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"PROPOSAL AND DESING OF SACHA INCHI DESCAPSULATOR MACHINE, IN THE JUN□N REGION"

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Abstract - The development of this project addresses the problem that is currently being presented by the central jungle of Peru, who are engaged in the cultivation of the Sacha Inchi seed. At present, the industrial process that is carried out with sacha inchi is not adequate due to the lack of specialized equipment, therefore, its production is currently deficient, being one of Peru's important export products. The lack of knowledge of industrial process techniques wastes the value of such an important seed.

This design was developed taking into account each of the established objectives: Investigate the advances and techniques used in the world of production of Sacha Inchi, make a diagnosis of the problem and its causes, establish an alternative solution, develop the machine design and draw up the plans of manufacturing for fulfilling the proposed objective.

It is a machine that is designed on the basis of a square structure that in the upper part has a cylinder incorporated into a conical hopper for the feeding of the unprocessed product. In the lateral part of the structure a sorter is incorporated and in the center part. It has an axis with multiple moving components, as well as a disk and rotating vanes controlled by an electric motor.

In conclusion, the design of two processes in one, generates the reduction of a farmer's time in two minutes to process 12kg, that is, the processes will be more optimal, which means a greater contribution to the farmers of the central jungle of Peru.

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Key Words: techniques, seed, diagnosis, processes, machine.

1. INTRODUCTION

Sacha inchi is an oleaginous plant native to the Peruvian Amazon, also known as sacha yuchi, sacha yuchiqui, sacha inchik, sacha inchic, mountain peanut, wild peanut, Inca peanut, Amui-o (Huitoto tribe). In addition, it is known that for 3000 to 5000 years there is evidence that the Incas cultivated such seeds known as the Inca peanut. l sacha inchi es una planta oleaginosa aut□ctona de la Amazon□a peruana, tambi□n conocida como sacha yuchi, sacha yuchiqui, sacha inchik, sacha inchic, man□del monte, man□silvestre, man□del inca, Amui-o (tribu huitoto). Adem□s, se sabe que desde hace 3000 a 5000 a□os existen evidencias, de que los incas cultivaban dichas semillas conocidos con el nombre de man□ de los incas (1).

Also, the fruit has a starry shape, each tip is a lobe, which in turn contains a seed whose surface can be smooth or rough, flat or slightly flattened, its size ranges between 0.9 cm and 2.0 cm, these characteristics are dependent on the agroclimatic conditions of the crop (2). Inside the seed is the almond, which contains about 50% oil; value higher than the content in soybeans, cotton, sunflower and peanut (3).

It was observed that in the Andean populations they have used this fruit in traditional preparations such as soups, cookies, food for children, among others, especially in Peru, where they obtain oil by various methods and flour by atomization, which is used for the preparation of meals , drinks and snacks as a source of omegas 3 and 6 (1).

According to nutritional characteristics of sacha inchi, they have motivated farmers and companies to start the exploitation of this seed with the purpose of exploiting its derivatives in the future. However, this cultivation is carried out in an artisanal and low-tech way, so we seek to improve the production of the Jun□n region, making known the benefits of the product and giving added value to the

technified processes in order to promote export to other new markets (4).

An alternative solution to the artisanal process is to publicize the decapsulating machine that has pallet mechanisms that fulfill the function of a crusher with the purpose of husking the seeds, and also increasing productivity compared to the craft process.

2. MATERIALS AND METHODS

The design of a team or machine is characterized by creativity and, at the same time, marked by compliance with the requirements imposed by the client, users, the market and / or competition. The complexity and importance of this design process have motivated a multitude of studies and the establishment of various methodologies that help design teams guide procedures, focus creativity and reach agreed upon requirements. These methodologies contemplate and incorporate in the design decisions the market studies, the analysis of user needs, the generation of specifications, proposal and valuation of alternatives, etc. (5)

In our investigation we do not base on the methodology of the State of the Art (6), Looking for solutions to the problem detected, with knowledge of mechanical engineering, that is to say we propose ideas and from a construction and calculation approach looking for previous references and establish the current state according to the need of the inhabitants of the Jun□n sector exactly in the central jungle of Per□

