FABRICATION OF WIND ENERGY BASED REFRIGERATION SYSTEM USING THERMOELECTRICPLATES

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Abstract

The project Aim is to fabricate thermo electric refrigerator using Wind energy. Exhaust fan is attached to the system to spread the cooling to the surroundings. Micro controller reads the temperature sensor values which is connected to the thermoelectric plate. The temperature values displayed on the LCD. It is pollution less project, made by using thermoelectric module. It supports for both heating and cooling. Hence it proves to be very helpful. The research focused on simulation of a thermoelectric based refrigerator. In the recent years, we have many problems such as energy crises and environment degradation due to the increasing emission of CO2 and ozone layer depletion has become the primarily concern in both the developed and developing countries. Our project utilizes the wind energy for its operation. Wind energy-based refrigeration using thermoelectric module is going to be one of the most cost effective, clean and environment friendly system. This project does not need any kind of refrigerant and mechanical device like compressor, prime mover, etc for its operation. The main purpose of this project is to provide refrigeration to the remote areas where power supply is not possible.

Keywords: PIC microcontroller, Temperature sensor, LCD display, Exhaust fan, Thermo electric plate, SMPS, wind turbine.

1. Introduction.

Thermoelectric refrigerator works on the PELTIER effect that The Peltier - see back effect, or thermoelectric effect , is the direct conversion of thermal differentials to electric voltage and vice versa. The Peltier-see back effect and Thomson effect are reversal of one another ,joule heating cannot be reversible under the laws of thermodynamics. Thermoelectric icebox also called as thermoelectric cooler module. Warmth will moved from one side to other, by applying low voltage DC control source to the thermoelectric module. Thus, one face of module gets warmed and other face will be cooled. Thermoelectric coolers and solid ice chests are tended to by the laws of thermodynamics and both refrigeration structures are destroys same models yet significant in shapes. Till now inspectors have discovered, distinctive laws impact are one of them. A Thermoelectric module is a solid state imperativeness converter made out of two let go substrates that fill in as a foundation from exceptional semiconductor material (P-N make). Which on obliging, they will show up thermally in parallel and electrical in strategy. This module can be used for cooling and warming. The cooling impact made by TEM has unmistakable applications in warm affiliation and control of microelectronic contraptions.

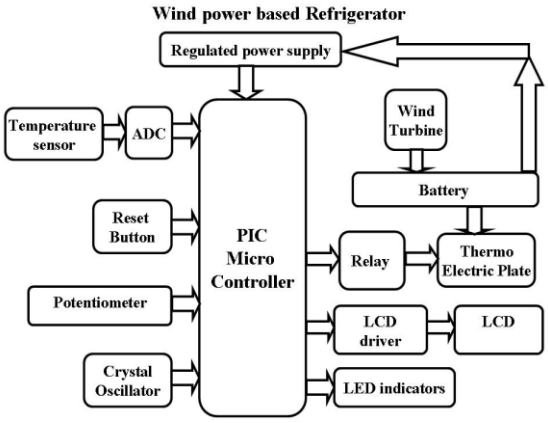
2. LITERATURE SURVEY

Jincan Chena et al.,[1]:-According to non equilibrium thermodynamics ,cycle models of single stage and two stage semiconductor thermoelectric refrigeration were experimentally investigated. By using the three important
Parameters which governs performance of thermoelectric refrigerator i.e. coefficient of performance (COP), the rate of refrigeration, and the power input, development of general expressions performances of the two stage thermoelectric refrigeration system took placed. It was concluded that performance of thermoelectric refrigerator depends on temperature ratio of heat sink to cooled

space. When this ratio is small, the maximum value of COP of a two stage
Thermoelectric refrigeration system is larger than COP of a single stage thermoelectric refrigeration system; however maximum rate of refrigeration is smaller than that of a single stage thermoelectric refrigeration system. Hence it is convenient to use single stage thermoelectric refrigerator when ratio is small. When temperature ratio is large two stage thermoelectric refrigerators is observed to be superior to single stage by both parameters i.e. maximum value of
COP and maximum rate of refrigeration.

