Design and Development of Vegetables and Fruits Sorting Machine.

Prashant Kasbe[1] Dattaraj Karulkar[2] Sarvesh Jadhav[3] Hrishikesh Kinholkar[4] S.M.Jadhav[5]
[1,2,3,4,5]Department of Mechanical Engineering
[1,2,3,4,5]SKNCOE, SPPU, Pune, India

Abstract — Farmers cultivate variety of vegetables while various fruits are produced by farmers practicing horticulture, this produce is sold to customers by various means. The quality and price are quantified according to the size thus it is essential for the farmer to sort out his produce according to size to earn accordingly. Sorting process is carried out manually, this makes the process slower, more labour intensive and not as effective as required. Thus, there is a need to mechanize this process to make it quick and effective. Hence, 'Design, and Manufacturing of Fruit or Vegetable sorting Machine' is taken as a project. By conducting literature review, it was identified that there is no machine available to perform sorting at medium scale, also the identified cost of machine is too high. To understand the user as a small-scale farmer, data collection project was carried out within small scale communities. Some of the problems revealed were, manual labour and Identified bias, easy to operate, also reducing the overall cost of machine. Automation in machine due to constraints in cost and simplicity is not preferred.

Keywords: Vegetables and Fruits, Sorting Machine

I. Introduction

For mechanizing the sorting process we have proposed a simple, non-powered and effective machine, the working principle of this machine is that a pipe is placed at a certain angle relative to other pipe so that axial distance goes on increasing and both of them are inclined on same side at a specific angle, any fruit or vegetable is gravity fed between these pipes. They roll down the pipes until their width is more than the axial distance between the pipes after that they drop through the pipes and fall on a collection tray and get collected separately. This simple mechanism with more number of pipes connected in the same manner can be used for sorting fruits and vegetables of nearly spherical shape.

II. Design and Development

A. *Hopper Design Calculations:*

Design Calculations Includes the following:
Defining specifications of product:
The Important quantity to be defined as a specification would be the capacity of Hopper, thus we should first determine it.
We then prepare a general layout of configuration.
Next for the determined specifications we design the individual components.
Specifications of Hopper:

- Mass: 30 kg
- Total Volume: 0.066 m^3
- Density(max): 700 kg/m^3
- Actual Volume: 0.0429 m^3

Therefore,

- Hopper Dimensions: 800X600X275 (mm^3)

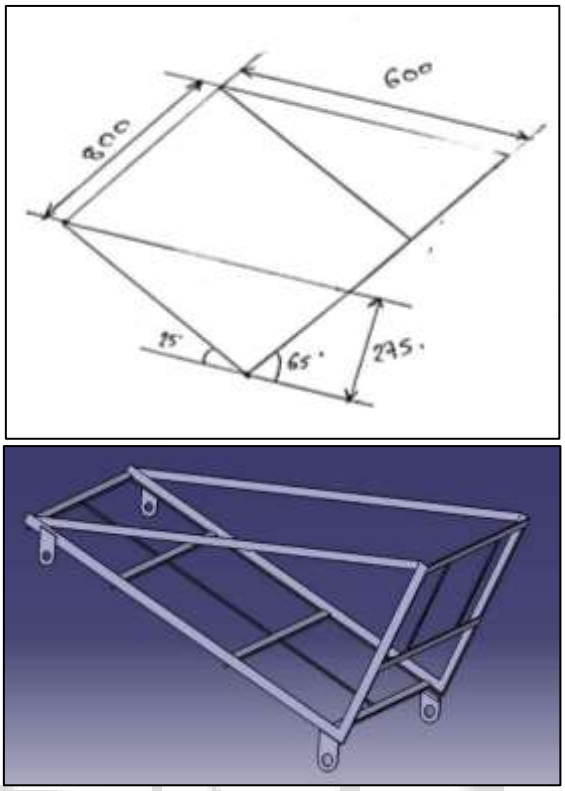

Fig. 1: Design of Hopper

B. *Frame Design Calculations*

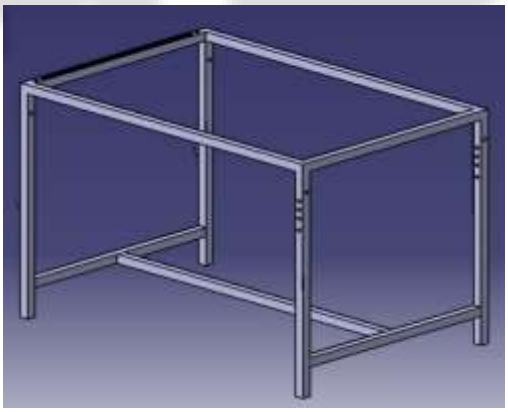

Fig. 2: Design of Frame

Frame Dimensions:
1500x1000x1000 (in mm)
C/S of Frame Members:
40X40 Thickness: 2mm

