SPECTROMECH-2020

-APPLICATION OF MECHANICAL ENGINEERING

TECHNIQUE POLYTECHNIC INSTITUTE

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Vision of the Institution

- To be a premier institute in pursuit of excellence in technical education and skill development committed to serve the society

Mission of the Institution

- To promote excellence in learning, teaching and technology transfer
- To improve the quality of skilled workforce through a structured programme and professional skills training
- To inspire students to learn and facilitate their overall development with social orientation and values

Vision of the Department

- To be a centre of excellence in Mechanical Engineering to impart technical & professional skills to cater industrial requirements while considering environmental aspects fulfilling societal obligations

Mission of the Department

- To impart the necessary technical skills among students
- To enhance the interaction with industry
- To produce competitive& employable Diploma Engineers
- To inculcate ethical & professional values among students

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- **Successful career (PEO #1):** To provide students strong foundation of technological fundamentals, necessary to analyze, design, manufacture using modern technological tools to become successful professional in real life world

- **Adaptability with new learning environment (PEO #2):** To build up the aptitude for an understanding of requirement analysis, ability to adopt new working environment and solves complex problem especially in multidisciplinary in nature

- **Keeping pace with developing world (PEO #3):** To provide adequate exposure to promising radical change in technology, training and opportunity to work as teams in cross functions project with effective communication skill and leadership qualities

- **Integration with the society (PEO #4):** To promote student awareness on the life sustained learning by bringing them to their professional principles of practice based on professional ethics of codes so as to achieve the ability to integrate in to the world of practicing professionals for collaborations, mutual support and representing the profession to society

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FOREWORD

Heartily welcome to our sixth edition of Mechanical Engineering Technical magazine 'SPECTRO MECH' in 2020. We excited to report that the Department of Mechanical Engineering continues to grow to meet our vision of the department which is analyze by Faculty Course Assessment Report(FCAR). Mechanical Engineering is one of the largest enrolled department in the collage with more than 380 under graduate student over the period of 2010-2020 more than 20 students are already placed at various companies as well as higher studies. All the initiatives are possible by the efficient contributions of alumni, friends, faculty members and staffs.

I would like to express my appreciation to all the authors of the article in this issue of the Magazine. Our goal is to create quality education for the student of the twenty first century. The success of 'SPECTRO MECH' depends on energetic and joint effort of all stake holders of the Institution. I would appreciate your feedback and any suggestion for improvement.

SoumendraNathBasu
Executive Director
Technique Polytechnic Institute

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MANUFACTURING OF ARECANUT DEHUSKING MACHINE

By
SUJIT KUMAR GARAI, Faculty
With my dear students of final year 2020 passing out batch
Department of Mechanical Engineering
Technique Polytechnic Institute
Panchrokhi, Sugandhya, Hooghly

ABSTRACT:

Areca nut has to be processed in dry condition by peeling the outer shell completely. Peeling of Areca nut is very difficult by hand. However it is being done manually by using a sharp knife with a production rate of 3kg/hr. So it is essential to develop an agri-machine which will increase the production rate and safety to labors. Presently there are few machines available but these machines are not suitable for variety of sizes of Areca nut which leads into the insufficient removal of outer shell of Areca nut. Therefore there is enough scope to develop anagri-machine suitable for variety of sizes of Areca nut which will overcome these problems.

The present project work emphasizes on developing an Areca nut Dehuskingagri-machine for three different sizes of Areca nut. The concept is to shear-off the husk of the dry Areca nut by shearing force. The features a Dehusking mechanism with a power drive. The experiments were conducted by changing the blades, and selecting the best method.

INTRODUCTION:

Areca nut is an important commercial crop in India. An Areca nut is the seed of the Areca nut palm. It plays a prominent role in the social, cultural functions, religious and economic life of people in India. The income produce is the fruit called “betel nut” and is used mainly for masticatory purposes. These Areca nut has uses in ayurvedic and veterinary medicines. And it is estimated that nearly ten million people depend on Areca nut industry for their livelihood in India. The quality, variety and types of Areca nut vary from one place to another. The Areca nut palms grow under a variety of climatic and soil conditions. This Areca nut palm grows well from almost sea level up to an altitude of 1000 m in areas of abundant and well-distributed rainfall or under irrigated conditions. While fresh, the husk is green and the nut inside is so soft that it can easily be cut with an average knife. During the ripening of fruit the husk becomes yellow or orange and, as it dries, the fruit inside hardens to a wood-like consistency. The nut derived from this dried fruit is called Areca nut/Supari/Betel nut. The white variety of Areca is mainly grown in Dakshina Kannada and North Canara of Karnataka state and northern parts of Kerala. Red variety supari is prepared by harvesting the tender (green) Areca nut, boiling it and peeling off the husk. The nut derived by peeling the tender nut, are processed as per the variety required (i.e., whole nut, two pieces, 8pieces, etc) boiled in water and then Sun dried. The red variety of Areca nut is mainly produced in Shimoga, Chickmangalur, Chitradurga, and Tumkur Districts of Karnataka. The white variety accounts for 60 percent of the production with the rest going for red.

LITERATURE REVIEW:

- **GENERALCHARACTERISTICS**

There are two varieties of Areca nut, called White Supari and Red Supari. White variety supari is prepared by harvesting fully ripe Areca nut and by sun drying for 40 to 50 days. After drying the nut, the shell of the nut has to be removed by hand/machine. Andhra Pradesh, West Bengal and Orissa are the other important producing states. Mumbai, Ahmadabad, Indore, Jaipur, Delhi, Nagpur, Patna, Calcutta, Cuttack, Mangalore, Bangalore, Rajkot, and Chennai are the important marketing centers of Areca nut in India. Total consumption in India is estimated to be 330,000 ton per year. India also exports limited quantity mainly in the form of pan masala, scented supari and gutkha.

