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Design and Construction of Drip Irrigation System for Draught Areas

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Abstract: The area where there is no ground water and no rain for years together is known as drought area. In such places due to the dry land people doesn't cultivate, but with the help of a mechanism designed here, it is possible that water can be generated from such areas. It is an innovative project work and nowhere is it existed. The specialty of this system is that it can capture the water present in the atmosphere and the method employed here is aimed to condense water vapor present in the air by cooling it through Thermo-Electric devices (TED). Since it is a prototype module, low cost device is designed which can produce little water, but for real time applications huge mechanisms can be designed to produce gallons of water and it can be energized using solar energy. The demo module is constructed with a model of drip irrigation system in which water droplets delivered from the devices should fall directly over the roots of tiny plants. In practical, solar energy can be used in the fields and a special type of mechanism constructed with TED & panel can be arranged over the plant in the field. But since it is a prototype module and keeping in view of cost and size of the panels, the required power sources for the TED's is derived from the main supply source through step-down power transformers. In practical, the amount of water collected throughout the day can be fed to the roots of plants continuously. Since it is a prototype module, basic concept is proven with 4 Thermo-Electric devices such that very little water in the form of water drops will be delivered from the mechanism.
Keywords: TEC Device, Prototype, Solar energy, Transformer.

I. INTRODUCTION

In many countries like India it is difficult to obtain water resources for irrigation, especially in dry regions due to lack of rainfall. With the idea of drip irrigation system water can be obtained by condensing the water vapour present in air with the help of thermo electric cooling devices, popularly known as peltier cooler water vapour molecule present in the air will be converted in water. The system developed here can be used for drip irrigation in the drought areas when it is converted in to a real time configuration. Since it is a prototype module, small size TEC devices are used and are powered through main supply source such that little water in the form water droplets will be delivered from the devices slowly. In our trail runs we found that each TEC module can generate nearly 125ml water in 12 hours at normal humidity conditions.

The prototype module constructed here is having 4 TEC modules such that all 4 devices together can generate nearly 500ml water in 12 hours. The amount of water produced in certain time is purely depends up on the moisture content present in the air. If the system installed in near sea shore, more water can be produced because moisture content will be more at sea shores.

As per the analysts of specific department, nearly one percent humidity available at sea shores, and remaining areas including deserts, minimum 0.4% humidity will be presented in the air.

A. *Thermo Electric Cooler*

Thermo electric cooler also known as peltier cooler is the technology which can be applied to refrigeration applications. Here, this technology is chosen to conduct experiment to grab water from atmosphere, In this regard the basic concept will be proven with 4 TEC modules. TEC coolers are preferred because they are very small in size. Thermo electric coolers are operate by peltier effect.

Fig1.1. Thermo Electric Cooler

B. Peltiereffect

Thermoelectric coolers operate according to the Peltier effect. The effect creates a temperature difference by transferring heat between two electrical junctions. A voltage is applied across joined conductors to create an electric current. When the current flows through the junctions of the two conductors, heat is removed at one junction and cooling occurs. Heat is deposited at the other junction.

The main application of the Peltier effect is cooling. However the Peltier effect can also be used for heating or control of temperature. In every case, a DC voltage is required.

C. High-performance Bismuth Telluride

Thermoelectric thin films fabricated by using the two-step single-source thermal evaporationStoichiometric Bi_2Te_3 thin films were successfully fabricated via the two-step single-source thermal evaporation.Rapid thermal process was used to further improve the crystallinity and thermoelectric properties of thin films.

The See beck coefficient of the thin films increased after rapid heat treatment, leading to enhanced power factor. Thin films exhibited low thermal conductivity due to their nano-sized grains, resulting in high ZT value.

Bismuth telluride (Bi_2Te_3) is an efficient thermoelectric material, and fabricating Bi_2Te_3 thin films with good thermoelectric properties is a prerequisite to realizing the potential of these materials in micro device application. Controllable content deposition and low-negative thermal treatment are the two main challenges in preparing high-performance thin films. In this study, stoichiometric Bi_2Te_3 thin films were successfully fabricated via the two-step thermal vapor process with a single evaporation source. Then, the rapid thermal process, which could avoid component loss, was used to further improve the crystallinity and thermoelectric properties of thin films. The Seebeck coefficient of Bi_2Te_3 thin films clearly increased after rapid heat treatment, leading to enhanced power factor and good flexibility. Such thin films exhibited low thermal conductivity due to their nano-sized grains, resulting in high ZT of flexible Bi2Te3 thin films.

D. Atmospheric Water Generators

An atmospheric water generator (AWG) is a device that extracts water from humid ambient air. Water vapor in the air can be extracted by condensation - cooling the air below its dew point, exposing the air to desiccants, or pressurizing the air. Unlike a dehumidifier, an AWG is designed to render the water potable. AWGs are useful where pure drinking water is difficult or impossible to obtain, because there is almost always a small amount of water in the air that can be extracted. The two primary techniques in use are cooling and desiccants.

The extraction of atmospheric water may require a significant input of energy. Some AWG methods are completely passive, relying on natural temperature differences, and requiring no external energy source. Bio mimicry studies have shown the beetle Stenocara gracilipes has the natural ability to perform this task.

E. Problem Statement

1) Effects of Agriculture crops due to less amount water resources available in Drought Areas.
2) Scarcity of water for daily usage in Draught Areas.

F. Objective

1) To extract water from atmosphere and use it in agriculture by delivering water and other nutrients directly to the root of the crop.
2) To reduce the severe yield reductions when there is a scarcity of water supply

II. LITERATURE SURVEY

Anbarasu and Pavithra,[1] The water generator, made from air-conditioning and dehumidifier parts, can generate enough amount of water to meet the drinking water requirements of a regular household. It also addresses the need for safe drinking water in remote areas and responds to the impending scarcity of potable water in certain areas due to the effects of global warming and natural disasters. It can also replace or supplement the currently available water devices in the market to reach the more remote areas.

