Literature Review on Solar Operated coconut Oil Extraction Machine

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Abstract

Solar energy is available in an amount and free, which is the best suitable alternative for non-renewable energy sources for variety of application, it is freely available everywhere in sufficient amount, making it one of the most promising, non-pollution sources. Coconut palm is a tree of life, in addition to its food value it has health, medicinal, and cosmetic value. Wet coconut oil (virgin coconut oil) is the oil made from the fresh coconut meat .This wet coconut oil method eliminates the use of solvent; it lowers the investment cost and energy requirement. This is the healthiest oil having more shelf life; therefore in this research coconut oil is produced by solar operated coconut oil extraction machine. In this research D.C. Motor is run by solar panel to crush the coconut. After crushing the coconut milk is obtained, this coconut milk is allowed to undergo fermentation process for some period of time. This fermentation process can be achieved by two ways such as natural and forced fermentation, after fermentation the obtained curd is heated with help of circular shaped parabolic dish collector and after filtering pure coconut oil is obtained.

Keywords: D.C.Motor,Solar Panel, Parabolic Dish Collector,Fermentation, Coconut oil etc.

I.INTRODUCTION

Now a day's the prices of non-renewable energy sources are increasing and increase in the environmental problem by exhaust emission, therefore world is mostly attracted towards the utilization of renewable energy sources. In today's climate of growing energy needs and increasing environmental concern, alternatives to the use of non-renewable and polluting fossil fuels have to be investigated. One such alternative is solar energy. Solar energy is quite simply the energy produced directly by the sun and collected elsewhere, normally the Earth. The process creates heat and electromagnetic radiation. The electromagnetic radiation (including visible light, infra-red light, and ultra-violet radiation) streams out into space in all directions. Only a very small fraction of the total radiation produced reaches the earth with the commercialization of solar wet coconut oil making machine, it is possible to make better use of solar energy.

Wet coconut oil making machines are present but in our system time required for the oil formation is less, an even though it is solar operated it can also be used at night time, by using battery for crushing the coconut and soybean oil for heating purpose by storing heat energy, for a limited period of time.The main objective of "Solar operated coconut oil extraction machine," is to produce coconut oil by using wet extraction method, for cooking purpose and cosmetics, with the use of solar energy at day time. Also to reduce the cost of coconut oil and make its production at home level.

II.LITERATURE REVIEW

M. Kindermann et al. [1] In this paper it was analyzed whether small scale coconut oil production can be profitable and if coconut oil can be locally produced to a price which enables to complete with the common cooking fuels like kerosene, LPG, fuel wood and charcoal. This paper gives the different oil extraction methods such as wet coconut oil extraction method dry coconut oil extraction method.

A.M. Marina et al. [2] This paper mainly discusses on some of the findings associated with VCO up to date. Physicochemical properties, antioxidant activity, clinical and authentication studies of VCO were some of the topics addressed in this review**.** This paper is mainly focused on wet oil extraction method in which fermentation technique is explained in detail, also enzymatic oil extraction method, physiochemical properties of oil, antioxidant properties of oil and presence of phenolic compound are discussed

D.M. Dissanayake et al. [3] This paper tells about the study the effect of method of extraction on the oil quality. It tells the acid value and peroxide value were 89% and 95% respectively higher in commercial coconut oil compared to homemade coconut oil, indicating that commercial coconut oil

is more prone to oxidation. It also compares the amount of fatty acid and there composition between commercial coconut oil and homemade coconut oil, it also gives the amount of phenolic compound. These results indicate that quality of coconut oil is highly dependent on method of extraction.

J.Folaranmi [4] This paper reports the design, construction and testing of a parabolic dish solar steam generator. It also describes the sun tracking system unit by manual tilting of the lever at the base of the parabolic dish The whole arrangement is mounted on a hinged frame supported with a slotted lever for tilting the parabolic dish reflector to different angles so that the sun is always directed to the collector at different period of the day. On the sunny and cloud free days, the test results gave high temperature above 200°C.

S.A. Kalogirou [5] In this paper a survey of the various types of solar thermal collectors and applications is presented. Initially, an analysis of the environmental problems related to the use of conventional sources of energy is presented and the benefits offered by renewable energy systems are outlined. A historical introduction into the uses of solar energy is attempted followed by a description of the various types of collectors including flat-plate, compound parabolic, evacuated tube, parabolic trough, Fresnel lens, parabolic dish and heliostat field collectors. This is followed by an optical, thermal and thermodynamic analysis of the collectors and a description of the methods used to evaluate their performance.

S.Dubowsky et al. [6] This paper tells the Large parabolic dish concentrator mirrors are an important component of many solar energy systems. They need to be relatively precise and are expensive to fabricate and to transport, also a new concept for designing and fabricating large parabolic dish mirrors is presented. The dish mirror is formed from several optimal-shaped thin flat metal petals with highly reflective surfaces. Attached to the rear surface of the mirror petals are several thin layers whose shapes are optimized to have reflective petals form into a parabola when their ends are pulled toward each other by cables or rods. The concept has the potential to provide precision solar parabolic solar collectors at a substantially lower cost than conventional methods.

