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DESIGN AND ANALYSIS OF SEMI AUTOMATIC PAPER CUM ARECANUT PLATE MAKING MACHINE

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Abstract –This paper is mainly focusing on *the cutting operation and punching operation are done independently in the current self-loader areca nut plate making machine. To conquer this, self-loader areca nut plate making machine joins both activities, which will expand creation rate. The fundamental concentration of the venture 'Plan and examination of semi-computerized areca nut plate making machine' is to outline the machine for assembling of 12-inch areca plate. The primary parts of the machine are upper bite the dust and lower kick the bucket, engine and warming curl. The working rule of the machine follows up on water driven constrain. The upper and lower pass on are warmed by warming curl which is controlled by power. The water driven constrain is instigated in the machine to move the kick the bucket in vertical movement. As an areca nut leaf sheath is set between the passes on, the development of the bite the dust causes punching and cutting procedure in the sheath. The energy of the engine is 2Hp. The water driven weight is 100kgf/cm2. The stroke length is around 12cm.The current utilization by the machine is 2unit for 8hours. Areca nut plates are accessible in different sizes as per pass on sizes. These plates are helpful, airtight, light in weight, solid, biodegradable. The venture 'Plan and examination of areca nut plate making machine lessens the assembling time and expands the creation requiring little to no effort.*

Key Words: Areacanut leaf, heating coil, dies, hydraulic press

1. INTRODUCTION

Leaf cups and plates are traditionally made by hand in Indian villages. These are commonly used for serving food at marriages, religions and social functions. The laborious craft can now be converted into a machine operation to make these containers in elegant shapes and sizes. Such cups and plates are made out of plant leaves of beautia, arecanut sheath, banana etc. These have good dimensional stability and are inexpensive, hygienic and biodegradable. In India 4 Lac Hectares of Areca Crop has been cultivated, near about 5400 Million Areca Leaves are seeded and Treated as Agro waste. These leaves can be converted as a Value added Product. The leaf container machine is a straightforward pedal worked machine, physically worked with least power utilization. It requires 300 watts of electric power. It can likewise work without power by lamp fuel oil blowlamp. The leaves are washed and dried to hold their malleability and kept in a polythene pack to abstain from drying before utilize. The leaves are put on the lower kick the bucket platen, the pedal is pushed down and discharged following a few moments. All the operation like collapsing, trimming, squeezing into shape and drying are done in a solitary operation by squeezing the pedal lever. The leaf container, subjected to warming to 150 degree C for 10 seconds additionally gets disinfected. This machine comprise of accessible detail of Hydraulic Valves, Production every Hour, Power Consumption, Working Air Pressure, Working Air Volume and others. The machines are utilized for cutting paper into various shapes, for example, rectangle, square or circle. The essential material which can provided into the machines are cardboard, crude paper, or slate paper, leafs of areca nut and different leafs. Paper plate making machine works under the electric supply and it comprises of engine and water driven barrel. Water driven framework is utilized to work the machine and toward the finish of the cylinder shaft pass on is associated which is the replaceable. Bite the dust is the vital part to make a plate, bring down kick the bucket and upper bite the dust were utilized. In the lower kick the bucket nourish is given and the upper pass on is settled and the radiator is mounted on the upper pass on. Warmer is essential to warm the areca nut or paper nourish utilized, on account of the warming it changes to the position of the bite the dust by moving the lower kick the bucket. Upper bite the dust is settled inflexible and lower bite the dust moves by the water powered framework. Weight of the pressure driven framework is noted and guided the lower pass on for the execution of making plates. Less and simple upkeep it can be worked through hands. These water powered programmed framework based machines are less demanding to work, require less support and simple to introduce. The innovation embraced for making paper plate is eco-accommodating. Plate framing procedure is absolutely consequently done by the machine, just bolstering and bundling includes manual work. The piece papers made out of this assembling procedure additionally can be sold for reused paper converters. Thus there is no way of any contamination.

2 MATERIALS SELECTION

2.1.Design of lower die

Passes on are intended for making twelve inch areca nut leaf plate. What's more, made by throwing technique. Bring down bite the dust is use to accomplish the state of the areca nut plate. it comprise of warming curl and air pass openings and it is settled in the bite the dust seating.
Internal width of the lower die= 250 mm
External distance across of the lower die= 345 mm

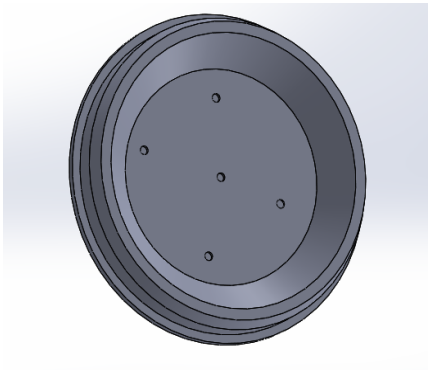

Fig.1. Design of upper die

2.2.Design of hydraulic motor

Agreeing to Balasubramanian M(2000),et.al., "Mechanical properties of areca nut the water driven framework is a result of stream and weight, less wasteful aspects. While choosing water powered pump as well as engine for a particular application the connections between stream, dislodging, speed, torque and weight, and the impact of wasteful aspects must be considered. This archive discloses how to estimate water powered pump or engine for a specific application. By the term torque, it is implied the turning or curving snapshot of a compel around a hub. It is measured by the result of the constrain and the span at which this compel demonstrations.

