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LITERATURE REVIEW ON DESIGN, MODELLING AND ANALYSIS OF VEGETABLE CLEANING MACHINE FOR AGRICULTURE USE

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ABSTRACT

Tubers such as radishes, carrots, potatoes, etc. should be removed from soil particles and loam after harvest, and then moved from the field to the market. Usually, Indian farmers follow the traditional peeling method of carrots and radishes, which is to wash the roots with hands and feet. The processing seems to be time-consuming and laborious. The best solution to this problem. In the design of this vegetable peeler, vegetables can be peeled correctly. The focus of this research is the design of the vegetable peeler. In this project, we create a CAD model of the machine and execute FEA on the machine. Help us understand tensions and displacement.

Keywords: CAD model, finite element analysis.

I. INTRODUCTION

Vegetable washing is an important step in any technical process that makes vegetables attractive and chemical-free. The roots and stems of tomatoes, potatoes, onions, carrots, and radishes must be cleaned of soil particles and clay after harvest. Indian farmers usually use traditional methods to peel the carrots and radishes where the roots are before transporting them from the fields to the market. Indian farmers need an inexpensive rotary vegetable peeler that anyone can afford. Flushing is a basic operation of the main processing unit, used to remove dirt, harmful chemicals, foreign matter and microorganisms on the surface before being sold on the market. The added value of the company's first-class products. Usually, vegetable pollution is an unhealthy harvest and sales habit. Due to lack of time, farmers did not peel them properly. From a public health point of view, because they may be harmful to health.

Aim And Objective

- Develop a conceptual plan for the development of clean vegetables.
- Calculate the design of vegetable cleaners.
- CAD modeling of the conceptual design. Reduce labor costs; reduce the energy and time required for peeling.
- Peel vegetables thoroughly and remove unwanted particles.
- Bring vegetables to the market as soon as possible.

II. LITERATURE REVIEW

This paper developed a model of a vegetable washing machine with a limit of 50 kg and evaluated its efficiency. The effects of various rotors at speeds of 1466 rpm, 1476 rpm and 1486 rpm were evaluated. During the execution at the limit of 20 cm (110 liters), the water depth was convincingly recorded. The washed fruit is used to assess the exposure of potatoes. The cost ratio of manual and mechanical cleaning of potatoes is 5.89:1. The average cost of mechanical cleaning is Rs.24.80 per ton. The cost of this car is 14,650 rupees, including the electric motor. The external dimensions of this configuration are 1000 x 560 x 750 mm. Experiments show that the washing efficiency of all rotors used for washing potatoes is between 96.36% and 98.18%. The installation limit is between 340.87 and 892.11 kg h-1. PI is between 2.25 and 3.26. On rotor C at 1486 rpm, the maximum PI value kg/h of potatoes is 3.26. R.N.Kenghe [1].

This research is devoted to the design and development of the automatic system of root crop cleaning machine, which is a kind of equipment that can be used in farmland.The soil and clay particles must be cleaned after harvest before they can be sold. Indian farmers usually follow the traditional process of peeling radishes and carrots with hands and feet. This research focuses on the details of the installation. Insert the root disc into the drum through the hole on the drum. Then close the opening with a belt and lock. Provides conditions for supplying pressurized water to the root cleaner. The drum is pressurized with a bucket, and the electric motor is used to rotate the drum. The rotation of the drum and the continuous water supply remove soil and clay particles from the root crops. The turbid water drops through the groove on the drum. Therefore, the tubers are cleaned and transported. Prepare the vegetable market. Ravdeep Singh [2].

This research describes the design and manufacture of low-power eradicating vegetable cleaners from computer simulation to structural prototypes, mechanical design, material selection, development and prototyping. The effectiveness of cleaning tubers is proven. The main goal of the root crop cleaning project is to meet the requirements of the student-run McGill Ecopark by reducing the impact of fresh cleaning on processing. A powerful conceptual design solution through computer simulation, design analysis and prototype development. The correct and improved washing machine model obtained after a successful test. Long-term solutions for MSEG agricultural activities. Future student of the School of Bioresource Engineering. Michelle Choi [3].

The purpose of this article is to develop an economical mechanical power carrot washing machine. Reduce working time and manpower. Operating limitations and design considerations include lifting capacity from 3 kg (6.6 lbs) to 11 kg (24.5 lbs), reduced operating speed to avoid breakage and crushing, low flow rate and water pressure, small parts retention, easy loading and unloading, and saving money Compared with manual and operator safety cleaning systems. Before washing in this system, the carrots are separated from the stems and leaves. There is no requirement for safe food washing. Non-submersible rotating cleaning system with a 208 liter (55 gallon) horizontal roller, supported by a roller drive, and equipped with a low-pressure spray gun. J. A. Moss [4].

