e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:04/April-2024 Impact Factor- 7.868 www.irjmets.com

FABRICATION OF SOLAR CUM ELECTRIC VEGETABLE- FRUIT DE- HYDRATING EQUIPMENT

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DOI : https://www.doi.org/10.56726/IRJMETS54361

ABSTRACT

Most of the vegetables and fruits that are available in the market are seasonal and Their prices also fluctuates depending upon various factors like demand, supply, festival seasons, health conditions of the buyers etc., Looking to the demand and high Prices of certain fruits / vegetables, large number of farmers cultivate same fruits /Vegetables. By the time farmers get the crop, the prices will drop drastically due to Abundant availability of same fruits / vegetables in the market, which results in huge Losses to the farmers. On the other hand, customers have to pay huge prices for fruits And vegetable that are scarce in the market. To overcome above problem de-hydrating of fruits / vegetables is one of the best Solutions. As of we have two types of dryers available, namely solar dryers and Electrical dryers. Solar drying is cheaper but quality of products gets affected by the Bad weather conditions, which leads to low quality of dry fruits / vegetables. Quality Of vegetables and fruits dried by electric drying equipment is superior, but Consumption of electricity by this equipment is very high, hence the end products cost Will go high. As a part of our project work, we are planning to fabricate direct solar cum electriVegetable-fruit de-hydrating equipment.

I. INTRODUCTION

Foods are dried (de-hydrated) to inhibit microbial development and quality decay. However, the extent of drying depends on product end-use. Cereals and oilseeds are Dried after harvest to the moisture content that allows microbial stability during Storage. Vegetables are blanched before drying to avoid rapid darkening, and drying is Not only carried out to inhibit microbial growth, but also to avoid browning during Storage. Concerning dried fruits, the reduction of moisture acts in combination with its Acid and sugar contents to provide protection against microbial growth. Products such As milk powder must be dried to very low moisture contents in order to ensure Flowability and avoid caking. T

his moisture is lower than that required to ensure Inhibition to microbial development. Other products as crackers are dried beyond the Microbial growth threshold to confer a crispy texture, which is liked by consumers.

Application of hot air (convective or direct drying). Air heating increases the drying Force for heat transfer and accelerates drying. It also reduces air relative humidity, further increasing the driving force for drying. In the falling rate period, as moisture Content falls, the solids heat up and the higher temperatures speed up diffusion of Water from the interior of the solid to the surface. However, product quality Considerations limit the applicable rise to air temperature. Excessively hot air canal most completely dehydrate the solid surface, so that its pores shrink and almost Close, leading to crust formation or “case hardening”, which is usually undesirable.

Advantages;

- Profitable to farmers, because they need not to dump vegetables / fruits when
- There is no demand
- Profitable for buyers as they can use dry vegetable or fruits when their prices Are high
- Low cost of production when compared to electrical drying
- Better quality of products when compared to only solar drying

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II. LITERATURE REVIEW

REVIEW OF DRIED FRUITS: PHYTOCHEMICALS, ANTIOXIDANT

EFFICACIES, AND HEALTH BENEFITS – SUI KIAT CHANG

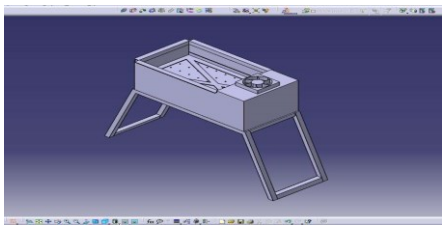
The paper explores dried fruits, refers to fruits that have had their moisture content Removed through various drying methods, such as sun drying, oven drying, or using food dehydrator. The process of drying concentrates the natural sugars in the fruit and Preserves its flavors, nutrients, and texture

Dried fruits contain antioxidants and dietary fiber, supporting digestive health and Overall well-being. However, portion control is important due to their calorie density, and it's advisable to choose unsweetened or naturally dried fruits to avoid added Sugars or preservatives.

