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Design Analysis of Dehydration Trays for Farm Products: A Review

Milind Devidas Sonawane[1], Prof. Arif Mansuri[2]

[1] M-tech Student, Department of Mechanical Engineering,
School of Engineering and Technology Sandip University, Nashik, Maharashtra, India.
[2] Professor, Department of Mechanical Engineering,
School of Engineering and Technology Sandip University, Nashik, Maharashtra, India

ABSTRACT

In the Last year the global food service market valued of about 2000+ billion Dollars. By the article of this market will grow up to a 5000+ Billion Dollars of market size in world wide. This this modern world everyone wants food service in fast and quick manner.In the world people will spend about 5.4 minutes at restaurants to get their orders at the table and everyone know that this is not possible by our old and traditional methods. There is something going on in that restaurant's kitchens and the secret is nothing other than all the premix and preprocessed food. They just need to make heat it and here we go, the food is ready to eat. But here we meet our first enemy. The Life time of processed food. And for that I have a best example. You know what happen when the military sergeants don't have that much space to store food in their bags in the replacements of necessary equipment. That's why during the Revolutionary war when it was on its peak.

Keyword *–FRH(Flameless Ration Heater), MRE (Meal Ready to Eat), U.S. (United States)*

I. INTRODUCTION

In current market we see that the due to short life span of Fruits and vegetable they will get rotten very quickly and after time to time it also decrease the quality of vegetables and fruits and in some cases, it can also lead to a food poisoning. In current market scenario, I find out that by doing dehydration of fruits and vegetables, tremendously increase the lifespan and decrease the chances of getting poisonous.

Being a significant industry, agriculture has always played a crucial part in the nation's economic growth. Abundant fertile land, an effective irrigation system, and intensive farming have made it the economy's most important industry, contributing 21% of GDP, and employs over 45% of the workforce overall, whereas 61% of the rural. The sector is essential to the livelihood of the populace.

By consuming local products, paying higher prices, and giving them employment chances in the food business, these new technologies can help people living in distant locations earn more money.The congressional Resolution establish the first U.S. Soldier ration. This ration will provide one day meal of Beef, Peas and Rice to a soldier.

For this Dehydration Machine I got contact with Vicrop Overseas Company, which is Fruits and Vegetable Dehydration Company located in Jalgaon Maharashtra.

Then they moved to canned food in civil war and after many years of evolution, now they have the MRE (Meal Ready to Eat). In this pack of food, they have wide range of food verities like Main Course, Side Dish, Dessert or snack, Crackers or bread, spread of cheese, Peanut Butter or jelly, Powdered beverage mix, etc. In this pack of meal, they add a separate compartment for the thin layer of FRH which is Flameless Ration Heater feature. This FRH make the food hot by doing Exothermic reaction which make the food warm, and now the soldiers have the best possible meal in the heat situations, And the main thing is this food will stay fresh for about a 3 to 5 years.

Now as we can see how the global race is going on in the food service industries. Now the main thing here is what is the purpose of me adding this in this review paper and the reason is so simple that, I am working on a Vegetable Dehydration machine which is used to dehydrate the vegetable and make them more convenient to restaurants to use and that also increases the shelf life of vegetable.

II. DEHYDRATED PRODUCTS

Dehydration is an energy-intensive process, but fruits and vegetablesConverted into value-added products and harnessed with solar energy optionsremote workers. Dehydration products have domestic and potential marketsInternational.

TABLE. II.I - Products and Moisture Contain

Sr. No.	Product Name	Moisture Contain
1	Onion	86 %
2	Garlic	59 %
3	Ginger	91%
4	Tomato	95 %
5	Lemon	82.64%
6	Green Chili	86.6 %
7	Tamarind	23.3%
8	Beetroot	88%
9	Potato	75-85%
10	Moringa	81%
11	Lemon Grass	69%
12	Mint	75-95%
13	Curry Leave	85%
14	Kasturi Methi	86%
15	Spinach	93.2%
16	Oregano	12%

17	Amla	17%
18	Okra	90%
19	Carrot	86-95%
20	Green Peas	79 %

III. PROCESS DESCRIPTION

Vegetables can be dehydrated with different methods,

Ex,Solar Drying, Sun Drying, etc. where the tunes used for commercialcontact, which contain huge chamberconstructed with bricks through which different trays inserted in it. To maintain theoriginaltaste some processes some processes deployed.

2.1Pretreatment of vegetables/ Fruits before the dehydration

2.2 Sorting of rotten vegetables and fruits from the raw materials.

2.3 The remaining Fresh vegetables are used for dehydration process after cutting them in to the small pieces as per requirement.