Root vegetables such as carrots grow in thick, rough, and heavy soil. Since these vegetables grow underground, dirt and dust must be removed. Pick root vegetables and leaves by hand to minimize damage during transportation. They are very susceptible to microbial contamination, cracks, cuts, bruises, etc. It is recommended to remove particles from the soil as soon as possible. Granulate the soil as quickly as possible. It is recommended to remove soil particles as soon as possible. Because they cannot stay on unwanted particles for a long time. Debris on the floor and particles that aid in post-processing must be removed. Processing. There are relatively few data in the research literature on mechanical cleaning of tubers from small farmers. C. S. Ambrose [5].

This research was conducted to design, manufacture, and evaluate performance to achieve the highest cleaning performance available on the market and to determine the maximum cleaning capacity of the equipment. The performance of this configuration is also compared with the manual. The washing machine operates under the following parameters: preparation productivity, labor cost, and ease of use. For anyone, this is a very difficult job. Manually clean root crops. Before weighing, sorting and sorting, cleaning the soil and debris on potatoes is an important step. Potato tubers are the key process for freshness and highest price. For consumers, buying fresh potatoes at high prices is not a problem. Glaizalyn B. Batara [6].

The focus of this research is on washing fruits. Manually. This process is inefficient and time consuming because it requires a lot of work. Therefore, the method needs to be mechanized to ensure hygiene and easy to use and maintain. In this research, imagine the design of a fruit washing machine that can peel various fruits according to round and spherical shapes such as apples, cashews, pineapples, papaya, oranges, and mangoes. The developed configuration includes hopper and roller brush, stainless steel water tank, cover, water injection system, control valve, transmission chain, bearing, main frame and outlet. The machine was developed using local materials driven by a 3 HP electric motor. The results show that the cleaning efficiency and machine productivity of orange are 89.73% and 480.57 kg/hr, which are 90.16% and 326%, respectively. Pineapple is 63 kg/h. S. A. Adegbit [9].

The design and development of the fruit washing workshop takes into account the technical and economic conditions of the small and medium farmers who are committed to the facility. High efficiency and capacity should also be considered. To ensure quality, stainless steel is used in the construction. By fully supporting the frame, the stability of the system is additionally considered. The design of the facility includes guards around moving parts and components to improve safety, ergonomics, ease of use and maintenance. In the test phase, the conveyor belt transports the fruit under high pressure to remove adhering foreign objects. The test results show that the cleaning performance is 0.0163 tons/hour or 16.3 kg/hour, and the cleaning performance is

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62.Fives%. The machine is equipped with a 1HP single-phase motor and gearbox, and costs US$300. All building materials are provided on site. F. I. Oyeleke [10].

The vegetable cleaner can be constructed by the cleaning effect of a water jet, a soaking chamber or a brush. Cleaners using water jets are similar to ordinary household dishwashers, cheap, reliable and suitable for a variety of fruits. This article proposes two variants of this dishwasher: a standard dishwasher with a fixed basket and rotating nozzle, and a turntable dishwasher with a fixed nozzle and rotating basket. And water spray system. Several standard nozzles were tested on the spray table to determine strength and uniformity. The potato is placed in the fruit washing machine for a period of time, and then the change in the distance between the potato and the potato is visualized. Nozzle, position and direction in water, nozzle type and dirt type have no influence on TOBY J's cleaning performance. TOBY J. MENDENHALL [7] .

Stripping tubers on small farms can be challenging, especially when there are time and climate constraints. In the interior of Alaska, root crops usually mature when the weather is cold, and cold temperatures, short deadlines due to urgent other projects, and a large number of laborers in the area result in a limited number of workers, which hinders the rush to do a good job. . Pour the harvest from one box to another is a decent but difficult task. Reduce food waste, expand production to meet community demand for local products, and increase our profits. Mike Emers [8].

In this research a prototype was developed that can clean larger number of root crops and reduce any damage during processing. This configuration can clean a container(18 gallons) of product for an operator in 5 minutes. Design with interchangeable pulleys even if there is no intermitted or continuous operation, it can also provide three speed settings to handle product of different shapes. Installation is not only easy to maintain, but also easy to use. no tools are need to switch. The developed configuration is mounted on casters and can be carried by one person. The drive shaft components are made of stainless steel to avoid corrosion problem when painting other parts of the assembly. Solomon Fung [11].