- **INDIAN SCENARIO**

The current world productivity of Areca nut is 1.287 tones/ha. India is the largest producer of Areca nut in the world. India ranks first in both area (58%) and production (53%) of Areca nut. Besides India, China, Bangladesh, Indonesia, Myanmar, Thailand are the other important Areca nut producers. It is estimated that more than 10 million people depending on this crop for their livelihood. The main pockets of production of Areca nut in India are distributed in the states of Karnataka (42% of area and 45% of production), Kerala (28% of area and 24% of production), and Assam (20% of area and 16% of production). Tamil Nadu, Maharashtra, Andhra Pradesh, West Bengal and Orissa are the other important producing states. Mumbai, Ahmadabad, Indore, Jaipur, Delhi, Nagpur, Patna, Calcutta, Cuttack, Mangalore, Bangalore, Rajkot, and Chennai are the important marketing centers of Areca nut in India. Total consumption in India is estimated to be 330,000 ton per year. India also exports limited quantity mainly in the form of pan masala, scented supari and gutkha.

- **AGRI-MACHINE**

An agri-machine or Decorticator is a machine for stripping the skin, bark, or rind off nuts, wood, plant stalks, grain, etc., in preparation for further processing. It is nothing but de-shelling process for several seed (groundnut seeds, Jatropha seeds and Pongamia seed) varieties. The word decorticator is also referred to a device which helps to separate the seeds from the Pods, the structure of device varies from crop to crop based on seed type.

In the present project, a protocol has been proposed to design the agri-machine. The principle behind this fabrication is that, the mechanical separation of seeds from Pongamia pods by developing appropriate technology i.e., Machine operated Agri- Machine which requires less human energy to achieve sustainable development of rural farmers.

RELATEDWORKS

There are few Areca nut peeling machines are available in the market. These machines are further classified into:

- ***Manually operated machines:*** These machines are either hand operated or pedaloperated.
- ***Fully automated machines:*** These machines are operated by electric motor and other source of energies.

The below machine placed to aid shelling and to pass the Dehusked material down. After Dehusking kernels and husk flow to the duct and reach the air stream, produced by a blower. The husk is thrown out and the kernels/nuts are collected at the bottom. Depending upon the size of fruits, the concave has to be changed for higher efficiency and in the following figure consists of a mainframe on which a rotary shelling drum having 8 numbers of solid rubbers on its periphery is mounted. Below this, a concave is minimum breakage. Grading the dried fruits before Dehusking will also help to increase the Dehusking efficiency and reduce the breakage. 1 hp electric motor is required to run this machine. Its production capacity is30kgperhour.ThecostofthisunitisRs.25000. But this machine is suitable only for dried Areca nuts.

The below machine was developed by Mr. M J Francis, Kerala. This machine is priced at Rs 850 and can Dehusk 14 nuts in one minute. But it requires skilled labours. Since this machine is pedal operated and not suitable for continuous peeling process.

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The below machine was developed by Post Harvest Technology Centre, University of Agricultural Sciences (UAS), Gandhi Krishi Vigyan Kendra (GKVK), Bangalore. Machine assembly consists of two sharp edged flaps, one being stationary and the other movable, operated by the pedal through a linkage mechanism. The unit has a hopper to hold about 20 kg of Areca nuts. Assembly is made of mild steel, the entire unit is mounted on an angle iron stand and the Dehusking mechanism is made of spring steel. This is suitable only for Dehusking freshly harvested mature green Areca nuts of all varieties under cultivation. The machine can be operated by four persons to Dehusk Areca nuts simultaneously. The Dehusking capacity of the unit is 160 kg per day with a running time of eight hoursper day. The unit is priced at Rs. 3500. This semi- mechanized Dehusker operates at reasonably high output causing less drudgery compared to the traditional method of Dehusking which requires a lot of manpower. But it requires skilled labours. Also only half portion of the husk can be removed by using this machine and the rest should be removed by hand.

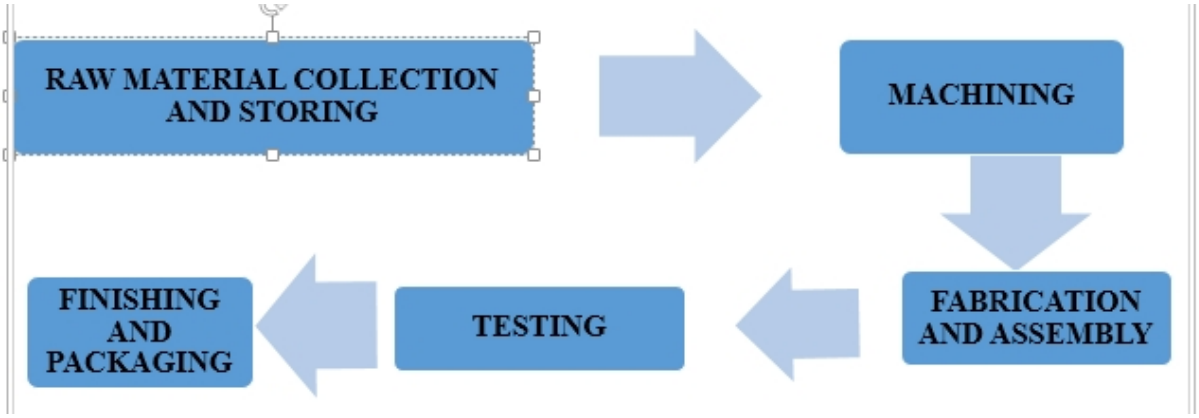
PROBLEM DEFINITION:

Cost of processing of Areca nut to remove the nuts has revealed in a day. This work is done by skilled labours only. Shortage of labour is a major problem which almost every village and farmer faces, especially during the harvest season. Therefore it is essential to develop a machine which will enhance the rate of production & eliminate the risk of labour injury involved in the traditional manual peeling process. That about 35-40 per cent of the total cost of processing is spent for Dehusking Areca nut alone. Peeling of Areca nut is one of the labour intensive processes. This task is mainly carried out by ladies and children in the village. Peeling of Areca nut is very difficult by hand. Presently it is being done manually by using a sharp knife with a production rate of 3kg/hr. and normally one will do about 24 kg.

Presently there are few machines available in the market, but these machines are not suitable to peel variety of sizes of dry Areca nut and also which are not fully efficient in the view of complete removal of outer shell. These existing machines are more costly and are complex in design. The main problem is that they are heavy in weight and not portable. Some machines may cause damage to the Areca nut and not easy to operate. Under these circumstances, there is enough scope to develop a suitable machine to peel the Areca nut of different sizes completely and efficiently. The machine should be simple in design, easy to operate, portable, low cost and easy to operate by unskilled person.

