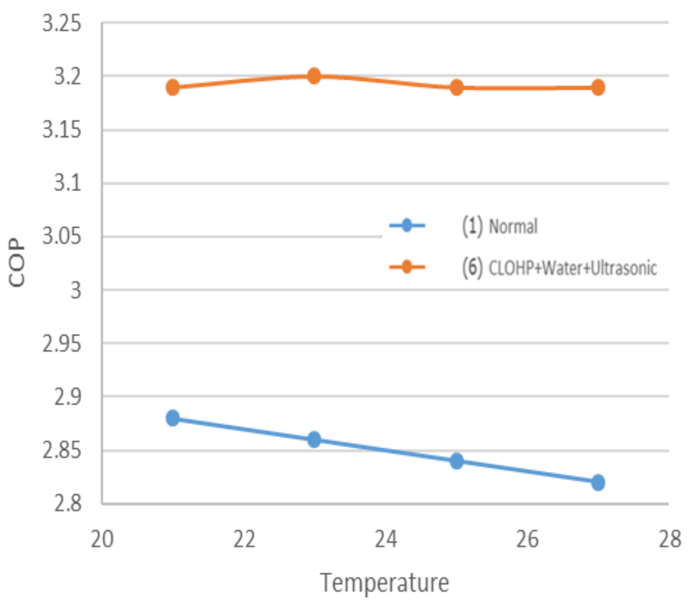

Figure 4. Graph compare COP-Temperature

The graph illustration information compares COP-Temperature between (1) Normal and (2) CLOHP+Water+Ultrasonic wave at temperature 21ºC, 23ºC, 25ºC, 27ºC show that (2) CLOHP+Water+Ultrasonic wave give COP over than (1) Normal Obviously. At temperature 21ºC is the highest and at temperature 27ºC is the lowest COP.

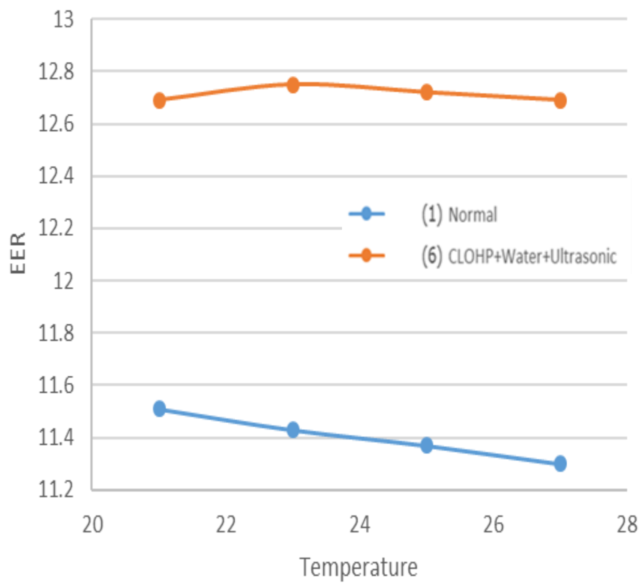

Figure 5. Graph compare EER-Temperature

The graph illustration information compares COP-Temperature between (1) Normal and (2) CLOHP+Water+Ultrasonic wave at temperature 21ºC, 23ºC, 25ºC, 27ºC show that (2) CLOHP+Water+Ultrasonic wave give EER over than (1) Normal Obviously. At temperature 21ºC is the highest and at temperature 27ºC is the lowest COP.

5. Conclusion and Recommendation

The experimental operation of the air conditioning system with separate pipes thermosiphon system with water of air-condition system and ultrasonic wave system to be compared. Coefficient of performance (COP) and the cooling efficiency (EER) of the experiments showed Conditions inside the air-conditioned room temperature 21ºC, 23ºC, 25ºC and 27ºC when the variables are analyzed for the coefficient of performance and cooling efficiency. by comparison, The second case to the COP and EER higher than case 1 to 10.66% and 10.31% respectively.

Acknowledgement

The authors would like to thank the research assistants and the research facility. Supported by Rajamangala University of Technology Phra Nakhon. Conflict of interest: The authors declare that they have no competing financial interests or personal relationships that could appear to influence the work reported in this article.

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