



ANALYSIS OF ENERGY EFFICIENCY RATIO (EER) IN AIR CONDITIONER (AC) TYPE SPLIT

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ABSTRACT

Cooling system is something that is already familiar to the people of Indonesia, both in domestic and industrial use. The cooling system functions to reduce the temperature of a room so that the temperature is as desired. The development of air conditioners is increasingly modern. The use of air conditioners (AC) is growing rapidly so that the CFCs produced affect the environment which can cause the ozone layer to be damaged and cause global warming. Therefore, there is a need for research related to the level of energy use. This study discusses the Energy Efficiency Ratio test to realize a government program that is "one family one number testing". Retrieval of data in this report is by testing the split type air conditioner, where this test aims to obtain an energy-saving star label on the air conditioner. All tests are carried out at the AC Chamber Laboratory located at the Center for Energy Conversion Technology (B2TKE) - BPPT which is a professional energy conversion testing center in Indonesia. The testing process is carried out in a structured way from initial checking of test materials, preparation of tests, testing to analysis of test results. Based on the test analysis results, it can be concluded that the Energy Efficiency Ratio (EER) value to get the energy saving sign star label and the test results obtained the Energy Efficiency Ratio (EER) value of 11,805 Btu / h and get a four star.

Keywords: Air Conditioner, Energy Efficiency Ratio, Energy Saving Sign Label.

INTRODUCTION

Electrical energy has become a basic requirement for modern society. Indicators of community prosperity are determined by the level of use or consumption of electricity. Electricity demand continues to increase along with increasing population and the rate of economic growth. Where economic growth is triggered by various factors, including industry, technology and commercial.

Growth in electricity consumption is triggered by population growth factors. The population in Indonesia according to data from the Central Bureau of Statistics (BPS) is estimated to be 265,000,000 by 2018 and will be 293,000,000 by 2035. Population growth with an average range of 0.89% - 1.24% will certainly have an impact on the use of various resources such as land for settlement, agriculture, industry, etc. This will increase energy consumption, one of which is electricity.

In modern times, technology influences the survival of human beings such as in the home, office or vehicle. Especially for people who live in the Tropics like Indonesia, AC is an electronic item that must be owned by every home, office, or vehicle. The use of air conditioners that are growing and affecting the environment where CFCs produced by the use of air conditioners can cause the ozone layer in the earth's atmosphere to become hollow and will cause global warming.

With the growing use of AC, the Ministry of Energy and Mineral Resources applies regulations regarding "the application of minimum energy performance standards and the inclusion of energy saving sign labels for air conditioning devices" this regulation is stated in ESDM Regulation No. 57 of 2017 aimed at "one family one test number" .

Air Conditioner is able to condition the air in the room and provide a comfortable effect for the body. Some people do not know that electricity consumption, achievement coefficient (COP) and the level of energy use (EER) about AC is very important to know. Therefore, the authors will conduct COP and EER tests on Split type central air brand Air Conditioners to find out the coefficient of achievement and the level of energy use in this air conditioner.

RESEARCH METHODOLOGY

The method used in this study is a reference study, testing and observation that is by conducting testing to get EER on the air conditioner. Data is collected by using a psychrometer.

Data collection procedure that is conducting test preparation, ac split type EUT installation, operation of testing facilities, installation of water sampling, regulation of the psychrometer, regulation of temperature conditions, enthalpy testing and overall testing.

RESULTS

The air conditioner test results are as follows:

Information	Test result	Data Specifications
EER	3.460 W/W	3.490 W/W
	3.460 x 3.412 =	3.490 x 3.412 =
	11.805 Btu/h	11.907 Btu/h

Based on the data above, it can be seen the Energy Efficiency Ratio specification data on the Air Conditioner (AC) tested in the BPPT B2TKE lab which is 3,490 W / W where EER is a comparison of cooling capacity with power input. Cooling capacity is measured using Btu / h while power is measured using watts.

The formula to get the EER is multiplying the data with 3,412 for the specification data to get an EER of 11,907 Btu / h and for the test results in B2TKE using the enthalpy method to get an EER of 11,805 Btu / h. In this experiment every five seconds takes one data and every five minutes the data that has been taken is averaged so that the data that has been steady can be displayed on the graph.

Experiment using the enthalpy method. This enthalpy method reviews air to test AC performance by measuring the enthalpy and volume of air in the AC inlet and outlet. This method has many advantages of speed, convenience and high-test precision to meet production requirements. The air enthalpy method aims to measure the difference in enthalpy of air inlet and outlet in the AC

chamber and calculate the AC capacity through the heat exchanger air flow.

The analysis of energy saving sign labels is as follows:

ESDM Regulation 57 of 2017	Minister No.	Data Specific ations	Test Result Data	Label in Indonesia
★	8,53 ≤			
EER < 9,01				
★★	9,01 ≤	11, 907	1, 805	★★
EER < 9,96		Btu/h	Btu/h	★★
★★★	9,96 ≤			★★
≤ EER < 10,41				
★★★★				
10,41 ≤ EER				

From the data above, it shows the criteria for labeling energy saving signs in the Air Conditioner (AC) test, where Indonesia has criteria of one to four stars that have been set in the Ministry of Energy and Mineral Resources No. 57 of 2017. The test results obtained in testing in B2TKE, which is getting an Energy Efficiency Ratio (EER) of 11,805 Btu / h, which is getting a star rating of four stars because the EER yield exceeds 10.41 Btu / h. This shows that the air conditioner tested already has enough stars to meet the energy-efficient air conditioner.

From the results above, it shows the difference between specification data and test data, this can occur due to several factors including:

1. The producer takes the maximum number when doing the test, this can

happen because the producers when testing for production take the average value of the test taken the highest value.

2. There is a difference in cooling capacity testing. This cooling capacity is influenced by latent and sensible heat. In refrigeration and air conditioning systems, the unit of heat energy is expressed in the British Thermal Unit (BTU). The heat that affects the latent heat is the heat needed to change the phase of an object, starting from the melting point or boiling point or freezing point until the object changes phase perfectly, but the temperature is fixed, the next is sensible heat, sensible heat is the heat that can be measured heat that causes the increase / decrease in temperature.
3. The occurrence of heat loss, this can occur due to inaccurate ducting and problems with the taister code. When connecting ducting with taister code or ducting with an evaporator or condenser there is a possibility that there is a gap so that air from the environment of the test room enters the equipment. This can result in a loss of actual cooling capacity or heating capacity.
4. If heat loss occurs, the cooling capacity rises, so that the EER will rise.

CONCLUSION

From the above test, it can be concluded as follows:

Testing split type air conditioner to get the value of Energy Efficiency Ratio (EER) has the following work steps: test preparation, installation of split AC type EUT, when the air conditioner being tested is split type then the next step is connecting the refrigerant pipe, checking the pipe leakage, vacuum drawing, start operation of the testing facility, installation of air sampling, psychrometer settings, type of entalpy testing, connect all channels, pick up the taister nozzle code and start the testing phase.

The EER results obtained in tests conducted at B2TKE-BPPT are 11,805 Btu / h, for energy saving sign labels through ESDM Regulation No 57 of 2017, it gets four stars. This indicates that the air conditioner tested is in compliance with regulations and saves energy.

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Sumber Daya Republik Indonesia .
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Pencantuman Label Tanda Hemat Energi.

