

**DESIGN AND FABRICATION OF PONGAMIA DECORTICATOR AND OPTIMISATION
OF BIO-DIESEL PRODUCTION VIA ALKALI -CATALYSED METHANOLYSIS USING OIL
EXTRACTED FROM DECORTICATED SEEDS OF *PONGAMIA PINNATA***



A Research Project Carried-out under the sponsorship of

KSCST - 35TH SERIES OF STUDENT PROJECTS PROGRAMME



Submitted to KSCST for final Project Presentation program

KARNATAKA STATE COUNCIL FOR SCIENCE & TECHNOLOGY (KSCST)

INDIAN INSTITUTE OF SCIENCE, BENGALURU- 560012

A collaborative interdisciplinary Project executed by

**MECHANICAL ENGINEERING
&
BIOTECHNOLOGY AND ENGINEERING**

Project Team

SANMATHI K	1SV08BT030
SANGEETHA M	1SV08BT029
HARSHITH S	1SV09ME403
KIRAN K	1SV08ME026
MEDA KARAN VENKATESH	1SV08ME060

Guide

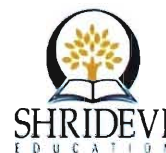
Dr.G.Panduranga Murthy

Scientist and Head, R&D-Biotechnology

Co-Guide

Mr. B.H. Vasudeva Murthy

Asst. Professor & Head, Dept. of Mechanical Engineering



SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY

(Affiliated to VTU, Belgaum, Karnataka and An ISO Certified institution)

SIRA ROAD, TUMKUR-572106.

2012

ABSTRACT

In a search for new energy sources, much attention is focused on biomass as a reliable and renewable source that is able to satisfy a significant part of the energy demands. There is an urgent need of an alternative energy source which is renewable. Currently, bio-diesel is considered as a real alternative to diesel fuel, which can be produced using different sources namely, non-edible plants, vegetable oils, algae etc. The most important plants of concern are non-edible oils such as *Jatropha curcas*, *Pongamia pinnata*/glabra. In India *Pongamia pinnata* is widely used because of its abundance and Pongamia oil is a non edible oil extracted from seeds of *Pongamia pinnata* (L) family 'Fabaceae' commonly known as 'Karanja. The study was initiated with base line survey at Koratagere taluk of Tumkur district. Interaction was made with village farmers to collect some relevant data. The *Pongamia* pods were procured from the farmers for further study. Pongamia pods are presently de-hulled manually in the absence of a suitable mechanical device. Manual decortications of Pongamia pods for the purpose of extracting seeds are a time consuming and tedious operation. A small, continuous, hand-operated machine specially designed and constructed for decortications of Pongamia pods has been done and evaluated for performance parameters. The major components of the machine are the frame, hopper, decorticating circular drum, rotating blades, gear shaft, handle, four legs and a discharge outlet to collect seed and shell. The performance parameters of the machine including Percentage of whole seed, broken seed, partially shelled pods, unshelled pods, machine efficiency and decortications efficiency, were evaluated. This design is preferred, because of its rapid operation, low human-energy expenditure, low breakage factor for the seed as well as relatively no dust being emitted during shelling; hence leading to a relatively-healthier local atmosphere for the operator. 'Crude Pongamia oil' was transesterified using NaOH as catalyst and Methanol to form Bio-diesel. The conversion was 88% at 60⁰C with 1:6 Molar ratio (Oil: Methanol) for NaOH (1% by wt) catalyzed transesterification. Further, the fuel properties of Pongamia oil methyl esters (Bio-diesel) on comparison with those of accepted Bio-diesel standards indicate that esterification of oil does improve its properties making it similar to commercial diesel. The fuel properties especially viscosity (5.5 Cst @ 60 ⁰C), flash point (115 ⁰C) and Fire point (155 ⁰C) of the transesterified product (bio-diesel) compare well with accepted bio-diesel standards *i.e.* ASTM and German bio-diesel standards.