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DESIGN and FABRICATION of CHAKALI MAKING MACHINE

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ABSTRACT
This machine is related to food industry. It helps to reduce the labour cost as well as time. It also reduces the work load. We are trying to manufacture a machine which will give high speed with more accurate shape of chakali. This machine has high efficiency also the production rate as compare to manual and conventional process.

Keywords:Food Industry, Chakali, Efficiency

I. INTRODUCTION
Chakali is a savory snack from India. It is a spiral shaped, pretzel like snack with a spiked surface. Chakali is typically made from flours of rice, Bengal gram and black gram. It is several variations ,depending on the type and proportion of flours used murukku, a similar snacks typically made without the Bengal gram flour, is also sometimes called chikki..

Fig: Manual Chakali Making Process

This machine is related to food industry. It helps to reduce the labour cost as well as time. It also reduces the work load. We are trying to manufacture a machine which will give high speed with more accurate shape of chakali. This machine has high efficiency also the production rate as compare to manual and conventional process.We provide you with high quality of Automatic Chakli Making Machine. Our Automatic Chakli Making Machines are used for making Quality Chakli in Uniform Shape and Sizes. Our Automatic Chakli

Making Machines are fabricated from superior quality metal to gain utmost durability and smooth functioning. Use of state of the art technology, popularize these Automatic Chakli Making Machines amongst our valued customers all over the world.

II. LITERATURE REVIEW

Design & Development of Automatic Fast food Machine

Amit B Solanki et al give the proposed detail of design and development of automated fast food machine for large food industry applications. Automated fast food machine is a device that squeezing the duff mixture of fast food with following categorized efficiency such as time, human effort, safety, cleaning and quality during fast food making. In this design, it is mainly notified about cost of the machine as well as time efficiency. This designed machine can squeeze duff mixture using screw extruder with electric power, and extruded out using rotating conveyer from machine die to away as near to operator. Therefore, production rate of the fast food making machine is high compared with other manual and commercially available machines

Machine Learning: An Artificial Intelligence Methodology

Anish Talwar et al focus on the problem of learning and decision making is at the core level of argument in biological as well as artificial aspects. So scientist introduced Machine Learning as widely used concept in Artificial Intelligence. It is the concept which teaches machines to detect different patterns and to adapt to new circumstances. Machine Learning can be both experience and explanation based learning. In the field of robotics machine learning plays a vital role, it helps in taking an optimized decision for the machine which eventually increases the efficiency of the machine and more organized way of pre forming a particular task. Now-a-days the concept of machine learning is used in many applications and is a core concept for intelligent systems which leads to the introduction innovative technology and more advance concepts of artificial thinking.

III. SCOPE

In Maharashtra the demand of chakali is more. There is mass production of chakali. Automatic chakali machines are big and costly. Small scale industries cannot afford these large machines.

We are trying to make a automatic machine having low cost and small size. The machine is suitable for MAHILA BACHAT GAT.

3.1 Problem Definition

Today chakali making process faces the following problems:

More time require

In conventional process, putting dough in machine for regular interval of time is time consuming process.

High labour

Chakali is produced in mass. So more labors are required.

Different shape and size of chakali:

Due to number of peoples working, the size and shape of chakali is different.

Low production rate

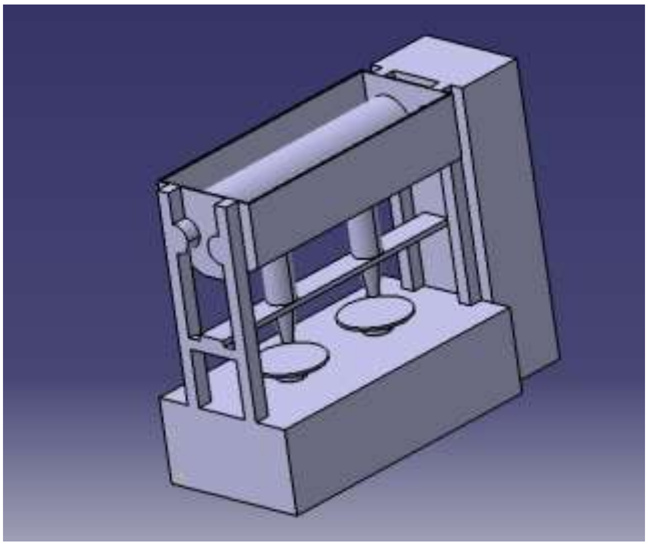
In conventional process lots of time is waste in filling the dough in machine. Efficiency of people for doing the work is also low which will ultimately increases the production time.

