

Experimental Investigation of The Real Time of Cooling Comparable to Temperature of An Air - Conditioner

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Abstract- *The experimental investigation of the real time of cooling comparable to temperature of an air - conditioner (1.5HP) attached to an office of size 6.83mx0.248m has been studied. It was found from the experiment that it takes (12) minutes to cool the Office-Room with the corresponding Air Conditioner Unit Temperature of 16⁰C and as the Temperature of the Air Conditioner increases, the time taken for cooling increases as well. Moreso, for every 1⁰C rise in the Temperature of the Air Conditioning, there is a corresponding rise of 1.2% time taken for the cooling. Recommendation of cleaning the Air-Conditioner Filter in every two (2) weeks was made.*

Indexed Terms- *Air Conditioner, Temperature, Time, Cooling, Thermometer*

I. INTRODUCTION

The air conditioning system is a machine that is made for conditioning of air. The process of conditioning of the air includes: supplying and maintaining the desired internal atmospheric conditions for human comfort irrespective of the prevailing external conditions [1]. Practically, the main work of the air conditioning system is to expunge out heat from air inside an enclosed space like the office-room in this case and discharged the heat that is expunged out: outside. Meanwhile, this machine that is called air conditioning system, has two salient operational principles like liquid absorbed heat when it transforms from liquid into gas and gas emit heat when it transforms from gas into liquid. In addition, the water absorbs heat from the flame as it boils and changes into gas. When the gas condenses into liquid there is a radiation of heat [2][3]. The location of the compressor and condenser are normally outside the portion of the air conditioner

while the evaporator and expander are located inside the house. The refrigerant gets at the compressor which in turn influences the pressure of the fluid by increasing it. This action packs the molecules of the fluid in a closer state together. The closer the molecules the higher the energy and its temperature [3][4].

The performance of R-123YF in a mobile air - conditioning systems under separate heating load conditions was performed by [5]. It was found while operating on the best refrigerants changes air - conditioning cooling capability and the C.O.P of R - 123yf was 11% and 8.3% comparably lesser than that of known R-134a system.

The experiment to find the waste of heat from 1.5HP air - conditioner unit was done by [6]. The study shows that about 145.81KJ heat was rejected to the atmosphere and ways of utilizing the wastes rejected to the atmosphere were recommended.

Thus, this work will perform experiment to investigate the real time of cooling and compare it to the corresponding temperatures of the air - conditioner.

II. METHODOLOGY

Practically, in order to find the real time of cooling comparable to the corresponding temperature, the air conditioner was switched on with the aid of the remote control and it was set at the lowest temperature level which is 16⁰C (and it indicates 16⁰C at the Air conditioner Screen-Surface board) after the initial temperature of the room was taken and recorded. Then the Thermometer is switched on

alongside with the Stopwatch simultaneously. This experiment was conducted when the Office-Room is properly closed (i.e., Windows and Door) without letting anybody come inside or go outside during the experimental processes. Then the Observer being inside the Office-Room observes the thermometer when the temperature of the room decreases to 16⁰C and then the corresponding actual time taken recorded. The experiment continuous till the last temperature in the Air-Conditioner Unit which is 30⁰C was observed and its corresponding time taken for the Air Conditioner to cool at that temperature recorded. The experiment was carried out for fifteen working days designating each temperature level in the Air Conditioner Unit for a day. Moreso, the day is splits into three sections such as Morning(7am-9am), Afternoon(12pm-2pm) and Evening(4pm-6pm). The

size of the Office-Room is 6830mmx2480mm. The door and window are of normal size. The EXCEL SOFTWARE Programme was utilized to correlate the temperature of cooling comparable to average time taken and the Pie Chart which revealed the percentage of the average time taken to cool at that specific temperature as shown in Figure 1 and Figure 2 respectively.

III. RESULTS AND DISCUSSION

• RESULTS:

The values in Table1 were reading obtained from the stopwatch starting from 16⁰C to 30⁰C. Also, Table2 has the average values for the time taken for cooling and the calculation for the Pie Chart.

Table1. Readings Obtained from the Stopwatch

S/N	Temperature (°C)	Initial (°C)	7-9(am) (Minutes)	12-2 (pm) (Minutes)	4-6(pm) (Minutes)
1	16.00	32.00	12.05	13.04	11.00
2	17.00	33.00	13.58	14.02	12.55
3	18.00	32.00	14.05	15.07	14.48
4	19.00	34.20	16.07	15.23	15.00
5	20.00	30.00	17.30	17.00	16.48
6	21.00	40.00	19.05	19.03	18.05
7	22.00	36.00	20.10	20.50	19.30
8	23.00	33.30	20.50	20.58	20.01
9	24.00	35.50	21.10	21.00	20.00
10	25.00	37.40	22.30	22.00	21.02
11	26.00	38.00	24.50	23.50	23.00
12	27.00	39.20	25.00	24.00	24.00
13	28.00	36.00	26.00	26.00	25.50
14	29.00	38.00	28.00	28.00	27.35
15	30.00	40.00	30.20	29.30	29.00

Table2: Calculated Values of Average Time of Cooling Comparable to that of the Pie Chart

