OIL EXTRACTION MACHINE

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ABSTRACT

Groundnut oil extraction involves extracting oil content of the groundnut seed. The prepared ground nut comes under three roller mills between top roller and feed roller of these roller's rotates the prepared ground nut is squeezed. Once by which oil is extracted and collected in a trough the bagasse obtained after squeezing the oil is guided by means of trash plate to the opening between top roller and discharge roller and bagasse is squeezed once again inset of three roller mills. Many researchers fabricated equipment's to extract oil from groundnut. Its advantages and limitations are explained in the literature review. The basic three-roller mill designed and developed in two compressions in the mill with high frictional work between compressions over the trash plate. about design and fabricated of new extraction machine using rollers, belt drives, Three roller mills which are used for extraction of oil consist of three rollers. This work explains motor and gear. This fabricated equipment has many advantages like simple in construction and cost effective.

.In three roller mill, three rollers are arranged in triangular pattern for removing sucrose up to 96-97 % maximum.

I Introduction

A Introduction about ground nut

Peanut oil, also known as groundnut oil or arachide/arachis oil, is a mild-tasting vegetable oil derived from peanuts. The oil is available with a strong peanut flavor and aroma, analogous to sesame oil.

Groundnut (Arachishypogaea) contain up to 50% oil (although the usual range is 40% to 45%). ITDG (2011). The oil is known for its high concentration of monounsaturated fatty acids, considered by many as healthy oil. 1 cup of peanut oil, i.e. about 216 gm of this oil contains 99.79 gm monounsaturated fats, 69.12 gm polyunsaturated fats and 39.5gm saturated fats. It contains a high level of oleic acid, linoleic acid and palmitic acid. The oil has a high smoke point, which makes it ideal for cooking in high temperature without burning. It is known to possess a light nutty aroma and a pleasing taste.

B. Introduction about extraction machine

Extraction otherwise called leaching is the preferential solution of one or more constituents of a solid mixture by contact with a liquid solvent. This unit operation, one of the oldest in the chemical industries, here been given many names, depending to some extent upon the technique used for carry out extraction of oil from groundnut seeds can be carried out using any of the two solid extraction method namely; mechanical method or the use solvent otherwise called mass-transfer method.

In groundnut oil extraction used the traditional method despite the drudgery and inefficiency involved. Since now we are using same tradition method .In view
of this, different technological interventions were made by different researchers inform of; shelling, roasting, de- skinning and winnowing, kneading and screw press machines to avert the problems involved with the traditional method. Therefore, this study presented the findings of this technological interventions made by different researchers and also the limitations of this technologies were also identified which can be used as basis for further researches towards getting optimum performance on these various technologies.

C. Principles of extraction machine

The prepared ground nut comes under three roller mills between top roller and feed roller of these roller's rotates the prepared ground nut is squeezed. Once by which oil is extracted and collected in a trough the bagasse obtained after squeezing the oil is guided by means of trash plate to the opening between top roller and discharge rollerand bagasse is squeezed once again inset of three roller mills. Three roller mills which are used for extraction of oil consist of three rollers this work explains motor and gear.

D. Description of the machine

The oil extracting machine from nuts consist of cylindrical head with feeding hopper, the machine housing(casing), rotating shaft, flange, electric motor seat, bearings and pulley system. The feeding hopper holds the nuts for extracting processes. The material to be used for fabrication were selected after careful study of the desired physical, mechanical and chemical and even aesthetic characteristics of a number of proposed material.

For this project, due to economical considerations and availability of raw materials, high and medium carbon steel was mostly used for body parts and chuck materials while cast iron was chosen for the pulley, Kurmiand Gupta . The machine housing is also made of 1.5mm mild steel sheet and it houses the rotating shaft. The machine operates with a crushing shaft to grind and extract the oil from the nuts.
The solid drive shaft protrudes out and a pulley fixed at one end. Base

Spur gear
Pulley and V-belt connection of the
Electric Motor to the Reduction Gear
Roller
Frame

E. Types of rollers rollers are classified into two types

Live shaft roller
Dead shaft roller

F. Live shaft rollers

Live Shaft means that the shaft is fixed to the idler roll and therefore rotates with the roller body. The roller bearing is mounted to the machine frame, generally a pillow block or flange mounted bearing.

