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Thermo Electric Dish Power

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Abstract- **In these days of modern technical world, the electricity is needed for everything from our basic needs to luxurious needs. With the advent of digital television and high definition broadcast, television setup boxes have become basic needs of houses today. So; in this paper we are presenting the idea of saving and generating electricity for our daily requirements. Here we are using dish antenna for two purposes like to receive T.V. Signal, to generate electricity with the help of heat trapped by thermoelectric paint, painted on dish surface. From previous discoveries, it was found that 30% of dish antenna is sufficient to receive a good quality signal, and the 70% is used for generation of electric power by the help of thermoelectric paint. The thermoelectric paint is responsible to produce electric power of 4mW/cm2. The heat received on surface of dish antenna is responsible for generation of power a battery can also be connected can also be connected across the terminals to get charged up. It is a clean green source of energy..**

1. INTRODUCTION

In this modern era, power is used for basic needs to the luxurious needs, we have seen the new inventions such as the electric cars and also we have seen some countries declaring power holidays for industries. Energy management is one of the important challenges that the world is facing. With advent of digital transmission and high definition broadcast, TV setup boxes have become quite common in houses today. According to the research conducted by the NRDC(Natural Resources Defence Council) suggests that high end setup boxes with HD and DVRs can consume a lot of electricity if they are not switched off from the plug point. Setup box consumes about 8W of power if 24hours ON can consume 70units in a year, setup box with standard deviation and definition consumes 18W of power 158 units in a year. Conventional wisdom says that the dish antenna for a Dish TV arrangement collects the beamed signals and focuses the beam on to the Feed horn – the device which is mounted in front of the dish and connects to the set-top-box. Different brands of Dish TV use dishes of different sizes though the picture quality remains about the same. Also, the Feed horns used by different brands were more or less of the same size. Since the signal broadcasted TV signal is the same, we can hypothesize that perhaps the entire dish surface is not needed for a good reception. It was found that only about 30% of the dish area is necessary for obtaining a good TV signal .This implied that 70% of the dish area was not strictly necessary for TV reception. This paper was framed around this idea, and it was decided to line this large 'Free area' with thermoelectric paint and generate electricity. The dish TV setup would then serve its primary function and as well as to provide an alternate source of clean energy.

Figure 1: Power consumption in various setup boxes

The thermoelectric paint is painted on the surface of the dish antenna as shown in the below figure, and the output goes to charge a 12V 7AH SMF battery through a voltage regulated charging circuit. A voltage regulated charging circuit allows the battery charging cycle to shift from full charge to trickle charge as required.

Figure 2: Hardware Layout

II. WORKING

A satellite dish is a dish shaped type of parabolic antenna designed to receive microwaves from communications satellites, which transmit data transmissions or broadcasts, such as satellite television. The parabolic shape of a dish reflects the signal to the dish's focal point, mounted on the brackets at the dish's focal point is called a Feed horn. This Feed horn is essentially at the front end of a waveguide that gathers the signals at or near the focal point and conducts them to a low-noise block down converter or LNB. The LNB converts the signals from electromagnetic or radio waves to electrical signals. Direct broadcast satellite dishes use an LNFB, which integrates the Feed horn with the LNB.

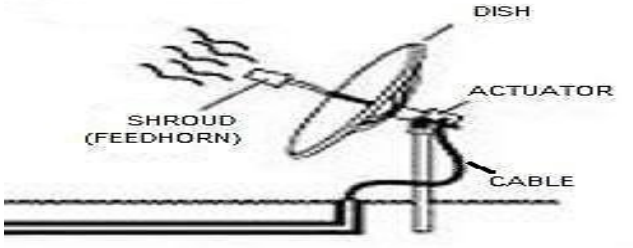


Figure 3: Parts of a Dish Antenna

The satellite dish consists of following materials:

- A parabolic reflector made of fibreglass or metal, usually aluminium with a protruding mounting arrangement for the Feed horn system.
- A steel actuator that enables the dish to receive signals from more than one satellite.
- The Feed horn is enclosed in a metal (usually aluminium) shroud so as to reduce side interference. The Feedhorn with shroud is mounted about 10cm to 45cm away from the dish along its focal axis.
- Cables, usually copper, in weather-proof vinyl insulation.