2.4 For the dehydration process first we need to places the raw cut vegetables on the tray and slide those trays into the dehydration machine and can start the dehydration process.

2.5 After the dehydration process done material send to lab testing process.

2.6 When the lab gives green sign then material is ready to dispatch.

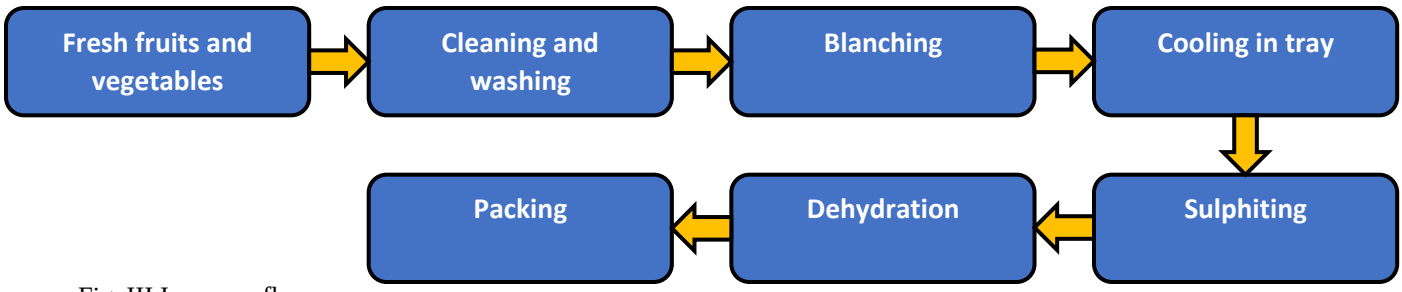

Fig. III.I process flow

IV. COMPONENT AND SPECIFICATIONS

TABLE. IV.1 – Parts and Parts Specification.

Sr. No.	Part Name	Specification
1	Trays	50*50 Cm
2	Heat Exchanger	Double tube heat exchanger
3	Stream Line pipe	Ø10 cm
4	Vent	10 Cm

5	Temperature regulator	Range 40-120^0 C
6	Power indicator	Red, Green, Yellow Light
7	Cabinet	2Ft*2Ft
8	Blower	1000 – 5000 RPM DC Fan
9	Door	2Ft*2Ft
10	Heating element	Circular Copper Coil

I. CONSTRUCTION:

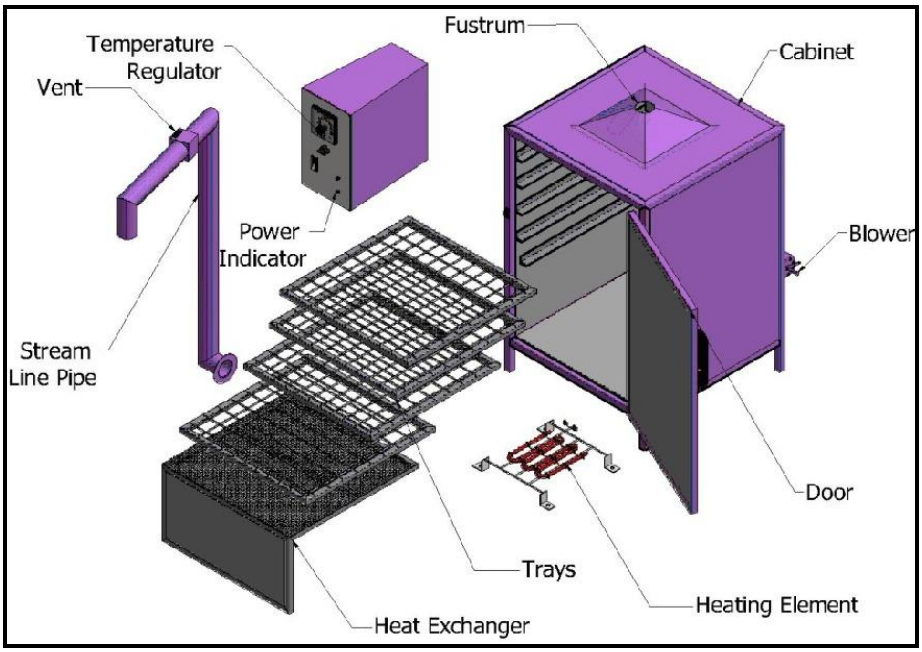

Fig IV.1.1. - Components of Dehydrator.

4.1.1Trays

Main purpose of trays is to space out each piece of vegetablesproperly to which dehydrated. Most of trays are made from non- stick aluminum trays. Which have some holes on it to pass hot air in between two trays. As per the size of cabinet, trays are design and capacity of machine depends upon size of tray and its arrangements.

