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Saving of Electricity in VCRs Based Refrigerator by Using Solar Energy

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Abstract- Research has demonstrated that solar energy is an ideal source for low temperature heating applications such as space and domestic hot water heating. The use of solar energy to provide refrigeration is rather less intuitive. The negative environmental impacts of burning fossil fuels have forced the energy research community to seriously consider renewable sources, such as naturally available solar energy. Solar refrigeration technologies harness the energy of the sun and use it to run a cooling system. This type of solar application is an attractive option for the preservation of food and the refrigeration of vaccines and medicines in areas with a high intensity of solar radiation and no electricity supply.

Keywords- Saving, electricity, VCRS, refrigerator, solar energy.

I. INTRODUCTION

In the increasing generation, it then get to see and use new appliances like refrigerator, refrigerator is such a machine or to say that it is such a device with the help of which we can cool things and keep them for a long time, the can increase the life of some extent, the ice box usually kept 4° C - 5 ° C cool household people keep food and drink in it and cool those things more.

Fig 1. Text Here Your Fig Title.

Till the time which are able to use those things, such devices are used in the refrigerator, with help which are cool down in shortest possible time, use this refrigerator has increased a lot nowadays season Because cool keep them safe even in season, the use of freeze is increasing as much as people are using it, then the consist of two systems, mechanical and electrical system, both these systems make the refrigerator useful.

Fig 2. Working VCRS.

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With the help of which they are able to cool the refrigerator and use it, in its mechanical system, it makes the gas flow. And give power supply to the electrical system, by which whole works and the refrigerator, due able refrigerator, this has a thermostat with an it whole It how much cooling done it, it has one five are according a reading, it is set and get the same number of calls as the refrigerator which is a normal old refrigerator, this refrigerator is power consumption.

Does a lot more than today's refrigerator. In refrigerator which is on old runs on mechanical and if a refrigerator then have a in which is supply and equipment in by that can start our, this also useful to start compressor.

Mechanical VCRS vapor compression able to itself, it work, those are valve, Evaporator. This heart of refrigerator, without it there is no cooling, first and important part this a type of and this a part that works on both and systems. The most important part of the compressor is if it fails, it does not fix it, it has to be changed, it has three pipelines, sax line, discharge line, charging line, in which are fill a gas or fill oil that line is charging. This line is called line, this line is on only at the time of filling oil or gas, rest time is closed and discharge is from which go out and is which flows.

II. WORKING OF COMPONENT IN VCRS

There is a pistol Inside it the connecting road and crankshaft shaft are connected, on top of it there are inlet and outlet valves, when the supply power to the compressor, the refrigerant inside it is in the vapour as soon as the serve, then the compressor the piston inside does the suction discharges vapour inlet valve has suction, send out all while, due discharge, its temperature rises greatly from 10-20° C The refrigerant contained in it is in vapour form inside the compressor. The vapour goes to the condenser with high temperature.

When this gas flows through a pipeline from the discharge line to the condenser. The back side which is made of iron mesh, it called which joint pipeline thin and pipeline thicker there is space to get when someone goes to vapour with temperature, it vapour, whatever is the refrigerant, it cool in the vapour form and brings it to the liquid form, whatever it comes in the liquid So it goes into the drier when the fill the gas in the refrigerator from the charging line, then the outside air comes inside its pipeline and the take it out, if that air is not able to come out then that air remains for some reason. That the Freon gas, this gas is called when any outside air remains in the component, then it cools it and freeze it, due to which the pipeline becomes closed, so use parts and silica gel liquid from condenser comes form, in liquid the of silica gel to absorb the remaining of the liquid, then it goes to the liquid.

If any liquid from the drier goes through temperature and pressure, then it controls the temperature and pressure. It reduces by rolling, so the call is expansion valve, when a liquid from the drier goes through temperature and pressure, then it controls it and reduces it, so it is called expansion valve.

It is installed at the front of the refrigerator, its job is to call, also gas pipelines in it. There is a flow of liquid in the evaporator, then it's very from after enter evaporator and slowly starts flowing line, then it cools the evaporator. The form or energy is given to the material kept in it like vegetables, milk, water etc. Whatever material is kept in it have a little temperature, face changes, they give their energy kept it, that cool. Whatever there evaporator, after face incoming gradually starts converting vapour form, being form, entered accumulators, whatever liquid left vapour, coming vapour form, it goes back to the compressor, this cycle continues again like this.