Niewenhuis et.al.[2] A senior design project was aimed at designing and creating a prototype of an atmospheric water generator . They have tried to incorporate Liquid Desiccant method to extract humidity from air and convert it into drinking water. Wet desiccation is a process where a brine solution is exposed to humid air in order to absorb water vapour from that air. The solution is then sent into a regenerator where the water vapour is extracted from the solution.

This method has grown in popularity because of its efficiency and the ease with which it can be adapted to renewable energy, particularly solar. In their paper and others have also described a novel and unique method to extract water from air. They have said that it is possible to compress humid air so much that it will start condensing at the ambient temperature itself. As pressure increases the dew point rises; thus, enough compression will force the dew point above the ambient temperature resulting in spontaneous condensation. But compressing air to extract water could potentially require pressures up to five times the ambient pressure. This will require a very sturdy tank that can handle high amounts of stress in its walls. This method has great potential for low energy demands, especially if one was able to recapture some of the energy in the compressed air using a turbine or piston. The energy efficiency of this design option has great promise but it is heavily dependent on compressor and decompressor efficiency and humidity. The primary advantage of pressure dehumidification is the low energy requirement; the only unavoidable loss is the pressure applied to the water vapour. However, any inefficiency in the compression/decompression cycle is amplified by the large volume of air processed per unit water produced. Additionally, the rate of production when driven by natural convection cooling to the atmosphere is too slow for significant production; some mechanism to speed up this heat transfer needs to be implemented, increasing the energy cost.

Kabeela et.al.[3] In his paper “Solar-based atmospheric water generator utilization of a fresh water recovery: A numerical study” has done thermodynamic analysis for a Peltier device which is used to develop a device that uses the principle of latent heat to convert molecules of water vapour into water droplets called the Atmospheric Water Generator. It has been introduced a bit before, though it is not very common in India and some other countries. It has a great application standing on such age of technology where we all are running behind renewable sources. Here, the goal is to obtain that specific temperature, called the dew point temperature, practically or experimentally to condense water from atmospheric humid air with the help of thermoelectric Peltier (TEC) couple.

III. SCHEMATIC LAYOUT

The material used in this project is aluminium as it is a good thermal conductor, corrosion resistant, light in weight, and can be easily shaped and extruded. The system is composed of components that is, peltier coolers, transformer, heat sink, circuit panel, cooling fans. The peltier cooler used is high performance peltier cooler which is made up of bismuth telluride and the temperature rise of this peltier cooler is 80 degree Celsius, it has high temperature difference. The transformer used here is a single phase step down transformer which has 800 primary windings and 200 secondary windings. The heat used is extruded for a good amount of heat transfer from one component to another component. The circuit panel consists of a PIC microcontroller, temperature sensor, LCD temperature display unit, bridge rectifier, analog to digital converter. The cooling fans are used for removing excessive heat, the cooling fans are of peltier module cooler type, it has 1300 rpm of fan speed which operates at 10.8-13.2 volts.