G. Dead shaft rollers

Dead Shaft means that the bearing is in the idler roll body and therefore the dead shaft remains stationary. The shaft is fixed to the machine frame in various manners.

II Literature review

Adeeko, found that the effects of particle size, heating temperature, heating time, applied pressure, and duration of pressing on the yield and quality of mechanically expressed groundnut oil were investigated. Generally, oil yields from coarsely ground groundnut were higher than those from finely ground samples, but the free fatty acid values were lower. Increasing the temperature did not improve the oil yield after 25 min of heating. Oil yield increased with pressures of up to 20MPa beyond which the yield either levelled off or decreased. The rate of oil expression was increased by an increase in temperature, time of heating, and particle size. An increase in the heating temperature and time increased the free fatty acid, peroxide value, and the colour intensity of the oil expressed.

Abdulkadir B. H, found that a floating bush journal bearing has a thin bush rotating freely between journal and fixed bush, forming two hydrodynamic oil films. This bearing, widely used for rotors operating at some hundred thousand rpm is known to show peculiar behavior of bush-to-shaft speed ratio

and also to show stability behavior different from those of other journal bearings experimentally that the bush-to-shaft speed ratio decreased with increasing shaft speed at very high shaft. Speed sin his test rig of lightly loaded floating bush journal bearings, although conventional theoretical models.

Santosh Y. Salunkhe, found that the three roller is the most vital part of sugar industry & sugar roller mill is used for to separate thesucrose-containing juice from the cane i.e. extraction of juice consist of three rollers namely Top, Feed and Discharge. The extraction of juice in a mill is achieved by squeezing prepared cane between two rolls. The main objective of milling is to separate the sucrose containing juice from the cane. The prepared cane comes under three roller mills between top roller and feed roller of these roller's rotates the prepared cane is squeezed. Once by which juice is extracted and collected in a trough the bagasse obtained after squeezing the juice is guided by means of trash plate to the opening between top roller and discharge roller and bagasse is squeezed once again inset of three roller mills. In three roller mill, three rollers are arranged in triangular pattern for removing sucrose up to96-97 % max. The arrangement of rollers in three roller mill is as follows.

A. Review

In order to perform this project, literature review has been made from various sources like journal, books, article and others. This chapter includes all important studies which have been done previously by other research work. It is importance to do the literature review before doing the project because we can implement if there are information that related to this project. The most important thing before starting the project we must clearly understand about the topic that we want to do. So by doing the literature review we can gain knowledge to make sure we fully understand and can complete the project.

B. Components

The basic components of oil extraction machine:

Motor
Roller
Gear
Side frame
Pulley
Key
V-belt
Base

C. Motor

The basic principle of operation motor is, "whenever a current Carrying conductor placed in a magnetic field, the conductor experiences a force tending to move it."

Found in applications as diverse as industrial fans, blowers and pumps, machine tools, household appliances, power tools, and disk drives, electric motors can be powered by direct current(DC) sources, such as from batteries, motor vehicles or rectifiers, or by alternating current(AC) sources, such as from the power grid inverters generators. Small motors may be found in electric watches. General-purpose motors with highly standardized dimensions and
characteristics provide convenient mechanical power for industrial use. The largest of electric motors are used for ship propulsion, pipeline compression and pumstorage applications with ratings reaching 100 megawatts. Electric motors may be classified by electric power source type, internal construction, application, type of motion output.

D. Roller

Roller where used for crushing of nuts with speed. Which is made by a mild steel it has been machined by uses of lathe for an turning operation and milling as to been done for the key way cutting .Where rollers are used as power transmitting shaft through the motor power is come to rotation and also it consisted of crushing forces from the support side frame.

E. Spur Gear

Spur gears teeth are manufactured by either involute profile or cycloidal profile. Most of the gears are manufactured by involute profile with 20° pressure angle. When two gears are in mesh at one instant there is a chance to mate involute portion with non-involute portion of mating gear. This phenomenon is known as "interference" and occurs when the number of teeth on the smaller of the two meshing gears is less than a required minimum.