C. *Sorting Pipe Dimensions:*

Length: 1550mm
Diameter: 40 mm
Thickness: 3mm

III. CONSTRUCTION

A. Design and Analysis of Hopper

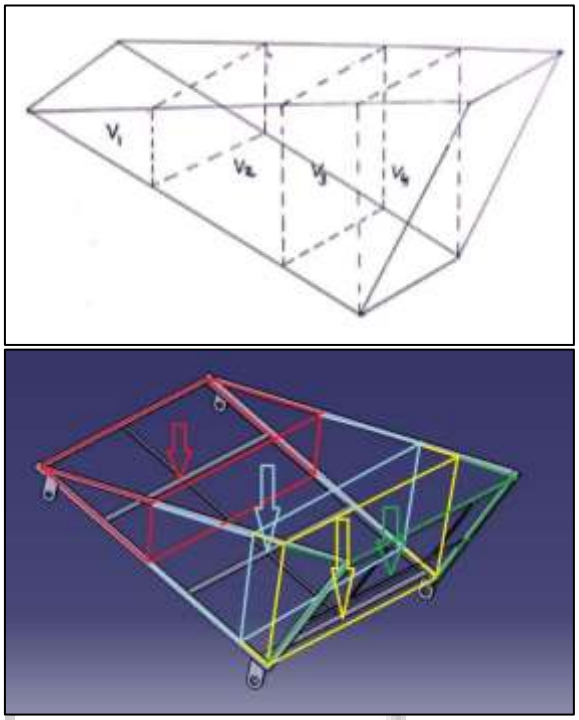

Fig. 3: Loading on hopper

We develop a structure for the hopper and then design the structural members according to the loading conditions. we should also determine how the hopper would be constructed and how the structural members are connected together. The load carried by each of the structural members would be the weight of fruits loaded above them. To determine the loads, we divide the total volume such that fruits present in individual division would load up corresponding members.

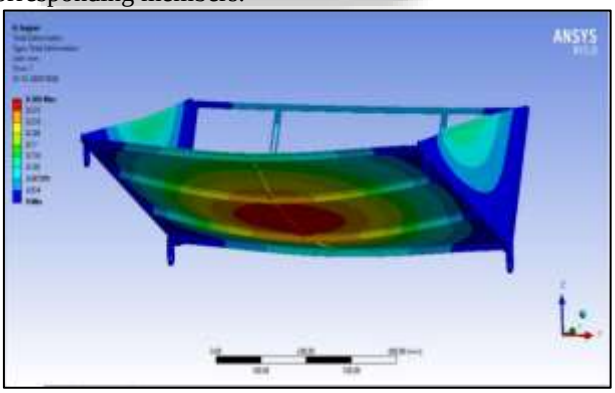

Fig. 4: analysis of hopper

We have designed the structure of the hopper and also determined the dimensions of the structural members. The hopper will be constructed by welding metal sheets on the frame; thus, we also need to determine the thickness of the sheet required. It would be quite complicated to determine the thickness analytically thus we use Finite element method.

B. Design and Analysis of Machine Frame

We designed a frame which should be able to withstand a 30 kg load and be structurally sound to hold the mechanism.

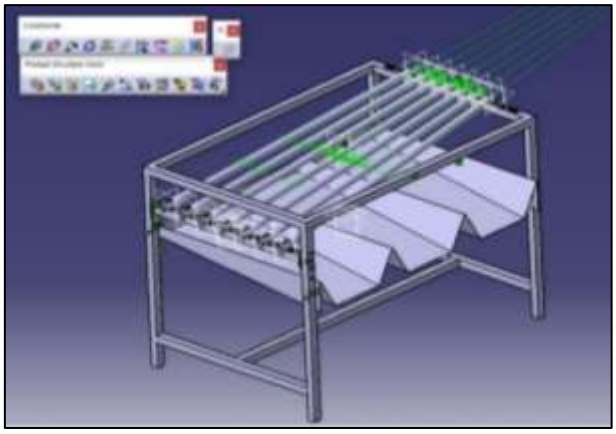

Fig. 5: Frame Design

IV. FINAL ASSEMBLED MACHINE

Following is the final representation of fruit/vegetable Sorting Machine which can be used for industrial purposes.

Fig. 6: Fruit Sorting Machine

V. FUTURE SCOPE

The above mechanism can be used for any Fruit or Vegetable of spherical shape, by doing appropriate changes in the Machine.

The above measures will increase the productivity of Farmers as time and efforts involved as well as human error will also decrease.

VI. CONCLUSION

The proposed machine would be beneficial for farmers who carry out the sorting process manually and considering the fact that it does not requires any energy input it can be broadly accepted by the farming community. This may standardize the sorting process and help the farmers to earn more profits for their produce. For normal operations the machine just needs to be configured once after which even a non-skilled person can use it easily.

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