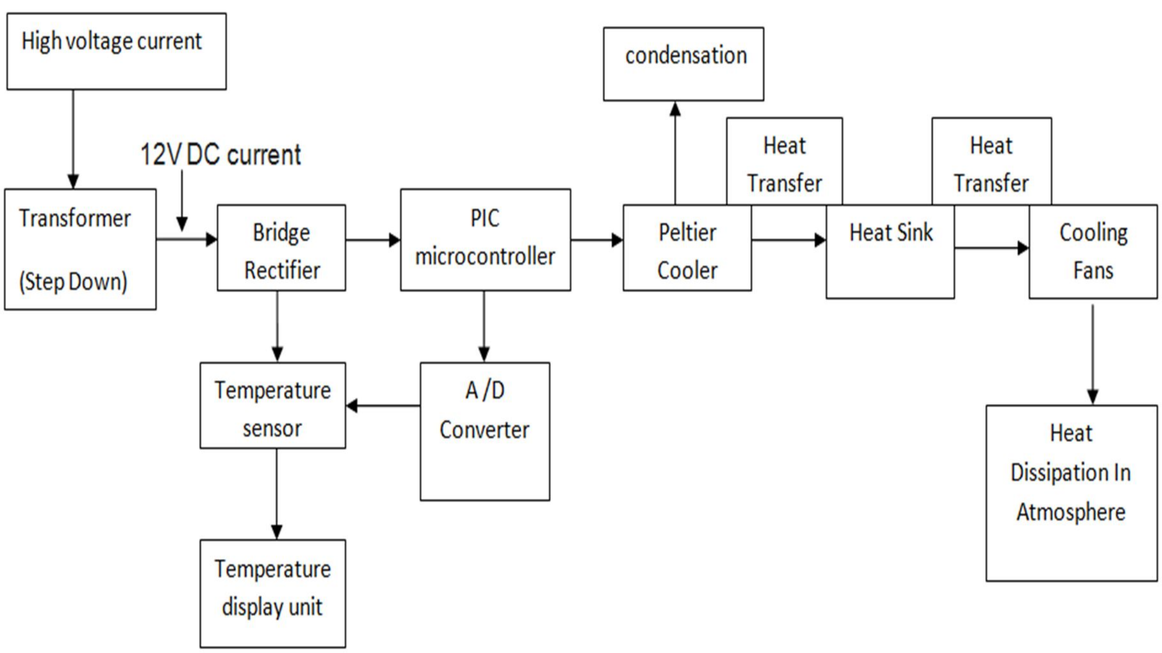

Fig.3.1: Flow Chart of Drip Irrigation System

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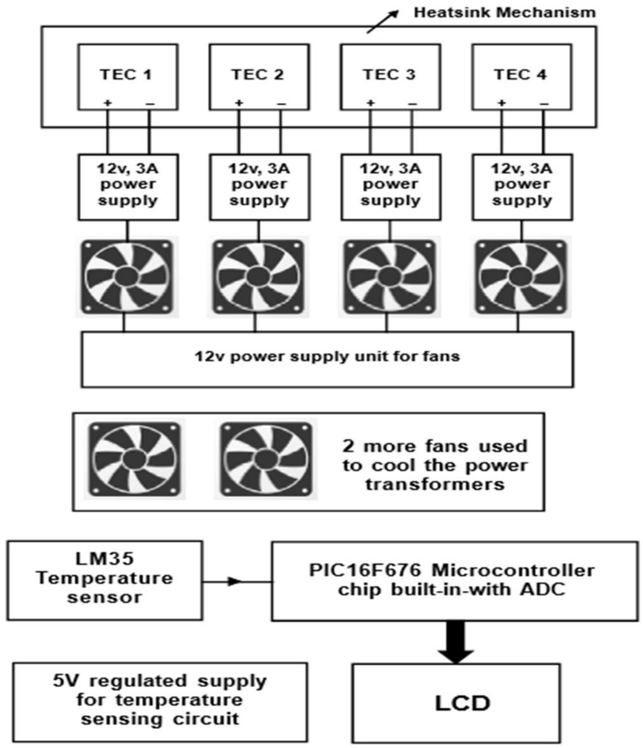

Fig.3.2: Schematic layout of the system

Table 3.1: Specifications

S.no	Components	Description
1	Peltier cooler	High performance, bismuth telluride
2	Step down transformer	120/277 V
3	Heat sink	Extruded heat sink,500x75mm
4	Temperature sensor	Temperature range: -55 to 150° C

A. Component Description

Drip irrigation system consists of several components such as Peltier cooler, Step down transformer, Heat sink, bridge rectifier, Temperature sensor, PIC microcontroller, Temperature display unit, Cooling fans, A/d converter.

Fig.3.2: System Setup

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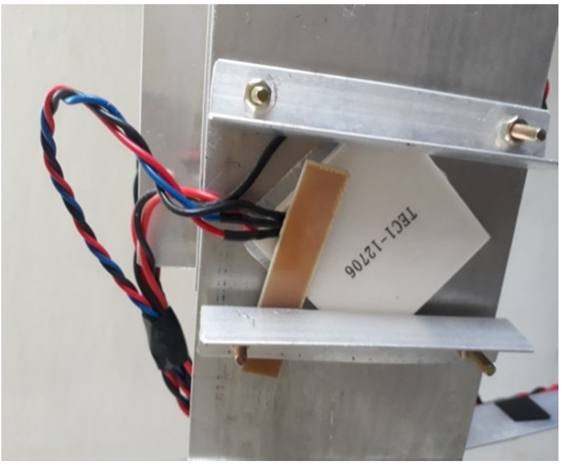
1) *Peltier Cooler:* The thermoelectric effect is the direct conversion of temperature differences to electric voltage and vice versa via a thermocouple. A thermoelectric device creates voltage when there is a different temperature on each side. Conversely, when a voltage is applied to it, it creates a temperature difference. At the atomic scale, an applied temperature gradient causes charge carriers in the material to diffuse from the hot side to the cold side. This effect can be used to generate electricity, measure temperature or change the temperature of objects. Because the direction of heating and cooling is determined by the polarity of the applied voltage, thermoelectric devices can be used as temperature controllers. The term "thermoelectric effect" encompasses three separately identified effects: the Seebeck effect, Peltier effect, and Thomson effect. The Seebeck and Peltier effects are different manifestations of the same physical process. Peltier cooler, is a semiconductor-based electronic component that functions as a small heat pump. By applying a low voltage DC power source to a TE module, heat will be moved through the module from one side to the other. One module face, therefore, will be cooled while the opposite face simultaneously is heated. It is important to note that this phenomenon may be reversed whereby a change in the polarity (plus and minus) of the applied DC voltage will cause heat to be moved in the opposite direction. Consequently, a thermoelectric module may be used for both heating and cooling thereby making it highly suitable for precise temperature control applications. Peltier module: principle of operation The principle of operations of the Peltier module is based on the Peltier effect which consists of heat energy transfer in response to the applied voltage. Thermal energy flows between two sides of the module: cold and hot.



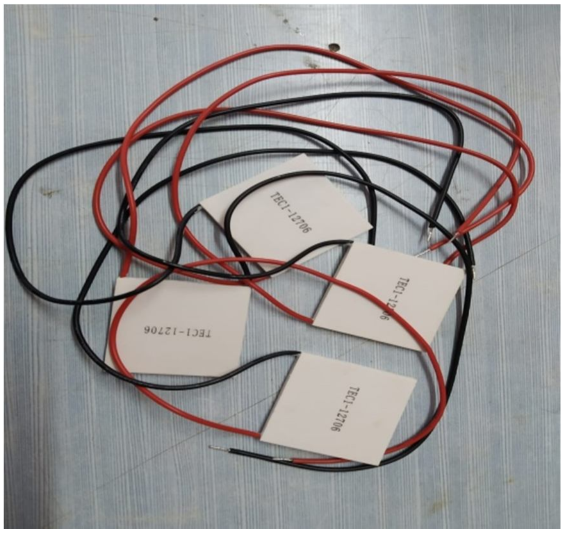


Fig.3.4: Peltier Cooler

Consequently, the module absorbs heat from an element (e.g. LED) touching the cold side and gives it away to another element in the system (e.g. radiator) which is in contact with the hot side. A peltier cooler is a cooler that uses a peltier element (TEC). Peltier coolers consist of the peltier element itself, and a powerful heatsink/fan combination to cool the TEC.

