The Effect Of Time Of Using Air Conditioning (AC) Condensors From Various Types Of Increased Temperature

Yushardi, B Supriadi, Z R Ridlo, S W K Putri

Abstract: Condensers are an important component of Air Conditioning (AC) which functions as a heat exchanger. The heat produced by the condenser is relatively large, which ranges between -. The amount of heat produced by the condenser can affect human comfort. Therefore, it is necessary to conduct research related to Air Conditioning (AC) condenser, which aims to find out the amount of heat produced by condensers of various types. This research was conducted experimentally using a variety of condenser types. From the variation of the condenser type, it is seen how the temperature produced by each type of condenser for 240 minutes is used. The results showed that Type 1 condenser produced four temperature increase patterns and three temperature drop patterns. The specification value is greater when compared to type 2, the temperature produced by type 1 is smaller in the pattern formation. For type 2 condenser produces 3 temperature increase patterns and 3 temperature drop patterns, with a smaller specification value, the temperature generated by type 2 is greater in the pattern formation. It is also known that the type 1 condenser experiences a pattern of temperature rise in a faster period, that is, in the span of 20-30 minutes, when compared to the type 2 condenser which experiences a temperature increase pattern in the span of 50-70 minutes. The results showed that there were differences in temperature produced by each condenser.

Keyword: Air Conditioning, Various Types, Increases Temperature, Heat and Temperature, Condensor Types, **Index Terms**: Minimum 7 keywords are mandatory; Keywords should closely reflect the topic and should optimally characterize the paper. Use about four key words or phrases in alphabetical order, separated by commas.

1 INTRODUCTION

The development of this modern era has an effect on increasing the use of technology. One example of the use of technology that has increased is the use of air conditioning technology. We can see that the use of air conditioning technology now is not only used in cities but also in areas far from urban areas such as houses in the neighborhood.

An air conditioning is used for human comfort in his life. Stoecker and Jerold 1995 explained that the human body is an organism that can adjust admirably. In the long term the body is able to function in extreme thermal conditions. But also the diversity of temperature and body adaptation, therefore good conditions are needed in the house so that a healthy and comfortable environment can be maintained

The air conditioning system aims to condition a room controlled by the user. The air conditioning system itself is a process in which the air is cooled by the step of drying, cleaning and circulating for the amount and quality of the air conditioning with the control of the user. Air conditioning in carrying out its function continuously requires an energy source to drive the compressor so that it can compress the flow of refrigerant coming from the evaporator in order to reach a certain state so that it is able to release heat energy when condensing in the condenser [10].

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Konrad 2015 explained that an air conditioning machine is a machine used to absorb heat from a cooled room and then release the heat out of the room. The heat is released through the condenser, with the refrigerant temperature entering the condenser around 50^{o} and cooled to the condenser 55^{o} out temperature. So it can be seen that the heat released by the Air Conditioning condenser is quite large The simplest air conditioning system has the main components, namely compressors, condensers, expansion valves, and evaporators [4]. There are two heat exchangers that work in the AC system. First is the evaporator which functions to absorb heat from the room and move it to the working fluid (refrigerant). The second heat exchanger is a condenser that functions to transfer the heat received by the working fluid to the outside air [1]. Thermodynamically, an AC system that works with a steam cycle (UAP) will take / absorb heat in a conditioned room (evaporator) at low temperatures and pressures [2]. Setyawan and Widodo 2016 explained that one of the important components of air conditioning is the condenser. The condenser itself functions as a National Exchanger. Condenser parts that play an active role in helping heat exchange process are fans located outside the room, fan-shaped, and serve to cool the refrigerant on the condenser. In the fan area which is part of the condenser this heat from the evaporator is released. This event is a heat transfer mechanism known as forced convection. Kreith (1997) explains that convection is heat transport by the motion of a heated substance. The process of heat transfer by flow / convection is a surface phenomenon. Heat transfer by convection is classified into three categories: free convection, forced convection, mixed convection. Bejan