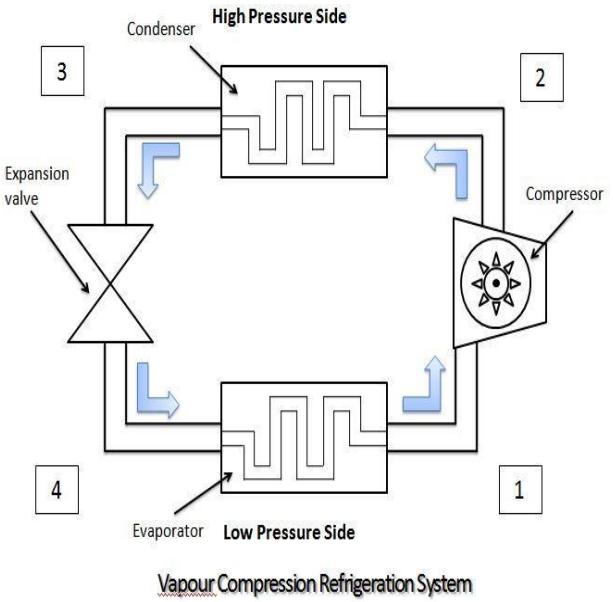

Fig 3. Refrigerator Cooling System of VCRS.

III. SOLAR ENERGY

Solar Energy is such as coming in human life which is making human life easier. In today's era where energy sources like coal, petroleum, natural gas etc. are getting destroyed. At the same time by using solar panels, this is the source which is a never ending source. In the increasing generation the solar system is being used everywhere like bike, car, refrigerator, AC etc. There is also no problem of contaminated gas emissions from vehicles running on solar energy and after cycles can also be called a cell, it is of silicon, the higher in purity of silicon, the better or it can generate as much power.

It made that the upper layer are made in quantity and they are in the bottom holes, it absorbs electrons slowly, flows it runs like this throughout panel, this way create become hot by producing than required, due to which it is controlled by using its cell diode, it has also proved to be very useful for maintaining safety. Solar energy is considered in two types, which are defined as, which includes sun, water, wind of is found this Non- include coal, petroleum, fossil fuels, etc. includes water, can considered very useful rural areas because can see a lot of problems there, the of energy very important there.

Fire, apart from the visible wavelength spectrum, there are two layers of short and long wavelength radiation which are easily passed through the solar cell, it has not use, and only the spectrum of visible light is there. Directly absorbs in the bottom layer and knockout the ion which is a free electron, comes to the upper electron and gets absorbed by coming in the N-type, it can attract these electrons from the silver bus bar. the positive ions that are knocked out go to the bottom layer P- type of the cell and it get absorbed in the same way that continuous radiation is absorbed at the center layer of the cell, then it will have a lot of free electrons add to absorb then able to get a complete by can get (DC), similarly the works, this cell gives about 0.5 watt power, the connect such a series, it will able run any machine easily when a 0.5 watt solar cell If the combine a a module, then it becomes a solar module able to generate more electricity.

Frame, There are solar cells, they have many layers, this is a layer of upper side glass, and work of this is keep safe water dust breakage. energy is, then the solar cell reflects about 55%, but with this glass it can stop this reflection, it allows only about 4% of the light to reflect, it is coated inside and it encapsulate is applied. Protects moisture, absorbs all energy comes, below there is get energy completely. its n-type and starts working in beating again encapsulate under this cell the put and there is a bed sheet under it, so that no sunlight can go down, there is a junction box under it, from which is the supply of current is sent, it is very important to put the glass that is there, the put all this by putting an iron frame.

Boxed them the main glass of this is about 3.2 mm low iron and temperature which comes with ERC (Elastomeric Roof coating). This glass also capsulate free and UV resistant; anodized aluminum.

The sun light comes electrons are generated and power it has a junction box through which the current is a supplied, our solar system works more with the glass more glasses are attached to it. Those who do not allow moisture water come cell, protect dust, protect all by putting an iron frame prepare a structure which that can call module panel or say it system. There important that people use to make energy.

Fig 4. Polycrystalline and mono crystalline.

This is do not battery, this is mostly where cut is less about 2-4 hours, where is used is a ready like this Where supply like 240v is supplied our house. Module according the need, from the take that much and the remaining power used as a of electricity. Connecting it its one advantage that be not only and same time are also able run household appliances easily without fault, this equipment very much.

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Useful where very less, you can use can also be government it has a very good advantage that it can sell electricity to the government with its help. The system has not proved to be as useful in the backward village as the village sees a lot of power cuts. Electricity is available 24 hours very less, around 6-7 hours, we increase on grid is not used, does village then is more cut night time. If cut then visible to through this system because not be able to get from this system night.