Table 3.2: peltier cooler

Peltier cooler	Temperature degree Celsius	Description
High performance	80	High temperature difference, bismuth telluride
High temperature	200	Moisture protection
Micro	80	Compact size
Multi stage	80	High temperature difference
Series parallel	80	Higher voltage circuit
Standard	80	Excellent thermal performance

a) *Solders:* Provide assembling of the TE module. The most standard solders used include Lead-Tin, Antimony-Tin and Gold-Tin alloys. The solders must provide good assembling of the TE module. The melting point of a solder is the one of limiting factors for TE Cooler reflow processes and operating temperature. Leading wires are connected to the ending conductors and deliver power from a direct current (DC) electrical source. A single-stage module consists of one matrix of pellets and a pair of cold and warm sides. A multi-stage module can be viewed as two or more single stages stacked on top of each other. The construction of a multi-stage module is usually of a pyramidal type each lower stage is bigger than the upper stage. Once the top stage is used for cooling, the lower stage requires greater cooling capacity to pump heat that is dissipated from the upper stage.
b) *Ceramic Plates:* Cold and warm ceramic layers of a module. The plates provide mechanical integrity of a TE module. They must satisfy strict requirements of electrical insulation from an object to be cooled and the heat sink. The plates must have good thermal conductance to provide heat transfer with minimal resistance. The aluminum oxide ceramics is used most widely due to the optimal cost/performance ratio and developed processing technique. Other ceramics types, such as aluminum nitride and beryllium oxide, are also used. They have much better thermal conductance – five to seven times more than Al_2O_3 – but both are more expensive.
c) *Electric Conductors:* Provide serial electric contacting of pellets with each other and contacts to leading wires. For most of the miniature TE coolers, the conductors are made as thin films (multilayer structure containing copper as a conductor deposited onto ceramic plates. For large size, high-power coolers, they are made from Cu tabs to reduce the resist
d) *Regular matrix of the elements-Pellets:* Usually, such semiconductors as bismuth telluride antimony telluride or their solid solutions are used. The semiconductors are the best among the known materials due to a complex optimal TE performance and technological properties. Material is the most typical for TE cooler.

2) *High Performance Peltier Cooler:* High-performance peltier modules with arctec structure features a unique construction delivering superior cooling performance and a longer cycle life. The innovative structure combats the effects of thermal fatigue found in thermoelectric modules. the structure incorporates a thermally conductive resin between the electrical interconnect and ceramic on the cold side of the module, high-temperature solder, and larger p/n elements made from a premium silicon ingot. the combination of these three enhancements greatly improves the reliability, performance, and cycle life of peltier modules built with the arctec structure, allowing them to outperform conventional thermoelectric coolers in the most demanding applications.

Fig.no.3.5: High Performance Peltier Cooler

3) *Micro Peltier Cooler:* Micro modules are devices that have semiconductor element footprints of less than 1.0mm square, allowing higher numbers of couples for a given size module. These modules are metallized (but not solder tinned) on both hot and cold surfaces and they are suitable for mounting with solder or via compression (compression is recommended). TE Technology's proprietary "potting" for moisture protection and ruggedizing is available as an option. These modules are rated for use up to 80°C.

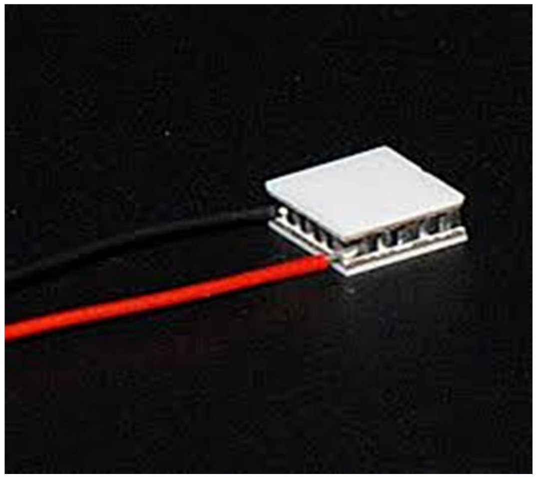


Fig.no.3.6: Micro Peltier Cooler

4) *Multi Stage Peltier Cooler:* Multi-stage thermoelectric coolers (TECs) are designed for medium to high heat pumping capacity requirements. Single-stage coolers can only obtain a maximum temperature difference of around +70°C. Multi-stage thermoelectric are built with as many as five additional levels or "stages". Each additional stage allows for higher heat pumping. The Multistage MS Series of thermoelectric coolers are able to reach colder temperatures than single stage thermoelectric coolers. It offers the highest temperature differential (ΔT), up to 129°C. This product line is available in numerous temperature differentials, heat pumping capacities and geometric shapes.

