

DESIGN AND FABRICATION OF A TEST RIG TO TEST THE OXIDATION STABILITY OF INDIGENOUS BIOFUELS.

A PROJECT REPORT SUBMITTED TO

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ABSTRACT

The present day world is hard pressed for finding alternate sources of energy. The dependence on conventional fuel has resulted in a huge deficit in the demand and supply cycle, and the more serious aspect of using conventional fuels is the problem it causes to the environment. Be it automobile exhaust or the chimneys bellowing thick smoke from a power plant, conventional fuels are inadvertently the cause of a lot many environmental issues.

In our quest to reduce the dependency on conventional fuels, the alternatives which are being sought are bio fuels and biodiesel. A biofuel is a type of fuel whose energy is derived from biological carbon fixation. Biofuels include fuels derived from biomass conversion, as well as solid biomass, liquid fuels and various biogases. Biofuels are gaining increased public and scientific attention, driven by factors such as oil price hikes and the need for increased energy security. Biodiesel is one of the liquid derivatives of biofuels.

One of the major drawbacks of using biodiesel is its shelf life, or in a more technically correct term- its low oxidation stability. The low oxidation stability leads to rapid degradation. Their oxidation stabilities when compared to conventional fuels are very low. For example, European Standards EN14214 specifies oxidation stability of FAME/ biodiesel to be 8 hours. In other words, the biodiesel should be stable for 8 hours, before undergoing complete degradation. However, the oxidation stability of various biofuels is much lesser. The oxidation stability of honge (*Pongamia Pinnata*) oil, which is extensively processed in India, is only 2.24 hours.

This project deals with fabricating an apparatus for the measurement of oxidation stability. The core component- an oxidation bomb apparatus has been procured from Oel-Waerme Institut, Aachen, Germany. The subsequent in house development of the test rig has been done in NIE, which included fabrication of the rig and components, design and fabrication of the programmable logic controller followed by writing of a set of codes to ensure that the data generated by the rig is given proper graphical representation on a computer.

There exist a lot of indigenous biofuels like honge (*Milletia pinnata*), jatropha (*jatropha curcas*), simrouba (*simarouba glauca*) etc whose oil can be extracted and converted into biodiesel. This test rig has been fabricated to ascertain the oxidation stability in terms of hours of the biodiesel obtained from these seeds. Once known, the life of these biodiesels can be extended by addition of antioxidants. Thus, a single reactor test rig has been fabricated in NIE, and testing of indigenous biodiesel is underway.