III. CURVATURE OF THE DISH:

The most common misconception regarding the curvature is that the dish is pure parabola. This implies the focal point is along the centre of the dish. In fact, it is actually an asymmetrical segment of a paraboloid, with result the focal point is shifted towards one edge. The purpose of this design is to move feed structure out of the beam path, so it does not block beam. The LNBF is therefore mounted towards one edge of the dish. The LNBF is by itself sufficient to receive signals, and the dish merely serves to increase the signal density. For instance, one BBC News downlink shows a signal being received by the LNBF directly instead of being beamed to the dish. We have made use of this and will use a portion of the dish to generate electricity while leaving sufficient area for collecting signals.

IV. THERMO ELECTRIC PAINT:

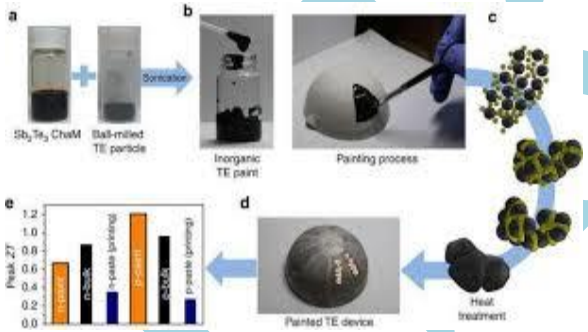


Figure 4: Preparation of Thermoelectric Paint

The Thermoelectric paint is the paint which can be applied directly to almost any surfaces, which captures the waste heat from hot painted surfaces and converts it into electrical energy. The paint is made with bismuth telluride, which is often used in thermoelectric materials, and a special process was used to fuse the particles together. The paint is applied to a surface and then heated at high temperatures for 10 minutes, which increases its density and makes it more efficient at converting the heat energy into electricity. Tests show that the paint is more efficient than any other ink or paste-based thermoelectric material to date.

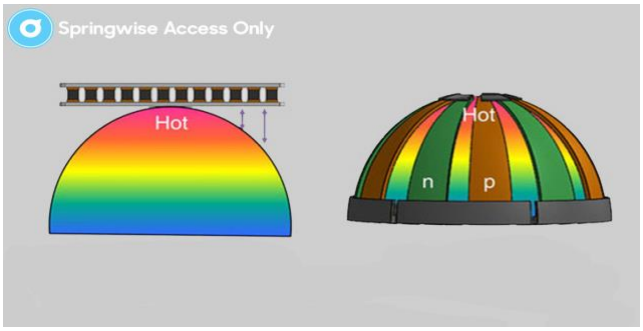


Figure 5: Thermoelectric painted objects.

Benefits of Thermoelectric Paint are:

1. Longevity.
2. Efficiency.
3. Low maintenance cost.
4. Greater Absorptivity.

Further Applications of Thermoelectric Paint are:

1. Walls and Roofs of houses.
2. Cars and Ships.

VI. SPECIFICATIONS

As researchers prepared Bi2Te3-based inorganic paints using the molecular Sb2Te3 chalcogenidometalate as a sintering aid for thermoelectric particles, with ZT values of 0.67 for n-type and 1.21 for p-type painted materials that compete the bulk values. Devices directly brush-painted onto curved surfaces produced the high output power of 4.0 mW cm−2. Since the output voltage depends on the intensity of sunlight, this approach paves the way to designing materials and devices that can be easily transferred to other applications.

VII. WORKING OF DISH – TV CUM THERMOELECTRIC PAINT:

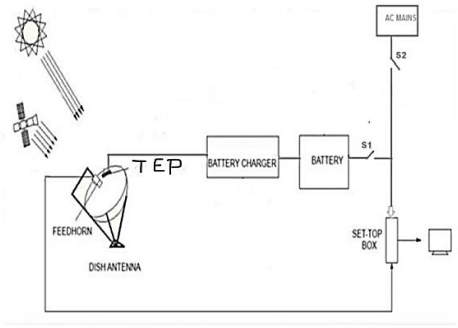


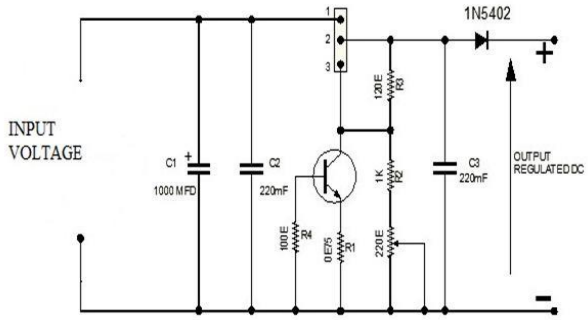
Figure:3 Block diagram of proposed system