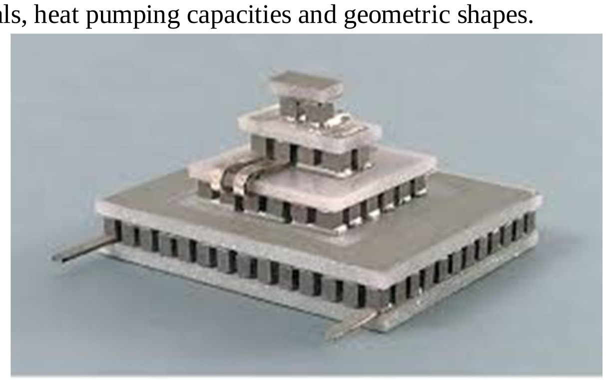


Fig.No.3.7: Multi Stage Peltier Cooler

5) *Step down Transformer:* A transformer is one of the most common devices found in electrical system that links the circuits which are operating at different voltages .These are commonly used in applications where there is a need of AC voltage conversion from one voltage level to another. It is possible either to decrease or increase the voltage and currents by the use of transformer in AC circuits based on the requirements of the electrical equipment or device or load. Various applications use wide variety of transformers including power, instrumentation and pulse transformers. A transformer is a static device that consists of one, two or more windings which are magnetically coupled and electrically separated with or without a magnetic core. It transfers the electrical energy from one circuit to the other by electromagnetic induction principle. The winding connected to the AC main supply is called primary winding and the winding connected to the load or from which energy is drawn out is called as secondary winding. These two windings with proper insulation are wound on a laminated core which provides a magnetic path between windings.

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A step-down transformer is a type of transformer that converts the high voltage and low current from the primary side of the transformer to the low voltage and high current value on the secondary side of the transformer. The reverse of this is known as a step up transformer.

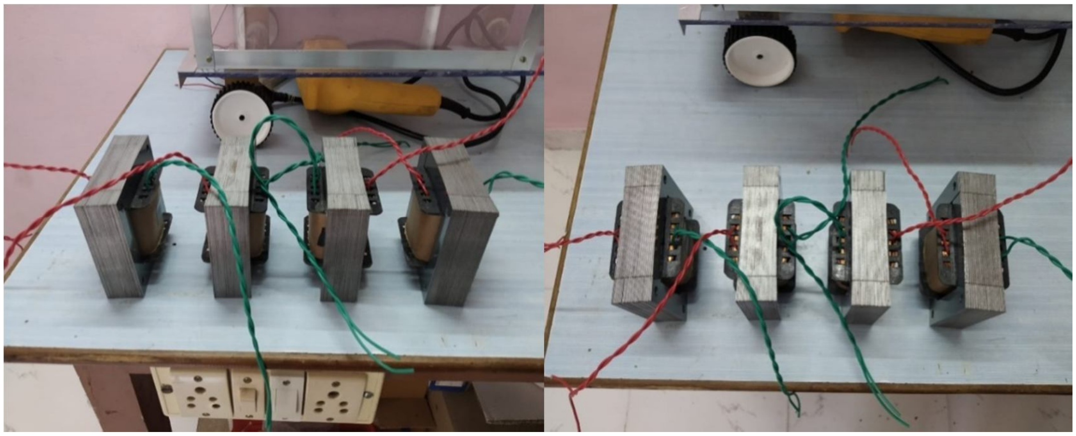

Fig.3.8: Step down transformer

6) *Heat Sink:* Heat sinks are designed to maximize the surface area in contact with the coolant fluid. Aluminum alloys are the most common heat sink material. This is because aluminum costs less than copper. However copper is used where higher levels of thermal conductivity are needed. A heat sink isa passive heat exchanger that transfers the heat generated by an electronic or a mechanical device to a fluid medium, often air or a liquid coolant, where it is dissipated away from the device, thereby allowing regulation of the device's temperature. In computers, heat sinks are used to cool CPUs, GPUs, and some chipsets and RAM modules.

Fig.3.12: Aluminium Heat Sink

Heat sinks are used with high-power semiconductor devices such as power transistors and optoelectronics such as lasers and light emitting diodes (LEDs), where the heat dissipation ability of the component itself is insufficient to moderate its temperature. A heat sink is designed to maximize its surface area in contact with the cooling medium surrounding it, such as the air. Air velocity, choice of material, protrusion design and surface treatment are factors that affect the performance of a heat sink. Heat sink attachment methods and thermal interface materials also affect the die temperature of the integrated circuit. Thermal adhesive or thermal paste improve the heat sink's performance by filling air gaps between the heat sink and the heat spreader on the device. A heat sink is usually made out of aluminium or copper.

Table 3.4: Heat Sink

Heat sink	Extruded heat sink
Type	Convention at heat sink without holes, with full length fins
Material used	Aluminium
Designation	Chs01
Geometry	500 mm x 75mm

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7) *Temperature Display Unit:* Regarding temperature monitoring cum display unit, the process starts with the temperature sensor. For this purpose LM35 is used and it is attached to the cold body of thermoelectric device by which temperature can be measured and displayed accurately. The output of the sensor is fed to the PIC controller chip, as this chip is having built-in-with ADC, the analog data generated by the sensor will be converted in to digital internally. Based on this digital value, the controller chip is programmed to read and display the temperature value in degree centigrade. LCD is used to display the temperature value in digital.

Fig.3.18: Temperature Display Unit

Table 3.5: Temperature Display Unit

Name	LM35IC
Temperature range	-55 to 150 degree c
Type	Semiconductor based
Accuracy	-10 degree c
Current operated	5 v

8) *PIC Microcontroller:* It is an 8-bit CMOS PIC microcontroller, based on Flash and developed by Microchip. It comes in 14-pin interface with high-performance RISC CPU that makes it an ideal choice for most of the electronic applications that are widely related to embedded systems or industrial automation. This tiny chip incorporates everything we need to develop individual projects. Memory space and a number of pins are little less as compared to other controllers in the PIC community. However, flash-based technology makes this device compatible with external devices. In this article, each and everything related to PIC and its pin out with description, main features, block diagram, memory layout and applications, etc, will be explained.PIC is an 8-bit PIC microcontroller that comes with a 14-pin layout design. It is based on flash where high-performance CPU adds up the processing speed. It comes in mainly two packages called DIP. Both versions are available in 14-pin configuration.PIC contains program memory with memory space around 1.7 KB, while RAM and EEPROM memories are 64 bytes and 128 bytes respectively.


