

Research Paper on Solar Based Hot Storage System

Miss Nikita Chaudhari¹ Mr. Amol Lokhande² Mr. Durgesh Borse³

¹ Student ^{2,3} Professor

^{1,2,3} Department of Mechanical Engineering

^{1,2,3} School of Engineering and Technology, Sandip University, Mahiravani, Nashik, India

Abstract — Everyone now-a-days uses small hot storage system at home to store processed food and hot water mainly to maintain the warm temperature after a longer period. There are basically lot of types of small storage system to store hot food, but this system can store food warm for max 24hrs. Factories like Nestle have been using hot storage facility to store coffee beans at certain temperature to provide the same fresh and quality after longer period of time. But the problem they are still facing is of storing the product for longer period as storing the coffee bean at cold storage will result in loss of freshness and Aroma. So, we are working on “Design and Analysis of Solar based Hot Storage System” to resolve the problem of the factories in storage of their product at warm temperature and can provide fresh product after a longer period. It also aims towards reduction of the power uses as there is high consumption of power in this hot storage, we implemented more conventional way of power generation present now is “Solar Energy”. We trying to resolve the problem of time consumption on providing sustainable temperature again and again for same product, by using the temperature sensors and It will also help the provider in saving by storing the data every time the temperature inputted.

Keywords: Storage System, Solar Energy, Power Generation, Processed Food, Fresh Product, Temperature Sensors

I. INTRODUCTION

Storage facility is being used from older times for storage of food and other utility items as per the need of the people. Previously in villages people used to store grain and crops in containers were made up of soil and clay. It used to provide isolation from outer atmosphere and used to provide insulation from insects. Ever since at first human beings started roaming the planet in search of meals and water has continually been our first and foremost concern. Right from the very second of harvest, meals start to interrupt down which reasons us as human beings a chief trouble. Heat, cold, time and moisture are all enemies of meals and its lifetime. Food shortage enabled historical guy to make roots and stay in a single area and shape a community (1). They now not needed to kill or harvest immediately for food, however, may people wanted to hold on a few stocks of food for later use. Each tradition preserved their neighbourhood meals reasserts the usage of the identical fundamental strategies of meals renovation. In different words, it allowed civilization as we understand it to shape. Since the time of the historical Egyptians, Mayans and Greeks there was improvements within the generation and strategies which have helped us provide you with the strategies that we use today (1)

II. LITERATURE SURVEY

A heating element for use within a smoking device which is intended to be held in the lips of a consumer, and which

without burning, heats a flavour- generating medium within the device to produce an aerosol, vapor, or flavour, which the consumer may gobble. This invention provides an electrically resistive direct heating element for use in anon-burning device. In a preferred personification the element consists of three element corridors, vicelike a base region, a separating region, and a heating region. Each heating region may correspond of a single resistive heating member or be comprised of a plurality of electrically separate resistive heating parts. In the former case, a plurality of heating rudiments would be used within a single device; in the ultimate, only a single heating element would be needed (2).

The heating element consists of a substrate or core of anon-magnetic material having high thermal and electrical conductivity, sheathe with a face subcaste of a ferromagnetic material of low electrical conductivity. The top object of the present invention is to give a resistive heating element which is naturally tone- regulating at a mainly constant temperature despite large changes in thermal cargo. An alternate object of the present invention is to give such a resistive heating element which is tone- regulating at a temperature determined by a physical parameter of the accoutrements used to make the heating element. A third object of the present invention is to give a resistive heating element which utilizes the skin effect, whereby interspersing currents are most heavily concentrated near the face of a captain, as a means to achieve natural temperature regulation (3). A fourth object of the present invention is to give a resistive heating element in which localized variations in thermal cargo over the face extent of the heating element are locally compensated to achieve a high degree of temperature constancy slightly over the extent of the heating element.

III. REQUIREMENT

In India seventy preclassic development population depend on Agriculture. Upliftment of those orders can ameliorate the overall status of the State. Comparing the developed States of our country, the profitable condition of growers of our State is miserable (4). The profitable condition of utmost of the people is poor out of the total growers about 47 to 48 percent of people cultivate cabbage, sap, onion, sweet potato, Brinjal, pea etc which has a veritably limited period. also, the fruits have also limited life after crop. Post Harvest cooling fleetly removes field heat, reduces respiratory exertion, reduce internal water, hanging, decelerate the growth of microorganism and reduces the product of natural growing agent i.e., ethylene. Post Harvest cooling also provides marketing inflexibility by allowing the farmer to vend yield at the most applicable time. Attainability cooling and storehouse installations makes it necessary to vend the yield incontinently after crop and may affect un torture trade (5). This can be a profitable to farmers who supply products capps. and grocery stores or to small farmers who stay to assemble truck cargo for transportation to another place. Post Harvest

cooling can be an effective tool to deliver loftiest qualitative yield to the consumer. Intervention through Post Harvest cooling will help the growers to store their produces and vend them at the seasonable time.

