



3D Modeling of vegetable and fruit washing machine

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Abstract: A vegetable and fruit washing machine was designed and fabricated taking into consideration the techno-economic status of the micro, small and medium scale fruit farmers who are the intended users of the machine. Considerations also included high washing capacity and efficiency and the desire to make the materials of stainless steel to ensure the quality of the washed product. Other consideration was a strong main frame and fancy look and easy to moving any ware as support to ensure structural stability of the machine. The machine was designed for ergonomic value, safety and ease of operation and maintenance by incorporating guards around the moving parts and components.

Index Terms – Machine, Shower machine, Washing, Fruit, Vegetable

I. INTRODUCTION

Washing of vegetables is vital step in any processing operation, which gives attractive and chemical free vegetables [1]. The vegetables like potatoes, tomatoes, cabbage, carrots, radish, etc., after harvesting needed to be cleaned off the soil and clay particles before transporting them from field to the market [2]. Normally many Indian farmers follow a traditional method of cleaning the carrots, radish in which the roots are washed manually by hands and feet. There is need to design a vegetable cleaner which every farmer in India can afford [3]. Washing of vegetables before selling it into the market, is an important primary Process, which reduces the surface microbial load, while removing the field soil, dust And even residual pesticides, thus leading to the value addition of the produce at the Farm level [4]. Contamination of vegetables is generally due to unsanitary cultivation and marketing Practices. The microorganisms and pesticides involved with the food if remained Un-sanitized can be critical from a public health point of view, because they can lead to health hazard [5].

II. LITERATURE REVIEW

Compared to manually operated washing of root crops, the mechanically operated cleaning setup achieved considerable improvements in simple processing speed and reduced labour requirements with no reduction in carrot quality. The cleaner should be adaptable for all types of root vegetables [6]. The designed manual root crop cleaner was of 10 kg holding capacity and it was witnessed suitable for washing root crops like carrot and radish [7]. The machine has a maximum washing capacity of 6.82 kg/min and maximum cleaning efficiency of 93.82%. Meanwhile, the machine was able to obtain the minimum skinning damage of 3.51% [8]. Depth of water, speed of rotor and quantity of material are the factors which vary the capacity, performance index and efficiency of the machine [9]. The vegetables like Radish, carrot and potatoes, etc. need to clean off from soil and clay particles after harvesting before transmitting them to market [10]. The primary objective of the root crop cleaning design was to fulfil the needs of the McGill Student- Run Ecological Garden by alleviating the processing impact of cleaning fresh root crop vegetables [11].

III. COMPONENTS USED

3.1 Barrel: Barrel is fabricated with 2mm perforated steel sheet. Barrel diameter is 300mm and Length is 914mm. Drum is supported at one end with shaft and open at another end. MS flat 25x3mm is framed from inside to form a drum shape.



Fig 3.1 Barrel

3.2 Drive Mechanism: Barrel is powered by 0.5HP electric motor driven by belt drive mechanism as shown. 9teeth belt mounted on the motor shaft which drive 44 teeth sprocket by belt with 76 links. Another 13 teeth sprocket is mounted on the same shaft which drives 43 teeth sprocket with belt having 56 links, mounted on barrel shaft.



Fig 3.2 Drive Mechanism

3.3 Stand Structure: Supporting frame fabricated with Steel angle section 30x30x3mm. Which supports the complete setup including water tanks at bottom. A supporting provision is provided with frame for barrel open end to avoid vegetables fell out of the barrel during cleaning. Height of setup is 1524mm.

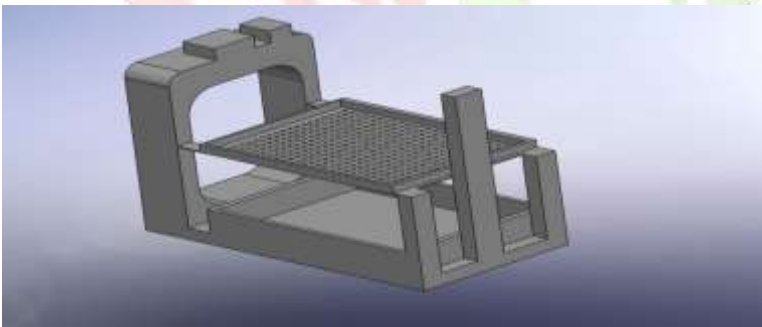


Fig 3.3 Stand Structure

IV. ASSEMBLY MODELING

The following steps were performed to generate the CAD model of vegetable and fruit washing machine with the help of operation tool, the 2D diagram has been created and converted to 3D. This CAD model of vegetable and fruit washing machine was further used to wash the all type of eating product with the help this machine. This is what it looks like once the model becomes full following CAD design also it moveable any critical places.