Fig.3.19: Pic Microcontroller

One ADC module is added in the device that is 10-bit and comes with 8 analog channels. This module plays a vital role for sensor interfacing and converting analog values to digital ones. Power on Reset, Comparator, in-circuit serial programming, and master clear reset are some other features incorporated in the device that help it stay ahead of the other onboard chips and remove the need of buying external components for carrying out different operations.

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B. Construction

wo unique semiconductors, one n-type and one p-type, are used because they need to have different electron densities. The semiconductors are placed thermally in parallel to each other and electrically in series and then joined with a thermally conducting plate on each side. When a voltage is applied to the free ends of the two semiconductors there is a flow of DC current across the junction of the semiconductors causing a temperature difference. The side with the cooling plate absorbs heat which is then moved to the other side of the device where the heat sink is. Thermoelectric Coolers, also abbreviated to TECs are typically connected side by side and sandwiched between two ceramic plates. The cooling ability of the total unit is then proportional to the number of TECs in it.

C. Performance

A single-stage TEC will typically produce a maximal temperature difference of 70 °C between its hot and cold sides. The more heat moved using a TEC, the less efficient it becomes, because the TEC needs to dissipate both the heat being moved and the heat it generates itself from its own power consumption. The amount of heat that can be absorbed is proportional to the current and time.

In refrigeration applications, thermoelectric junctions have about 1/4th the efficiency compared to conventional means (they offer around 10–15% efficiency of the ideal Carnet cycle refrigerator, compared with 40–60% achieved by conventional compression-cycle systems. Due to this lower efficiency, thermoelectric cooling is generally only used in environments where the solid-state nature (no moving parts, low maintenance, compact size, and orientation insensitivity) outweighs pure efficiency. Peltier (thermoelectric) cooler performance is a function of ambient temperature, hot and cold side heat exchanger performance, thermal load, Peltier module (thermopile) geometry, and Peltier electrical parameters.

D. Uses

Thermoelectric coolers are used for applications that require heat removal ranging from milli watts to several thousand watts. They can be made for applications as small as a beverage cooler or as large as a submarine or railroad car. Tec's have limited life time. Their health strength can be measured by the change of their AC resistance (ACR). When a TEC gets "old" or worn out, the ACR will increase.

E. Science and imaging

Peltier elements are used in scientific devices. They are a common component in thermal cyclers, used for the synthesis of DNA by polymerase chain reaction (PCR), a common molecular biological technique, which requires the rapid heating and cooling of the reaction mixture for denaturation primer annealing and enzymatic synthesis cycles. With feedback circuitry, Peltier elements can be used to implement highly stable temperature controllers that keep desired temperature within ±0.01 °C. Such stability may be used in precise laser applications to avoid laser wavelength drifting as environment temperature changes

The effect is used in satellites and spacecraft to reduce temperature differences caused by direct sunlight on one side of a craft by dissipating the heat over the cold shaded side, where it is dissipated as thermal radiation to space.

Fig.3.26: Drip Irrigation System

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F. Frame

Frame of the system is made up of Aluminium as aluminium is lighter in weight when compared to other metals like stainless steel, iron, copper etc. Aluminium has a much better thermal conductivity and it is a good conductor of heat than stainless steel which is one of the main reasons why it is used in the project It is typically cheaper than stainless steel.

Fig.3.27: Frame

Table.3.11: Frame details

s.no	Name	Material	Quantity	Dimensions In mm
1	Base frame bar	aluminium	4	610x20
2	Transformer support bar	aluminium	2	480x20
3	Vertical bar	aluminium	2	600x20
4	Inclined bar	aluminium	2	620x20

G. Humidity an Overview

Humidity is the amount of water vapour present in air. Water vapour, the gaseous state of water, is generally invisible to the human eye. Humidity indicates the likelihood for precipitation, dew, or fog to be present. The amount of water vapour needed to achieve saturation increases as the temperature increases. As the temperature of a parcel of air decreases it will eventually reach the saturation point without adding or losing water mass. The amount of water vapour contained within a parcel of air can vary significantly. For example, a parcel of air near saturation may contain 28 grams of water per cubic metre of air at 30 °C, but only 8 grams of water per cubic metre of air at 8 °C.

Three primary measurements of humidity are widely employed: absolute, relative and specific. Absolute humidity describes the water content of air and is expressed in either grams per cubic metre or grams per kilogram. Relative humidity, expressed as a percentage, indicates a present state of absolute humidity relative to a maximum humidity given the same temperature. Specific humidity is the ration of water vapor mass to total moist air parcel mass.

Humidity plays an important role for surface life. For animal life dependent on perspiration to regulate internal body temperature, high humidity impairs heat exchange efficiency by reducing the rate of moisture evaporation from skin surfaces. This effect can be calculated using a heat index table, also known as a humidex.

H. Heat Transfer

Heat transfer is a discipline of thermal engineering that concerns the generation, use, conversion, and exchange of thermal energy or heat between physical systems. Heat transfer is classified into various mechanisms, such as thermal conduction, thermal convection, thermal radiation, and transfer of energy by phase changes. Heat transfer, any or all of several kinds of phenomena, considered as mechanisms that convey energy and entropy from one location to another. The specific mechanisms are usually referred to as convection, thermal radiation, and conduction. Heat can travel from one place to another in three ways: Conduction, Convection and Radiation. Both conduction and convection require matter to transfer heat.

