

GeoSolar Cold Storage

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Abstract— This is a Cold Storage system using Geothermal and Solar Energy that can be used for the storage of anything at any specific temperature at any specific humidity. In this context, the claimed idea is created and prototype will be developed soon. It is a storage facility where the temperature, humidity, radiation, pressure etc. are controlled as per requirement. In this the geothermal energy will be used for the initial temperature control. Later the cooling is done by Air conditioner systems which are being run on solar power. And the cooling of their compressor will be done by geothermal energy. It can store various products or anything related to agriculture and food products up to duration in food grade quality. It will be equipped with electronic sensors, machinery, supporting systems as described and as per requirement. It is a completely eco friendly storage facility using totally non-conventional energy sources for running and operation. It can be installed at the remote locations at low scale too. This will directly benefit to the farmer and Agriculture society too. The proposed work aims to move the storage facility beyond the conventional and expensive traditional storages. It can be developed and deployed to provide affordable, clean, safe, reliable, sustainable and expandable storage facility for mankind especially for agriculture industry.

Index Terms— Geothermal Energy, Ecofriendly, Smart Storage, Agriculture, Efficiency, Electricity, Green, Energy Conservation.

I. INTRODUCTION

A warehouse or Storage of goods/agric-products is a commercial building for storage of goods, are used by manufacturers, importers, exporters, wholesalers, transport businesses, customs, etc. They are usually large plain buildings in industrial parks on the outskirts of cities, towns or villages where the materials can be put or stored.[1] Cold storage basically a place or area where we can store our material at required temperature, humidity and other physical parameters to preserve the subjects as much time possible in usable condition.

The origins of the warehouse are difficult to pinpoint. Early civilizations relied on storage pits rather than large structures to protect seeds and surplus food. Sociologists like Alain Te start have argued that these early storage techniques were essential to the evolution of societies.[2]

The modern day when the earth in in energy crisis, we need a sustainable way of conventional processes so that we can save the conventional sources. We can utilize the non-conventional sources which are naturally recreated by nature continuously.

Nature provides storage systems between the seasons because thermal energy is passively stored into the ground and groundwater by the seasonal climate changes.[4]

Below a depth of 1–2 m, the ground temperature is not influenced and equals the annual mean air temperature. Therefore, average temperature of the ground is higher than the surface air temperature during the winter and lower during the summer. That nature of temperature will be utilized for the initial decrement of the temperature and the rest cooling will be done using Air Cooling systems which are being operated on Solar Power System[3]. Simultaneously the air inlet of air cooling system will be provided after geothermal temperature exchange. Hence less than 40% of power is required. This cold storage unit will be portable and easily deployable at remote places as well.

II. FIELD OF INVENTION

The present invention relates to the use of geothermal energy via temperature exchange for cooling in summer and heating in winters of any closed area i.e. cold storage, in particular, a part thereof. And rest electric load is to be driven by Solar Energy.

III. PRIOR ART DESCRIPTION (BACKGROUND)

Currently, The technique used for cooling of cold storages is use of compressed gases and then temperature exchange. These conventional processes requires huge amount of fixed and running capital. The operating cost is also high. Also provoke the use of conventional energy source. That causes direct and indirect both adverse impact also on our environment and society.

Till now there is not any kind of such alternate available so that this problem can overcome. Most of the farmers have to sell their products to merchants then they can only store at bulk level. This process also average cost of the products and directly decreases the earning of a farmer. Because at the time of respective season when the price is very low the farmers have to sell their products due to unaffordability and uncomfotability of storage facility at their end. Sometimes they are not able to get their production cost even. Heavy Expenses have also reportedly incurred in some cases when the storage is in demand.

It is pertinent to mention that a proper technical solution for such critical problem is the need of the hour. More so in times of technical advancements and continuous research, technocrats should take the responsibility to find an alternative way out. It is an issue of national, environmental as well as social concern and an early step in the direction of developing a system for the affordable cold storage facility is desirable.

Disadvantage with prior Art:

1. Increase the load of conventional sources for the cooling..

2. Large amount of water and electricity is required.
3. Only feasible at large scale.
4. Huge investment and operating cost.
5. Easily not accessible for the farmers directly.
6. Very difficult to built without of Govt. or Financial institution support.
7. Adverse impact on environmental and agricultural system.
8. Cause for wastage of production sometimes.