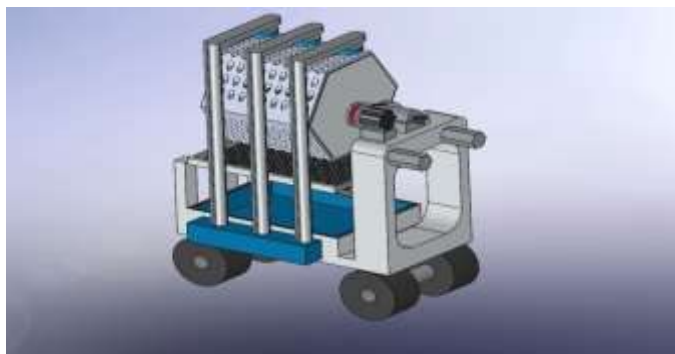


Fig No.4.1 Vegetable and fruit washing machine

V. METHODOLOGY AND DEVELOPMENT OF MODAL

The Design of vegetable cleaning machine with reduced cost can be executed with following methodologies. Deep study of previous research in agricultural field will guide in the right direction. Existing requirement analysis and implementing analytical and experimental design approach will result in the optimized design solutions with cheapest possible outcome. In this research load calculations, cad modeling, design optimization and fabrication will be performed.

MS angular sections of 30x3mm size used for the fabrication of base frame. A cylindrical Frame is fabricated with MS flat 30x3mm to form a barrel shape which is supported at end by Shaft. Cylindrical Frame is Covered with Perforated Steel sheet around the circumference. One end of cylinder is kept open and another is covered with MS plate 2mm. Both barrel and motor shaft constrained with frame by bearings to provide the rotation about shaft axis. All Sprockets mounted on the shafts and linked with belt as per design calculations

VI. CONCLUSION

By this project, Farmers will be directly benefitted. In farms when the vegetables such as potato, carrot, beetroot etc. are removed from the soil, these vegetables carry a lot of dust particles and pesticides from the soil which is harmful for human beings if taken as food. So to remove these farmers are washing those vegetables by hand and this take a lot time. So vegetable cleaner is manufactured so that it will save the time as well as save the human efforts. This vegetable cleaning machine helps the farmers to clean or to wash the vegetables properly with very less time as well as less water.

A physical Model of machine is fabricated and washing of root crops understood by performing the experiment. With the achievement of this project the vegetables are cleaned properly with water so to remove pesticide and dust with help of vegetable cleaner in a short period of time. The process of placing and washing vegetables in vegetable cleaning machine will be easy and required less time. Also, lots of vegetables can be washed at a time as per the capacity of vegetable cleaner.

Both small and large tanks mounted on the frame and water pipeline connected to the spray, a submerged pump is used for water flow.

VI. REFERENCES

- [1] A.P. Magar "Performance testing of stirrer type fruit washer", 'International Journal of Agricultural Engineering' Vol. 3 No. 1, April, 2010, pp.89-93
- [2] Dawn C. P. Ambrose "Development of a manually operated root crop washer", 'African Journal of Agricultural Research' Vol. 8 No. 24, June 2013, pp.3097-3101.
- [3] Glaizalyn B. Batara "design, fabrication, and performance evaluation of a small-scale barrel type potato (solanumtuberosum L.) Washer", 'Conference. UPD, 11th Engineering Research and Development for Technology Conference'
- [4] Mateusz Stasiak "Mechanical Properties of Native Maize, Wheat, and Potato Starches", 'Czech J. Food Sci.' Vol. 31 No. 4, 2013, pp.347-354.
- [5] S. A. Adegbite "Design and Development of Fruit Washer", 'Journal of Scientific Research & Reports' Article no.JSRR.46041 21(6), 1-11, 2018, pp. 2320-0227
- [6] F. I. Oyeleke "Development of a fruit washing machine", 'Journal of Agricultural Engineering and Technology (JAET)' Vol. 22 No. 01, March 2014, pp.29-36
- [7] TOBY J. MENDENHALL "Design of a vegetable washer for the foodservice Industry", 'Foodservice Research International' Vol. 5 No. 01, February 1988, pp.43-65
- [8] R. N. Kenghe "Design, Development and Testing of Small Scale Mechanical FruitWasher", 'International Journal of Trend in Research and Development' Vol. 2 No. 04, July 2015, pp.168-171
- [9] Michelle Choi "Design of a Small Scale Root Crop Washer", 'Final Design Report-McGill University – MacDonald Campus' April 18, 2014, pp.01-28
- [10] Mike Emers "Barrel washer for cleaning root crops", 'Alaska Agricultural Innovation Grant Report 2012' 2012, pp.01-08
- [11] Solomon Fung "UBC Farm Topped Vegetable Barrel Washer", 'The University of Brithish Columbia Project report' June 9, 2011, pp.12