Fig.2. Design of Hydraulic Motor

For an armature of an engine, to pivot about its inside, a digressive drive is vital. This compel is produced within the engine itself.
Torque (T) = ½ (I_a / A) BDC Z N m
Using the relation,
B = φ x P / (Π Dł)
T = 0.162 x φ x Z x I_a x (P/A) Kg-m
The torque given by the above equation is the developed torque in the machine. But the output torque is less than the developed torque due to friction and wind losses.
Torque of the motor
Torque T = Fc x r
m = Area x length x density
= b x t x l x ρ
Where,
b = Breadth of the chain= 0.015 m
t = Thickness = 0.007 m
l = Length = 1 m
ρ = Mass density = 1140 kg/m^3

So,
m = 0.1197 kg/m
v = 35.90 m/sec
Tc = m x v^2
= 0.1197 x $(35.9)^2$
= 154.27 N
Fc = Tc
Now torque = Fc x radius of sprocket in the motor
= 154.27 x 0.1143
= 17.633 N-m
Power rating of the motor
Torque at motor sprocket = 17.633N-m
Torque at the reduction gear = 5.289 N-m
Power of the motor = Torque x (2 x 3.14 x N) / 60
= (5.289 x 2 x 3.14 x 650) / 60
= 360 Watts
= 360/735.5
= 0.49 H.P≈ 0.5 H.P
Design of frame
The frame is designed in the way so that the dies can be placed and so that it is taken forward to punch areca leaf plate. The frame is designed in Solid Works 2013 and the material used to manufacture the frame is mild steel.
Length of the frame (L) = 730mm
Breadth of the frame (B) = 690mm
Height of the frame (H) = 1105mm

3.FABRICATION AND TESTING

Fabrication of areca nut plate making machine .The fabrication of the model is done, such that it should not deviate with the designed model. First process of fabrication involves the selection of appropriate materials, which will be available readily and should have optimum cost. The selection of materials is done such that the component

should have good strength and serve the required and optimum performance and withstand at maximum pressure. The materials are also selected based on the availability and cost.

Fig.3. Conceptual Design

The second process of fabrication involves the procurement of the required models. The necessary components and raw materials were purchased. First the hydraulic motor and the pump setup of the standard part is purchased. Then the dies of designed dimensions have been manufactured. Then according to the length of the areca nut leaf plate dies are manufactured. Then the die seating has been manufactured. Then the lower die is fixed in the die seating. The lower die is unmovable. Then the upper die is fixed to the reciprocating piston by means of connecting hub. Then the heating coil is connected to the upper die and lower die.

The frame material which is purchased is machined into the required form by machining through the lathe, gas cutting, milling and drilling process. Thus the dead weight is shaped into the required size as it must be in the required form. Then the welding process is carried out, the square plates are welded together with the i-section and motor bed is also placed along the i-section and is welded together. The welding used here is tungsten Inert gas (TIG) welding as it gives more strength when compared to the MIG and arc welding process.

After finishing the plates they were welded together using a TIG welding machine and it is filed to clean away the burr.. After finishing the fabrication the rust were removed using emery sheets and the prototype is painted for better look and to increase life.

Thus the fabrication process is done with the best industrial practices and it is placed in the company for the manufacturing purpose.

3.1.Employment opportunity

Each Areca leaf plate manufacturing unit provides direct employment to 3 persons and there is an indirect impact of creating employment for 2 other persons. Rural area is selected to create employment. Also work shed &labour will be at low cost.

3.2.Areca leaf procurement

In India 4 Lac Hectares of Areca Crop has been cultivated, near about 5400 Million Areca Leaves are shredded and Treated as Agro waste. These leaves can be converted as a Value added Product. One Areca leaf plate manufacturing unit Needs 195000 leaves per year. In this scenario near about 27700 plates manufacturing units can be established all over India. 1.5 lakh fresh employments can be given in 27700.This Particular project can create "A Rural Employment Revolution" in India. At present only 1500 units are established all over India. In that around 1000 units are in south India. The major suppliers of raw materials for south Indian units are Tamilnadu (Salem, Coimbatore), Kerala and Karnataka (Thumkur, Shimoga).

3.3.Waste disposal

Food plates thrown after eating will be naturally degraded within 60 days of time like any plant matter. Manufacturing waste of Areca sheaths will be used for vermin compost, dry fodder for animals, bio-fuel bricks.

