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Design and Fabrication of Portable Oil Extruder

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Abstract: Edible oil plays an important role in day to day life. Vegetable oils are mainly produced from oilseeds (e.g. rapeseed and sunflower seed)as well as from legumes (e.g. peanut and soybean), nuts (e.g. walnut and almond)and flesh of some fruits(e.g. olives). Refined vegetable oils are pressed from the plants to produce high-quality oils which is suitable for use as an ingredient in recipes for frying and spreads oil contains the rich vitamins. It is extracted by using metal extruder in mass production in oil mills. Many vitamins or minerals of oils are destroyed due to the high temperature of existing metal extruder. In this, the portable oil extruder has been designed and fabricated to avoid the aforementioned problem.

Keywords: oilseeds, high temperature, vitamins, portable oil extruder.

Introduction

The background of the existing oil expellers in the market, the needs of oil expeller in oil production industries, the development of oil industries especially in developing countries. It is followed by the overview of the product which is the oil produced in the market and continued with the overview of the materials of the product by the oil expeller. The Oil Expeller is a screw type machine, which presses oilseeds through a caged barrel-like cavity. Raw materials enter from one side of the press and waste products exit the other side. The machine uses friction and continuous pressure from the screw as it drives in and compresses the seed material. The oil seeps through small openings that do not allow solid seed fiber to pass through. Afterward, the pressed seeds are formed into a hardened cake, which is removed from the machine. Expeller pressing (also called oil pressing) is a mechanical method for extracting oil from raw materials.The raw materials are squeezed under high pressure in a single step. When used for the extraction of food oils, typical raw materials are nuts, seeds, and algae, which are supplied to the press in a continuous feed. If we scale down the Industrial Oil Expeller we can see that the main workings of the expeller are the helical thread in the barrel that creates a large amount of force pressing the raw material in the process of expelling the oil. The best scale down version of the helical thread is to use a screw press in a cage barrel or press chamber. It will act as a miniature expeller and it will be cost-effective for a setting up a small business. In other words, the Oil Expeller in this report is a miniature or a scale down version of its industrial cousins. The design of the oil expeller needs to be suitable for small-medium businesses where the total cost of setting up and running the machine is low. Despite its low cost, the efficiency of the machine should be high. The profitability of oil processing depends on reducing the capital and operating costs as much as possible, and at the same time maximizing the income from the sale of oil and by-products. A careful study of all costs should be undertaken before setting up a production unit.

Literature Review

SANGAMESHWARA G S B.S.RAVAIKIRA AUG 2015 The machine has a simple construction and is light in weight which makes it portable and can be used for both domestic and commercial purposes. This machine can also be operated by the unskilled person. This machine is widely used for extraction of the contents like coconut and can also be used for high production in small-scale industries. Our intention is to overcome those above problems by applying engineering knowledge and to give the good machine to produce virgin coconut oil by using these machine they can produce products in a reliable way and to compete in the market. In conventional extraction processing is carried over by continuous Pressing, Hydraulic presses these are used in the large installations. But those machines are not flexible enough to produce virgin coconut oil and those machines not suitable for virgin oil for their higher cost, larger machine size. This project work aim on design and fabrication of portable coconut oil extraction machine which will eliminate all drawbacks the machine is light in weight which makes it portable and can be used for industrial production. The machine can be handled by unskilled labour and there is less need for the power source as it is manually operated.

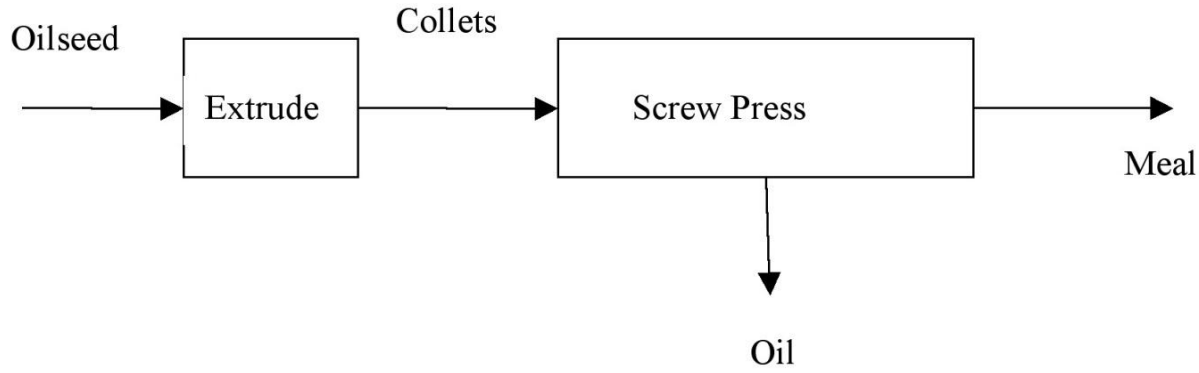
DESIGN AND ANALYSIS OF OIL EXPELLER SPARES Mr.Mangesh A PACHKAWADE DEC 2013 The paper review various researches which has been work carried out through design failure analysis of various spares of oil expeller. The research contributes to the problem evaluation of a small-scale industry

working in the area of oil extraction. The research fruit forwards the method of diagnosis of failure of the worms and worm shaft of the cottonseed oil extraction unit before prescribed life period. This could help the industries working in these areas to improve the life and function ability of the unit which would in their term lead to higher productivity. This literature tries to diagnosis the reason for uncertain failures and would suggest the constructional solution in the same regards. The proposed works not only check the dimensional through traditional method but also implies computerized techniques to evaluate thermal stress analysis. This will, in turn, would decide the criteria of material selection and dimensional decisions. Thus, the work contributes to the reduction of running cost of an industry and sudden breakdowns occurring on the shop floor.