IV. CLASSIFICATION OF ENERGY STORAGE SYSTEMS

A. Electrical Energy Storage:

Directly storing electricity in devices like capacitors or superconducting magnets; The advantage of these storage methods is that they quickly release the stored energy. (14)

B. Mechanical Energy Storage:

Electrical energy storage in the form of kinetic or potential energy, such as in a flywheel or compressed air energy storage (CAES) or pumped hydroelectric storage (PHS). (14)

C. Chemical Energy Storage:

Chemical energy storage, such as flow batteries, fuel cells, and batteries; Typically, chemical energy storage experiences modest losses during storage. (14)

V. CLASSIFICATION ACCORDING TO USAGE

A. Bulk Energy Storage:

The discharge power ranges from 10 to 1000 MW, the discharge times range from 1 to 8 hours, and the stored energy ranges from 10 to 8000 MWh for bulk energy storage. Such storage is used for load levelling and spinning reserve. (14)

B. Distributed Generation:

The discharge power range of distributed generation storage is between 100 and 2000 kW, the discharge time range is between 0.5 and 4 hours, and the stored energy range is between 50 and 8000 kWh. Such storage is used for transmission and peak shaving. (14)

C. Power Quality:

The stored energy ranges from 0.028 to 16.67 kWh, and the discharge time ranges from one to thirty seconds for power quality storage. End-use power quality and reliability are the applications. (14)

VI. WORKING PRINCIPLE

We have incorporated this idea from storage facilities present in time, as well as we have inspired our idea of the project form electric oven used in normal domestic homes. Since there are a lot of crops that are being grown in India, with time they tend to get damaged due to environmental conditions like moisture and temperature. Especially in northern part, the crops that have been grown tend to get damaged (8). So, we have implemented it in such a way that the crops can be kept inside a Aluminium container where the moisture and temperature can be controlled automatically and the crops don't get damp and hence get damaged. We have made a prototype from Aluminium. It is based on the principle of microwave oven. Also, for the temperature and moisture control we will need electricity and to provide electricity we have used solar panels (8). The solar panels used will extract solar energy and convert it into electrical energy and hence the power is also renewable and much cheaper for a longer period. We have first used the boosters

through which the power is boosted and inside the container we have a control unit. The control unit controls the heating coil system and moisture control system. If the temperature is less than required then the control unit automatically turns the heating coil on and if the temperature is more than required then it turns on the fan to keep it cool (8).

VII. PRINCIPLE OF MICROWAVE OVEN

As known, the use of microwaves for cooking was invented by Percy LeBron Spencer in 1945. Already in 1947, the first microwave oven was created which weighed more than 660 pounds. But, in the second half of the 20th century, experts repeatedly discussed the safety of microwave cooking which, of course, limited the distribution of these devices. Impossibility of using traditional metal utensil was also a limiting factor in that period. But today, these two problems are completely resolved (10). Companies offer a huge range of special plastic and glass microwave cookware at a reasonable price, and numerous studies have repeatedly proved the complete safety of modern models. Moreover, reliable door screening eliminates the penetration of high-energy microwave radiation into the room. However, there is an easy way to independently verify the quality of the door screening. It is enough to put a mobile phone into the chamber, close the door and dial its number (10). The lack of communication will be convincing proof of the door screening reliability. Nevertheless, knowledge of the microwave oven operation principle can additionally remove suspicions about possible harm from its use.

VIII. CONCLUSION

Due to the increasing demand and unstable nature of solar power, solar energy storage techniques are urgently required. In order to achieve energy security and lessen the impact on the environment, proper energy storage must continue to be implemented. Using just one factor, it's hard to compare different storage methods. In fact, there is no one-size-fits-all method of energy storage. Different storage techniques are available and should be taken into consideration for specific circumstances, geological locations, and existing facilities. Battery storage is currently the most widely used method for storing solar energy. Now, the main areas of focus in thermal energy storage are lowering the costs of storage material, operating costs, and energy storage efficiency.

The expected outcome is to provide a sustainable storage system that can be used by food industries for suitable items. We think this is a better way since it can be cost effective on the long run because it uses solar energy which is a renewable source of energy. We have estimated that use of solar energy will reduce the power consumption by almost 50 percentage. It is also better for the environment to use this alternative source of energy.

