

Design and Development of Oil Seed Presser by Using Human Power

B.R. Chavan¹ P.D. Kulkarni²

^{1,2} Mechanical Department, Sinhgad Institute of Technology, Lonavala, India

Abstract - This project discusses the importance of human power from the earliest times to the present and its future scope. As the use of natural fuel is increased due to industrial development, its storage going to end. More effective use of human power can do by using mechanisms. The technology used to transmit human power to the working unit is termed as human powered machine. The appropriate and most effective technology to use human power efficiently is bicycle technology. In bicycle technology the operator uses the pedal to operate the machine and transmits power through crank, chain and freewheels to the working unit. The oil seed presser is used to draw oil out of locally produced seeds and to be economical for production of oil on small scale. The design and development in the screw presser design to increase the output is the objective of project.

Keywords: - Ground nut, Human power, Oil seed presser.

I. INTRODUCTION

Bicycle technology is one of oldest technology in world, it can be used to transmit power. Current scenario of power supply in rural areas is worse load shedding of 10 to 12hrs daily is experienced so electrical machines are rarely used. groundnuts are important seed used for oil extraction, our state is larger producer of groundnuts but oil extraction in industry is less beneficial for farmer and farmer is unable to extract oil due to limited resources so our aim is to develop an machine which runs on human power and helps easier oil extraction .there are Various Method of Extraction of Oil such as Distillation, Expression, Effleurage, Maceration, Extraction of Oil By Oil Seed Presser. The Human Powered oil seed presser can be used to extract oil from seeds for a small scale quantity. For domestic purposes human mechanical power can be used to extract oil from various seeds at a lower scale.

The Screw press is basically a helical screw groove machined on a tapered shaft held by bearing inside stationary cylindrical barrel. As the shaft rotates the screw leads the seeds over its thread forward towards the discharge end of the assembly which is fed through the hopper inlet the seeds are pressed. In crushing region the oil expressed is collected in container below the perforation in the barrel bottom and the cake is removed from discharge end of the barrel.

The oil seed presser can be used widely in community to extract oil locally and benefit the farmer easily the screw press is simple in design and easy to fabricate, can be usable by anybody, even without previous technical training.as well as the cake generated from the presser can be used as nutrient fodder for the livestock of the farmers.

Specification of major component of oil screw press

Base dia. of screw shaft	30 mm
Max dia. of screw shaft	46 mm
Length of taper	100 mm
Angle of taper	1.43 °
Diameter of barrel	48 mm
Speed of rotation	700 rpm

Table I Specification of Oil Screw Press

II. DESIGN CALCULATION

The Screw Press Operation

Continuous pressing by means of expellers (also known as screw press) is a widely applied process for the extraction of oil from oil seeds and nuts. It replaces the historical method for the batch wise extraction of oil by mechanical or hydraulic pressing. The expeller consists of a screw (or worm), rotating inside a cylindrical cage (barrel). The material to be pressed is fed between the screw and barrel and propelled by the rotating screw in a direction parallel to the axis. The configuration of the screw and its shaft is such that the material is progressively compressed as it moves on, towards the discharge end of the cylinder. The compression

effect can be achieved, for example by decreasing the clearance between the screw shaft and the cage (progressive or step-wise increase of the shaft diameter) or by reducing the length of the screw flight in the direction of the axial movement. The gradually increasing pressure releases the oil which flows out of the press through the slots provided on the periphery of the barrel, while the press cake continues to move in the direction of the shaft, towards a discharge gate installed at the other extremity of the machine.

Design of rotating screw presser shaft

Consider the Material for shaft (C-20)

$$\sigma_y = 260 \text{ MPa}$$

Let the factor of safety (FOS) = 3.

Now, bending stress is given by

$$[\sigma_b] = \frac{\sigma_y}{FOS} = \frac{260}{3} = 86.67 \text{ MPa}$$

The tensional shear stress is given by,

$$\tau = \frac{\sigma_b}{2} = \frac{86.67}{2} = 43.33 \text{ MPa}$$

Energy is given by,

$$E = \frac{1}{2} \times I \times \omega^2$$

Assume maximum speed of the shaft N=700rpm

$$\omega = \frac{2\pi N}{60} = 73.30 \text{ rad/sec}$$

Moment of Inertia of Flywheel is given by

$$I = m \times K^2$$

Where, Mass of flywheel m=38Kg, K = Radius of Gyration, D = Diameter of flywheel = 80cm

$$K = \frac{r}{2}, K = 40\text{cm} = 0.4\text{m}$$

$$I = m \times K^2 = 38 \times 0.4^2 = 6.08 \text{ Kg-m}^2$$

Energy is given by:

$$E = \frac{1}{2} \times I \times \omega^2 = \frac{1}{2} \times 6.08 \times 73.3^2 = 16370.54 \text{ Joules} \approx 2.670 \text{ KWatts}$$

Now, torque is given by:

$$\text{Torque } T = \frac{E}{\omega} = \frac{16370.54}{73.3} = 223.33 \text{ N-m}$$

The twisting moment of shaft is calculated as

$$\text{Twisting moment (Te)} =$$

$$\text{Neglecting Moment i.e. } M = 0$$

$$T_e = T =$$

$$223.33 \times 10^3 =$$

$$d = 16.23 \text{ mm}, d \sim 20\text{mm.}$$

Hence, the diameter of the shaft taken is 30 mm.

III. RESULTS

As per design shaft and barrel we have fabricated the model of oil seed presser and the material used is mild steel as it is easily available and cheaper and easier to machining

This is a solid works image of assembly of oil seed presser

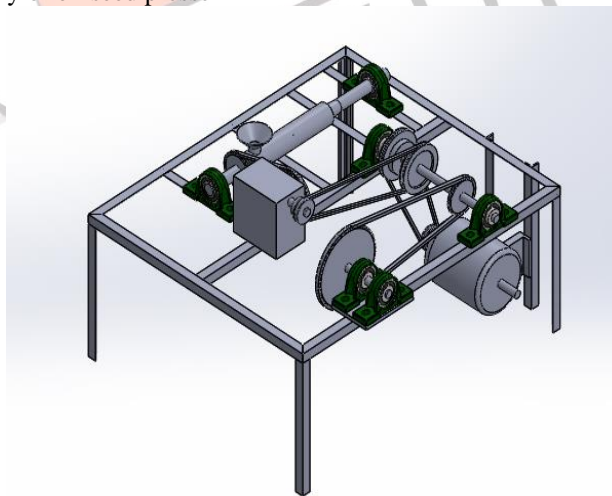


Figure 1 Assembly of oil seed presser

Trial experiment were taken with different sample of groundnut after 4 trial of each sample average output of each sample is listed in table II

Sample of groundnut	Extraction of oil by screw presser/1000 grams

Sample 1	182 grams
Sample 2	186 grams
Sample 3	223grams
Sample 4	164 grams

Table 2 – Results

	Light weighted person	Medium weighted person	Heavy weighted person
Oil extracted per 1000 grams	215 grams	230 grams	235 grams

Table 3 – comparison of oil extracted

The above table shows the amount of oil extrude by oil seed presser powered by different people

IV. CONCLUSION

From above discussion it can be concluded as

- From the results obtained we can conclude that sample no 3 we obtain maximum amount of oil.
- Human power is easy to use and no need of special training.
- As no combustion of fuel takes place so no air pollution.
- Human powered machines can be manufactured locally.
- Low initial and maintenance cost.
- Self-dependent source of energy.
- Best alternative source of energy

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