S/N	Temperature(°C)	Average Time (Minutes)	Pie Chart Calculation in Degree (°)
1	16.00	12.03	14.19
2	17.00	13.38	15.79
3	18.00	14.52	17.13
4	19.00	15.43	18.21
5	20.00	16.93	19.98
6	21.00	18.71	22.08
7	22.00	19.97	23.56

8	23.00	20.36	24.02
9	24.00	20.70	24.42
10	25.00	21.77	25.69
11	26.00	23.67	27.93
12	27.00	24.53	28.94
13	28.00	25.83	30.48
14	29.00	27.78	32.78
15	30.00	29.50	34.81

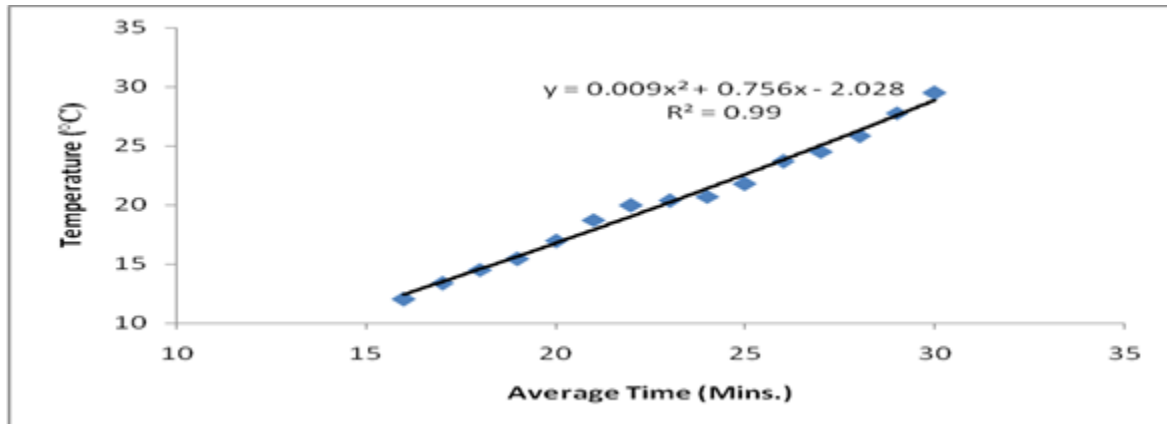


Figure 1: Temperature Comparable to Average Time of Cooling.

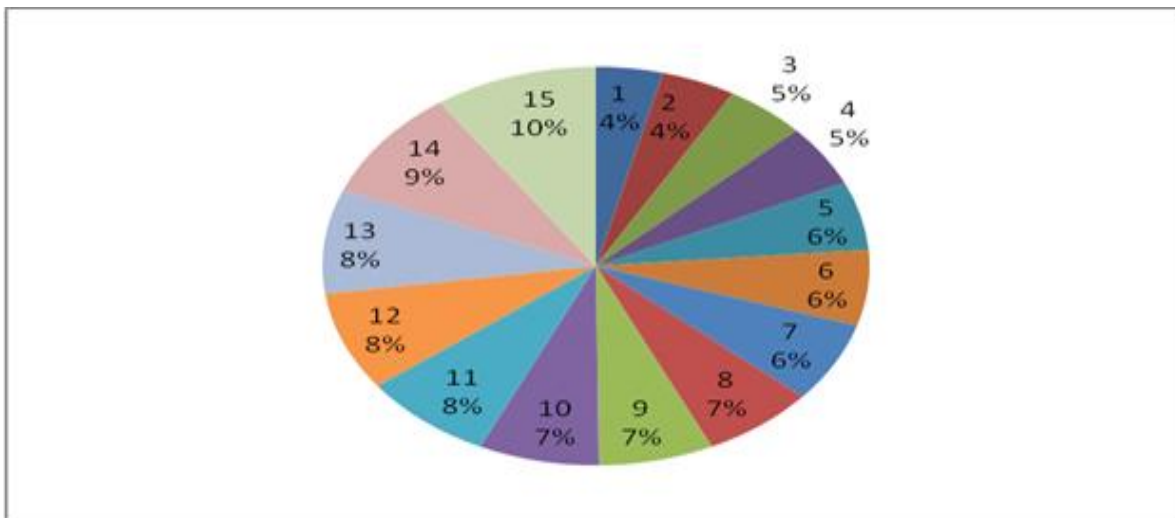


Figure 2: Pie Chart Depicting the Percentage of Average Time of Cooling Comparable to the Temperature

Figure 1 depicts that as the temperature increases the average time of cooling the office space increases. The revealed that the air conditioner takes much time to cool at higher temperature and lesser time to cool at lower temperature like 16°C. Also, this will also make the air - conditioner to do much workdone at higher temperature and lesser workdone at lower

temperature. Figure 2 indicates the percentages of average time of cooling comparable to temperature. Pictorially, the Pie Chart revealed the percentage of each average time of cooling comparable to the temperature of the air conditioner.

CONCLUSION

The experimental investigation of the real time of cooling comparable to temperature of an air - conditioner has been performed. The investigation reveal that as the temperature increases, the average time of cooling increases and as the temperature decreases; the average time of cooling decreases. Also, it was discovered that the 16⁰C temperature cool faster than the 36⁰C temperature. Practicably, an average temperature of 23⁰C was recommended since it can take twenty minutes and thirty-six seconds(20.36Mins.) to cool the office.

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