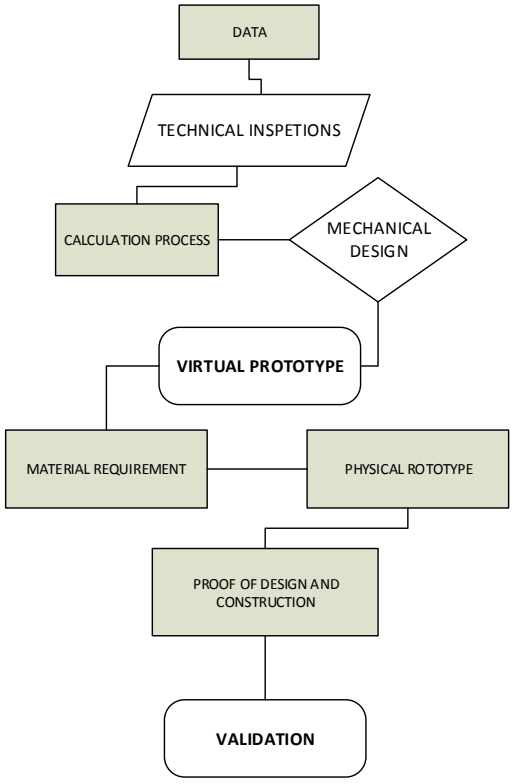

Table 1.1 process table the sacha inchi decapsulator machine

3. MECHANICAL DESIGN

According to the study conducted on the different methods of seed decapsulation, it is concluded that the most suitable system for the implementation of the prototype (8). In which it consists of a mechanism that begins with the entry of the seed into the hopper, going through a second process in which a 1/16 inch thick metal cylinder is attached and inside the cylinder there is a welded shaft With radially positioned fins, the quality removes the seeds and strips them of their outer cut. the seed towards the selected one by size and added to strip of its outer cortices to the rest of seeds that were not impacted by the fins.

Once the seed reaches the sorter, the husks are ejected with the help of an electrically operated centrifugal fan with a 220 AC power supply (7)

Figure 1.1 sketch of the sacha inchi decapsulator machine
list of mechanical design elements

Table 1.1 Numbering and description of the components of the solution concept.

ELEMENT TABLE
1 Structure
2 Cylinder
3 axis
4 Ball bearing 1
5 Ball bearing 2
6 16 inch pulley
7 Cylinder cover
8 Hopper
9 Grain sorter
10 8 inch pulley

11 2 HP three-phase motor
12 2HP motor base
13 Belt type A
14 Centrifugal fan
15 0.25HP single phase motor

The elaboration of the machine was based on the calculations carried out according to the Von Mises theory in order to determine the failure of a critical point subjected to a uniaxial tension state, the failure that occurs when the maximum shear stress of the load exceeds the tension shear of material creep, that is when τmax = τpy. (9)

In our calculations we have developed the study of the main axis and its axial loads to determine the diameter of the axis and its main components. components.In order to approximate more accurately the dimensions of the axis, we use the ASME (elliptical) theory that according to the safety factor subjected to the actual work and the coefficient of concentration of stress, surface, size, among others we obtain the calculation of the ideal diameter and include the most optimal material in order to reduce deficiencies in the work that will be done (10).

Likewise, the load calculations previously obtained on the axis were used in the selection of taxiways, cotters, transmission belts and nuts (11), which is why we use the quantitative method that seeks to make real tests and measure the productivity function with respect to at the time of the machine compared to the time of the farmer and his productivity, also taking into account that the machine is designed for a micro industrial sector with large-scale principles (12) That is why we seek to encourage the inhabitants of the Junín region that we can be macro producers in industrial process scale, of such an important seed.A continuación, medimos la Productividad según los factores de tiempo y recursos utilizados:

Productividad = (Productos o servicios producidos)

/ (recursos utilizados)

Next, we measure Productivity according to the factors of time and resources used:

Productivity = (Products or services produced)

/ (Resources used)

To check the time it takes for the machine to decapulate and measure power consumption, resulting in optimum productivity (17).

