Abstract - Expelling has been an operation prevalent in India for several centuries and still continues to support rural households. 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, its operations as well as it does require skilled workers and high electricity. A machine is fabricated which will perform this pressing operation not by electric power but by human power.

The pedal powered flywheel motor has been adopted for many designs of rural applications in the last two decades. In the recent past a pedal powered process machine has been developed for brick making, chaff cutter, water pump, blender, wood turning, clothes washing and drying and earthen pot making etc. The machine consist of a human- powered flywheel motor using a bicycle-drive mechanism with speed increasing gearing and a flywheel, which drive the process unit through a spiral jaw clutch and torque increasing gearing . The operator puts energy into the flywheel at a convenient power level for about one minute. After enough energy is stored, pedaling is stopped and the energy in the flywheel is made available to the process unit. Pedal power is the transfer of energy from a human source through the use of a foot pedal and crank system. This technology is most commonly used for transportation and has been used to propel bicycles. Less commonly pedal power is used to power agricultural and hand tools and even to generate electricity. This kind of intermediate mechanism is helpful in driving various rural operations utilizing unskilled workers.

The design and working details of the Oil Expeller machine are described. The machine is economically viable, can be used by unskilled workers, save time otherwise spent in traditional mixing and can be adopted for human-powered process units which could have intermittent operation without affecting the end-product. The paper discusses about the basic design and Development of human energized source which has tremendous utility in energizing many rural based process machines in places where reliability of availability of electric energy is much low. This development will help to maintain the environment green and pollution free as it has no negative repercussion on the atmosphere. 'Human-scale' technology involved in these applications could be of great benefit to developing countries.

Keywords— Flywheel, Spiral Jaw clutch, Oil Expeller, Human powered

I. INTRODUCTION

There are many factors affecting agricultural productivity in developing countries and it would be simplistic to assume that the solution to problems of low productivity is purely one of applying the right technology. India is one of the largest producers of oil seeds in the world and Maharashtra is one of the major oil seed producing and edible oil producing state in India [3]. Over the last two decades, world production and consumption of oil fruits and oil seeds and their products has almost doubled. Power ghanis are faster than manual or animal types but are more expensive and their higher capital and operating costs. Now a day, Oil Expellers play a very vital role in the oil extraction process. Oil seeds are extracted in two Primary ways. Mechanical pressing is the most popular
method worldwide for separating oil from vegetable oilseeds. This method ensures extraction of a non-contaminated, protein-rich low fat cake at a relatively low cost [4]. However, mechanical presses do not have high extraction efficiencies of available oil in the cake are left un-extracted [5]. Second method is the chemical method or solvent method, done by either continuous solvent extraction or aqueous extraction. This extraction is a complex operation which is not suitable for small-scale processing because of high capital and operating costs, the risk of fire and explosions from solvents, and the complexity of the operation [6]. Once the oil is removed from the seeds, either mechanically or chemically, the oil and its by-products can serve various purposes some of which are liquid fuel, gas, electricity, fertilizer and soap [7].

II. NEED FOR MANUALLY ENERGIZED OIL EXPELLER

The main objective to design and develop a machine, which uses the human powered flywheel motor as an energy source [5]; Human power is one such form of renewable energy that has been used historically to varying degrees but it was neglected during the periods when there was rapid use of fossil fuels. But due to very high prices of fossil fuels and hazardous environmental pollution from them, the human power again came in light as renewable energy source. In the context of the present condition in India and third world countries the Power shortage and exhaustion of coal, fuel reserves and unemployment, it is felt that “Manually energized oil expeller machine” for oil extrusion is very necessary. Traditional technologies usually have the advantage of requiring low investment but are labor intensive and time consuming. Some oil expellers is also operated by hand that causes strain to the body parts due to incorrect ergonomic posture, which will be eliminated by using this machine and mechanism. This machine is environment friendly i.e. non-pollutant. It will bring Innovation & mechanization in agricultural engineering. Encourage rural development as wealth and self-employment jobs are generated in villages. Development of such an energy source which has tremendous utility in energizing many rural based process machines in places where reliability of availability of electric energy is much low also encourage animal husbandry by making oilcake available as best cattle feed. It increases milk production considerably. The need for development of oil expeller is base on the cost and efficiency of the machine especially for the usage in small and medium size industries. Oil extrusion process can be done by manually operated machine and electric operated. Traditional technologies usually have the advantage of requiring low investment but are labor intensive and time consuming. Some oil expellers is also operated by hand that causes strain to the body parts due to incorrect ergonomic posture, which will be eliminated by using this machine. The main objective to design and develop a machine, which uses the human powered flywheel motor as an energy source consisting of a bicycle mechanism, use of non-conventional energy a source [9]. Developing countries of third world like India are facing problems of Power storage due to rapid industrialization, non-availability of power in rural areas and workers. In the context of the present condition in India and third world countries the Power shortage and exhaustion of coal reserves and unemployment, it is felt that “Human powered energized oil expeller machine” for oil extraction is very necessary. This machine is environment friendly i.e. non-pollutant. It will bring Innovation & Mechanization in agricultural engineering. Unskilled workers may also get employment. Development of such an energy source which has tremendous utility in energizing many rural based process machines in places where reliability of availability of electric energy is much low. In shorts we can say that 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 its operations.