SUMMARY OF VEGETABLE

CLEANING MACHINE

Technique	Author	Summary
Mechanical Fruit Washer	R. N. Kenghe	water depth, rotor speed and material amount are the factors that change the performance, performance and efficiency of the machine.
Automatic Root Crop Washer	Ravdeep Singh Ghuman	Vegetable needs to be must remove dirt and clay particles from the vegetables after harvest before they can be put on the market.
Root Crop Washer	Michelle Choi	The main goal of the root crop cleaning project is to meet demand by minimizing the impact of the fresh root cleaning process in the eco-garden run by McGill students..
Mechanical Carrot Washer	A. Moos	Compared with a manual root washer, the advanced cleaning system completely increases the speed of the main processing and reduces the required working conditions without affecting the characteristics of carrots.
Manually Operated Washer	C. P. Ambrose	The handheld cleaner developed has a capacity of 10 kg and was found to be suitable for washing tubers, such as carrots and turnips.
Barrel Potato Washer	Galizalyn B. Batara	The minimum skin damage of the machine is 3.51%, the maximum machine washing capacity is 6.82 kg/min, and the maximum cleaning efficiency is 93.82%.
Vegetable Washer	Toby J. Mendenhall	After extensive research, redesign and laboratory testing, we believe that it is possible to create a configuration that meets the needs of the food service industry in a cheap, easy-to-use, compact and reliable way to clean fruits and vegetables..
Barrel Washer	Mike Emers	I can only recommend the use of movable washers to all

		manufacturers and reduce the production time of the product. Facts have proved that this washing machine is so successful and fast that other manufacturers use trucks to bring crops up to make washing easier. Soon other producers nearby brought our harvest to us in trucks. Make cleaning easier.
Fruit Washer	S. A. Adegbite	Manufactured and tested low-power washing machines for tomatoes and oranges. Preliminary tests of the prototype showed satisfactory performance. The machine performance of the two products shows that the equipment is suitable for large and medium-sized operations.
Fruit Washing Machine	F. I. Oyeleke	Studies have shown the effects of compressed aerosols and conveyor belts on roots and fruit crops. In fruit processing, the peeling and washing of the whole fruit are indispensable and essential in every fruit processing industry.
Vegetable Barrel Washer	Solomon Fung	Setting up automatic cleaning will reduce the current labor force while allowing other employees to work on other farms. The compact design of the drum plate fits the space allocated by UBC Farm customers, and the pneumatic wheels allow users to easily move the equipment.

III. PROBLEM DEFINITION

Usually, Indian farmers follow the traditional method of peeling carrots and radishes, which involves washing the roots with hands and feet. Washing hands takes a long time and requires more work. Because farmers lack time to bring vegetables directly to the market for sale and improperly peel them, a large number of unwanted particles will stick to the surface, which will bring health risks. Therefore, vegetable cleaners are needed to solve this problem.

IV. CONCLUSION

According to the requirement of vegetable peeling machine, the data collection and structure calculation of the machine are considered in the design. This project aims to clean all vegetables according to the goals, collected data calculations result, and CAD model of lifting mechanism. After CAD modelling, finite element modelling and finite element analysis were carried out, and FEA method used for verification to verify the developed CAD model.

V. REFERENCES

[1] International Journal of Research and Development Trends. Design, Development and Testing of Small Mechanical Fruit Washing Machines. R. N. Kenghe, A. P. Magar and K.R. Kenghe, Department of Agricultural process Engineering, Mahatma Agricultural University, rahuri, India.

[2] .IIRMET is designed and manufactured by Ravdeep Singh Ghuman, Rachit Khanna, Sidhanta Singla, Preetpal Singh, Harvinder Singh of the School of Mechanical Engineering, Chitakara University, Punjab, India.

[3] A small washing machine for root crops designed by Michelle Choi, Isabella Khan and Kurosh Mokhtasami.

[4] Mechanical washing of baby carrots used to produce research examples Author: A. Moos, D. D. Steele and D. C. Kirkpatrick.

[5] Development of Manual Root Scrubber" Down C.P., Ambrose and S. I. K. Annamalai Central Institute of Agricultural Engineering Regional Center, Coimbatore-641 003, Tamil Nadu, India.

[6] Design, manufacture and evaluation of the operational characteristics of small machines (Solanum Tuberosum L.)" Glaizalyn B. Batara; Teresito G. Aguinaldo, Francisco D. Cuaresma.

[7] "Building vegetable washing machines for the food industry" Toby J. MENDENHALL, TOMBOSSA D. NEGUSSE, Stanley G. Solomon, IR. And RANDY R. PRICE, Department of Agricultural Engineering, Oklahoma State University, Stillwater, Oklahoma.

[8] Mike Emers, a bucket washing machine for washing root crops, "Alaska Agricultural Innovation Grant Report," 2012.

[9] "Design and Development of Fruit Washer" S. A. Adegbite, S. K. Adeyemi, A. O. Komolafe, M. O. Salami, C. F. Naches and A. A. Ogunbiyi. Journal of Scientific Research & Reports 21(6): 1-11, 2018; Article no.JSRR.46041 ISSN: 2320-0227

[10] The development of fruit washing machines F. I. Oyeleke, A.M. Olaniyan, M. O. Sunmonu and S. K. Oyeniyi Department of Agricultural and Biosystem Engineering, Faculty of Engineering, University of Ilorin, Nigeria.

[11] UBC Agricultural Covered Vegetable Dishwasher Solomon Fung, Wendy Huang, Callum McGregor, Rocky Tam.