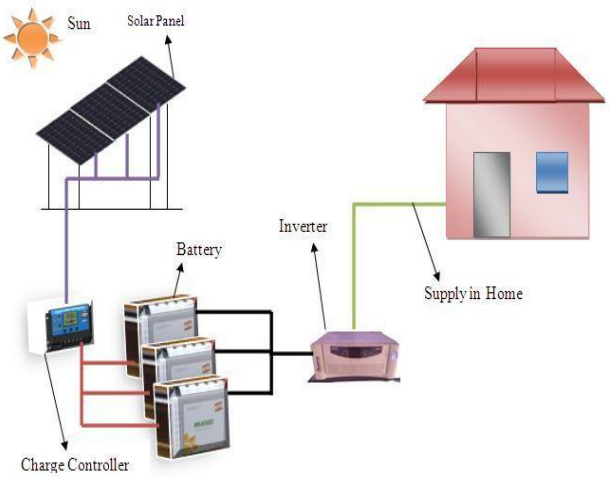

Fig 5. Off Grid Solar System.

IV. RESEARCH METHODOLOGY

1. Calculation of Coal and Electricity Bill for Using of 190 Liter Refrigerator:

The refrigerator work by consisting of two systems, one is all those parts come in the electrical system because they run on electricity; the mechanical components of the refrigerator are the same. The cooling remains in the part this is a mechanical system that sends calling to the refrigerator. It cool material like a milk, water, vegetables, etc. cool and these things will start getting worse when the turn on the 190 liter normal refrigerator with electricity. If you supply it takes about 280-380 v.

Initially and when our refrigerator cools down after some time with the help of compressor, then after some time the compressor automatically turns off it stay off only till that time. it does not come to the normal temperature, there is a system in the refrigerator which it call the thermostat, this fixed thermostat system set the calling of the refrigerator when the set it is a calling number, then the compressor of the refrigerator cools it down by giving that number of calls. Automatically shut down and normal load run from about 100 to 150 watts. Refrigerator takes more load only when is started because not due shutdown then not when down then. It takes only load is some electrical systems inside like bulbs.

Although bulb remains closed, but it, then this bulb installed in our refrigerator turns on, which means that the load given to the refrigerator increases some more power in it, this bulb is about 5-7 watt which turn on only when the refrigerator gate is opened and this bulb turns off as soon as the door is closed, it is necessary to supply electricity to the refrigerator for at least 8 hours because the material kept in it like milk, Fruits, vegetables, etc. so it is necessary to keep the refrigerator running for at least 8 hours, if it remains closed for more than the chances of it getting spoiled also increase, if we supply power in the freeze, It comes when the refrigerator becomes cold, if be run it for 12 hours with the help of electricity or solar panel then it will be in 12 hours.

Fig 6. Performance of cooling 190 Liter Refrigerator.
Calculation of Unit Formula.

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Unit = KWH

$$\frac{\text{Power consumption in watt} \times \text{time} \times \text{day}}{1000}$$

Table 1. Refrigerator 190 liter Power Consumption 12 hour (watt/year).

Gross volume (liter)	Star Rating	Cooling capacity	power consumption (watt/year) Unit 11-12 hours	Power consumption per Unit 6 rupee
190	5	Direct cooling	570	3424
190	4	Direct cooling	640	3840
190	3	Direct cooling	732	4392

2. Search and Selection of Solar Off Grid System Best Suited for Run 190 Liter Refrigerator:

A normal mono panel basically consists of small cells which connect 72 cells together to form a solar module. These cells are connected in series with the group to form a complete module, if connected in series, if any one if the layer becomes loose or there is a shadow then it stop working its connection drops, but even if one party gets loose in the parallel connection, then its other parts work. In this method, the solar module is divided into two parts.

Each other with a parallel connection, even below is disabled, then above does not stop working, it has multiple advantages, one is shedding advantage continuous shadow any one point. If it happens, that place stops working when it stops working due to some place, then a hotspot is developed above that place because it will stop working due to the shadow falling there obviously resistance.

It comes when resistance some place, and due, the hot hail will start and when it becomes hot, the place become disabled. So the hotspot is saved, the whole panel gets disabled, but since the half-cut solar panel technology has come, due to Here the half cut solar panel is of 144 cells, it can generate about 430 - 440watt and when there are more number of cells, due to this the internal resistance is also less and that is why it gives more output and it is more efficient solar Panel are called, earlier there used to be due to more bus bar, more current flows in half cut solar panel. The voltage of a 144 cell panel remains around 49-57v. at the time of sunlight and its ampere is about 7-8amps.