MANUFACTURING PROCESS:

- **PRODUCTION LAYOUT**



- **DESCRIPTION / SPECIFICATION OF COMPONENTS**

The objective of this project is to design and manufacture an areca nut dehusking machine which could tear out the areca nuts. Power input is provided by an electric motor operating at 1500 rpm and connected to the shaft.

ELECTRIC MOTOR: An *electric motor* is an *electrical* machine that converts *electrical* energy into mechanical energy. Most *electric motors* operate through the interaction between the *motor's* magnetic field and *electric* current in a wire winding to generate force in the form of rotation of a shaft.

FLYWHEEL: A flywheel is a mechanical device specifically designed to efficiently store rotational energy (kinetic energy). Flywheels resist changes in rotational speed by their moment of inertia. The amount of energy stored in a flywheel is proportional to the square of its rotational speed and its mass.

FRAME: MS Angles are L-shaped structural steel represented by dimension of sides & thickness.

BEARING: A *bearing* is a machine element that constrains relative movement to the desired motion and reduces friction between moving parts.

SHAFT: A shaft is a rotating machine element, usually circular in cross section, which is used to transmit power from one part to another, or from a machine which produces power to a machine which absorbs power.

BUCKET CONVEYER BELT: Bucket conveyors consist of endless chains or belts to which are attached buckets to convey bulk material in horizontal, inclined, and vertical paths. The buckets remain in carrying position until they are tipped to discharge the material.

POWER TRANSMISSION GEAR: Essentially, it is a gear or series of gears combined in such a manner as to alter the torque of a motor. Typically, the torque increases in direct proportion to the reduction of rotations per unit of time. Speed reducers come in two varieties: base mounted and shaft mounted.

ARECA NUT CUTTER: In the context of machining, a cutting tool or cutter is any tool that is used to remove some material from the work piece by means of shear deformation. It is a body having teeth or cutting edges on it. Grinding tools are also multipoint tools.

SHEET METAL: Sheet metal is metal formed by an industrial process into thin, flat pieces. Sheet metal is one of the fundamental forms used in metalworking and it can be cut and bent into a variety of shapes. Countless everyday objects are fabricated from sheet metal. ... The larger the gauge number, the thinner the metal.

CASTOR WHEEL :A caster (or castor) is an un driven, single, double, or compound wheel that is designed to be attached to the bottom of a larger object (the "vehicle") to enable that object to be moved.

IDLER: A gear wheel placed between two other gears to transmit motion from one to the other. It does not alter the speed of the output, but it does alter the direction it turns. It is used to ensure that the rotation of two gears is the same. An idler gear is placed between two gears.

PROBLEM SOLUTION:

To solve the above problems a modern ARECANUT DEHUSKING MACHINE of capacity 50 kg/hr is designed. Following are the steps of manufacturing.

- **DESIGNING PROCEDURE**

❖ **DESIGN OF THE FRAME (L-SECTION)**

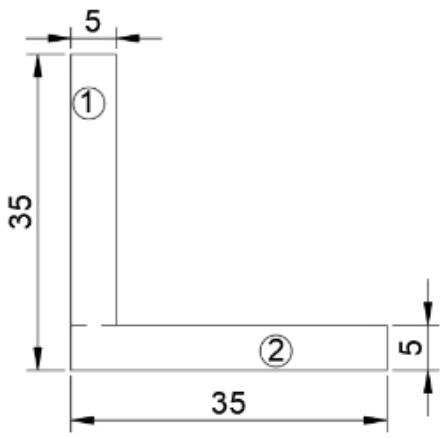
Assumptions taken:

- Load should be uniformly distributed
- Material should be homogeneous and isotropic
- There will be no stress concentration

Total load on 4 legs = 1600N (Max.)
Therefore, load on single leg = 1600/4 = 400N
Considering the one leg of frame as short column,
Using Euler's formula:
Load, $P = (\pi^2 EI)/L_e^2$; E= Young's Modulus
$400 = (\pi^2 * 200 * 10^6 * I)/450^2 = 200 * 10^6$ N/mm

I = 0.041 mm^4 L_e= Equivalent length
= (900/2) =450 mm
I= Moment of Inertia

From the actual L-section calculating the moment of inertia: As an equal angle section $I_{xx}=I_{yy}$



$a_1 = (30*5)\ mm^2$

$a_2 = (35*5)\ mm^2$

$y_1 = 20$ mm

$y_2 = 2.5$ mm

$\bar{y} = \{(a_1y_1) + (a_2y_2)\}/ (a_1+a_2)$

$= \{(30*5*20)+(35*5*2.5)\}/ (30*5+35*5)$

$= 10.57$ mm

$h_1 = y_1 - \bar{y} = 20 - 10.57 = 9.43$ mm

$h_2 = \bar{y} - y_2 = 10.57 - 2.5 = 8.07$ mm

$I_{1xx} = I_{G1} + a_1h_1^2$

$= (1/12)*5*30^3 + (30*5)*9.43^2$

$= 24588.74\ mm^4$

$I_{2xx} = I_{G2} + a_1h_1^2$

$= (1/12)*35*5^3 + (35*5)*8.07^2$

$= 11761.44\ mm^4$

$I_{xx} = I_{1xx} + I_{2xx}$

$= 24588.74 + 11761.44$

$= 36350.18\ mm^4$

$= I_{yy}$

$>0.041\ mm^4$

Therefore, the design of frame is safe.