PRODUCTIVITY

Table 2.1 comparison and description of the productivity components with respect to the time and resource used (Own source)

Compa	kilos	Tiempo	energía eléctrica	Productividad
Unit	kg	h	kwh	
Farmer	12	4	0	3
Machine (decapsulator)	12	0.033333	2	6

The following table shows the comparison between the workforce of the farmer and the machine, thus giving sustainable support to reduce the effort of the farmer, so it makes the work easier and more efficient, thus recommending that the process of decapsulation by the machine is highly productive. less time and cost.

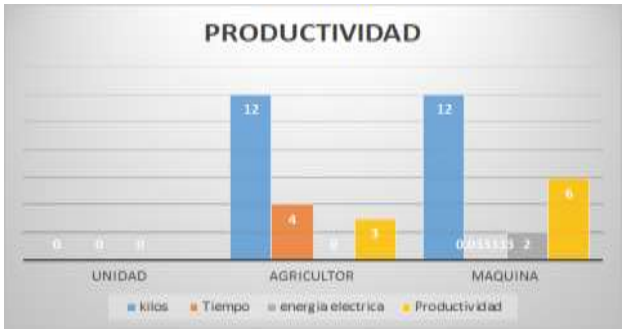

Figure 2.1 productivity comparison

4. RESULTS

The design of the different components of the machine was made using rules, equations and input parameters of the Sacha Inchi, so we studied the critical parts of the machine, resulting in the following decapsulation process (13).

In addition, the constituent elements of the sacha decapsulating machine have stainless materials as they are in contact with the seeds (19), the parameters of seed moisture were also considered, and with respect to the seed's ability to enter the seed. Hopper is 12 kg / min for the dimensions of the machine. The strategy developed achieves production as close as possible to the objective as a function of time (20).

Figure 3. Machine under construction

5. DISCUSSIONS

The use of stainless materials was considered taking into account the relative humidity of the air, since in an article it mentions the tests of the prototype operation that were carried out in the city of Quito in average environmental conditions of temperature 15 ?C and relative humidity of 50 %. (15) Samples of 20 kg of seeds from different sources were used at speeds of 20 and 80 rpm and it was also observed that when performing the analysis of the operation in a vacuum and with a seed load for the extraction of oil in the field, there was a temperature increase within the extraction chamber by 70%. This is because there is more friction between the seed and the screw. Which experimentally validates the mathematical model of frictional force (11). Therefore, the mass of oil extracted with the device increases depending on the speed of the screw. This can be justified since the temperature increases according to this parameter, which causes the viscosity of the fluid to decrease. That is why we have considered the drying time of the seeds of 144 hours, in order to avoid these inconveniences with respect to moisture.

The automatic parameter configuration strategy was created in a closed network where production results and monitoring information is only available in one system (14). For future work, necessary applications and protocols could be configured to allow monitoring of plant information from a decentralized server or using Internet services

The Arduino platform (16) can be started and learned quickly. Thus, students focus on the problems of experiments, such as the development and programming of control algorithms that operate the robot or the machine with the given specifications (13).

6. RECOMMENDATIONS

For the construction of the mechanical part, stainless plates with a thickness of 1/16 in. Have been used, but it is recommended to use a material other than this in the parts where there is no contact with the product, in order to reduce costs in the product Final and with respect to the welding used, it is recommended to change the use of cellocord electrodes since it may be possible that there is a moisture leak for this purpose it is recommended to use MIG MAG welding. Also with respect to the fins housed in the shaft it is recommended that they be adjustable in order to also be able to use with other types of grains similar to sacha inchi, and finally it is recommended in the future, to automate the part of the selection process by size using inductive and capacitive sensors.

7. CONCLUSIONS

The industrial machine that we propose seeks to cover the needs of the sector dedicated to the cultivation of sacha inchi seed, which is why the process we take for the decapsulator is fundamental is a process without contaminants for the material since it has galvanized steel.

The capacity of our machine is to reduce the time of 12kg in 2 minutes in maximum work is suitable for the micro industrial process

For disposal the sophisticated implement of an air pump reduces costs in selection and design materials

This project contributes to the change of artisanal production, giving added value to regional and national agricultural production as a previous step to the process of obtaining oil in our flagship seed produced in greater quantity in the Peruvian jungle sacha inchi.

8. THANKS

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