In early 1800's the modern thermoelectric coolers are invented which are based on the physical principles of thermoelectric cooling and heating. Thermoelectric modules were made available in late 60's. A German scientist, Thomas seebeck , found that continuous flow of electric current in a closed circuit which is made up of two dissimilar metals where as at two different temperatures junction of metals were maintained. In 1834, A French physicist, Jean Peltier, investigated the seebeck effect and found out the opposite phenomenon in which, the electric current flow within the closed circuit whereby thermal energy is absorbed at one dissimilar metal junction and discharged at other junction. This is the basic fundamental principle of thermoelectric systems

3. Implementation:



In this wander temperature sensor and LCD are interfaced to the Micro controller. These sensors related with the thermo electric plate, Micro controller inspects the temperature sensor regards which are associated with the thermoelectric plate. The temperature regards appeared on the LCD. Thermo electric plate works with peltier impact, on applying DC using battery, the assortment of pellet having positive and negative charge bearers alter warm hugeness from one substrate and unavoidably release it to the substrate at in invert side. In this approach, cool surface showed up in view of ingestion of warmth essentialness. This ingested warm essentialness is being released unexpectedly surface, ends up hot. Vapor fan is secured to the system to spread the cooling to nature.

4. HARDWARE MODULES:

The brief introduction of different modules used in this project is discussed below:

PIC MICROCONTROLLER:

PIC stands for Peripheral Interface Controller given by Microchip Technology to identify its single-chip microcontrollers. These devices have been very successful in 8-bit microcontrollers. The main reason is that Microchip Technology has continuously upgraded the device architecture and added needed peripherals to the microcontroller to suit customers' requirements. The development tools such as assembler and simulator are freely available on the internet at www.microchip.com .

Peripheral Interface controller (PIC16F72):

The PIC16F72 is one of the types of peripheral interface controller. A Microcontroller is a programmable digital processor with necessary peripherals. It consists of 4KB of ROM and 128 bytes of RAM. Operating voltage is about 2v to 5.5v.

WIND TURBINE:

Wind turbines convert the kinetic energy in the wind into mechanical power. This mechanical power can be used for specific tasks (such as grinding grain or pumping water) or a generator can convert this mechanical power into electricity to power homes, businesses, schools, and the like.

How Wind Power Is Generated

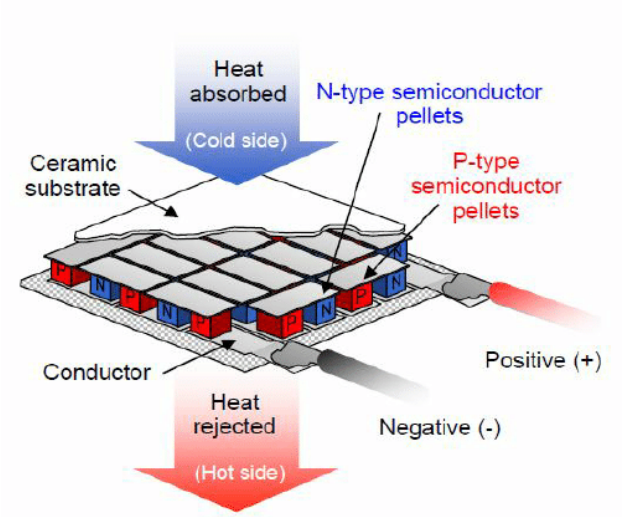
The terms "wind energy" or "wind power" describe the process by which the wind is used to generate mechanical power or electricity. Wind turbines convert the kinetic energy in the wind into mechanical power. This mechanical power can be used for specific tasks (such as grinding grain or pumping water) or a generator can convert this mechanical

power into electricity to power homes, businesses, schools, and the like.

Wind Turbines

Wind turbines, like aircraft propeller blades, turn in the moving air and power an electric generator that supplies an electric current. Simply stated, a wind turbine is the opposite of a fan. Instead of using electricity to make wind, like a fan, wind turbines use wind to make electricity. The wind turns the blades, which spin a shaft, which connects to a generator and makes electricity.