(1993) explains if the mixing movement is solely as a result of differences in density caused by temperature gradients, it is said to be free convection, whereas if the mixing motion is caused by a certain device from outside it is said forced convection and mixing motion caused by differences in density and tools of outside is said to be mixed convection. Based on the above explanation it can be seen that the condenser is an important component of air conditioning. A good condenser work will also affect the air conditioning. Therefore, based on this description, further research is needed regarding the characteristics of the condenser as an information source for the development of air conditioning machines. This study aims to examine the effect of the use time of air conditioner (AC) condensers of various types on increasing the temperature produced. This research was conducted experimentally using a variety of condenser types.

2 METHODS

The research method used is an experimental research method, this study aims to examine a symptom or influence that arises as a result of certain treatments. In this research activity the researcher observed what happened to the object or region under study, then explained what happened in the form of the research report in a straightforward manner. This study examines the effect of using Air Conditioning (AC) condensers of various types on increasing the temperature produced. This research was carried out at the central library of the University of Jember with the consideration that there is a condenser for Air Conditioning (AC) that operates / active and the operating time of the condenser is in accordance with what is needed by the researcher. The space where Air Conditioning (AC) is connected to the condenser under study is the room with an area of 99 with the condition of the room without any activity in it during the research because it is related to the variables controlled in the study. This selection uses a purposive sampling area method. The study was conducted 1 day because the measurements were carried out at the same time for 2 different locations with researchers of 1 person at the study site. So from that place, 2 samples of Air Conditioning (AC) condenser were selected with the following characteristics:

Table 1. Type 1 condenser

Capacity	19.440/ 5,4	kJ/h kW
Voltage	220-240	V-
Frequency	50	Hz
Cooling	5,40	kW
Input Power	1,68-1,73	kW
Current	7,4-7,8	A
Refrigerant	R22/ 1,40	Kg
High side pressure	2,7	MPa
Low side pressure	1,6	MPa

Tabel 2. Type 2 condenser

Capacity	12.560-12.740/ 3,9	kJ/h kW
Voltage	220-240	V-
Frequency	50	Hz
Cooling	3,49-3,5	kW
Input Power	1,17-1,21	kW
Current	6,0	A
Refrigerant	R22/ 820	G
High side pressure	2,7	MPa
Low side pressure	1,6	MPa

This research variable is as follows:

a. The free variable in this study is the research time at the measurement point of the condenser

b.Variabe.l is bound in this study. This is the temperature at the measurement points of the condenser.

c. The control variables in this study are the temperature of the air conditioner, the area of the room, the condition of the room and the condition of the condenser installed (in addition to the condenser usage time and the resulting temperature is controlled)

The increase in temperature produced by various types of condensers is measured using a digital thermometer. Measurements are made at a point that is 0.5 meters from the direction of the depani. The temperature measurement produced by the condenser is carried out every 5 minutes for 240 minutes from the time of ignition of the Air Conditioning (AC) condenser. The measurement data obtained will then be entered into the measurement table. From these data are then analyzed using graphs and analyzing the temperature gain of each type of Air Conditioning (AC).

3 RESULT AND DISCUSSION

From the results of measurements that have been made obtained some temperature data generated by various types of condensers needed for analysis are as follows:

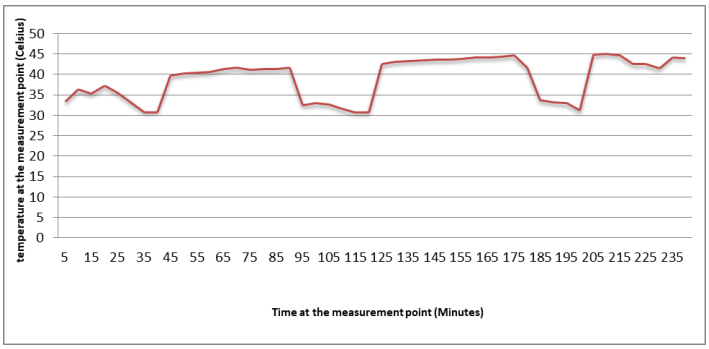

Fig 1. Graph of Type 1 Condenser Temperature Measurement Data

Figure 1 shows that the temperature produced by a Type 1 condenser varies. In this graph it is known that type 1 condenser has 4 temperature increase patterns and 3 temperature drop patterns. In the first pattern of temperature rise, occurred in the 5th minute to the 20th minute, but from