The temperature and moisture inside the container are also controlled automatically and hence there is no need for extra manpower for the control of moisture and temperature. It is more economic for industries. The temperature is automatically set to an optimal level and so the life span of the food that is being stored is increased. We have also escalated that the container should provide optimum insulation.

REFERENCES

- [1] Kiran Kumar bm, august 2019: Conference: IEEE International Conference on Distributed Computing, VLSI, Electrical Circuits and Robotics (2019 IEEE DISCOVER)
- [2] Seetharaman C. Deevi, Francis M. Sprinkel July 2006:
- [3] Siegenthaler, J. "Chapter 2." Books on Google Play Modern Hydronic Heating: For Residential and Light Commercial Buildings: For Residential and Light Commercial Buildings. N.p.: Cengage Learning, 2011. N. page. Print.
- [4] Philip S. Carter, John F. Krumme:
- [5] Merrick Burden, Gilbert Sylvia, Edward Kolbe (2004) Optimal storage temperature Design for Frozen Food Seafood inventories: Application to Pacific Whiting surimi, IIFET, 2004 Japan Proceeding
- [6] R. Abu-Mallouha, O. Badranb, S. Abdallaha, Y. Abdellatifa:
- [7] "U.S. Energy Information Administration - EIA - Independent Statistics and Analysis." EIA. U.S. Energy Information Administration, 23 Jan. 2014. Web. 11 Feb. 2014
- [8] Merrick Burden, Gilbert Sylvia, Edward Kolbe (2004) Optimal storage temperature Design for Frozen Food Seafood inventories: Application to Pacific Whiting surimi, IIFET, 2004 Japan Proceeding
- [9] Mashud Ahmed, Oliver Meade, Mario A. Medina (2009) Reducing heat transfer across the insulated walls of refrigerated truck trailers by the application of phase change materials, Energy Conservation and Management 51 (2010) 383-392
- [10] N. Yusoff and M. Ramasamy(2010), Selection of RGP Optimization variables using Taguchi Method, Journal of Applied Science 10(24) 3313-3318,2010 ISSN 1812-5654
- [11] ASHRAE Hand Book of Fundamentals, New York, 1981
- [12] Duffie J a Beckman WA. Solar engineering of thermal processes. New York: Wiley,1980
- [13] G.Comodi, M.Bevilacqua, F.Caresana, L.Pelagalli, P.Venella, C.Paciarotti, LCA Analysis of Renewable Domestic Hot Water Systems with Unglazed and Glazed Solar Thermal Panels. Dipartimento di Ingegneria Industrial e Scienze Matematiche (DIISM), University Polytechnical delle Marche, Via Brece Bianche, Ancona 60131, ITALY (12 January 2015).
- [14] Solar Energy Thermal Storage System, TASNEEM JAHANGIR ,2020, ICRRD HIGH INDEX RESEARCH JOURNAL.
- [15] Heat and Mass Transfer by Dr. D S Kumar, S.K. Kataria and Sons, New Delhi
- [16] Lokhande Amol D., R. L. Shrivastava, and Rashmi R. Shrivastava. "A Review on Critical Success Factors of Re-Manufacturing." International Journal of Entrepreneurship & Business Environment Perspectives 3, no. 2 (2014): 982.
- [17] Dr. Amol Lokhande, Dr. C. Venkateswaran, Dr. M. Ramachandran, C. Vidhya, R. Kurinjimalar, A Study on Various Implications on Reusing in Manufacturing, REST Journal on Emerging trends in Modelling and Manufacturing 7(2) 2021, 63-69.
- [18] Dr. Amol Lokhande, Dr. C. Venkateswaran, Dr. M. Ramachandran, S. Chinnasami, T. Vennila, A Review on Various Implications on Re engineering in Manufacturing, REST Journal on Emerging trends in Modelling and Manufacturing Vol: 7(3), 2021,70-75.
- [19] Dr. Amol Lokhande, Dr. C. Venkateswaran, Dr. M. Ramachandran, S. Chinnasami, T. Vennila,
- [20] Recycling Process Impact in Current Scenario Manufacturing: A Study, REST Recent trends in Management and Commerce, Vol: 2(1), 2021: 20-25
- [21] Kamble, A. G., R. Venkata Rao, A. S. Potdar, and A. D. Lokhande. "Prediction and optimization of spur gear pair by response surface method." Journal on Advances in Science and Engineering, Section B 1 (2010): 23-28.