

# E-Jacket with Health Monitoring System Using Renewable Source of Energy

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**Abstract** - We have developed E-jacket with cooling, heating, charging & health monitoring using renewable energy source. Our device/product is capable to deal with certain weather conditions like cold & warm and will keep the soldier body temperature normal in every kind of weather. We are using Proteus & Arduino IDE software platform with simulating & programming the product Algorithm and we are using Arduino Uno, Heart Beat sensor, Peltier plate, Solar panel as hardware. The objectives of this work are to develop an Environmentally friendly product which will be used by military to keep themselves safe in difficult weather conditions also, it will also provide continuous health monitoring of soldier & send data of it to the head quarter. The system consists of three main parts: 1) Solar panel: We used solar panel as source so energy to complete system which is reusable & easily accessible. 2)Peltier plate: This is the heart of E-jacket, it will provide cooling & heating effect to the body according to the conditions and selected mode. 3)Heartbeat sensor: This will provide continuous sensing of one’s pulse by which we can get his health information at every instant of time

**Keywords** - Peltier plate, Sensor, Heat & Cool, LM 35, E-jacket, ESP8266

## I. INTRODUCTION

The aim of the project is to design & develop an all-rounder E-JACKET for soldiers, which will help Indian military to with stand in extreme cold conditions also, this jacket will keep the soldiers warm & it will also provide a charging output to charge their walkie talkies, torch & other devices as such as it will provide continuous health monitoring of pulse & heart beat to keep soldiers safe. At very cold temperature serious concern is hypothermia & in hot is heat stroke. This product as E-jacket which gives better protection who lives in extreme weather conditions. Health monitoring is also used for continuous monitoring. At very cold temperature serious concern is hypothermia & in hot is heat stroke. This product as E-jacket protects soldier who lives in extreme weather conditions. Health monitoring is also used for continuous monitoring.

## II. RELATED WORK

Other system is limited as they provide only heating & cooling facility, but this system also gives continuous health monitoring of ones.

## III. METHODOLOGY

In this paper we are using solar panels as the main source of input which is renewable, we collect the energy in lead acid batteries & use as per need. A device Peltier plate is used to produce cooling effect on one side & heating effect on other side through heat sink. The temperature sensor LM35 is detects the body temperature for working of Peltier plate according to conditions, all the data is shown on LCD module attached to it.

LCD is used for displaying values of battery charge & health related readings such as pulse & temperature of body. All this information is also forwarded to the main headquarters through ESP8266 Wi-Fi module, as they can react and help the soldier in his need.

We use a health monitoring system which has 2 sensors, Pulse sensor & Temperature sensor. Pulse sensor will continuously monitor the heart beats of soldier & temperature sensor will monitor temperature of the body. If soldier is sick or in tough environmental conditions then all the health information of soldier will be transmitted to the head quarter so they can help him sooner.

## IV. BLOCK DIAGRAM

E-Jacket with renewable energy source

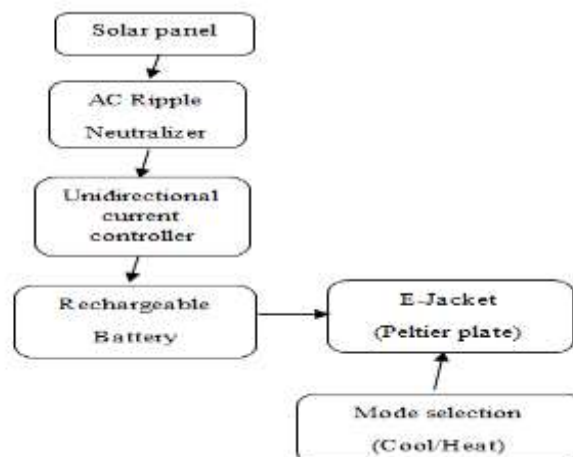


Fig. 1 E-Jacket with renewable energy source

In the above block diagram, we can see Solar panel is used as the input source which is free and renewable, this solar energy is send to AC Ripple Neutralizer which removes ripples from the input coming & send it to Unidirectional current controller where it allows the current to flow in only one direction, as current can vary by time so it controls it to flow in one direction. These charges will be stored in rechargeable batteries which are made up of lead acid & as per our need by selecting the mode operation as cool or heat we can use this charge through E-jacket by use of Peltier plate.