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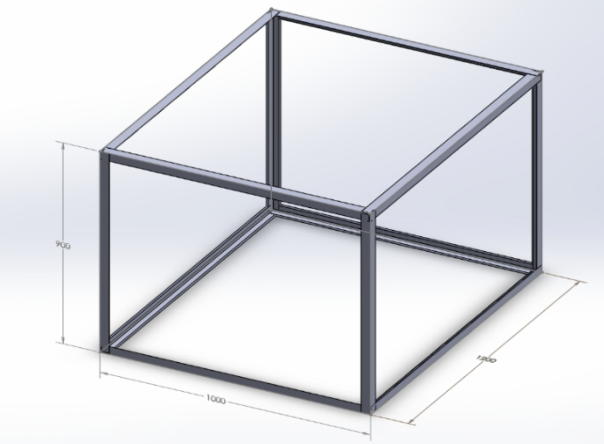
❖ CALCULATION OF FRAME



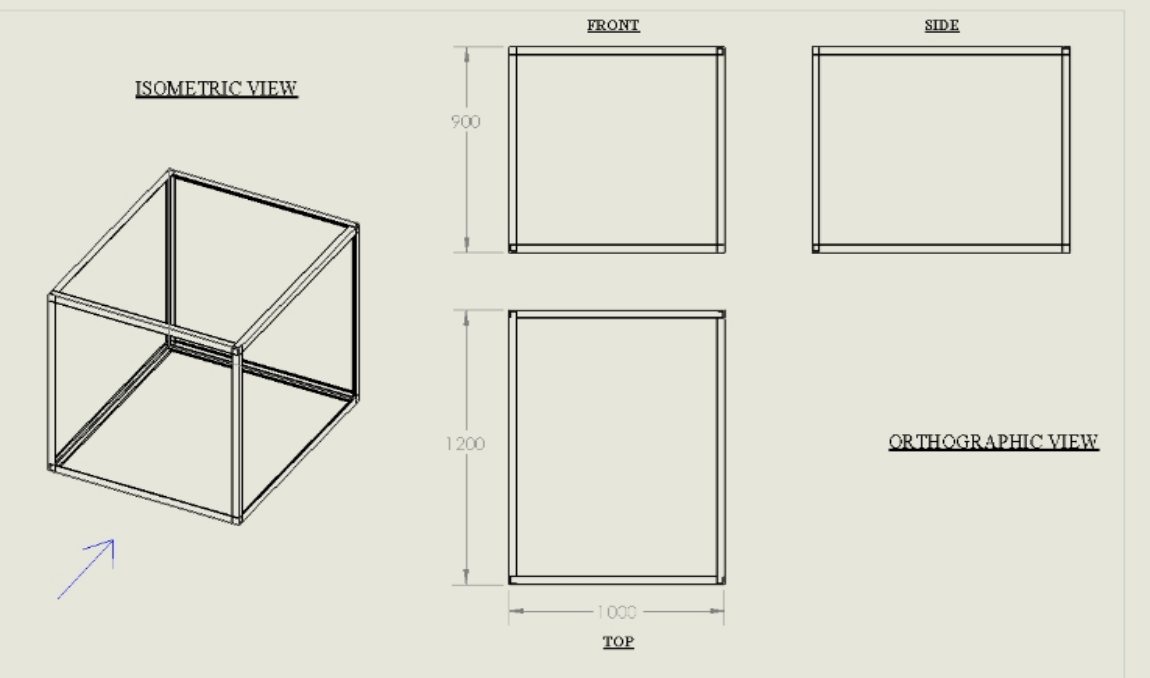
a_1= 35*5 = 175 mm^2

a_2= 35*5 = 175 mm^2

A= 175+175 = 350 mm^2

Volume of one leg of frame = 350*900

= 315000 mm^3 = 315 c.c



Weight = Volume*Density

= 315*7.8 = 2457 gm. (Density = 7.8gm/cc)
= 2457/1000 kg = 2.46 kg

Total weight of leg = 2.46*4 = 9.86 kg

Total length of bar = 2*(1200+1200+1000+1000) = 8800 mm

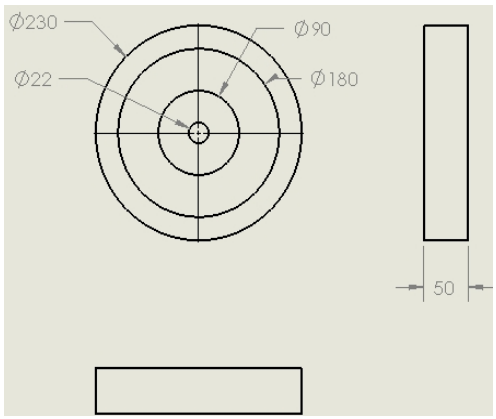
Volume of the bar = 350*8800 = 3080000 mm^3 = 3080 c.c

= 3080*7.8 gm. = 24024 gm.

= 24.02 kg

Total weight of the bar = 9.86+24.02 = 33.88 kg

❖ DESIGN OF FLYWHEEL



Outer diameter of flywheel, d = 230 mm = 0.23 m.

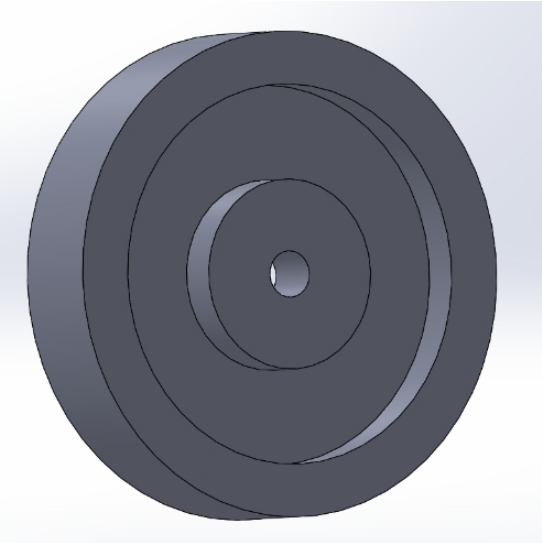
Length, l = 50 mm = 0.05 m.

∴ Volume, V = $(\pi/4)\ d^2 l$

= $(\pi/4)*0.23^2*0.05$

= 0.0021 m^3

Density of Cast Iron, $\rho = 7800 kg/m^3$



Mass of the flywheel,

$M = \rho V$

$= 7800*0.0021$

$= 16.38$ kg

In actual, we use the same dimensioned flywheel with much less mass (8 kg) according to material and maket availibility to get more safety in design.