To avoid interference we can have undercutting, but this is not a suitable solution as undercutting leads to weakening of tooth at its base. In this situation Corrected gears are used. In corrected gears Cutter rack is shifted upwards or downwards.

A gear or cogwheel is a rotating machine part having cut teeth, or cogs, which mesh with another toothed part to transmit torque. The teeth on the two meshing gears all have the same shape. Two or more meshing gears, working in a sequence, are called a gear train or a transmission. A gear can mesh with a linear toothed part, called a rack, producing translation instead of rotation.

F. Side frame

The machine frame supports the other parts of machine as well as providing (hence compressive force) and also to torque and vibration from the machine. The desired material should be of high rigidity, hardness, adequate toughness. For this purpose high carbon steel were chosen.

G. Pulley, belt

V-belt pulleys (also called v- belt sheaves) are devices which transmit power between axles by the use of a v-belt, a mechanical linkage with a trapezoidal cross-section. Together these devices offer a high- speed power transmission solution that is resistant to slipping and misalignment. V-belt pulleys are solely used for transmitting power between two parallel axels. The most notable difference between a v-belt pulley and other types of pulleys (round belt, flat belt etc.) would be the geometry of the groove or grooves located around the circumference of the pulley; these grooves guide and gain traction on a v-belt.

H. Shaft key

In mechanical engineering, a key is a machine element used to connect a rotating machine element to a shaft. The key prevents relative rotation between the two parts and may enable torque transmission. For a key to function, the shaft and rotating machine element must have a keyway and a key seat, which is a slot and pocket in which the key fits. The whole system is called a keyed joint. A keyed joint may allow relative axial movement between the parts.

III Shell wood

All rosewoods are strong and heavy, taking an excellent polish Presence of hints of coarse grains with the shiny and silky smooth texture, compared to the glossy finish of artificial polishes Even texture with an orange/yellow-red to deep purple with black bars color range

Even if artificial dyes can reproduce the color, if with an uneven texture it can be confirmed the product is not made of rosewood. Fake rosewoods products would have a thick color or light colors with white color in some space. If directly bought from workshop, the sawdust would have a flowery aroma.

If not, the product is compromised. Certain showpieces might have an unusual aroma, this is the effect of fragrant aerosol, not the quality. A drop of water mixed with sawdust will make the dust submerged and the droplet will have a purplish precipitation. A gentle knock on the wood will produce a crisp sound without noise.

A. Outer case

It is the metal formed by an industrial process into thin, flat pieces. Sheet metal is one of the fundamental forms used in metal working and it can be cut and bent into a variety of shapes. Countless everyday objects are fabricated from sheet metal. Thicknesses can vary significantly; extremely thin sheets are considered foil or leaf, and pieces thicker than 6 mm (0.25 in) are considered plate steel or "structural steel."

Sheet metal is available in flat pieces or coiled strips. The coils are formed by running a continuous sheet of metal through a roll slitter.

In most of the world, sheet metal thickness is consistently specified in millimeters. In the US, the thickness of sheet metal is commonly specified by a traditional, non-linear measure known as its gauge.

The larger the gauge number, the thinner the metal. Commonly used steel sheet metal ranges from 30 gauge to about 7 gauge. Gauge differs between ferrous (iron based) metals and nonferrous metals such as aluminum or copper. Copper thickness, for example, is measured in ounces; representing the weight of copper contained in an area of one square foot. Parts manufactured from sheet metal must maintain a uniform thickness for ideal results.

IV Selection of materials

A. factor determining the choice of materials

The various factors which determine the choice of material are discussed below. The material selected must possess the necessary properties for the proposed application. The various requirements to be satisfied

Can be weight, surface finish, rigidity, ability to withstand environmental attack from chemicals, service life, reliability etc.

The following four types of principle properties of materials decisively affect their selection

Physical

Mechanical

From manufacturing point of view Chemical

The various physical properties concerned are melting point, thermal Conductivity, specific heat, coefficient of thermal expansion, specific gravity, electrical conductivity, magnetic purposes etc.