IV. DESCRIPTION

The present invention can be understood with the Block Diagram and descriptions. Nature provides storage systems between the seasons because thermal energy is passively stored into the ground and groundwater by the seasonal climate changes. Below a depth of 1–2 m, the ground temperature is not influenced and equals the annual mean air temperature. Therefore, average temperature of the ground is higher than the surface air temperature during the winter and lower during the summer. That nature of temperature will be utilized for the initial decrement of the temperature and the rest cooling will be done using Solar Power System.

Broadly the System is divided into four parts.

1. **Underground Temperature Exchange:** As it is described that the average temperature of the ground is higher than the surface air temperature during the winter and lower during the summer. We make a temperature exchange unit that shift the air temperature upto the average ground temperature around 24Degree Celsius.
2. **Air-conditioning system interfaced with Solar System:** For approaching temperature lesser than 24Degree Celsius we will use air conditioners after decrement of room temperature up to 24Degree Celsius. And simultaneously the air coming from the underground temperature exchange unit will be diverted to the outdoor units of air conditioner systems for the optimal efficiency at lowest power consumption. All the electrical load is being operated on Solar power generation. Which make the product portable and easily installable at remote/isolated locations even at the farmer end.
3. **Air Flow System with Control:** Air flow starting from room to end with room via underground Temperature system and various air filters to control the humidity. After equalization of the room temperature with the average temperature, the temperature exchanged air is diverted to the outdoor units of air conditioner systems.
4. **Supporting Systems:** Various Air Thrusters for air flow. Diversion selections for controlling the air flow direction. One way flow control to block the reverse air. Solar charger, DC/AC inverters, power banks to support the Solar Power System.

Fig. 1 is a perspective detailed view of the invention.

In the following description, like reference characters designate like or corresponding combination throughout several illustrations are shown in the description. It is also

understood that terms such as “up”, “down”, “solar power system”, “Temperature Exchange”, “Air Thruster”, “Air Filter”, “Diversion Section”, “One Way Air Flow Control”, “AC Outdoor unit” “pipe” and “air conditioner system” the like are words of convenience and are not to be construed as limiting terms. Moreover, it will be understood that the illustrations are for the purpose of describing a particular exemplary embodiment of the invention and are not intended to limit the invention thereto.

As describe in Figure 1 the Setup for Cold Storage comprises of elements/parts Temperature Exchange Unit under the surface of Earth. Air Thrusters, Diversion Selection, Air Flow Control, Air Mixer, Air Conditioner System, Solar Power System etc.

In this concept we will be having a storage room/hall like warehouse for storage. And the temperature and humidity of that storage facility is to be controlled by this invented system.

As already described that below a depth of 1–2 m, the ground temperature is not influenced and equals the annual mean air temperature. Therefore, average temperature of the ground is higher than the surface air temperature during the winter and lower during the summer. And that is around 24Degree Celsius. In summers the temperature reaches up to 55Degree Celsius. So for controlling the temperature up to 24Degree Celsius we use this geothermal energy. We place a temperature exchange and That nature of temperature will be utilized for the initial decrement of the temperature. After reaching to 24Degree Celsius we turn our cooling system on air conditioners which are running on solar energy. And that 24Degree Celsius air coming out from underground temperature exchange units will be sent to outdoor units of these air conditioner systems now so that they will provide the optimal cooling at lowest consumption of energy.

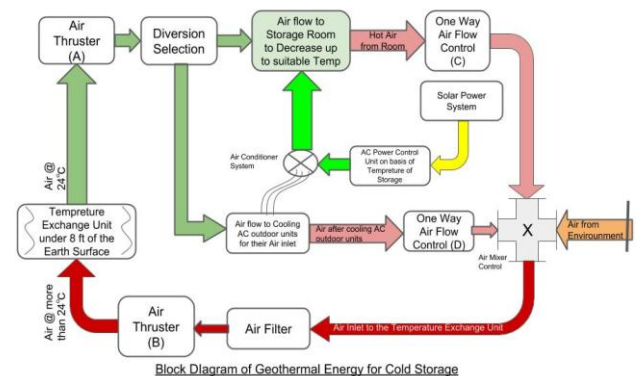


Fig. 1: Block Diagram of Geothermal Energy for Cold Storage with Solar Power

Hence we get a cold storage which is completely working on non-conventional energy sources, can be installed at small scale and remote areas as well.