IV. RESULT AND DISCUSSION

Drip irrigation technology improves the moisture regime and water availability in the soil root zone by a permanent slow input that can be adjusted according to the seasonal variation of water consumption of plants during growing season, this project is based on a working model so it produces 1 liter of pure distilled water in 24 hours. It has the potential to save water and nutrients by allowing water to drip slowly to the roots of plants, either from above the soil surface or below the surface; here evaporation is minimized as the water is directly being supplied to the roots in the ground. It is good for a small yard or for watering individual plants; it is highly effective in the areas where humidity ratio is high like sea coastal areas and supplying water directly to the soil. Water is applied close to plants so that only part of the soil in which the roots grows is wetted unlike surface and sprinkler irrigation which involves wetting the whole soil profile. It provides favorable high moisture level in the soil in which plants can flourish.

In normal or regular drip irrigation blockage may also occur if the water is not filtered properly or contains algae but in this case pure distilled water which is being condensed from atmospheric moisture is being supplied therefore eliminates the usage of any kind of filter and no chances of water containing algae or bacteria. This method can be very efficient in water use.

A. Calculations

In 1 peltier cooler,
Water produced = 10.4 grams
Time = 1 hour
In 4 peltier coolers
Water produced = 10.4x2
= 20.8 grams
Time = 1 hour
In 3 peltier coolers
Water produced = 10.4x3
=31.2 grams
Time = 1 hour
In 4 peltier coolers
Water produced = 10.4x4
= 41.6 grams
Time = 1 hour
In 4 peltier coolers
Water produced = 249.6 grams
Time = 6hours
Water produced = 499.2 grams
Time = 12 hours
Water produced = 998.4 grams
Time = 24 hours

Table.13: Output

S.No	Produced water quantity (grams)	Time(hours)
1	41.6	1
2	249.6	6
3	499.2	12
4	998.4	24

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B. 2D Diagramof Drip Irrigation System