the first pattern the temperature had decreased in the 15th minute. From the first pattern of temperature rise, in the 25th to 40th minutes the temperature formed the first pattern of decline. In the 45th minute to the 90th minute the temperature experiences a pattern of rising both. Then the second pattern of decline occurred in the 95th minute until the 20th minute. In the 125th minute until the 175th minute the temperature experienced the third pattern of increase. The third temperature decrease pattern occurred in the 180th minute until the 200th minute. Then for the fourth temperature increase pattern occurred in the 205th minute until the 240th minute, but the fourth temperature increase pattern can be seen the temperature irregularities in the 215th minute until minute 230 so that the pattern of decline is not too drastic compared to the 3 previous patterns of decline. So from the pattern of increase and decrease that has been obtained, it is known that every 20-30 minutes the condenser will experience a pattern of increase after the pattern of decline. The first temperature rise in the condenser is an increase in temperature for the process of adaptation of the condenser work. The condenser itself functions as a heat exchanger. The desired indoor temperature is certainly not instantaneously given, considering the heat absorption carried out indoors goes gradually until it reaches the desired temperature, as the condenser runs as a heat exchange place also experiences a gradual increase in temperature. The temperature rise in the condenser is due to the expansion required by the evaporator to produce the desired temperature, after the required expansion is appropriate, the condenser temperature conditions will decrease. The cooling work itself is an application of the second law of thermodynamics which states that "Heat will not flow spontaneously from cold objects to hot objects" thus cooling carried out by Air Conditioning (AC) in performing its functions requires the work of the surroundings one of which is a condenser.

The pattern of temperature rise and the pattern of temperature reduction that occurs in type 1 condensers is relatively more constant for each pattern, both when the pattern is increasing and the pattern is decreasing. If you see the specifications of type 1 condenser using a capacity of 19,440 kJ / h, the capacity of Air Conditioning (AC) is related to the need for cooling needed for the area of the room to be used. If it is calculated according to the capacity requirement of 19,440 kJ / h it is converted to 1842.6 Btu / h then the Air Conditioning (AC) is AC 2 PK which should be used for the area of room 36. But the area of the room used for this sample is 99 if it is taken into account the required PK AC is 2 PK as much as 3 AC considering the use of AC which is better the PK calculation is exceeded by the need.

Other specifications that are considered are the large input power, current, cooling and refrigent seen in Table 1 specifications for the type 1 difference is greater than type 2 seen in Table 2. The pattern of increase and decrease in type 1 is more constant in each pattern this can seen in Figure 1. However, for the temperature magnitude the type 1 increase pattern is smaller than type 2, so it can be seen that the expansion size required by type 1 is smaller than type 2. The size of expansion required for type 1 can be related to the value of the specifications is greater so that the expansion carried out by type 1 is lighter than type 2 considering that in this study the temperature and area of the room used were the same.

