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DESIGN AND FABRICATION OF HUMAN AIR COMFORT JACKET

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Abstract: Tropic and sub tropic countries receive maximum sun light, due to which these places are hotter when compared to rest of the world. More than 125 of the world's countries and territories are geographically located at least partially in the tropics which includes Brazil, Sri Lanka, Costa Rica, Cuba, Colombia, India, etc., These 125 countries experience maximum sun light when compared to the countries that are far from equator. Employees, construction & non-construction workers, students, hawkers and security personnel living in these countries travel from one place to another place either by bikes, cycles, walk or by buses in which AC is not available or possible and hence they get exposed to hot climate for longer durations. Due to excessive exposure to hot climate and sweating, people living in these areas get affected with health problems like skin diseases, sun stroke; temperature fatigue related problems and also has to bear lots ofdiscomfort.

Design and fabrication of human air comfort jacket will be a best solution to the above problem. The human air comfort jacket produces cold air using thermos electriccoolers and circulates it around upper body via channels that are cut inside the jacket. By implementation of this technology, we can protect humans from health problems like sun stroke, dehydration and skin diseases, and discomfort due to hot weather and uponthis jackets cost is lower when compared to commercial large sized heavy air conditioners that cannot by carried by human himself.

Keywords. Thermal Comfort, Thermo electric module, Heat transfer, Humidity.

I. INTRODUCTION

Thermal comfort is the condition of mind that expresses satisfaction with the thermal environment and is assessed by subjective evaluation. The human body can reviewed as a heat engine where food is the input energy. The human body will release excess heat into the environment, so the body can continue to operate. The heat transferis proportional to temperature difference. In cold environments, the body loses more heat to the environment and in hot environments the body does not release enough heat.Both the hot and cold scenarios lead to discomfort. Maintaining this standard of thermal comfort for occupants of buildings or other enclosures is one of the important goalsof HVAC (heating ventilation and air conditioning) design engineers.

Factors affecting thermal comfort:

Thermal comfort is the condition of mind that expresses satisfaction with the thermal environment. It is influenced by various factors such as air temperature, radiant temperature, humidity, air velocity, and personal factors like clothing insulation, metabolic rate, and physiological condition.

Benefits of Using Air Comfort Jacket:

Construction workers often work in hot and humid environments where the temperatures can rise to uncomfortable levels. In such conditions, it is vital for workersto regulate their body temperature to avoid heat exhaustion or heat stroke. An air- cooling jacket can help in the following ways

- Regulate body temperature: Air cooling jackets contain a fan system thatcirculates air around the body. This helps to regulate the worker's body temperature by dissipating heat and bringing down body temperature.
- Keep workers comfortable: By keeping workers cool while working in hot environments, air cooling jackets can significantly improve comfort levels, ultimately improving morale and productivity.
- Reduce risk of heat-related illnesses: Heat exhaustion and heat stroke are dangerous conditions that can occur when the body is unable to regulate its temperature. Air cooling jackets can help prevent these conditions by reducingthe body's core temperature.

II. MATERIAL SELECTION

Various materials are analysed and the most suitable are selected. Several properties including high tensile strength, weld ability, mach inability, ductility and electrical flowing parameters are analysed.

FOAM SHEETS

Foam sheet refers to a thin, flexible, and medium-density material made of foam, a type of plastic material. It is available in a variety of thicknesses, colures, and sizes, and can be easily cut, shaped, and glued to different surfaces. Foam sheets are commonly used for a wide range of applications, including crafting, packaging, insulation, cushioning, and protection. They are also popularly used for making costumes, props, and decorations for theatre, movies, and events. Additionally, foam sheets are lightweight, easy to handle, and have excellent shock-absorbing properties, making them a popular choice for many DIY projects and home improvements

POLYCARBONATE SHEET

Polycarbonate is an important thermoplastic polymer. Due to its high performance, polycarbonate has a range of engineering applications in construction, automotive, aircraft, data storage, electrical, and telecommunication hardware. However, polycarbonate’s use is limited in advanced applications due to limitations, such as strong hydro phobicity, relatively limited chemical functionality, high melt viscosity, notch sensitivity of mechanical properties, and relative softness. Blending with other thermoplastic polymers improves its physical characteristics. The present review outlines up-to-date developments concerning the design and applicationof polycarbonate blends.

III DESIGN

Fig: Conceptual Drawing

Fig: Final Model

IV. METHODOLOGY

Marking and Cutting of the foam:

The jacket taken of length 0.5m and width of 0.3m. The jacket is made of polyester the jacket has tiny holes for heat rejection from thebody. The jacket is widely used in by constructional sites as a part of dress code and safety concern. We have taken a foam sheet of 100x100cm and the marking on the foam sheet is done as per thedimensions of the jacket as shown in figure.
Marking of the Foam Sheet

Fig. Site Work Jacke

Fig: Marking of the Foam Sheet

Marking And Cutting of Polycarbonate Sheet:

Polycarbonate sheet are tough, hard, and transparent. As they have good strengththey are capable of holding all the equipment's. we have taken a polycarbonate sheet of 500x500mm in the project. As the polycarbonate sheet are hard they we can't cut themeasily so we require a cutting machine. We need to make a marking of 200x260mm as shown in fig. on the polycarbonate sheet the dimensions are taken according to the fitting and equipment's of the project. The polycarbonate sheets can withstand temperatures up to 140°C and -20°C.

V. Result & Discussions

The human air comfort was designed and fabricated. we have chosen a Sunny day of 15-05-2023, Monday to conduct the preliminary phase of testing the cooling rate shown by the apparatus. Experimental results as per test conducted were recorded.

Table Test Results Of Air Comfort Jacket:

Test time	Ambient temperature	Jacket temperature
9.00am	30ºC	27º C
11.00am	32ºC	28ºC
12.00pm	34ºC	30ºC
2.00pm	35ºC	31ºC
3.00pm	36ºC	31ºC
5.00pm	30ºC	27ºC

A cooling jacket is an essential component in many applications that require precise temperature control, such as in industrial processes, scientific experiments, and electronic devices. One common method of cooling is to circulate a liquid such as water or coolant through the jacket to absorb heat from the object being cooled. However, thisapproach can be cumbersome due to the weight and maintenance required for the liquidand associated piping.

To overcome these issues, we are planning to use a thermoelectric Peltier module in the cooling jacket. This device uses the Peltier effect to transfer heat betweentwo surfaces, creating a temperature gradient across the module. By applying a currentto the module, one surface can be cooled while the other is heated. In our design, we will use air as the circulating medium, which will reduce the weight and complexity ofthe cooling jacket.

VI. .CONCLUSIONS

- This project was able to furnish the principle of Peltier cooling as an effecting and adaptable means to promote cooling by eliminating complex refrigeration and cooling systems like vapor compression and vapor absorption refrigeration systems.
- However, the efficiency of the system in terms of energy consumption for a specified cooling is low. The future of thermoelectric cooling is of no doubt because it will replace the present system as it is simple, cheap and least polluting. Hence project is a breakthrough towards the adaptability of Peltier cooling for various aspects of day today.
- The project cost can also be reduced when mass production is done. This coolingjacket can be applicable in a extreme hot working condition of a worker. it canprovide comfort to some level so that the worker does his work efficiently
- Some more ideas and research can make this project more efficient. there's no doubt the Peltier cooling has a good scope in future.

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