International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 04 Issue: 03 | March -2017 www.irjet.net p-ISSN: 2395-0072

A Review on the Oil Expeller Screw Shaft

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Abstract - *The presented research concentrated on the designed and failure finding in existing types oil expeller shat used for oil extraction in the agricultural products. The different researches were studied for study failure occurred in the screw shaft. The presented review in this article can be useful for developing the new design of the oil expeller shaft. The proposed research not only finding the failures in the screw shaft but it can be useful developing the oil expeller through traditional techniques and computational techniques.*

Key Words: Oil Expeller, Shaft, Failure, Computational Techniques

1. INTRODUCTION:

The Oil extraction technology has been in use for a very long time in India and the techniques that are followed for expelling oil are very laborious and relatively inefficient. There has not been any significant improvement in the oil extraction processes and even today a century old technology such as single screw press, ghani, hydraulic presses1 are being used in various parts of the country. Mechanical screw presses are ideally preferred for oil extraction as they are economical and continuous production can be achieved. Any improvement in the technique of oil extraction tends to bridge the technological gap and increase availability of feedstock for extraction of oil [1].

An Oil Expellers is a horizontally rotating metal screw, which feeds oil-bearing seeds into a barrel shaped outer casing with perforated walls. The seeds of crop like cotton, ground nut are continuously fed over the expeller, which grinds, crushed and presses the oil out as it passes through the machine. The pressure of the expeller screws ruptures the oil seeds in the product and oil flows through the perforations provided in the casing and it is collected in a trough provided at the bottom of casing [2]. The residue of the material of crop seeds from which oil has been extracted called as cake. The materials used for manufacturing of an expeller press include mild steel. The oil expeller machine uses resistance and constant pressure from the screw drives to move and compress the seed material. In the some cases of expeller pressure created due pressing the heat is generated in the range of 140–210 °F (60–99 °C) [3].

The need for new designs of oil expeller is base on the cost and efficiency of the machine especially for the usage in small and medium size industries. It has to be cost effective and light weight to accommodate such demands. The existing oil expellers in the market are too big and too expensive for these small medium size businesses to invest on. Other limitations are its maintenances aspect as well as it operations.

2. PARTS OF OIL EXPELLER SHAFT:

The oil expeller consists of different parts. It mainly consists of body, hopper, main shaft and gear assembly. The screw shaft is provided with gear assembly to rotate in the cage. The following are the parts included in the construction of oil expeller machine shown in fig.1.1.

a. Body

The body is as the casing of the parts of oil expeller machine. It is made of the highly closed grained casting to ensure continued service without any vibration and accurately.

b. Hopper

The hopper is used for feeding the raw materials for extracting the oil from it. It is directly over the grinder and maintains the flow of oil seeds during the operation.

c. Bed

The bed is provided for support to the structure of oil expeller machine. The structure is made of the steel. This ensures the better alignment and balancing to the parts of the oil expeller machine. The bed is provided with good vibration absorbing mechanism so that with stand with loading capacity.

d. Main shaft

It is main part of expeller. It carries and support to worm gear, cone, collar, cutter, gear etc.

e. Gears

The gears and pinions of oil expeller are manufactured from alloy steel to ensure smooth running of gears. Induction and oil quenching hardness is given to gears for long life. The gears are fitted in oil bath case for smooth running.

f. Worms

The most essential part of modern oil milling is the shape, design and material construction of pressing worms.

g. Bearing

All imported heavy duty bearings, taper bearings, roller bearings and thrust bearing etc.

h. Barrel

The barrel is means for providing the cage structure to the oil expeller. It is made from the mild steel with assembly of tempered cage bars and frames.

i. Cone and collar

Cone is placed at the end of extraction of oil on the main shaft. It is mainly use for maintaining cake thickness. Collar has placed after the cone.

j. Cutter

Cutter has placed after cone and collar. It is use for cutting the cake.

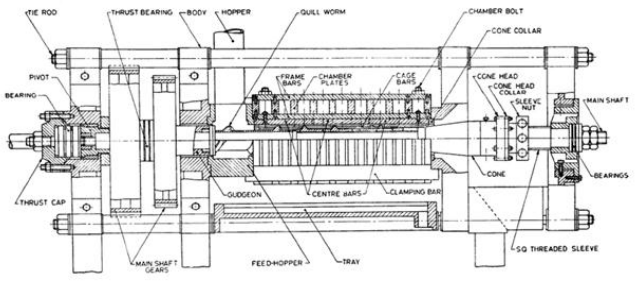

Fig.2.1 Parts of Oil Expeller Machine

3. WORKING OPERATION OF AN OIL EXPELLER MACHINE:

The expeller consists of the different parts as shown above figure. The seeds of the crop from which the oil extracted is fed into the hopper and then to the grinder. The grinder in the oil expeller is in the form of screw on the shaft. This screw shaft is rotated in the parallel direction and crushing the oil seeds. The arrangement of the screw and its shaft is made in the way that the material is progressively compressed as it moves on, discharge at end of the cylinder. The effect compression can be achieved, by means of decreasing the clearance between the cage and the screw shaft or by sinking the length of the screw flight in the direction of the axial movement. The oil is releases from the seeds by gradually rising pressure by the screw shaft. The extracted oil seeds collectively form a cake structure on another extremity of machine.