Trays are arranged in parallel manner.

4.1.2 Heat exchanger

Heat exchanger use to transfer heat in between source and working medium. Heat exchanger use for heating process. Heat changer is also use to kill small bacteria which is harmful. Heat exchanger transfer heat from one medium to another. medium may be air, fluid, solid surface etc.

4.1.3Stream line pipe

Stream line pipes are used to transfer hot air in between area. Heating medium produce hot air which can transfer to material though these pipes. Which is made from materials which cane sustain hot air temperature.

4.1.4 Vent

Vent is help to circulate hot air inside the chamber and escape moisture contain air.

So, food dehydrateequally. Vent is also help to prevent products to become to dry or too soft.

4.1.5 Temperature regulator

Temperature regulator is use to control temperature inside cabinet, as per the products require temperature low or high, it get increase or decrees as per required, when temperature requirement is low than reduce by regulator and also get increase same, temperature regulator input current increase or decrease than it maintains at specific temperature.

4.1.6 Power indicator

Power indicator is used to indicate proper power supply of electric equipment. Power Indicator turn on the warning light when temperature exceeds the idle limits. It mainly has 3 to 4 lights.

4.1.7 Cabinet

Main function of Cabinet is to restrict the temperature at specific area i.e., inside area of cabinet to does not pass hot air outside. Cabinet made from steel or aluminum sheet. Other component like fan mounted on cabinet.

4.1.8 Blower

Blower is basically a fan which circulate hot air inside cabinet, it can increase velocity of hot air when pass though small opening. Blower has another function to pass hot moist air outside the cabinet.

4.1.9 Door

Door can close cabinet. Which have may be insulation attached with t. they have some rubber fitting which can completely close the cabinet.

4.1.10 Heating element

Heating element is coil which can increase temperature from 40^0 C to 120^0 C. Heating coil mounted at bottom of tray or on side panel of cabinet. And when inside air of cabinet is got hot it can automatically switch off.

II. Working:

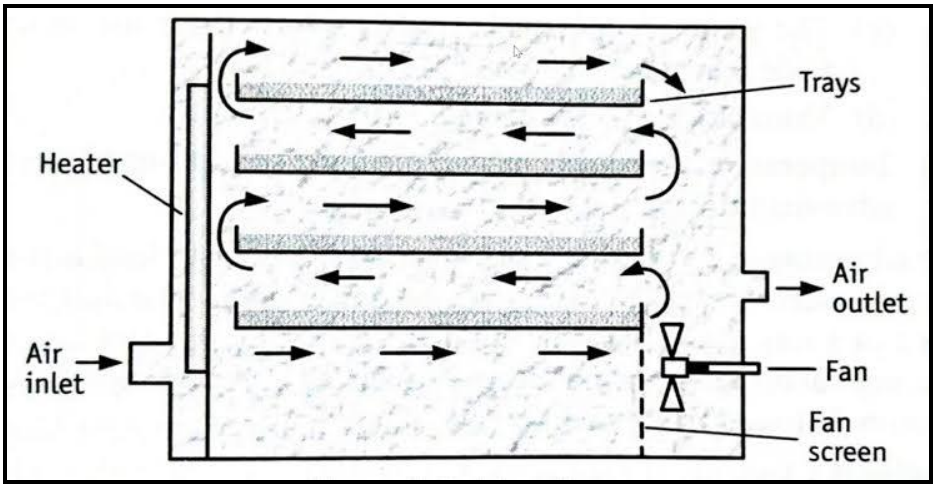

Fig. IV.2.1. - Working Principal of Dehydrator.

The working Principal in this Dehydration machine is divided in 3 main parts.

4.2.1Air Intake,

Intake is the way through the cold air get inside the Cabinet. This cold air is used to make the temperature maintain. After that the air circulation process starts.

4.2.2 Air Circulation,

In this section as you see in the above diagram the cold air is get in pushed upward direction. while going upward the cold air is get converted in hot air using the heating coil of copper. For this purpose of pushing the air in upward direction the machine has a several DC fans which have about 1000 to 5000 RPM of speed and these DC fans make the process easier.

4.2.3 Air Outlet,

This process is just an Exocet for the whole machine, which makes the hot air get outside the cabinet.

V. CONCLUSION

In this current world scenario, the vegetables and fruits are get exported and imported in vast quantity. These Fruits and vegetables are not easy to transport and maintain their quality up to the final customer. This situation also increases the risk of food poising and rotten. By using the dehydration process, fruits and vegetables are get easy to access and also, this process increases the shelf life of vegetables and fruits tremendously. Dehydration process is easy to do and have many benefits out of it.

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