If both are calculated, then its watt is generated approximately 445-455watt if we use a solar system. The panels are together but put the examinations, put this box, then the ampere of it come near 5-6amps. That means the solar system work to a great extent on which the shadow has come, it also works to some extent it does not stop working. If we keep a shadow or box on a normal mono panel, then its ampere is about 0.2-0.7amps.

It falls and if the shadow or box is removed from it, then its normal ampere remains up to about 5-6 watts, the half cut solar panel system, it's a junction box is separated into 3 parts, there is a negative terminal, and there is a positive terminal and there are 2 parts.

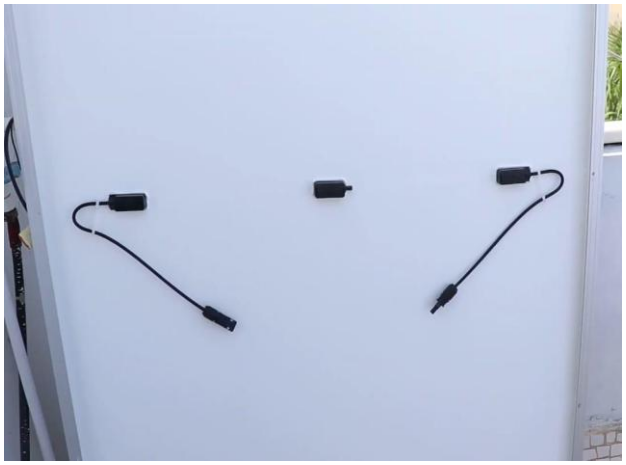

Fig 7. Mono half Cut Solar Panel,

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Which panel we are using, some information about this panel.

3. Solar Inverter:

The main function of invert is to charge the battery. It can charge from Luminous NXG-1800 inverter, be get 40 amps of charge controller, with this be can connect a 1200 watt motor and run normal, this is the advanced technology of normal inverter, it has an additional charge controller, so it is costly The DC output is given in the inverter, it run any direct current load, the terminal block is given in the back side of the solar inverter, inside it which is a PWM Apart from this, pure sine output is available in it, along with it there is a battery selection switch so that the run any type of battery, apart from this be can easily run 1000 watt system, it is 24v system.

It has a helpline number mode when any default come then it turns on ECO Mode is that when do not keep ECO on to run any system like laptop computer light etc., keep it on UPS mode, it does not cause any fault System on battery means that whatever our load is running. Like light, TV, fridge, etc

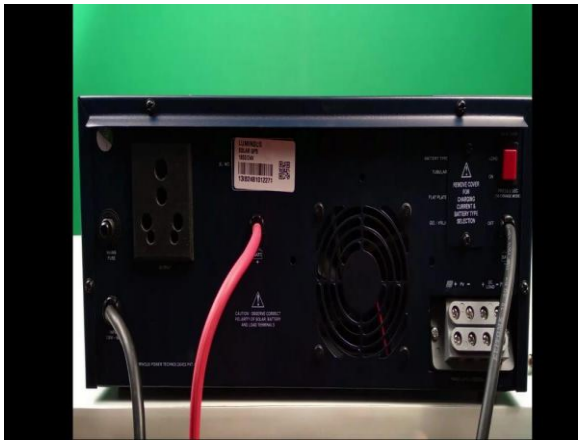

Fig 7. Solar inverter.

It get two types of solar inverters here which are PWM (Pulse Width Modulation) and MPPT (Maximum Power Point Ranking) MPPT Solar Inverter which he also called as Solar PCU MPPT Solar PCU is a latest technology. Inverter which by boosting energy coming from specification of PWM type inverter almost same MPPT, the load or panel capacity of this type of inverter is almost same but their voc Range varies and their price varies greatly.

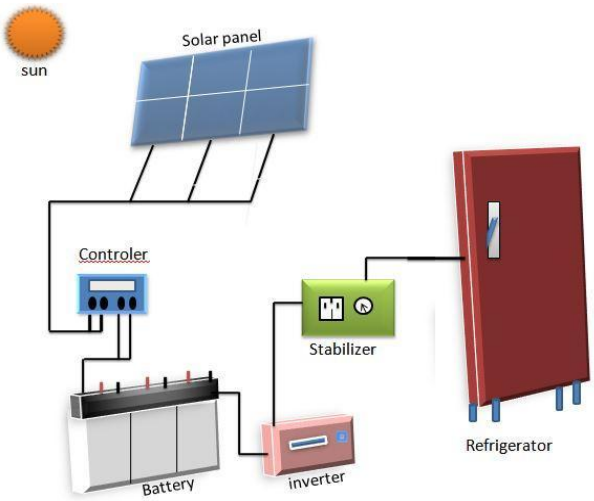

Fig 8. Mono Half Cut Solar Panel off Grid Run by 190 Liter Refrigerator.