PELTIER PLATE:



PRINCIPLES OF OPERATION

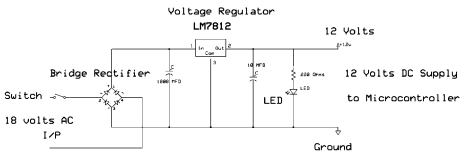
Peltier effect is the basis of thermoelectric module operating principle. In peltier effect, on applying the voltage between two electrodes connected to sample of semiconductor material, temperature difference is created. A thermoelectric cooling (TEC) module is a semiconductor-based electronic part that breaking points as a little warmth pump. By applying DC control source to a TEC, warmth will be exchanged beginning with one side of the module then onto the following. It makes a cool and hot side.

They are comprehensively used as a piece of mechanical zones, for example, PC CPU, CCDs, flexible refrigerators, therapeutic instruments, and so forth.

RECHARGEABLE BATTERY:

A rechargeable battery, stockpiling battery, or aggregator is a kind of electrical battery. It involves at least one electrochemical cells, and is a kind of vitality collector. It is known as an optional cell since its electrochemical responses are electrically reversible. Rechargeable batteries come in various shapes and sizes, running from catch cells to megawatt frameworks associated with balance out an electrical dispersion networSeveral distinctive blends of chemicals are generally utilized, including: lead–corrosive, nickel cadmium (NiCd), nickel metal hydride (NiMH), lithium particle (Li-particle), and lithium particle polymer (Li-particle polymer).

Charging circuit:



From the above circuit diagram, we can see that the 18v AC is being converted to 18V pulsating DC which is in turn converted to smooth DC with the help of the Capacitor. This 18V Smooth DC is converted to 12V DC by the Voltage Regulator 7812. At the output of the regulator, we get some spikes which are not desirable. These spikes are removed with the help of another capacitor used. We can get 12V Steady DC at the output terminal which can be indicated if the LED glows.

SMPS:

The AC to DC converter **SMPS** has an AC input. It is converted into DC by rectification process using a rectifier and filter. ... Then, the output of this transformer is rectified and smoothed by using the output rectifier and filter.

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REFERENCES

[1] Onoroh Francis, Chukuneke Jeremiah Lekwuwa, Itoje Harrison John,―Performance Evaluation Of a Thermoelectric Refrigerator‖ [IJEIT], Vol. 2, Issue 7, Jan 2013, PP 18-24.

[2] Kirti Singh, NishitaSakhare, SangitaJambhulkar, ―Compressor-less Refrigerator cum Oven‖ [IJRASET], Department of Mechanical Engineering, Vol. 3, Issue 4, April 2015, PP 1014-1019.

[3] ChakibAlaoui, ―Peltier Thermoelectric Modules Modeling and Evaluation‖, International Journal of Engineering (IJE), Volume (5) : Issue (1) : 2011, PP 114-121.

[4] Prof. VivekGandhewar, Miss. PritiBhadake, Mr. Mukesh P. Mangtani, ―Fabrication of Solar Operated Heating and Cooling System Using Thermoelectric Module‖, [IJETT], Vol. 4, Issue 4, April-2013, PP 586- 590.

[5] Sandip Kumar Singh and Arvind Kumar, ―Thermoelectric Solar Refrigerator‖, International Journal for Innovative Research in Science & Technology(IJIRST) Volume 1, Issue 9 , February 2015 ISSN (online): 2349-6010, PP 167-170.

[6] Mr.Swapnil B. Patond, Miss. Priti G. Bhadake, Mr. Chetan B. Patond, ―Experimental Analysis of Solar Operated Thermo-Electric Heating and Cooling System‖, International Journal of Engineering Trends and Technology (IJETT) – Volume 20 Number 3 – Feb 2015, PP 125-130.

[7] P. Dasthagiri, H.Ranganna, G. Maruthi Prasad Yadav, ―Fabrication and Analysis of Refrigerator cum Chilled Water Dispenser‖, Advanced Engineering and Applied Sciences: An International Journal 2015; 5(1): PP 7-14.

[8] Simon Lineykin and Sam Ben-Yaakov,―Modeling and Analysis of Thermoelectric Modules‖ [ISRAEL] PP 2019-2023.

[9] MayankAwasthi and K.V Mali, ―Design and Development of Thermoelectric Refrigerator‖ [IJMERR], Vol. 1, October-2012, PP 389-399.