All dimensions are in mm

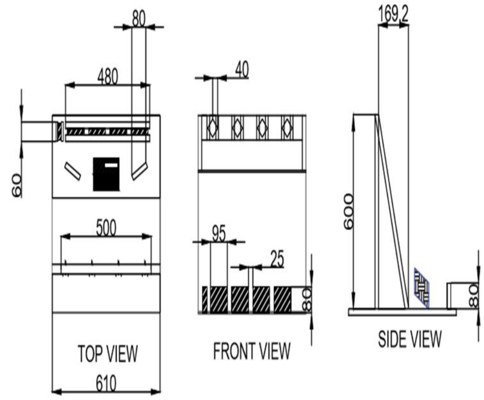

Fig.4.1: 2D Drawing of drip irrigation system

C. 3D Diagramof Drip Irrigation System

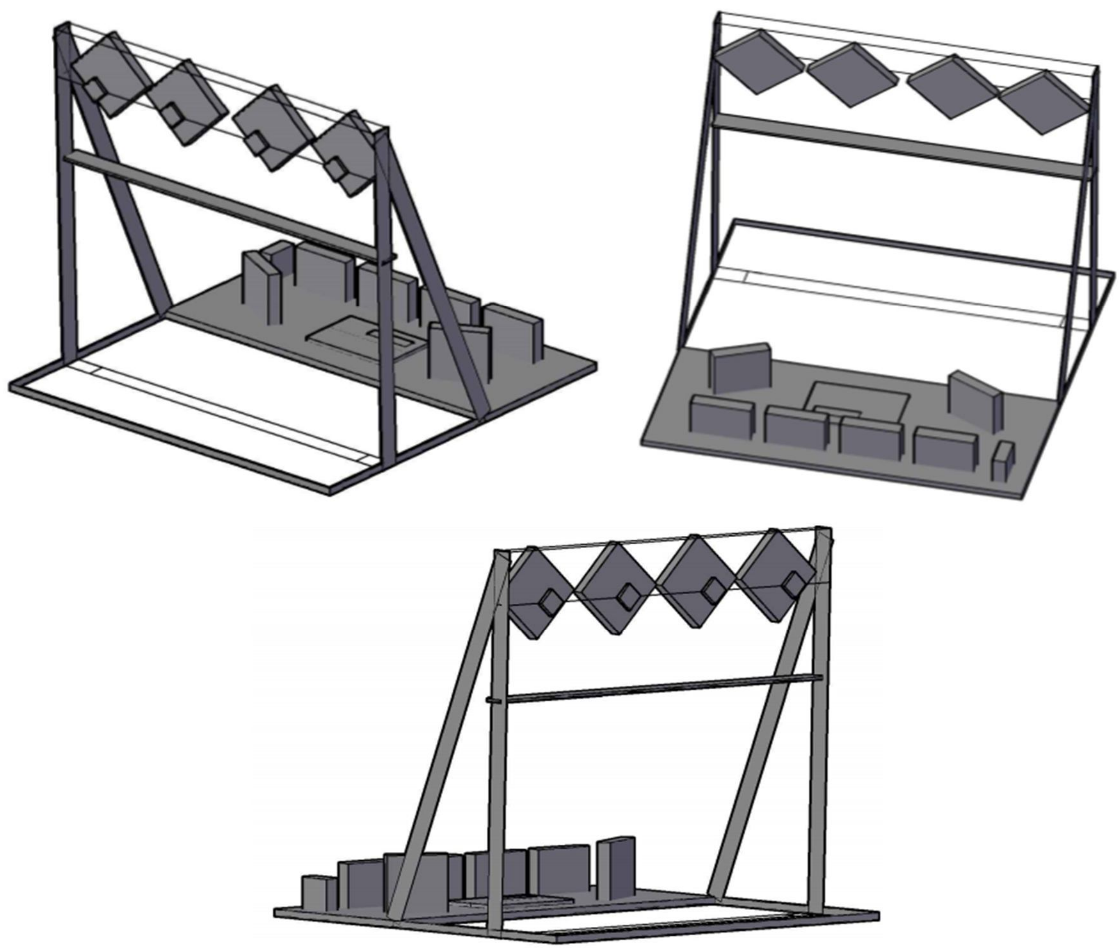

Fig.4.2: 3D Drawing Of Drip Irrigation System

V. CONCLUSION

The project work “Drip irrigation system designed for drought area” is successfully designed tested and a demo unit is fabricated. Results are found to be satisfactory. Since it is a prototype module and experiment wise, the system is constructed with 4 Peltier modules, but for real time applications many devices must be used according to the requirement. In fact large size of Peltier modules is essential to grab the more water from air, but since it is a prototype module, small size coolers are used for demo purpose.

A thermoelectric cooling systems must be coupled with proper heat sink mechanisms, these are supposed to be attached with hot bodies of TEC modules such that the heat generated by the devices can be absorbed effectively. If proper heat sink is not used, heat will be reversed to the cold body so that instant and continuous heat sucking device must be used to maintain the continuous cooling effect. Over all purpose of heat sink mechanism is to enhance the heat dissipation from hot side of thermoelectric module.

To figure out the performance of this proposed TEC system, an experimental apparatus was built with large heat sink, for this purpose multiple fins type of heat sink mechanism is used to radiate the heat in to air and in addition cooling fans are also used to reduce the heat sink temperature. Since it is an experimental module and to prove the basic concept, simple experiment is conducted, but it has to be developed further to make a real working system for which it must be studied well to enhance the technology in our future work. In our trail runs we found water droplets dropping from the cold body of the Tec modules.

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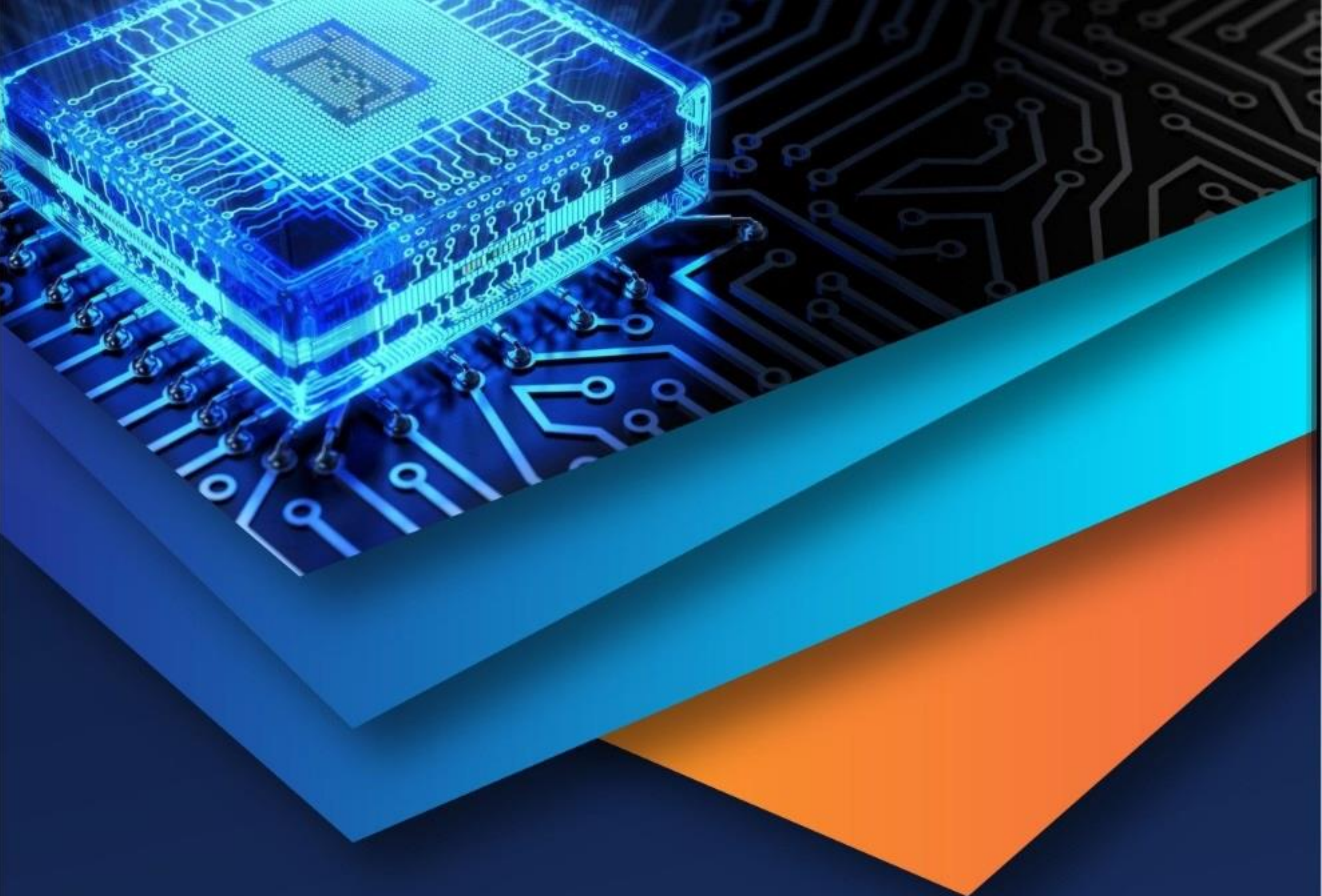

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