III. MODELING AND ANALYSIS

DESIGN

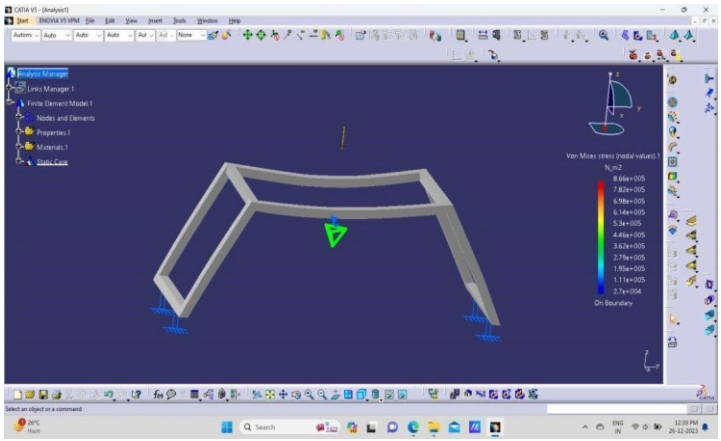
By using Catia V5 Software we designed the Prototype equipment is shown below Overall Structure of The equipment.



ANALYSIS

Design analysis is essentially a decision-making process in which analytical tools derived from basic sciences, mathematics, statistics, and engineering fundamentals are utilized for the purpose of developing a product model that is convertible into an actual product. Stress–strain analysis (or stress analysis) is an engineering discipline that uses many methods to determine the stresses and strains in materials and structures subjected to forces.

- Step 1: Define the Problem
- Step 2: Identify Material Properties. Step 3: Calculate Loads.
- Step 4: Determine the Beam's Geometry.
- Step 5: Perform Stress Analysis.
- Step 6: Check for Safety.
- Step 7: Iterate and optimize.
- Step 8: Finalize the Design.



Von-mises stress diagram

Load applied – 147.47N (15Kg)

Max Von-mises stress – 8.66 x 10

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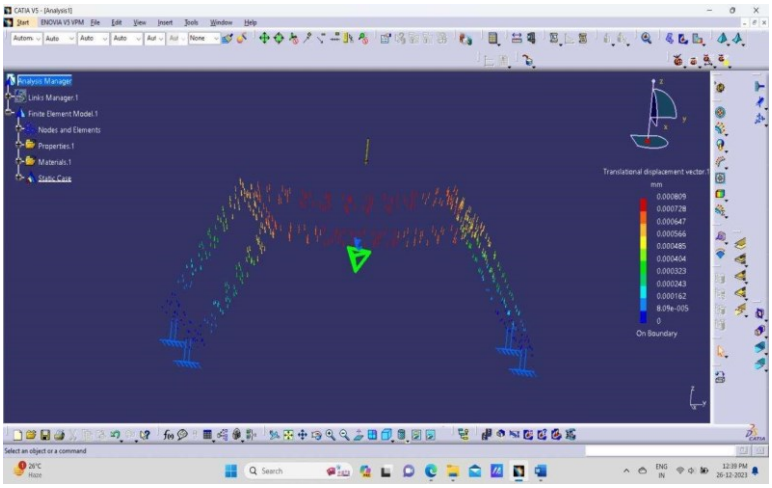
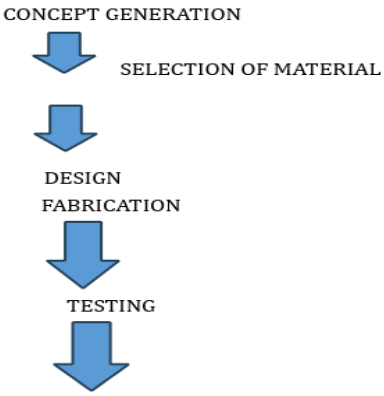


Transitional displacement diagram

Transitional displacement diagram 5 N_m2 which is lower than yield strength of Mild Steel material i.e.240 MPa

IV. METHODOLOGY



ERROR RECTIFICATION

A wooden cabin is prepared and placed by using a support of ms steel square rods. In the that cabin a u tube finned thermometer is placed in the cabin at a side. Porus plate is fixed in the cabin with some height with having base. Temperature regulator is connected to the temperature probe which is placed inside the cabin. Temperature indicator is placed outside the cabin, to indicate the temperature. Vapor discharge fan is along fixed with polycorbonate sheet. Which is transparent. The voltage having 12v is the input to the cabin.