4.RESULTS AND DISCUSSION

This chapter deals with the testing and the result phase of the arecanut plate making machine. The various testing phase includes the time and temperature, Soaking time vs Production time cost analysis and using the various techniques. The result for the above is also discussed in this project result and discussion chapter

4.1. Fabricated prototype

The fabrication of the prototype was done with good and industrial practices. The fabrication of the prototype was explained in the previous chapter 3.2. The prototype was designed such that it will have better performance while in operation. The fabricated prototype of the conceptual design is shown in the Fig below

Fig.4. Fabricated Prototype

4.1.1.Working

According to Baboo B (1981), "A device for dehusking areca nut". Journal of Agricultural Engineering (ISAE), 19(1), 63–65India has abundant Areca Palm Trees. These Areca Palm trees are cultivated for "Areca Nuts" which is chewed and is used in making Pan. Each Areca Tree sheds 10 to 15 leaves every year. These Leaf Sheaths, which naturally fall from the trees, are collected from the Areca Farms and transported by truck to our factory. These dry Areca Leaf Sheaths are soaked in water and thoroughly cleaned using brushes to eliminate the sand. The leaves are so arranged as to drain the water. These leaves are then pressed in the molds of various sizes and attractive designs according to the demand-requirements.
These plates are then packed as per customer requirements and kept safely. Areca leaf plates are perfect alternate to Plastics/Polymer based products and also Paper based products about which the entire world is concerned about. A 100% natural mechanism is followed for manufacturing these plates. The fallen areca leaf is collected from farms. The Sheath of the areca leaf cleaned and soaked in water for approximately 15 minutes and shade dried for 30 minutes. They are then compressed to different shapes using the correspondingly shaped Machines. They are then packed as per the customer requirement.

4.2.Manufacturing process

According to Dong-Woo Kim (2008),et.al.,"Application of Design of Experiment Method for Thrust Force the leaf container machine is a straightforward pedal worked machine, physically worked with least power utilization. It requires 300 watts of electric power. It can likewise work without power by lamp oil blowlamp. The leaves are washed and dried to hold their flexibility and kept in a polythene pack to abstain from drying before utilize. The leaves are set on the lower kick the bucket platen, the pedal is pushed down and discharged following a few moments. All the operation like collapsing, trimming, squeezing into shape and drying are done in a solitary operation by squeezing the pedal lever. The leaf container, subjected to warming to 150 degree C for 10 seconds likewise gets cleaned.

4.3.Market demand

There are more than 5,000 leaf cup making machines in operation in U.P., Bihar, M.P., Jharkhand, Himachal Pradesh, Gujarat, Maharashtra, A.P., Karnataka. There is a large scope for setting up cottage scale units.

4.4.Implementation period

According to Kiran K(2014), et.al., "Design and analysis of an Areca nut Dehusking Agri- machine" Proximity sensor Proposed Project can commence production within 6-8 weeks after sanction and first disbursement of term loan.

4.5.Analysis of upper die

Yield strength

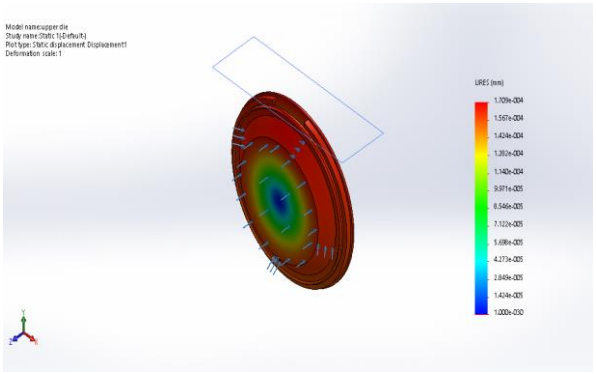

Fig.5. Yield strength of upper die

5.Conclusions

Financial aspects of areca nut development in Karnataka, a contextual analysis of Shivamogga, District" as industrialization is one of the significant strengths of monetary advancement in any area, smaller scale and little scale businesses assume a vital part in changing the economy of a state like Assam where vast and medium undertakings are practically missing. The Areca nut Leaf Plate Manufacturing Project not just gives a practical business chance to the unemployed youth additionally encourages fulfillment of independence, evenhanded appropriation of national pay and adjusted local development. Financial flexibility is accepted to clear route for territorial peace and incorporation. Notwithstanding few difficulties that exist in all little scale enterprises, the venture displays gigantic potential for catching both the national and global market with

its remarkable condition well disposed item. As the venture has a selective advertising unit, the issue of offer through delegates additionally does not exist. With a specific end goal to expand its promoting extension and to survive the opposition, especially from vast and little ventures arranged outside the locale, the venture must concentrate on decreasing the generation, offering and appropriation cost of the items.

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