The block diagram of the concept shows that the Dish T.V with thermoelectric paint feed the battery with the help of charging circuit and then from battery it is going to to set up box. The set up box is connected with the TV. So from the dish we are getting signals as well as we are running TV also in the absence of sun and battery we can run the setup box with AC source also.

VIII. TABULATION OF POWER WITH RESPECT TO SUN RADIATION:

SESSIONS	AMOUNT OF POWER PRODUCED
Morning	60%
Afternoon	90%
Evening	70%

IX. CHARGING CIRCUIT:



A Battery Charging Circuit is a circuit that regulates the power generated by the thermoelectric paint to a power required for charging a battery. The heart of the circuit is IC LM317, which is an adjustable positive voltage regulator IC. The pin 1 of the IC is the control pin which is used to control the output voltage. The pin 2 is the output pin at which the regulated output voltage appears. The pin 3 is the input pin to which the un-regulated DC input supply is given. The charging voltage and current is controlled by the Transistor Q1, resistor R1 and variable resistor R5. When the battery is first connected to the charging terminals, then the current through R1 increases. This in turn increases the current and voltage from LM 317. When the battery is fully charged the charger reduces the charging current and the battery will be charged in the trickle charging mode.

XI. FUTURE ASPECTS:

Probable Application

Such as;

- A dual function dish antenna can be easily used in homes for lightning, charging and can be used to run low power electrical devices.
- Mobile broadcasting vans, also known as outside broadcasting vans are used for remote coverage of an event, using a range of standard broadcasting facilities. As it is under the sun during the day time the paper concept can be used to its maximum.
- The concept can be used in sailing ships. As the ships communicate to the land system through satellite for transmission and reception, these painted plated antennas can be used for storing energy without hampering its usual work.
- Also, in defence sectors the purpose can be served.
- The power generated can also be used for decorative lightnings and fish tank.

XII. PROBABLE IMPROVEMENTS:

Every devices need improvements as the demand increases. In our paper the probable improvements can be,

Use of reflectors:
Reflectors are used to collect or project energy such as light, sound or radio waves. For our concept, we can use mirror, as it is the best reflector to project light energy coming from sun to the panels. Hence, with this maximum energy can be generated from the limited number of panels. For this, mirrors can be fixed at the periphery of the dish in such a way that sun rays are not blocked.

Better Thermoelectric Paint:
The second and the important improvement can be the use of more efficient thermoelectric paint. The research is going on to develop the ZT value. Once the ZT value is developed to 2.2 then it is expected to recover almost all the heat it absorbed into electricity.

Use of Anti Reflective material:
It may also be possible that the area which we have left for the reception of T.V signals can be taken into account, if anti reflective materials against radio signals are used. If so, then 100% of the dish can be used for generation.

XIII. AREA DETAILS:

Assuming the dish to be circular, the geometry of the " VIDEOCON" dish

are:
Diameter = 1.25m
Circumference = 392.75 cm
Total area = 1.227 m2.
Calculation of Area:
Experimentally found :
Area used by the TV signals =
(0.30×1.227) m2.=0.2445 m2

Usable area left for the use of
Thermoelectric paint.
= (1.227– 0.2445) m2
= 0.9825m2.

Percentage of effective area used by Thermo electric paint

= 70.2%

XIV. APPLICATIONS

1. In normal homes.
2. In mobile broadcasting vans.
3. In sailing ships.
4. Defence purposes.

XV. LIMITATIONS

1. Irregular power generated.
2. Unavailability of Sun.
3. Insufficient power supply.

XVI. CONCLUSION

"Electricity produced from natural and conventional sources are not sufficient to meet the today's power demands, so we are striving on some renewable sources".

XVII. REFERENCES

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