MULTIEXTRACT MACHINE ARUNKUMAR.E, KAYELAIMANI.S, RAJASHEKAR.G, VINOTH.T MAR 2014 Extraction of oil from coconut either by dry process or wet process could be more difficult during rainy seasons and for those who are not comfortable with conventional method of oil extraction process, we have developed a new machine without making use of solar heat for 10-15 days for drying coconut. Hence this compact model has been developed to eliminate the disadvantage of drying mature coconut in the sun for more than a week. Here, instead of drying mature coconut for dehumidification, we made use of heater and blowers to dehumidify the coconut moisture. As the title reveals that this will be in compact structure so that it can be portable and it could be used anywhere since it has more commercial value. In this machine, we can also extract coconut milk by putting the fresh coconut directly into the screw press. In this report, we will be developing a compact machine to overcome the disadvantages of the conventional model with simple mechanisms.

DEVELOPMENT OF AN OIL EXTRACTION MACHINE FOR JATROPHA CURCAS SEEDS A. T. SALAWU1*, M. ISIAKA1 AND M. L. SULEIMAN1 2015 This study aimed to solve one of the problems which Jatropha curcas seeds (JCS) oil extraction industry is facing in the Northern part of Nigeria; the lack of efficient small-scale oil extraction machines. A small-scale JCS oil extraction machine was therefore designed, developed, and evaluated for performance. Study Design: The study was conducted using 3 × 3 × 3 Factorial Experimental Design. The results obtained were analyzed using ANOVA while Least Significant Difference (LSD) test was used to separate the means. Place and Duration of Study: Department of Agricultural Engineering, Ahmadu Bello University, Zaria, Nigeria between January 2011 and April 2013. Methodology: Base on design calculations, locally sourced materials with indigenous technology were used for the development of the machine. In evaluating the developed prototype machine, the effect of speed, feed-rate, and moisture content on throughput, extraction rate, and extraction efficiency was determined.

Methodolgy



The oilseed, when fed into the extruder, where the bevel gears are there for the extruding process.And the cutter blades are also there for the fine extruding, then the collets will give oil and meal in the final stage of extrusion.

Dry process

Coconut oil can be extracted through “dry” or “wet” processing. Dry processing requires that the meat is extracted from the shell and dried using fire, sunlight, or kilns to create copra. The copra is pressed or dissolved with solvents, producing the coconut oil and a high-protein, high-fiber mash. The mash is of poor quality for human consumption and is instead fed to ruminants; there is no process to extract protein from the mash. A portion of the oil extracted from copra is lost to the process of extraction.

Wet process

The all-wet process uses raw coconut rather than dried copra, and the protein in the coconut creates an emulsion of oil and water. The more problematic step is breaking up the emulsion to recover the oil. This used

to be done by prolonged boiling, but this produces an odorized oil and is not economical. Modern techniques use centrifuges and pre-treatments including cold, heat, acids, salts, enzymes, electrolysis, shock waves, or some combination. Despite numerous variations and technologies, wet processing is less viable than dry processing due to a 10–15% lower yield, even compared to the losses due to spoilage and pests with dry processing. Wet processes also require the investment of equipment and energy, incurring high capital and operating costs. Proper harvesting of the coconut (the age of a coconut can be 2 to 20 months when picked) makes a significant difference in the efficacy of the oil-making process. Copra made from immature nuts is more difficult to work with and produces an inferior product with lower yields.

Conventional coconut oil processors use hexane as a solvent to extract up to 10% more oil than produced with just rotary mills and expellers. They then refine the oil to remove certain free fatty acids to reduce susceptibility to acidification. Other processes to increase shelf life include using copra with a moisture content below 6%, keeping the moisture content of the oil below 0.2%, heating the oil to 130–150 °C (266–302 °F) and adding salt or citric acid. Virgin coconut oil (VCO) can be produced from fresh coconut milk, meat, or residue. Producing it from the fresh meat involves removing the shell and washing, then either wet-milling or drying the residue, and using a screw press to extract the oil. VCO can also be extracted from fresh meat by the grating and drying it to a moisture content of 10–12%, then using a manual press to extract the oil. Producing it from coconut milk involves grating the coconut and mixing it with water, then squeezing out the oil. The milk can also be fermented for 36–48 hours, the oil removed, and the cream heated to remove any remaining oil. A third option involves using a centrifuge to separate the oil from the other liquids. Coconut oil can also be extracted from the dry residue left over from the production of coconut milk. A thousand mature coconuts weighing approximately 1,440 kilograms (3,170 lb) yield around 170 kilograms (370 lb) of copra from which around 70 liters (15 imp gal) of coconut oil can be extracted.

Conclusion

The main problem in the normal extrusion is heat generation in extruder so that the oil also gets heated up. In this, the metal extruder is replaced by the wooden extruder to avoid heat generation and to have minerals are retained.

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