❖ DESIGN OF SHAFT

Considering the maximum load acting on a single shaft of flywheel,

Weight, W = 8kg ≈ 80N

Length, L = 1200 mm

Speed, N = 500 rpm

Power = 1 kW = 10^3 W

Bending Moment, M = (WL/4) = (80*1200)/4 = 24000 Nmm

We know, $P = (2\pi NT)/(60*1000)$

$\therefore$ Torque, $T = (60*1000*10^3)/(2\pi*500)$

$= 19098$ Nmm

Considering the keyway, Avg. Torque = T+30%T

$= 1.3T = 1.3*19098$

$= 24827.4$ Nmm

$T_{eq} = \sqrt{(T^2+M^2)} = \sqrt{(24827.4^2+24000^2)} = 34531$ Nmm

Assume, Shear stress of shaft, $\tau = 60 N/mm^2$

We know, $T_{eq} = (\pi/16)d^3\tau$

$\therefore$ Diameter of shaft,$d = \sqrt[3]{(16*34531)/60\pi}$

$= 14.31$ mm ≈ 15 mm

For more safety we take the shaft diameter as 22 mm for flywheel and 20 mm for others.

❖ DESIGN OF GEAR

As both gears diameter is same, Gear ratio, G =1

Distance between centres, L = 165 mm

Speed, N = 170 rpm

Let, Diameter of two gears = D

Number of teeth = T_G

Module = m

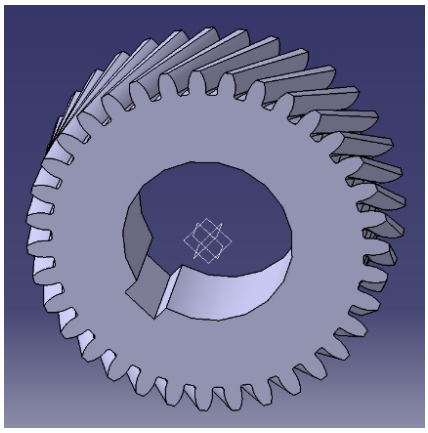
No. of teeth, $T = 2*A_w / G [\sqrt{\{1+(1/G)\}\{(1/G)+2\}\sin^2\phi}-1]$

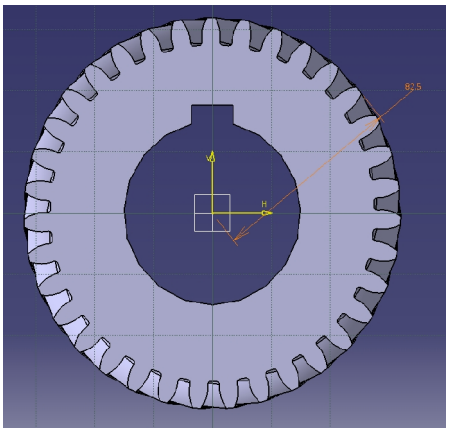
$= 2*1 / 1 [\sqrt{\{1+(1/1)\}\{(1/1)+2\}\sin^2 22.5°}-1]$

$= 10$

Both gears' Pitch Circle Dia, PCD = L = 165 mm

$\therefore$ Module of the gear, $m = PCD/T_G = 165/10 = 16.5$





$\therefore$ No. of teeth of each gear, $T_G = PCD/m = 165/16.5 = 10$

Torque acting on gear, $T = (P/60) / 2\pi N$

$= (10^3/60) / 2\pi*170$

$= 56.17$ Nm

$\therefore$ Tangential Load, $W_T = T / (PCD/2)$

$= 56.17 / (165/2)$

$= 0.68$ N

$\therefore$ Normal Load, $W_N = W_T / \cos\phi$

$= 0.68 / \cos 22.5°$

$= 0.73$ N

In actual we overcome all the dimensional limits. So, our design is safe.

- **ASSUMED BILL OF MATERIALS**

Sl no.	*Name of items*	*Units*	*Qty*	*Rate*	*Amount*
1	Electric Motor	HP	1	3600	3600
2	Flywheel	Pcs	1	3000	3000
3	Angle Sections	Kg	40	59	2360
4	Housing	Pcs	15	100	1500
5	Bearing	Pcs	15	100	1500
6	Power Transmission Shaft	Pcs	5	268	1340
7	Conveyor belt	Meter	2	600	1200
8	Power Transmission Gear	Pcs	2	500	1000
9	Cutter Housing	Pcs	2	500	1000
10	Areca Nut Cutter	Pcs	4	250	1000
11	Sheet Metal	$Meter^2$	400	1.25	500
12	Raw Areca Nut	Kg	10	50	500
13	Castor Wheel	Pcs	4	80	320
14	Idler	Pcs	2	150	300
Total cost					19120

- **ACTUAL BILL OF MATERIALS**

Sl no.	*Name of items*	*Units*	*Qty*	*Rate*	*Amount*
1	Electric Motor	HP	1	3000	3000
2	Flywheel	Pcs	1	490	490
3	Angle Sections	Kg	33	46	1520
4	MS Plates	Kg	25	48	1200
5	Bearing with housing	Pcs	12	150	1800
6	Power Transmission Shaft	Pcs	5	140	700
7	Conveyor belt	Meter	1	150	150
8	Conveyor Clip	Pcs	1	30	30
9	Conveyor Pulley	Pcs	2	75	150
8	Power Transmission Gear	Pcs	2	350	700
9	V-Pulley	Pcs	4	185	740
10	V-Belt	Pcs	2	100	200
11	Areca Nut Cutter	Pcs	1	400	400
12	Sheet Metal	$Meter^2$	400	1.25	500
13	Castor Wheel	Pcs	4	80	320
14	Idler	Pcs	2	50	100
15	Nut, Bolt, Washer	Pcs	50	5	250
16	Workshop equipments (Electrode, Grinder, Drill Bit)	-	-	-	390
17	Raw Areca Nut	Kg	10	50	500
Total Cost					13140

1.Measuring & marking

2. Cutting material using hacksaw

3. Joining of angle sections by Manual Metal Arc Welding

4. Turning operation by centre lathe

Conclusion:

The Areca nut Dehusking machine is developed successfully. This machine is compact in design, making it portable. This machine is economical compared to the other existing machines. It can be operated by semiskilled personnel also. This machine has three cutters making it suitable for Dehusking of three grades of Areca nut. Hence this machine has overcome the problems associated with the existing machines. After performing three experiments with different speeds and changing the number of cutters used, it can be concluded that the machine has an efficiency of 74% with single cutter at 125rpm.