III. CONCEPT OF MANUALLY ENERGIZED OIL EXPELLER MACHINE

Oil extrusion process can be done by manually operated machine and electric operated. The means of powering IT machinery commonly used are human and animal power electric motors and internal combustion engines using oil based fuels. Other methods which have been used either directly or via an energy storage medium are wind powers, water power, solar energy transducers or bio-gas.
engines. The suitability of a particular method in a given situation will be determined by local environmental, economic and technical conditions but there are generally applicable considerations which can be used as a basis for comparison. Such a comparison will not indicate a single method for universal application but can be used to establish the relative usefulness of human muscle power methods. Throughout history human, energy has generally been applied through the use of the arms, hands, and back. The power outputs obtainable from hand cranking are between 30-50% lower than methods using the leg muscles and fall further with operating times above 20 minutes [10]. It is, however, the simplest method of operating machinery requiring little power to operate. For heavier machinery and higher powers it is necessary to use the leg muscles which are more powerful than those of the –arms [11]. The technology involved in these methods using muscle power is relatively simple and can be simpler in most cases than ‘bicycle technology’.

The main use of pedal power today is still for bicycling, at least in the high-power range (75 watts and above of mechanical power). In the lower-power range there are a number of uses of pedal power— for agriculture, construction, water pumping, and electrical generation—that seem to be potentially advantageous, at least when At this level especially, pedal power often compares favorably with wind or water power. Depending on the application, pedal power can be extremely versatile. Pedal power is often a comfortable choice because it is a familiar technology— even though it may be used in unfamiliar ways. For this reason, the use of pedal drive is likely to be of the best alternative where high outputs are expected.

The average work rate of a man working continuously is equivalent to 0.13hp [14]. Therefore only continuous manufacturing process requiring less than 0.13 hp can be man powered. Any manufacturing process requiring more than 0.13 hp and which can be operated intermittently without affecting end product, a human-powered machine system can be employed. Such human powered manufacturing process can be based on the following concept. In this processes a flywheel is used as a source of power. Manpower is used to energize the flywheel at an energy input rate, which is convenient for a man. After maximum possible energy is stored in flywheel it is supplied through suitable clutch and gearing system to a shaft, which operates process unit [15] the flywheel will decelerate at a rate depends on load torque. Larger the resisting torque larger will be the deceleration. Thus theoretical a load torque of even infinite magnitude could be overturn by this man –flywheel system. Oil Expeller Powered by Human Powered Flywheel Motor operates on the basic of above principal.

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IV. WORKING

The technology involved in these methods using muscle power is relatively simple and can be simpler in most cases than ‘bicycle technology’. The energy unit consists of a bicycle mechanism, a
pair of speed-increasing gears G1 and a flywheel. The transmission consists of a spiral jaw clutch and the torque amplification gear pair G2. The suggested machine system uses human energy achieved by pedaling and stores this energy in a flywheel at an energy-input rate convenient to the peddler. After storing the maximum possible energy in the flywheel (pedaling time could be 1-2 minutes) the same can be made available for the actuation of any process unit (Extruder Unit) by making available the energy stored in the flywheel through a suitable clutch and torque-amplification if needed. Thus the flywheel will decelerate depending on the actual resisting torque offered by the process. It implies that the peddler does not pedal while the flywheel is supplying energy to the process-unit. Upon engagement of the clutch there is a rapid transfer of momentum and kinetic energy between the energy unit and the process unit. The process unit input shaft is thus instantaneously accelerated and, after reaching the maximum speed, is subjected to deceleration. This deceleration is induced by the resistance offered on account of oil expellers. The process unit consists of the gear pair G2 which is connected to the convener. The process unit consists of the gear pair G2 which is connected to Auger (i.e. screw shape tool used for crushing and squeezing of citrus). Because of which the auger rotate in the drum and provide crushing and squeezing action.

V. RESULT AND DISCUSSIONS
The pedal energized oil expeller machine was developed. The development of the Oil Expeller we can say that the design must be efficient and low in cost. The efficient use of human muscle power through pedal drive systems constitutes a useful alternative to other power sources for oil extrusion process. Future consideration of the 'human-scale' technology involved in these applications could be of great benefit to developing countries. In designing the pedal-powered oil expeller, the focus was on cheap, readily-available materials and we proposed a simplistic design that can deliver productive, efficient. This development will increase the productivity as well as efficient of the small medium business providing by self-employment jobs.

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