More efforts are required for squeezing

Because of these above drawbacks, we decide doing work on these problems. We think, why should not make a machine which is doing all your operations at a one time.

IV. CONSTRUCTION & WORKING

The frame of machine is made up of mild steel. Material is selected as per design data book. Approximate size of the frame is 55 cm by 35 cm. half horse power motor will be fixed in the frame. Pulley is attached to motor and the motor will be coupled with two rollers with the help of belt drive. Rollers will be fixed on the shafts. There are two rollers which will be fixed in four bearing. These four bearings will be supported on horizontal members. Hopper will also be supported o these supports. The hopper will be made in such a way that it should contain minimum 5 kg of dough. Two pipes are attached at the bottom side of the hopper. Nozzles will be attached at one end of the pipe. Linear motion will be given to these nozzles with the help of cam shaft. Nozzles will be attached to a shaft and this shaft will move with the help of cam. At the bottom side, another motor will be fixed having 100 rpm. With the help of this motor two discs are rotate. A shaft will be coupled with this motor and gear will be fixed on it. This gear will mesh with another two gears on which discs are attached. Spur gears will be used.



Dough is filled in the hopper. Two rollers present in the hopper will squeeze the dough and push it into the pipe attached to it. The nozzle is attached at the end of the pipe. When the dough comes out from the nozzle, linear moment of the nozzle starts. A disc which is placed at the bottom of nozzle is rotating. The dough is pushed through nozzle and the shape of chakali will be achieve.

V.DESIGN CALCULATIONS

5 .1 DESIGN OF GEAR

Power of motor = 0.373 Kw

N = 500 rpm

Sut = 660

FOS = 3

We choose gear with 45 teeth

Zp= 45

Zg= 45

As both gears are of same material and having equal numbers of teeth, we can design pinion or gear.

Torsion Moment

Mt = $\frac{60\times10^6\times Kw}{2\times\pi\times n}$

$$= \frac{60\times10^6\times0.373}{2\times\pi\times500}$$

= 7123.77

As electric motor is selected, service factor (Cs) from design data book is,

Cs= 1

Assuming the velocity = 5 $^{m}/_{s}$

Velocity factor (Cv) can be given as,

Cv =$\frac{3}{3+5}$

=$\frac{3}{8}$

=0.375

Lewis form factor for 45 teeth is

Y = 0.399

Module

Module (m) calculated as,

$$m = \left(\frac{60\times10^6}{\pi}\left(\frac{Kw\times Cs\times fos}{n\times z\times Cv\times\left(\frac{b}{m}\right)\times\frac{Sut}{3}\times Y}\right)\right)^{\frac{1}{3}}$$

$$= \left(\frac{60\times10^6}{\pi}\left(\frac{0.373\times1\times3}{500\times45\times0.375\times10\times\frac{660}{3}\times0.399}\right)\right)^{\frac{1}{3}}$$

m = 1.42

From design data book, standard module is 2

Hence,

m = 2

dimensions of gear are as follow,

Dp = $m\times zp$

= 2×45

= 90

Dg = 90

b = 10 × m

= 10 × 2

= 20

Where,

Dp = diameter of pinion = 90 mm

Dg = diameter of gear = 90 mm

b = face width = 20 mm

Tangential Load

Tangential load acting on shaft is

Pt = $\frac{2\times Mt}{dp}$

= $\frac{2\times 7123.77}{90}$

= 158.306 N

Velocity of gear is,

V = $\frac{\pi\times dp\times np}{60\times 10^3}$

= $\frac{\pi\times 90\times 500}{60\times 10^3}$

= 2.35 m/s

Cv = $\frac{3}{3+2.35}$

Cv = 0.56

e = sum of error between two meshing teeth

e = 8+0.63Ø

Ø = m+0.25$\sqrt{dp}$

Ø = m+0.25$\sqrt{90}$

Ø = 4.37

$.ep = 8 + 0.63 \times 4.73$

ep = 10.75

e = ep+eg

e = 10.75+10.75

e = 21.5 × 10^{-3} mm

Dynamic Load

dynamic load (Pd) is,

Pd = $\frac{21\times V\times (Ceb+Pt)}{21\times V+\sqrt{(Ceb+Pt)}}$

From design data book deformation factor $(c = 5700)$

$=\frac{21\times 2.35\times(5700\times 21.5\times 10^{-3}\times 20+158.38)}{21\times 2.35+\sqrt{(5700\times 21.5\times 10^{-3}\times 20+158.3)}}$