Outcome equipment Components

- U Tube electric heater
- Porus plate
- Vapor discharge fan
- Temperature probe

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- Liquid fill temperature regulator
- Vegetable tray
- Glass slab
- Specifications
- Voltage - 230v

Feature - The main feature of this equipment is that it is a hybrid dryer.It comes with both solar system and electric system. It is used to drying the Wide Use It is most widely used in home appliances. And it is also used in mini industrial purpose for drying the vegetables and fruits. Warm Tip Please clean the. Metal tray after drying, it will completely clean and we can make life span of tray more. Suitable For It is suitable for home appliances and also it used for mini industries. Easy to install and completely maintenance-free.

V. RESULTS AND DISCUSSION

The equipment is used to for drying the fruit and vegetables. Its is more profitable for the consumer. The drying can be done by both solar system and electrical energy. By using vapor discharge fan the driying can be done more quickly. It comes with solar dryer that reduces electricity. By using the dryer we can increase the life span of fruits and vegetables.

VI. CONCLUSION

This project work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding, planning, purchasing, computing, and machining while doing this project work. We feel that the project work is a good solution to bridge the gates between institution and industries. The will be working with satisfactory conditions. We can understand the difficulties in maintaining the quality. We have done to our ability and skill making maximum use of available facilities. In conclusion remarks of our project work, let us add a few more lines about our impression project work. Automation is a technology concerned with his application of mechanical and electronic to operate and control production. This project may be developed with the full utilization machines, and materials and money. Also, we have followed thoroughly the study of time motion and made our project economical and efficient with the available resources. This system was Designed, fabricated successfully, and tested. It works Satisfactorily. We hope that this will be done among the most versatile and interchangeable one even in future

VII. REFERENCES

[1] "Drying - definition of drying by the Free Online Dictionary, Thesaurus and Encyclopedia". Farlex. Retrieved 23 April 2011.

[2] Carroll, Gregory T.; Jungian, Mathilda G. M.; Piper, Dirk; Feringa, Ben L. (2010). "Spontaneous generation and patterning of chiral polymeric surface toroid's". Chemical Science. 1 (4): 469. doi:10.1039/c0sc00159g. ISSN 2041- 6520.

[3] Nude, Daniel I.; Hashim, Nonracial; Janius, Ramciel B.; Nawi, Nazmi Mat; Abdan, Khalina (2016-02-04). "Modeling the thin-layer drying of fruits and vegetables: A review" (PDF).

[4] Comprehensive Reviews in Food Science and Food Safety. 15 (3): 599–618. doi:10.1111/1541-4337.12196. PMID 33401820. 4. Kord, Tyler (June 29, 2019). "Cooking (and Shrinking) the Modern Combat Ration".

[5] Strande, L., Rongelap, M., Radmanovic, D. (eds.) (2014). Faucal Sludge Management (FSM) book - Systems Approach for Implementation and

[6] Operation Archived 2017-10-14 at the Wayback Machine. IWA Publishing, UK (ISBN 9781780404738) S Ashcroft, Neil; Mermin, N. David (1976). Solid State Physics. Harcourt.

[7] p. 20. ISBN 0-03-083993-9. We define the thermal current density to be a vector parallel to the direction of heat flow, whose magnitude gives the thermal energy per unit time crossing a unit area perpendicular to the flow.

[8] Kittel, Charles (2012). Elementary Statistical Physics. Courier Corporation. p. 60. ISBN 9780486138909