**Health Monitoring System**

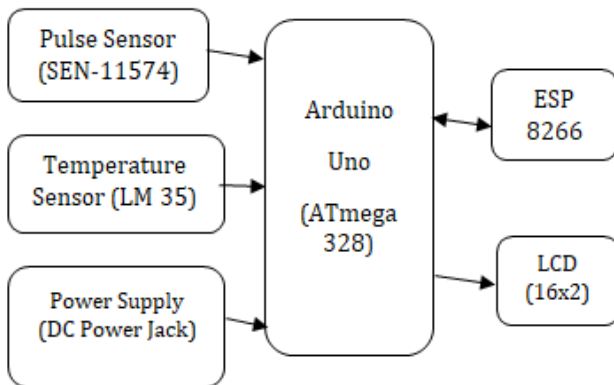


Fig.2. Health Monitoring System

In the below system of health monitoring, we have used two sensors, one is Pulse sensor (SEN 11574) & other is Temperature sensor (LM 35). These both sensors will take readings from human body and display on LCD module through use of Arduino uno, also these reading will be transmitted over Wi-Fi by using ESP 8266 to the headquarters of army.

**V. CIRCUIT DIAGRAM**

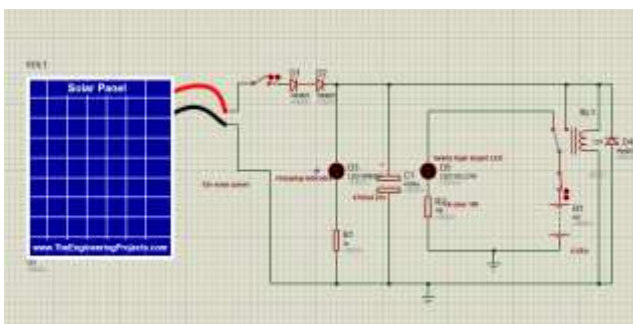


Fig. 3 Solar Energy Storage System

Above circuit diagram is of Solar energy storage which is designed in Proteus software. Solar panel is used to collect the energy and will send to two diodes in series D1 & D2 which is used to increase voltage. A Green LED is used for charging indication. Relay is used to connect or disconnect the circuit electrically. All the charge is stored in Lead Acid battery.

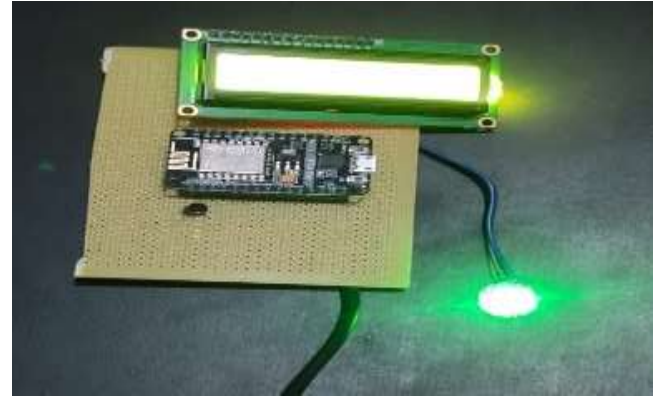


Fig. 4 Health Monitor Device

This is the actual hardware of Health Monitoring system, it has both sensors, Pulse & Temperature. All data will be shown on 16x2 LCD which will be available with the person & same data will be transmitted through Wi-Fi to main headquarters.

**VI. TEST RESULT**

Table 1 Test Result

Sr. No.	Time	Heart Rate	Temperature of Body	Climate Temperature	E-Jacket
1	Start	82 BPM	97.6 °F	30 °C	OFF
2	After 2 min	88 BPM	97.5 °F	35 °C	OFF
3	After 4 min	87 BPM	100.4 °F (Fever)	09 °C (Winter/Snow)	ON in Warm Mode
4	After 6 min	86 BPM	103.2 °F (High Fever)	02 °C (Heavy wind/snowfall)	ON in Warm Mode
5	After 8 min	90 BPM	98.9 °F (Heat Stroke)	47 °C (Peak summer)	ON in Cool Mode

As in above table we can see that time interval is of 2 minutes, Heart rates readings must be in range of 66 – 100. And normal body temperature must be from 97-99 Fahrenheit & climate temperature in 25-40 Degree Celsius.

First two conditions are normal condition in which system will be off, in 3<sup>rd</sup> condition person is having fever due to low climate temperature & system is switched ON in warm condition so he can get relief from cold. In next 4<sup>th</sup> condition person may have high fever & facing extreme wind or snowfall so system is in warm condition & health report of person will send to headquarters so they can help him to get out from there and do a proper health treatment on him. In last condition it's a peak summer in desert area so person may have heat strokes so he switches ON the system in Cool mode to provide give relief to his body from heat.

**VII. CONCLUSION**

A new innovative system has been proposed to give a hot and cold effect through a jacket to soldiers. Used a Peltier plate for it. A health Monitoring System is also used to get health data of every instant of time for soldier. Also designed a charging system for connecting various devices to charge like Torch, Walkie-Talkie, Satellite mobile. This system is a complete safety package for soldiers in emergency & intense conditions.

This system has more scope in future for military use, it is light in weight & easy accessible renewable energy source system. This is limited to by only solar system, if there is less solar energy then battery would not charge completely.

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