= 1966.33 N

Effective Load

Effective load $(Peff)$ can be given as,

Peff = Cs×Pt + Pd

=1×158.306+1566.33

= 1724.6 N

Bending Strength

Bending strength of gear (Sb) is given by,

Sb = $m \times b \times \sigma \times Y$

$= 2 \times 20 \times \frac{660}{3} \times 0.399$

= 3511.2 N

$Fos = \frac{3511.2}{Peff}$

$= \frac{3511.2}{1724.306}$

= 2.03

Design is safe

5.2 DESING OF SHAFT

For calculating the forces at pulley

P1 = tension in tight side

P2 = tension in slack side

P1 – P2 = $\frac{2\times Mt}{dp}$

$=\frac{2\times 7123.77}{90}$

= 158.306 N

$\frac{P1}{P2} = e^{\mu\theta}$

For mild steel $\mu = 0.6$

And angle of contact $\theta = \pi$

$= e^{0.6\times\pi}$

= 6.79

P1 = 6.79 P2

P1- P2 = 185.306

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Putting the value of P1

$6.79\times P2 - P2 = 158.306$

5.79 P2 = 27.34 N

P1 = 6.79×27.24

P1 = 185.63 N

Assuming 4 kg of dough is put in hopper,

Load of the dough acting on the shaft is,

P = 4×9.81

= 39.24 N

Pr = radial component of tooth force,

Pr = Pt $\tan \alpha$

= $158.306 \times \tan 20$

= 57.61 N

Fig: Shear Force Diagram

Fig: Shear Force Diagram

R1 + R2 = 39.24 + 57.61 + 212.17

= 309.82 N

Calculating bending moment at R1

0 = $39.24 \times 280 - R2 \times 560 + 57.61 \times 585 + 212.97 \times 610$

$R2 \times 560 = 174600.75$

$R2 = 311.78\ N$

R1 = 309.82-377.78

= -1.96

Finding the maximum bending moment,

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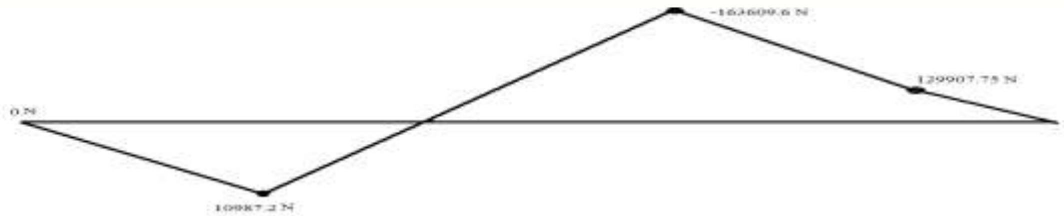

Fig: Bending Moment Diagram

The max bending moment = Mb = 163609.6

1.Diameter Of Shaft:

$$d^3 = \frac{16}{\pi \times 62.56} \times \sqrt{(Kb \times Mb)^2 + (Kt \times Mt)^2}$$

For load gradually applied.

Kb = 1.5

Kt = 1

$$d^3 = \frac{16}{\pi \times 62.56} \times \sqrt{(1.5 \times 163609.6)^2 + (1 \times 7123.77)^2}$$

d = 27.13 mm

VI.ADVANTAGES

- Reduces the number of labours.
- As it reduces labour cost of labour also reduced.
- It reduces the production time as compare to traditional method.
- Uniform shape and size of chakali achieved.
- Its cost is less as compare to the other machines available in market.
- It reduces the efforts like squeezing.

VII.DISADVANTAGES

For cleaning machine we have to take more efforts

VIII.CONCLUSIONS

After completing the work, it is concluded that work is simple in construction and compact in size for use manufacturing of machine is easy and cost of the machine is less .This machine can fabricate with less production time with ease by mass or batch production. This work can be implemented in small scale industries.

REFERENCES

[1.] Nish Talwar, Yogesh Kumar “Design & development of automatic fast food Machine”IJMERR,ISSN 2278-0149, Vol. 3, No. 3, July, 2014

[2.] Nish Talwar, Yogesh Kumar “MachineLearning: An artificial intelligence methodology”IJECS, ISSN:2319-7242,Vol 2 Issue 12,Dec 2013,Page 3400-3404

[3.] CMTI hand book for mechanical engineering

[4.] Design data book for mechanical engineering

[5.] Design of machine element by R.B. Patil.

[6.] Design of machine element by V.B. Bhandari.

[7.] Material science and metallurgy by V.D. Kodagiri’