The various Mechanical properties Concerned are strength in tensile, Compressive shear, bending, torsion and buckling load, fatigue resistance, impact resistance, elastic limit, endurance limit, and modulus of elasticity, hardness, wear resistance and sliding properties.

The various properties concerned from the manufacturing point of view are, Cast ability

Weld ability

Surface properties

Shrinkage

Deep drawing etc.

B. Manufacturing case

Sometimes the demand for lowest possible manufacturing cost or surface qualities obtainable by the application of suitable coating substances may demand the use of special materials.

Quality required

This generally affects the manufacturing process and ultimately the material. For example, it would never be desirable to go casting of a less number of components which can be fabricated much more economically by welding or hand forging the steel.

D. *Availability of material*

Some materials may be scarce or in short supply, it then becomes obligatory for the designer to use some other material which though may not be a perfect substitute for the material designed. The delivery of materials and the delivery date of product should also be kept in mind.

E. Space consideration

Sometimes high strength materials have to be selected because the forces involved are high and space limitations are there.

F. Cost

Sometimes factors like scrap utilization, appearance, and non- maintenance of the designed part are involved in the selection of proper materials.

G. Physical properties of mild steel

Mild steel is very strong due to the low amount of carbon it contains. In materials science, strength is a complicated term. Mild steel has a high resistance to breakage. Mild steel, as opposed to higher carbon steels, is quite malleable, even when cold. This means it has high tensile and impact strength.

V Design calculation

A. Belt, pulley design

The design and selection of appropriate power requirement for the rotation of the de pulpping stirring unit was selected based on the speed of the driving motor, centre to centre distance between the shafts at the condition under which the de pulpping action must take place.

Where,
D=pulley diameter of electric motor (mm) N=speed of the electric motor (rpm) d=pulley diameter of stirring unit (mm) n=speed of rotating the stirring unit (rpm) The centre to centre distance between driving and driven pulley is given as C = (D+ d)÷2
C= (150+75)÷2
C= 112.5mm

Where
C = center to center distance between the driving and driven pulley Determination of belt length
The belt length was obtained as given by
L =2C + ÷2 (D+d) + (D−d)÷4
L=2×180+ ÷2(150+75)+(150-75)²÷4×180
L= 747mm
Angle of contact
Θ= 180 – 60(D− d) ÷C
Θ= 180-60(150-75) ÷180
Θ= 155
Where
Θ= the angle of lap for driving pulley (degree)
C = Centre to centre between driving driving pulley and driven pulley (mm) Determination of belt speed
S=(πDn)÷60

S= (π×0.150×700)÷60
S= 5.49 m/s

determination of power transmitted by single belt
KW = (0.45 S^-0.09 -19.62÷d – 0.765×10^-4 S²) S
KW = 0.3860-0.2315-2.30×10^-3) 5.49
KW = 0.8335 kw
No of the belt
No of the belt = (P×Fa)÷KW×Fc×Fd
No of the belt = (0.75×1.3)÷0.8335×0.82×0.81 No of the belt = 1
Determination of width of the pulley Width= 2f+(n-1)e
Width = 2(10)+(2-1)15 Width of the pulley = 35mm

B. Spur gear design

Based on the input and output speed the steel is selected.The power of the motor is 0.5 hp and the input speed is 910 rpm. The diameter of the pinion is 54mm.

Determination of life of the cycle N= 60×n×T
N= 60×910×10000
N= 54×10^7 Cycle

Determination of no of the teeth

For 20° full depth teeth
Z= 25
I=Z÷z I = 25÷z z= 25×2 No of the teeth in
gear z=50
Where ,
Z= no of the teeth in pinion z= no of the teeth in gear
Determination of centre distance
a= m(Z+z)/2
a= 4(25+50)/2
a= 150mm
Determination of face width

b= Ψ×a b=0.3×150
b= 45mm
Determination of pinion diameter
d_1= Mz d_2= mz d_1= 4×25 d_2= 4×50 d_1= 100mm d_2= 200mm

Shaft key design
Based on the input and output speed the steel is selected. The power of the motor is 0.5 hp and the input speed is 910 rpm.