By selecting this project we gather the vast knowledge of machining, fabrication & marketing which will help us in our future life.

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Paper Manufacturing Process

……Sujay Biswas

Paper plays an important role in our daily life and papers have been used for many years from now. Papers are made with the pulp of the woods, which is an Eco-friendly product.

Paper Manufacturing Process

Paper is made through the following processes:

- ❖ Pulping procedure will be done to separate and clean the fibers
- ❖ Refining procedure will be followed after pulping processes
- ❖ Dilution process to form a thin fiber mixture
- ❖ Formation of fibers on a thin screened
- ❖ Pressurization to enhance the materials density
- ❖ Drying to eliminate the density of materials
- ❖ Finishing procedure to provide a suitable surface for usage

Pulp and paper are made from cellulosic fibers and other plant materials. Some synthetic materials may be used to impart special qualities to the finished product. Paper is made from wood fibers, but rags, flax, cotton linters, and bagasse (sugar cane residues) are also used in some papers. Used paper is also recycled, and after purifying and sometimes deinking, it is often blended with virgin fibers and reformed again into paper. Products such as cellulose acetate, rayon, cellulose esters that are made from cellulose will be used for packaging films, explosives. The pulping process is aimed at removing lignin without loosingfiber strength, thereby freeing the fibers and removing impurities that cause discoloration and possible future disintegration of the paper.

Hemicellulose plays an important role in fiber-to-fiber bonding in papermaking. It is similar to cellulose in composition and function. Several extractives such as waxes, oleoresins are contained in wood but they do not contribute to its strength properties; these too are removed during the pulping process.

The fiber extracted from any plant can be used for paper. However, the strength and quality of fiber, and other factors complicate the pulping process. In general, the softwoods (e.g., pines, firs, and spruces) yield long and strong fibers that contribute strength to paper and they are used for boxes and packaging.

Hardwoods produce a weaker paper as they contain shorter fibers. Softwoods are smoother, transparent, and better suited for printing. Softwoods and hardwoods are used for paper-making and are sometimes mixed to provide both strength and print ability to the finished product.

Steps involved in the Pulp and Papermaking Procedure:

Preparation of raw Material

Wood that has been received at a pulp mill can be in different forms. It depends on the pulping process and the origin of the raw material. It may be received as bolts (short logs) of round-wood with the bark still attached, as chips about the size of a half-dollar that may have been produced from sawmill from debarked round wood elsewhere.

If round wood is used, it is first debarked, usually by tumbling in large steel drums where wash water may be applied. Those debarked wood bolts are then chipped in a chipper if the pulping process calls for chemical digestion. Chips are then screened for size, cleaned, and temporarily stored for further processing.

Separation of Fiber

In the fiber separation stage, several pulping technologies will be diverged. The chips are kept into a large pressure cooker (digester), into which is added the appropriate chemicals in kraft chemical pulping.

The chips are then digested with steam at specific temperatures to separate the fibers and partially dissolve the lignin and other extractives. Some digesters operate continuously with a constant feed of chips (furnish) and liquor are charged intermittently and treat a batch at a time.

After the digestion process, the cooked pulp is discharged into a pressure vessel. Here the steam and volatile materials are tubed off. After that, this cooked pulp is returned to the chemical recovery cycle. Fiber separation in mechanical pulping is less dramatic.

Debarked logs are forced against rotating stone grinding wheels in the stone ground-wood procedure. Refiner pulp and thermo-mechanical pulp are produced by chips. These chips are ground by passing them through rapidly rotating in both processes.

In the second stage after refining, the pulp is screened, cleaned, and most of the process water is removed in preparation for paper making.

Bleaching Process

Raw pulp contains an appreciable amount of lignin and other discoloration, it must be bleached to produce light colored or white papers preferred for many products. The fibers are further delignified by solubilizing additional lignin from the cellulose through chlorination and oxidation. These include chlorine dioxide, chlorine gas, sodium hypochlorite, hydrogen perioxide, and oxygen.

Sodium Hydroxide, a strong alkali is used to extract the dissolved lignin from fibers surface. The bleaching agents and the sequence in which they are used depend on a number of factors, such as the relative cost of the bleaching chemicals, type and condition of the pulp.

Mechanical pulp bleaching varies from chemical pulp bleaching. Bleaching of mechanical pulp is designed to minimize the removal of the lignin that would reduce fiber yields.

Chemicals used for bleaching mechanical pulps selectively destroy colouring impurities but leave the lignin and cellulosic materials intact, These include sodium bisulfite, sodium or zinc hydrosulfite (no longer used in the United States), calcium or sodium hypochlorite, hydrogen or

sodium peroxide, and the Sulfur Dioxide-Borol Process (a variation of the sodium hydrosulfite method).

Papermaking Procedure

Bleached or unbleached pulp may be further refined to cut the fibers and roughen the surface of the fibers to enhance formation and bonding of the fibers as they enter the paper machine.

Water is added to the pulp slurry to make a thin mixture normally containing less than 1 percent fiber. The dilute slurry is then cleaned in cyclone cleaners and screened in centrifugal screens before being fed into the 'wet end' of the paper-forming machine. The dilute stock passes through a head-box that distributes the fiber slurry uniformly over the width of the paper sheet to be formed.