J. Sulistyo et al. [7] This paper mainly discusses about the coconut oil which has a unique role in the diet as an important physiologically functional food. The health and nutritional benefits that can be derived from consuming coconut oil have been recognized in many parts of the world for centuries. It also gives techniques for coconut oil extraction, such as physical, chemical, and fermentation or enzymatic processes. The extracted oil was analyzed for further experiment, especially on its antibacterial activity. According to this paper, it was found that this edible oil exhibited antibacterial activity to inhibit the growth of Bacillus subtilis.

D.D. Bawalan et al. [8] This book tells about the virgin coconut oil production manual, for micro and village scale processing, also it tells the demand for VCO is increasing over the world and its production is mostly done at household. It also gives the different processing technology, methods for the extraction of coconut oil and different fermentation techniques with economic analysis. The different operations and maintenance procedure is explained, other than this it gives the byproducts coming out from the coconut milk.

C.Y. Zhao [9] This paper focuses on the latest developments and advances in solar thermal applications, providing a review of solar collectors and thermal energy storage systems. Various types of solar collectors are reviewed and discussed, including both non-concentrating collectors (low temperature applications) and concentrating collectors (high temperature applications). These are studied in terms of optical optimization, heat loss reduction, heat recuperation enhancement and different sun-tracking mechanisms.

Y.R. Suple et al. [10] In this paper attempt is being made to trace the path of how solar concentrators evolved and to the day to day life. This energy can be harnessed by using different type of collectors such as flat plate collector, solar collector, photo voltaic cell and solar ponds. This paper tries to utilizesolar energy for the cooking purpose. Aim is to make the solar cooking as comfortable as possible and also it should be similar to conventional cooking system. In box type solar cooker with flat collectors only boiling and steaming is possible. However, use of concentrating type collector permits all operations like boiling, steaming, roasting and frying with relatively high capacity. Therefore keeping in view the food habits of rural people and for efficient utilization of solar energy, paraboloidal type concentrating collector was fabricated.

III.COCONUT OIL EXTRACTION METHODS

There are mainly two coconut oil extraction methods i.e. dry coconut oil extraction method and wet coconut oil extraction method. Wet extraction method is most beneficial for health and has lot of advantages.

A. Dry process

Coconut oil can be extracted through "dry" or "wet" processing. Dry processing requires that the meat be 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.

B. Wet extraction method

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 discolored oil and is not economical.

Virgin coconut oil is the oil which is produced by wet oil extraction method. This process extracts the coconut oil from fresh coconut. This method eliminates the use of chemicals which are used in refining of coconut oil. This is the healthiest oil which is used for disease cure and prevention with this the fat molecules in VCO can accelerate metabolism rate and it burns more calories faster. A thousand mature coconuts weighing approximately 1,440 kilograms yield around 170 kilograms of copra from which around 70 liters of coconut oil can be extracted.

IV. SOLAR POWERD COCONUT OIL EXTRACTION SYSTEM

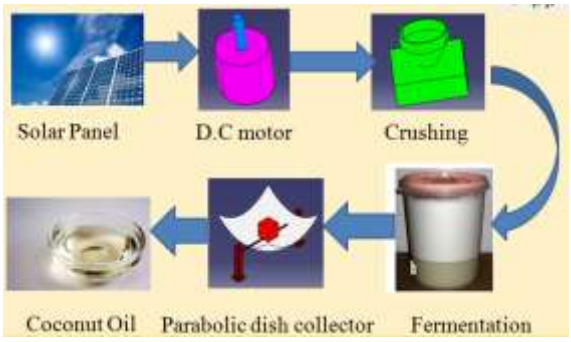

Fig.1.Layout of Solar Power Coconut Oil Extraction Machine

In this process DC motor is run by solar panel to crush the coconut. After crushing the coconut milk is obtained, this coconut milk is allowed to undergo fermentation process for some period of time. This fermentation process can be achieved by two ways such as natural and forced fermentation the obtained curd is heated with help of circular shaped parabolic dish collector and after filtering pure coconut oil is obtained .The oil obtained from wet oil extraction process consists of more amounts of antioxidants. The processes used in wet oil extraction method are given below

A. Raw material & cutting

In this type of extraction the fresh coconut is used as a raw material. Initially the meat of fresh coconut is cut into the small pieces and its weight is measured.

Fig.2. Fresh Coconut

B. Crushing & filtering process

In this process, the meat is crushed in food processer. For crushing meat, the D.C motor is used which operates on the solar energy. During crushing, water is added for proper mixing & extracting more oil from coconut. After crushing, the milk oil is passed through filter. In this process the solid particles present in the coconut milk get separated.

C. Fermentation process

Coconut milk is made from freshly grated coconut and then coconut milk is allowed to sit & ferment for a period of time. The heavier water sinks to the bottom & coconut oil lie at the top.

D. Heating process

In this process, the coconut cream present at the top portion of fermentation tank is filtered. The filtered coconut cream is then heated for a period of time by using the solar operated parabolic dish collector. Heating process is done until the coconut solid falls at the bottom of the pan.

V.CONCLUSION

In this system solar energy is used to run the set-up which saves the non-renewable energy sources. Solar operated coconut oil extraction machine," is to produce coconut oil by using wet extraction

method, for cooking purpose and cosmetics. Also to reduce the cost of coconut oil and make its production at home level. This system is cost efficient. The waste of coconut which is obtained after crushing, this waste can be utilized for making biscuits and coconut powder.

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