Determination of torque
The power is delivered to the shaft by some tangential force and the resultant torque (twist moment) set up within the shaft permits the power to be transferred to various machine components linked up to the shaft.
The torque, T = power angular accelertion
Where ω =2 N60 12
Torque, T= = ×602πN
P= (2×π×910×N)÷60
T= 3.90 N-mm
Determination of length of the square key
T= ×L×w×D÷2
Where,
L= length of key w= width of the key D= diameter of shaft Width and the thickness of the key is selected based on the diameter of the shaft Width= 14mm and thickness= 14mm
L= (3.90×10^3)(73.08×14×27)
L = 6 mm

VI Fabrication processes basic operations

Metal cutting

Metal cutting or machining is the process of by removing unwanted material from a block of metal in the form of chips. Cutting processes work by causing fracture of the material that is processed. Usually, the portion that is fractured away is in small sized pieces, called chips. Common cutting processes include sawing, shaping (or planning), broaching, drilling, grinding, turning and milling.

Sawing

Cold saws are saws that make use of a circular saw blade to cut through various types of metal, including sheet metal. The name of the saw has to do with the action that takes place during the cutting process, which manages to keep both the metal and the blade from becoming too hot.

A cold saw is powered with electricity and is usually a stationary type of saw machine rather than a portable type of saw.

Drilling

Drilling is a cutting process that uses a drill bit to cut or enlarge a hole of circular cross-section in solid materials. The drill bit is a rotary cutting tool, often multipoint. The bit is pressed against the work piece and rotated at rates from hundreds to thousands of revolutions per minute. This forces the cutting edge against the work piece, cutting off chips (sward) from the hole as it is drilled.

Welding

Arc welding is a type of welding that uses a welding power supply to create an electric arc between an electrode and the base material to melt the metals at the welding point. They can use either direct (DC) or alternating (AC) current, and consumable or non-consumable electrodes. The welding region is usually protected by some type of shielding gas, vapour, or slag. Arc welding processes may be manual, semi-automatic, or fully automated.

First developed in the late part of the 19th century, arc welding became commercially important in shipbuilding during the Second World War. Today it remains an important process for the fabrication of steel structures and vehicles.

Side frame

The machine frame supports the rolling shaft of machine so as providing of compressive force and also to torque and vibration from the machine. The desired material should be of high rigidity, adequate toughness. For this purpose carbon steel rod were chosen. It as to be made of number operations are taken for a lager drilling we used jig boring machine ,for cutting flame cutting as been used because of thickness plate is 12mm so we used flame cutting it have economic also to and it consisted of welding of joints(MIG).

Dimensions :

Width: 175 mm
Thickness : 12 mm

Height : 150 mm

Base

It consisted of the entire moving parts of the machine. It also provides support and balance for the machine. It made of mild steel because of its machine ability, and rigidity. It has been made by an welding joint (MIG) and also we make drilling of mounting motors and other all part of machine

Pulley

The pulley is attached to the rotating shaft. Cast iron was chosen for this purpose as the pulley would be subjected to tension forces from belt. Belt is rubberized fabric
.The pulley as been made by an casting method and it will be turning for a proper boring by used of lathe.

Roller

Roller where used for crushing of nuts with speed. Which is made by a mild steel it has been machined by uses of lathe for an turning operation and milling as to been done for the key way cutting Dimension:

Minimum diameter : 35 mm
Total Length : 300 mm
Operating Length : 200 mm

Figure1. Developed Oil extraction machine

VII. Conclusion

The oil extracting machine from nuts was fabricated from the available locally source materials. The machine is very applicable for local production, operation, repair and maintenance. The operation of the machine which could be manually or electrically operated makes it unique type compare to others. The automatic operation of the machine saved energy and did not required high skilled labour. Finally, the operation is simple, save time and energy. It can be used in rural areas where electricity is not available.

Merits of extraction machine

High Efficiency
Low Cost – approximately Rs.10,000
Easy To Operate
Require Less Space

Demerits of extraction machine

Collection of wastage is difficult
Large amount of production of oil is difficult at the time.

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