IV. RESULT AND DISUSSION

1. Refrigerator Runs By Electricity 24 Hours:

When it talk about a normal refrigerator 190 liters, then the refrigerator consumes power up to about 250-300watt, after some time its compressor stops automatically then it takes its normal load 130-150watt per hour initially when the refrigerator If it starts, it will take more load and after reaching the set point of the thermostat, the compressor stops.

Unit Formula:

$$\text{Unit} = \text{KWH}$$

$$\frac{\text{Power consumption in watt} \times \text{time} \times \text{day}}{1000}$$

Case I:

When the refrigerator runs for 24 hours, then its 1 day.

$$= \frac{\textbf{watt} \times \textbf{time} \times \textbf{day}}{\textbf{1000}}$$

$$= \frac{130 \times 24 \times 1}{1000}$$

$$= 3.12.$$

Case II:

When the refrigerator is run for 24 hours per month, then its electricity bill unit of the month.

$$\text{Unit} = \frac{130 \times 24 \times 30}{1000}$$

$$\text{Unit} = 93.6$$

Similarly the refrigerator generates electricity bill of 93.6 units in 1 month after running for 24 hours.

Case III:

When the refrigerator runs for 24 hours, the electricity bill unit throughout the year.

$$\text{Unit} = \frac{130 \times 24 \times 365}{1000}$$

$$\text{Unit} = 1138.8$$

Similarly the refrigerator will generate electricity bill of 1138.8 units in a year after running for 24 hours.

The unit which is ours or it Say that our electricity consumption comes to about 1000-1138unit in the whole year and if we look at the price of one unit in India, it is 6-7 rupees; similarly our refrigerator consumes electricity of 6000-7000 rupees in the whole year.

Table 1. Actually unit consumption per year 24 hours.

Gross volume (liter)	Star Rating	Cooling capacity	power consumption 24 hours (watt/year) unit	Power Consumption (watt\year) per unit 6 rupee
190	5	Direct cooling	1139	6834
190	4	Direct cooling	1280	7680
190	3	Direct cooling	1464	8784

2. Calculation of unit 24 hours per year burning by coal:

In which by burning about 500 g of coal, it get one unit of electricity if be talk about 190 liter fridge which is taking 3.1 units of electricity for 24 hours running in 1 day Then the average amount of coal burned. 3.1*0.47 = 1.4kg. If be remove 1.5Kg of coal in 1 day for a month, then according to the refrigerator 93.6 units, 43.9kg of coal will be spent, similarly 500kg of coal will be spent in a year. Coal is the most used substance in electricity generation. It comes in different grades

Table 2. Best Grade of Coal ..... [33]

Coal grade	Coal Name	Carbon Content (%)	Ash Content (%)	Heat Content (%)	Price of Coal in rupees
A	Anthracite	92-98	12-20	26-33	20-17
B	Bituminous	60-80	6-12	24-35	16-14
C	Lignite	60-70	6-19	10-20	13-11

If we make electricity from coal of grade one, as there is little pollution, the cost of this great is around 18 rupees, if they look at the cost of coal for a 24-hour unit for the whole year.

V. CONCLUSION

Increasing generation, a lot is developing in the cities around us where there is no shortage of electricity, but when the look at the backward villages, there is a lot of shortage of electricity there, there are many such villages where electricity is available for 6-7 hours in per day, due to which refrigerator in the village are not able to make much use of such as refrigerator, AC etc.

It is necessary to keep it on for hours, if the refrigerator is not able to get equal cooling, then the refrigerator can be damaged in the refrigerator does not get proper power, cannot use any material like Milk, water, vegetables etc. are not able to be kept safe for a long time, due to this there is a lot of damage to lack of electricity, the people of the village do not use the refrigerator.

When the refrigerator runs on electricity it takes about 1000 units every year to run it 24 hours and it know that 90% of the electricity in India is made from coal, it can burn about 500 kg of coal to run the refrigerator. It will be able to provide so many units that the refrigerator can run for 24 hours throughout

the year if there is no sunlight then it turns off, it remains off for 12-14 hours, so that the use of grid system, so that we can run the refrigerator even at night. With the help of solar system, it can run the refrigerator easily without any cut. Mono panels are installed because these panels can work well even in the cloud and they can run the fridge regularly, by this we can free the money spent in our solar system in 7-10 years.

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