V. WORKING

The following working description is for the purpose of illustration. It will be understood that the illustrations are for the purpose of describing a particular exemplary

embodiment of the invention and are not intended to limit the invention and its applications thereto.

1. An Air temperature exchange unit will be designed and installed under 8ft of Earth Surface. Connected to Air Thruster (A) and Air Truster (B) as described in Fig. 1. The output of this unit is at average temperature of Earth Surface Environment and input is more than that. Both Air Thruster (A) & (B) will be responsible for the air flow in the complete system.
2. Air Thruster will take the 24°C temperature air from the temperature exchange unit and thrust it to the future for cooling.
3. Diversion selection is a temperature based air directing device. There is a temperature measuring device which will measure and continuously monitor the temperature of storage space. And the same air afterward sent to the input Air Thruster (B) via Air Mixer and Air Filter.
4. Till the equalization of temperature of storage facility and the air coming from temperature exchange unit, the Diversion makes the flow of air towards the storage space.
5. One Way Air Flow Control (C) will control the unidirectional flow of the air. Block the reverse air flow to the storage space.
6. Air Mixer has three air input options and one air out. And Air filters will be operated according to required humidity. Paper and fiber filters will be used for this use.
7. For more temperature decrement, after equalization of temperature diversion selection will divert the air towards cooling of AC outdoor units.
8. Simultaneously the Air Conditioner system will be turned ON with the switching of diversion selection unit. The power supply of Air conditioner system will be delivered via Solar Power System.
9. Solar Power System will consist of Solar Panel Array, Solar Charger, Battery Bank, DC/AC Inverter, Connecting Cables, Interfacing Devices, Measuring Devices, Supporting accessories, Connecting Cables etc.
10. Air sent to the outdoor units of the ACs will decrease the temperature of compressors of Air Conditioner Systems. That will cause for the optimal cooling at the lowest consumption of Energy.

(Block diagram show the complete working of the System)

Parameters for different parts of the said instrument Air Thruster, Diversion Selection, One way Air Flow Control, Temperature Exchange unit, Air Conditioner System, Air Filters, Air Mixers etc., like length, size, rating, quantity, quality and capacity are adjustable and arrange able, as per

requirement. Multiple numbers of units of individual unit can be used for better and optimal performance of the system.

In this way, the Cold Storage will be made which will be using Geothermal Energy and Solar Power for Its operation and will be independent of the conventional energy uses. Also its can be use for any kind of storage at any controlled environment i.e. temperature, humidity etc..

The present invention can be embodied in many other forms or carried out in other ways, without departing from the spirit or essential characteristics thereof, and the above mentioned embodiment of the invention have been disclosed in detail only for illustrative purposes. It is understood that the invention is not limited thereto, but is susceptible of numerous changes and modifications as known to those skilled in the art, and all such variations or modifications of the disclosed apparatus, including the rearrangement of parts, lie within the scope of the present invention.

VI. ADVANTAGES OF INVENTION

- Use only non-conventional energy sources i.e. Geothermal and Solar Energy and thus directly decreasing the adverse impact on environment by reducing the use of conventional energy sources.
- Can be installed at small scales too.
- Can be installed at remote places too where it is difficult to supply electricity.
- Directly beneficial to farmers because can be installed at their farms too.
- Decrease the operational cost of cold storing of products.
- Directly decrease the large price inflation in the price of agri products.
- Efficient, easy, convenient, affordable and eco-friendly.

VII. CONCLUSION AND FUTURE WORK

This is a portable, farmer friendly, eco friendly portable coldstorage facility which will be working on minimum use of energy and providing optimal efficiency. Having lowest cost of operation. It will help farmer (sole of India) to retain their products for the good prices.

In the future it can be implemented at the remote places without much financial support.

REFERENCES

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