

R. V. COLLEGE OF ENGINEERING, BENGALURU-560059
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A Project report on
“DESIGN AND DEVELOPMENT OF A TWIN SCREW OIL
EXPELLER FOR PONGAMIA PINNATA SEEDS”

Submitted by

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ABSTRACT

Majority of the world's energy needs are supplied through petrochemical sources, coal and natural gas. These sources are exhaustible in nature and are depleting at an alarming rate. Diesel fuels have an essential function in the industrial economy of a developing country and are used in various sectors such as transportation, industrial and agricultural sectors. Hence, there is a growing interest for renewable energy sources and biodiesel is found to be a promising alternative to diesel. It is an environmentally friendly fuel as the greenhouse emissions are less compared to diesel and ideal for heavily polluted cities due to its less sulphur content. Biodiesel can be obtained by processing seeds such as Pongamia pinnata, Neem, Jatropha etc., or Animal fat. Biodiesel can be used alone or blended with petroleum diesel in any proportions. The existing single screw oil expeller can process only 25 – 30 kg of Pongamia pinnata seeds per hour in three or more passes, with low oil yield of about 18 percent. The increasing demands of biodiesel cannot be met by this machine with such low yields. Hence, this project was aimed to design and develop an oil expeller which meets the increasing demands by increasing the productivity of the expeller.

In response to the defined limitations of existing technology, various concepts were generated such as flourmill, sequential type, reverse worm and twin screw for oil extraction. Experiments were performed on the existing expeller and generated concepts. Since there is no oil expelling technology involving twin screw for non-edible seeds, experiments were performed using twin screw extruders used in polymer industry. The results from the experiments were compared based on productivity and the twin screw extruder which processed 80kg of seeds in one hour meets the project objective and hence, twin screw concept was selected. The separation of oil from cake was a challenge in twin screw extruder. This problem was solved by incorporating an innovative design named as slotted twin barrel cage. In order to prove the functioning of slotted twin barrel cage, a slotted barrel cage which incorporates a design similar to that of the slotted twin barrel cage was designed and fabricated for a single screw oil expeller. The twin screw oil expeller was designed in detail using CATIA V5 and analysed using ANSYS 14.5.

Experiments were conducted on slotted barrel cage and oil was separated successfully which proved the design and function of slotted twin barrel cage. Thus designed Twin Screw Oil Expeller when fabricated will meet the productivity of 80-100kg/hour in single pass; thereby reducing the production cost of the biodiesel and can meet the increasing demands.