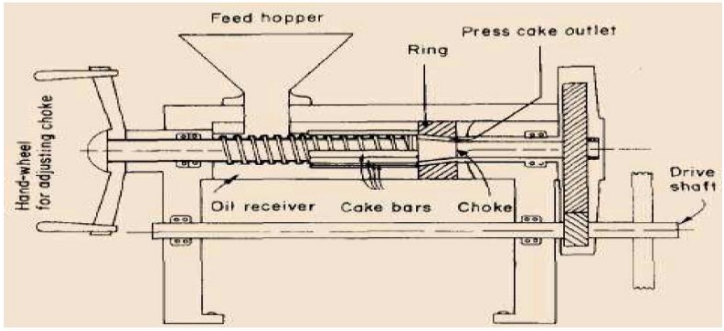

Fig. 3.1.Screwed Oil Expeller Shaft

4. LITERATURE REVIEW:

Aremu A. K et al [3] presented the design of an oil expeller machine for kenaf.The designed machine having the capacity of 36.5 Kg/hr and capable to extracted oil efficiency up to 62.2 %.The designed machine is provided with the best lubrication and easily maintained.

Shankar Haldar et al [4]presented the research study on the information about the oil expellers including the availability of raw materials .This study mainly emphasis on the different issues related with used o oil; expeller its design feature and process and the developing the site for oil expeller industries.

M. Zamanzadeh et al [5] presented the different failures analysis methods and the materials selection for oil expellers. In this research paper various subsets of the design materials are taken in to consideration applicable to the study. This study includes mainly on the failures in the, paints and coatings, plastics and electronics, as well as failure caused by corrosion and principles of root cause determination within that particular field.

Deli S et al.[6] carried out the research study effects of physical parameters in screw press machine. In this study Sativa seeds were studied using a KOMET Screw Oil Expeller. The study is carried out with different sizes of nozzle and at the different speed of shaft, also the different diameter of the shaft is taken into consideration for the study. It is found that the shaft diameter with 8mm shows low yields output but the

diameter of shaft 11 mm with speed of 65 RPM shows the good performance. The nozzle size of 12 mm recorded the same percentages of yields. The most of results obtained are varying with the changes in the physical parameters, the optimum conditions of parameters recorded 22.27 % oil yields with 8mm diameter and 19.05% with 11mm diameter of expeller shaft.

S Sreenatha Reddy, et al [7] developed the mini model of the oil expeller screw shaft and finding out the effect with variation of compression ratio of oil chamber along with speed of screw shaft. The experimentation is carried out with Pongamia and Jatropha seeds and the compression ratio is maintained at 14:1 to 21.5:1 with alternating speed of shaft between 35 to 654 RPM.The results of the study concluded that the compression ratios has significant impact on the performances of oil expeller screw.

Adesoji M. Olaniyan et al [8]. designed, a oil expeller screw press and tested with extraction of oil in palm kernel and soybean .The expeller is powered with 15 Hp three phase motor. The average extraction efficiency of 13.48 and 22.79 % obtained with designed expeller screw. The results concluded that the mini expeller can be useful in production of oil for soybean and palm extraction for community.

A.Ibrahim et al.[9] carried out the review on the different technologies for oil extraction from agricultural product.The presented study included the used of different techniques for pre-processing conditions including the removal of hulls and shells, pre-processing conditioning such as size reduction, moisture content adjustment, heat treatment and pressure application, as well as the methods employed in the extraction, namely; traditional and modern (improved) methods discussed in this paper.

Mehul.K.Modh et al. [10] presented the thrust ball bearing analysis in the oil expeller. The thrust bearing are designed with analytical treatment and then Pro-E software. The analysis of bearing are conducted for calculating the life of existing bearing using the ANSYS software and finally results are concluded with comparison between the analytical and computational stiudy.The analysis results the Principle stress, Principle strain and axial deformation found to be reduced.

V. S. Khangar et.al.[11] addressed the different techniques in failures analysis of shat used in oil expeller. Roll shaft failure can be prevented primarily by introduction of better material design optimization & by using correct manufacturing processes. The comparison of the different methodology used, their application & limitation presented for concluding the results.

Amruthraj M et.al.[12] carried out the research work on the design of twin screw oil expeller from extracting the oil from pongamia pinnata seeds. In this paper, a counter rotating twin screw expeller is designed for extraction of oil from the Pongamia pinnata seeds. This paper focuses on comparison between the twin screw and single screw press technology based on both technical and economical appraisals, study is been carried out on how twin screw technology is better compared to single screw.

4. CONCLUSION:

In the oil expeller shaft the failure due to uneven crushing load is common problem occurred in the industry. The presented research work concentrated on the different techniques and methods considered for design of oil expeller. The presented review research also concentrated on the finding out the optimum techniques for reducing the failure in the oil expeller shaft.

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