SOPHIA THE FIRST HUMAINOID ROBORT

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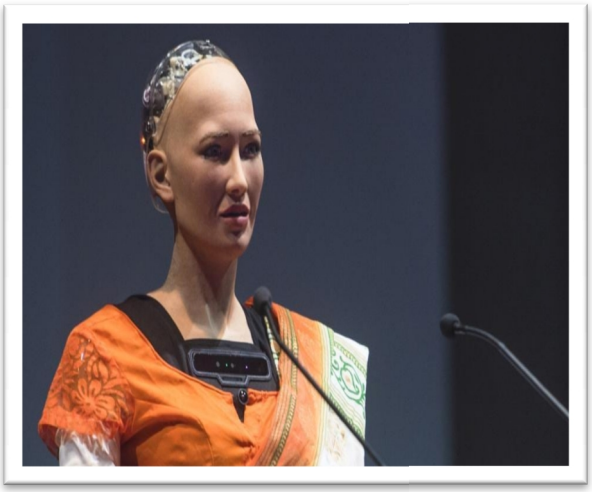
Sophia is a social humanoid robot developed by Hong-Kong based company Hanson Robotics. She is first humanoid robot who can talk smartly as a human. Sophia is designed to look like British actress Audrey Hepburn (1929-1993). Sophia was activated on February 14, 2016, and made her first public appearance at South by Southwest Festival (SXSW) in mid-March 2016 in Austin, Texas, United States. She is known for human-like appearance and behavior compared to previous robotics variants. Sophia imitates human gestures and facial expression and is able to answer certain question and to make simple conversations on predefined topics. She uses speech recognition technology from Alphabet Inc. Camera within Sophia's eyes combined with computer with computer algorithms allow her to see. She can follow faces, sustain eye contact and recognize individuals. Sophia is able to process speech and have conversations using natural language subsystem. Around January 2018, Sophia was upgraded with function legs and ability to walk. CNBS has commented on Sophia's "Lifelike" skin and ability to emulate more than 60 facial expressions.



Sophia is conceptually similar to the computer program ELIZA, which was one of first attempts at simulating a human conversation. The software has been programmed to give pre-written responses to specific questions or phrases, like a Chat bot. In 2017 Hanson Robotics announced plans to open Sophia to a cloud environment using a decentralized block chain marketplace.

David Hanson has said that Sophia would ultimately be good fit to serve in healthcare, customer service, therapy and education. In 2019 Sophia displayed the ability to create drawings, including portraits.

Sophia, world's first robot citizen or humanoid robot, is getting all the attention City of Joy, Kolkata where she has arrived after touring 65 countries. Sophia visited India during December, 2017. During her intersection at Nazrul Mancha. Interestingly Sophia appeared in a traditional attire, dapped in red Bengali saree. She said she is a citizen and enjoy all the right, but Sophia neither needs to prove her citizenship nor does she have any paper to do so. Sophia has now come to India to attend a technology-based session at Kolkata. She interacted with the engineering students and answered the questions. Sophia's massage to the student was "I know that your exams are nearing .study hard but don't rely only on memorizing". Sophia said humans should not be jealous of her because no one could replicate the complexities of human brain, which was fired by

Sophia in red Bengali saree

emotions.

Even amongst concern over the application of AI, Sophia has become really popular and impressed a lot of people because of her subtle demeanor. While her interviews still looked programmed and she has shied away from any controversy, her creators ensure that she is capable of having normal conversations. Sophia has promised to get more advanced after one year so that she can communicate with humans more effectively. As will ultimately be capable of wiping out the human race. Till that time, it may or may not be too late.

Animal compound feed & Feed mill technology

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Introduction: Animal feed is food given to domestic animals, especially in animal farming. Animal feed is an important input to animal agriculture, and is frequently the main cost of the raising animals. Farms typically try to reduce cost for this food, by growing their own, grazing animals, or supplementing expensive feeds with substitutes, such as food waste like vegetable peels, paddy straw, grains, and many other household food scraps.

Animal wellbeing is highly dependent on feed that reflects a well-balanced nutrition. The food with full of nutrition provides good health to the agricultural animals and also increase the productions of milk, meat, eggs, and other products.

In day-to-day life there is a huge demand of the animal products like milk, meat, eggs etc. in the market, and to produce that much of products, huge nutrition with balance diet is needed to the animals and natural source of food can't provide the needs, so at this stage compound feed is needed. Compound feed is nothing but the blend of various crops and additives. These blends are formulated according to the specific requirements of the target animal. They are manufactured by feed compounders as *meal type*, *pellets* or *crumbles*. The main ingredients used in commercially prepared feed are the feed grains, which include corn, soybeans, sorghum, oats, barley and various type of vitamins, medicines etc.

According to the American Feed Industry Association, as much as $20 billion worth of feed ingredients are purchased each year. These products range from grain mixes to orange rinds and beet pulps. The feed industry is one of the most competitive businesses in the agricultural sector and is by far the largest purchaser of U.S. corn, feed grains, and soybean meal. Tens of thousands of farmers with feed mills on their own farms are able to compete with huge conglomerates with national distribution. Feed crops generated $23.2 billion in cash receipts on U.S. farms in 2001. At the same time, farmers spent a total of $24.5 billion on feed that year.

(In 2011, around 734.5 million tons of feed were produced annually around the world.)

What is Compound Feed?

Compound feed refers to the feed that produced on the basis of animals' different growth stages, different physiological requirements and different production uses, as well as the experiment and Research on the evaluation of feed nutrition value, and according to the scientific formula that mix feed of various different sources uniformly in a certain proportion and processed by prescribed technology.

The production of compound feed began in the early twentieth Century. Since the 1950s, as the understanding of the needs of amino acids, vitamins and trace elements of domestic animals is becoming more and more accurate, antibiotics and sulphonamides are incorporated into the feed field as additives, and the production of compound feed grew rapidly. Its application first became popular in Europe and America, and soon spread to Asia and elsewhere.

According to nutritional components and uses, compound feed is classified into:

- Complete formula feed, concentrated feed, concentrate mixture, feed additive premix, super concentrate, mixed provender, artificial milk or milk substitute feed.
- Mash feed, pellet feed crumbled feed, expanded feed, floating feed, cubed feed, etc.

FEED PROCESSING TECHNOLOGY: there are mainly 4 types of feed processing technology are used in large scale these are

- *Livestock Feed Pellets Processing* – cattle feed pallets, goat feed pallets, rabbit feed pallets, pig feed pallets.
- *Poultry Feed pallets processing*- chicken feed pallets, duck feed pallets, pigeon feed pallets, ostrich feed pallets.
- *Fish feed pallets processing-* floating fish feed, sinking fish feed, slow sinking fish feed.
- *Pet feed pallets processing-* dog food, cat food.

