



FABRICATION AND EXPERIMENTAL ANALYSIS OF ENVELOPE AIR CONDITIONING

Mukunda Mahajan, Mayuresh Pathrekar, Gaurav Patel, Javed Ahmed, A.P.Singh, and O.P.Singh
Department of Mechanical Engg. , IIST, Indore (M.P.), INDIA

ABSTRACT

Conserving as much energy as possible has become the focal point in the eyes of world. Our design and construction of a envelope air conditioner is a new alternative to air conditioning which uses far less electricity. Objective of this project is to fabricate envelope air conditioner which consumes less power as compared to room air conditioner .We constructed envelope air conditioner using a bed, as our aim is to provide cooling only on bed rather than cooling whole room , thus saving energy.Person sleeping on that bed should just get enough comfort which is required . Cooling coil and exhaust fan are mounted on head of the bed . Compressor and condenser units are mounted below the head of the bed.Air conditioning has still not gained popularity in spite of higher temperature and the reason is higher price of product and higher running and operation cost. These reasons have lead to development of new concept called envelope air conditioning which can cool human beings laying over a bed at much more lower cost as compared to normal cost of running.For example a normal room air conditioner of 1.5 tons air conditioner consumes 1.5 kW of load per hour , but our air conditioner will only consume 0.7 kW of load per hour.This envelope air conditioning is based on vapor compression refrigeration system. This concept has potential to save more energy and cost, by improving design and with further research coefficient of performance of this air conditioner can be increased.

Keywords: Envelop Air Conditioner, cooling Coil, Compression,COP

I. INTRODUCTION

Envelope air conditioner is a device that lowers the air temperature in the enclosure provided. Bed is our Enclosure which is required to be cooled instead of cooling whole room .Air conditioning has still not gained popularity in spite of higher temperature and the reason is higher price of product and higher running and operation cost. These reasons have lead to development of new concept called envelope air conditioning which can cool human beings laying over a bed at much more lower cost as compared to normal cost of running. Like a 1.5 tons air conditioner is consuming 1.5 kW of load per hour , but our air conditioner will only consume 0.4 kW of load per hour. Our design and construction of a envelope air conditioner is a new alternative to air conditioning which uses far less electricity.

In this design cooling coil and exhaust fan are mounted on head of the bed .Compressor and condenser units are mounted below the head of the bed. This envelope air conditioning is based on vapor compression refrigeration cycle

II. LITERATURE SURVEY

Air conditioning has still not gained popularity in spite of higher temperature and the reason is higher price of product and higher running and operation cost. These reasons have lead to development of new concept called envelope air conditioning which can cool human beings laying over a bed at much more lower cost as compared to normal cost of running.



Various attempts have been made to cool human being on the bed instead of cooling whole room. Product like Bed jet , cooling bed sheets , cooling mattress ,cooling blankets are available in market. Basic concept behind air conditioning is said to have been applied in ancient Egypt, where reeds were hung in windows and were moistened with trickling water. The evaporation of water cooled the air blowing through the window. This process also made the air more humid, which can be beneficial in a dry desert climate.

III. OBJECTIVE

Due to global warming and increasing temperature air conditioner is now necessary part of life , as human feel comfortable between temperature range of 22 to 28 degree Celsius , but a common man cannot afford air conditioner as it is very expensive and high operational cost , but our envelope air conditioner is cheaper and has low operational cost . For example a normal room air conditioner cost around 30000 rupees but our air conditioner will cost much lower.

There are various cooling losses in room air conditioner like infiltration losses , through gaps in windows , door of room and on top of that we are spending energy to cool whole room . Air conditioning has still not gained popularity in spite of higher temperature and the reason is higher price of product and higher running and operation cost. These reasons have lead to development of new concept called envelope air conditioning which can cool human beings laying over a bed at much more lower cost as compared to normal cost of running. Like a 1.5 tons air conditioner is consuming 1.5 kW of load per hour , but our air conditioner will only consume 0.7 kW of load per hour. Our design and construction of a envelope air conditioner is a new alternative to air conditioning which uses far less electricity. In this design cooling coil and exhaust fan are mounted on head of the bed .Compressor

and condenser units are mounted below the head of the bed. This envelope air conditioning is based on vapor compression refrigeration cycle.



FIGURE 1. COOLING BED



FIGURE 2. ENVELOPE AIR CONDITIONER



FIGURE 3. ENVELOPE AIR CONDITIONER





FIGURE 4. ENVELOPE AIR CONDITIONER



FIGURE 4. COOLING COILS AND EVAPORATOR FANS IS LOCATED IN THE BED HEAD



FIGURE 5. CONDENSER AND COMPRESSOR

IV. HEAT LOAD CALCULATION :-

HEAT SOURCE		OBSERVATIONS	UNITS	MULTIPLIER	HEAT LOAD(KCAL)
WALLS	WEST /SOUTH	0.9144*1.524*2	Sq.m	35	97.5
	EAST /NORTH	2.05*1.524*2	Sq.m	25	156
WINDOW		0	Sq.m	30	0
CEILING	UNEXPOSED	2.05*0.9144	Sq.m	60	112.5
FLOORING		2.05*0.9144	Sq.m	60	112.5
OCCUPANTS		2	No.	125	250
ALLOWANCE HEAD				40%	
TOTAL HEAT					1019.9

$$\begin{aligned} \text{TOTAL TONNAGE OF AIR CONDITIONER} &= \text{TOTAL HEAT IN KCAL/3000} \\ &= 1019.9 \text{ KCAL} \\ &= 0.34 \text{ TONNES} \end{aligned}$$

V. RESULT

$$\text{COP} = \frac{\text{power output}}{\text{power input}} \quad (\text{Eq 1})$$

The maximum theoretical COP for an air conditioning system is expressed by Carnot's theorem, reduced to the following equation:

$$\text{COP}_{\text{maximum}} = \frac{T_c}{T_H - T_c}$$

Where T_c is the cold temperature and T_H is the hot temperature. For space cooling, the cold temperature is inside the space; for space heating, the cold temperature is outside. All temperatures are expressed in Kelvin.

$T_c = 23$ degree Celsius

$T_H = 32$ degree Celsius

$\text{COP}_{\text{max}} = 296/9 = 32.88$

But actual cop of air conditioner is one tenth of theoretical maximum cop

Therefore, actual cop = theoretical / 10

$\text{COP}_{\text{actual}} = 32.88/10 = 3.28$

VI. CONCLUSION

Innovation in air conditioning technologies continues, with much recent emphasis placed on energy efficiency.

Production of the electricity used to operate air conditioners has an environmental impact, including the release of greenhouse gasses. Humans perspire to provide

natural cooling by the evaporation of perspiration from the skin, drier air (up to a point) improves the comfort provided. The comfort air conditioner is designed to create a 40% to 60% relative humidity in the occupied space.

- 1 This envelope air conditioner can only provide cooling and comfort to a person as a bed can only accommodate only a single person.
- 2 As we have used mosquito net to provide partial insulation to avoid cooling loss but still, we were unable to give a complete insulation to system, so some energy is wasted to environment.

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