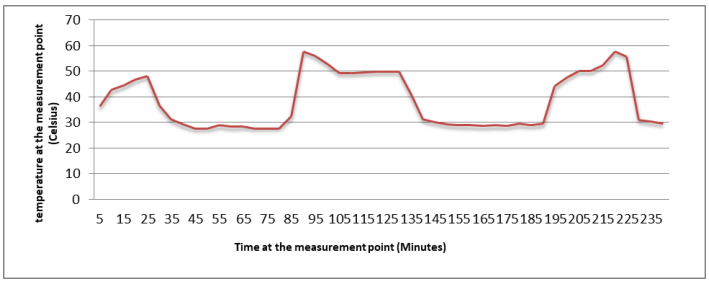

Fig 2. Graph of Type 2 Condenser Temperature Measurement Data

Figure 2 shows In type 2 Experiencing 3 temperature increase patterns and 3 temperature drop patterns. The first temperature rise pattern occurred in the 5th minute to the 25th minute. Then from the pattern of the increase, in the 30th to 80th minutes the temperature experienced the first pattern of decline. In the 90th minute until the 130th minute the temperature experienced a pattern of rising both, but in the second pattern of temperature rise there was a not too dramatic decrease in the 105th minute until the 130th minute with a constant retative temperature. In the 135th minute until the 190th minute the temperature experienced a second pattern of decline. Then the third temperature increase pattern occurred in the 195th minute until the 220th minute. In the 225th minute until the 240th minute the temperature experienced a third pattern of decline. Then from the pattern of increase and decrease that had been obtained, it was known that every 50-70 minutes of type 2 condensers would experience an increase pattern after the decline pattern. Type 2 condenos experience a longer time to produce a pattern of increase after decreasing when compared to Type 1 Condenser in accordance with the graph that has been produced. The first temperature rise in the condenser is an increase in temperature for the process of adaptation of the condenser work. The condenser itself functions as a heat exchanger. The desired indoor temperature is certainly not instantaneously given, considering the heat absorption carried out indoors goes gradually until it reaches the desired temperature, as the condenser runs as a heat exchange place also experiences a gradual increase in temperature. The temperature rise in the condenser is due to the expansion required by the evaporator to produce the desired temperature, after the required expansion is appropriate, the condenser temperature conditions will decrease. The pattern of temperature rise and the pattern of temperature decrease that occurs in type 2 condensers is steeper than that of the CU-C18DK condenser. If

you see the specifications of type 2 condenser using a capacity of 1270 kJ / h, the capacity of Air Conditioning (AC) is related to the need for cooling needed for the area of the room to be used. If calculated according to the capacity requirement of 1270 kJ / h converted to 1275.2 Btu / h then the Air Conditioning (AC) is AC 1.5 PK which should be used for room area 24. But the area of the room used for this sample is 99 if it is taken into account then the required PK AC is 1.5 PK as much as 5 AC considering the better use of AC, the PK calculation is exceeded by the need. Other specifications that are considered are the large input power, current, cooling and refrigent seen in Table 2 specifications for the type 2 difference is smaller than type1 seen in Table 1. The pattern of increase and decrease in type 2 is steeper in each pattern this can be seen in Figure 2. The temperature of the type 2 increase pattern is greater than type 1, so it can be seen that the expansion size required by type 2 is greater than type1. The amount of expansion required for type 2 can be associated with a larger specification value so that the expansion carried out by type 2 is heavier than type 1 given that in this study the amount of PK used is smaller for the temperature and the area of the room used is the same.

4 Conclusions And Suggestions

Based on the results of the research that has been done, it can be concluded that for 240 minutes the use of condensers of various types, it is known that each condenser has its own temperature increase. Type 1 condenser produces 4 temperature increase patterns and 3 temperature drop patterns. The specification value is greater when compared to type 2, the temperature produced by type 1 is smaller in the pattern formation. For type 2 condenser produces 3 temperature increase patterns and 3 temperature drop patterns, with a smaller specification value, the temperature generated by type 2 is greater in the pattern formation. It is also known that the type 1 condenser experiences a pattern of temperature rise in a faster time span, that is, in the span of 20-30 minutes, when compared to the type 2 condenser which experiences a temperature increase pattern in the span of 50-70 minutes. Based on the results of data analysis and discussion, then the suggestions that can be given for further research is that further research is needed on the influence of the time of using Air Conditioning (AC) condensers with variations of the model to the magnitude of the increase in temperature produced with more varied variations, the number of tools used for research must be in accordance with the sample to be studied, and variations in environmental conditions (in an open or closed environment) condenser can also be used as a reference for further research.

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