Here we only discuss about **Poultry feed pelleting process** though other feed pelleting processes are quite same .
Feeds are processed to facilitate handling and pelleting, and to increase feeding value by increasing digestibility or by inactivating specific growth inhibitors. Many processes that facilitate handling and pelleting increase the nutritional value of feeds as well, but the nutritional value of some feeds can be lowered by certain processes.

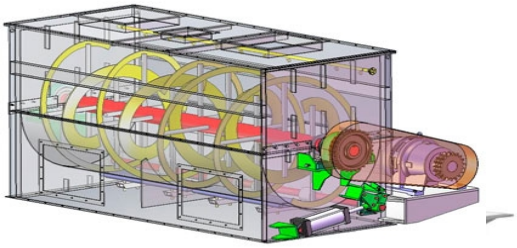
Processes:

- **Selection of raw material:** To give maximum nutrition to the poultry birds researchers recommends best sources of nutritious food for different birds. The main raw materials are Corn, Maize, De Oiled Rice Bran (DORB), Rice Bran, Huller Bran, Cotton seeds, Oats, Sorghum, Wheat, Bajra, Ragi etc.

- **Raw Material Cleaning Process :**It is the first stage of preparing the feed . In this stage Screen machine is normally used. Here in this stage the impurities removed from the raw material. In Screening Machine consist of a drive that induces vibration, a screen media that causes particles separation, and a deck which holds the screen media and the drive and it is the mode of transport for the vibration.

- **Storage of raw material :** After cleaning, the raw material stored in a stainless steel Silos. Silos are nothing but a tank made of high-quality Stainless steel. The storage capacity of the silos is deferent. These are made as per production capacity of the particular plant. The common storage capacity of the silos are 50,60,80,160 Ton etc. In silos the aeration system, temperature & moisture control system are used.

- **Raw Material Crushing Process:**



The crushing of feed raw materials is one of the most important processes in poultry feed processing. This process is to reduce the size of the bulk or granular feed material and crush into the size required for poultry feeding standards. This process is done by Feed Hammer Mill. Its main purpose is to redistribute the particle size of feed raw materials according to the characteristics of target feed pellets products and the needs of animal growth, so as to achieve the desired comprehensive effect. The crushing procedure can consume about 30%-50% power in the whole feed pellet production line.

- **Batching process:** It is a process of feeding and weighing various raw materials according to a given formula using a specific batching device, which is an important link to ensure the quality of formulated poultry feed pellets products.In automatic plants, weighing of assorted materials is done as per the formulation requirement. This makes one batch, and is called proportioning or batching. Any number of silos of appropriate capacity are incorporated as per the plant capacity. Mostly, two set of silos or bins are installed - one for main ingredients and other for secondary ingredients.

- **Mixing process:** The mixing process is done by feed mixing machine.The feed mixer is to ensure that the poultry and livestock can obtain all the necessary nutrients in every meal, in case animals only eat a part of feed ingredients. Therefore, feed mixer ensures uniform distribution of each component in the bulk material feed, especially those “active ingredients" which are added a very small amount but has great influence on animal growth and are required to be evenly distributed, such as vitamins, microelements, medicaments and other microconstituents, etc.

- **Pelleting:** Pelleting is an important step when setting up pellets making project or factory. Generally, the feed mixture is added 4-6% of water (normally tempered with steam, suitable for temperature at about 98□). When entering the Feed Pellet Machine, feed water content increases from air-dried state (moisture content about 10% to 12%) at ambient temperature to about 10% to 12% at temperature 80 to 90□. Water plays a role of lubrication when granulating, and heat causes gelatinization of raw starch on the surface of plant feed ingredients. Feed then is extruded from the outlet of the poultry feed pellet mill, and further raises the feed temperature to nearly 90□. Therefore, these feed pellets shall be cooled to a slightly higher temperature than the ambient temperature, and at the same time be dried to moisture content below 12% can they go to the next section.

- **Cooling:** Hard pellets are cooled immediately to an ambient temperature after extrusion. It will remove unwanted heat and moisture effectively from the pellets to improve their shelf life. Mostly, the efficient counter flow cooler is utilized for this function. Uniform cooling should be there from all sides.

- **Crumbling**: In animals’ (poultry and livestock) different growing periods, they need different size feed particles. Therefore, the feed pellets crumbler is used to break large size feed pellets into smaller particles. Sometimes, if the feed pellet mill directly presses feed into required small size feed, its output is low and the energy consumption is large.A well-designed crumbling machine should produce uniform crumb size, Should break the pellets without making much fines, and Mechanism for balanced gap adjustment on both the sides.

- **Screening :**Some separation is required in the manufacturing of pellets and crumbles, as small fines or fragments are there. For this purpose, a screening equipment is used in the process. The fines are returned to the pellet mill for reusing, or used as feed. The screening machine should have following attributes:

- Should remove required percentage of fines
- Should not clog oftentimes
- Easy changing of screens
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- **Bagging**: It is the final activity in which the finished products are filled into the required size bags. In small plants, bagging can be hand-operated but for higher production it is better to have advanced bagging machines. Electronic bagging machines perform high accuracy and faster rate bagging.

Quality Control: Quality is a blend of ingredient selection, processing parameters and operator skills. Quality of feed can well be classified into **Nutritional&Physical**

Nutritional quality in ingredients and in finished feed is commonly estimated by calculations and also by laboratory analysis. Also, in focus is the level in gelatinization in the conditioner of the pellet mill. However, some important physical quality parameters of finished feed and processing parameters are ignored, viz

I. Uniformity of mesh size measured through a mesh sieve
II. Uniformity of mixing, sometimes termed as co efficiency of mixing or coeffeciency of variation.
III. Pellet durability. This is measured by a pellet durability tester available in the market.
IV. Dryness factor in steam. Needs to be periodically checked from time to time. v.
V. Uniform conditioning of feed with steam
VI. Motor loading factor in pellet mill

Name of some best poultry feed manufacturer company are ***Promois International***, ***Japha India***, ***Godrej agrovet***, ***Salimer Feed***, ***CP***, ***Krishna valley Agrotech LLP*** etc.

(Reference- 1. www.fdocuments.in, 2. www.larkfeedplant.com, 3. www.Google.com, 4.www.feedpelletplants.com, 5. en.wikipedia.org)
