International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 04 Issue: 10 | Oct -2017 www.irjet.net p-ISSN: 2395-0072

SOLAR COLD STORAGE

Doke Namdev[1] , Mohite Sunil[2], Awatade Dhananjay[3], Chandane Sachin[4], prof. Ghodake

[1,2,3,4] Student, [5]Professor, Department of Mechanical Engg.
SPPU, S.P.V.P's. S.B.Patil College Of Engg. Indapur, Pune, Maharashtra, India

---

Abstract - *India stands as one of the major food producers in the world. The green revolution and white revolution refer to the drastic increase in food grain and milk productivity respectively and changed India"s position from being a net importer to becoming self-sufficient with regard to food production. Over half of its population is engaged in agriculture related activities. The agricultural produce market accounts for 14.5% of the GDP of the nation (Ministry of Finance, Government of India, 2011-12). While there has been a significant increase in the productivity from the 1950"s, the wastage of food produce is extremely high.*

Estimates place post-harvest food wastage due to inadequate cold storage at 40% (Desai, October 2011) for fruits and vegetables alone without including dairy produce and food grains. This has a bearing on India"s contribution to the world with regard to international food trade as although the country is self-sufficient, the export volume is comparatively low (Alam, 2006).The Ministry of Food Processing in India identified the cold chain to be a weak link in the food-processing sector. There exists much room for improvement in the cold storage and integrated cold chain infrastructure with regard to both capacity and operation. (MoFPI, Government of India, 2010). India is developing and while electrification is considered a top priority by the planning commission, there are still a great number of villages that are still to be electrified. Even the ones that are electrified have unreliable power (Gopal & Suryanarayana, 2011). This posesb a challenge with regard to the energy required for refrigeration of food produce.

Hence, there exists a pressing need to develop a smaller capacity refrigeration system which can be operated independent of the electrical grid. This thesis is an investigation into the methods of refrigeration that can be adopted for the purpose of reducing food produce wastage. Specific focus on solar based refrigeration is placed due to the tropical position of the country that ensures adequate delivery of solar energy through the year.

***Key Words*: cold storage,sunlight**

1. INTRODUCTION

The most significant application of refrigeration is in food preservation, weather it is by way of processing or for cold storage. The preservation of food is defined as the preservation of palatability and nutritive value of food preventing the natural spoilage with respect to time. Solar refrigeration is thought as one of the best techniques to address this issue, due to its good match to the variation of solar radiation; namely, the supply of sunshine, and the cooling output of a solar refrigeration system reach maximum levels at the same season. The thermoelectric refrigeration system (TEC), which has the merits of being light, reliable, noiseless, rugged, and low cost in mass production, uses electrons rather than refrigerant as a heat carrier, and is feasible for outdoor purposes in cooperation with solar photovoltaic (PV) cells, in spite of the fact that its coefficient of performance is not as high as for a vapor compression cycle [1]. The theory of combined solar thermoelectric refrigerator is proposed and for its optimum operation, the ratio of number of thermocouples required is given by Vella et al. [2]. After that, a small prototype of thermoelectric refrigerator powered by solar photovoltaic solar collectors was proposed by Sofrata[3].

1.1 Requirement of cooling system

In India seventy percent population depend on Agriculture. Upliftment of those categories can improve the overall status of the State. Comparing the developed States of our country, the economic condition of farmers of our State is miserable. The economic condition of most of the people is poor out of the total farmers about 47 to 48 percent of people cultivate cabbage, beans, onion, sweet potato , Brinjal, pea etc which has a very limited period . Similarly the fruits have also limited life after harvest. Post Harvest cooling rapidly removes field heat, reduces respiratory - activity, reduce internal water, wilting, slow the growth of micro organism and reduces the production of natural ripening agent i.e. ethylene. Post Harvest cooling also provides marketing flexibility by allowing the grower to sell produce at the most appropriate time. Unavailability cooling and storage facilities makes it necessary to market the produce immediately after harvest and may result un distress sale. This can be an advantageous to growers who supply products restaurants and grocery stores or to small growers who wait to assemble truck load for transportation to other place. Post Harvest cooling can be an effective tool to deliver highest qualitative produce to the consumer. Intervention through Post Harvest cooling will help the farmers to store their produces and market them at the opportune time.

1.2 Necessity of cold storage

The financial condition of the farmers does not permit to establish a cold storage having capacity of 5000 MT which is meant to store 50,000 quintals of the products in the cold storage which require crores of Rupees to establish it. The concept of cold room is to store vegetables, fruits and flowers for shorter duration for which a small and marginal farmer can store products for shorter period and sell it without deterioration of the product. Farmers will also get appropriate value of the product. It will reduce the distress sale. The farmers can establish cold rooms having 10 MT capacity where the storing of surplus quantities may vary from 100 quintals . Since the investment of such cold room is low a farmer can easily establish a cold room to store his surplus products.

2. Concept of the project

The capacity utilization in cold storage for fruits and vegetables is generally about 70% which is due to short storage life of the produce and availability of produce for storage throughout the year. Generally cold storage operates for 300 days in a year.The cold storage space of the proposed project shall be primarily used for storing fruits and vegetables for short duration storage of around 1-4 weeks. Such cold storage facility would enable them for bargain for a better price of their produce at the bi-weekly /weekly wholesale markets. Temperature Of different Fruits and Vegetables :

Foods and many other commodities can be preserved by storage at low temperature, which retards the activities of micro organisms. Micro organisms are the spoilage agents and consist of bacteria, yeasts and molds. Low temperature does not destroy those spoilage agents as does high temperature, but greatly reduces their activities, providing a practical way of preserving perishable foods in their natural state which otherwise is not possible through heating. The low temperature necessary for preservation depends on the storage time required often referred to as short or long term shortage and the type of product.

Table.1

Sl. No.	Fruits / Vegetables	Temperature Range (°C)
1	Apples	-1 – 4
2	Bean/Carrots/Cauliflower	0
3	Lychees/ Orange	4 – 7
4	Onions	0 – 2
5	Strawberries	0
6	Sprouts	0 – 2
7	Potatoes	7 – 10

3. CONCLUSIONS

An investigation into the refrigeration solutions for agriculture in india has been made using deductive reasoning based on evidence and case study to arrive at the best possible approach for holistic development of the cold chain .Heat driven refrigeration cycle were deemed most appropriate for the india scenario due to high solar isolation levels throughout the country.

ACKNOWLEDGEMENT

It is very important for agriculture purpose.

REFERENCES

[1]A kumar (2012) TERIIN webpage (online) available:

[2]Dr satish c. Jha 'Bihar's' Agriculture Development: opportunities and challenges'' planning commission of india report of special task force on bihar,2008.