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Production of biodiesel by Jatropha oil: A substitute fuel of diesel engine

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Biodiesel (fatty acids alkyl esters) is a promising alternative fuel to replace petroleum-based diesel that is obtained from renewable sources such as vegetable oil, animal fat and waste cooking oil. Vegetable oils are more suitable source for biodiesel production compared to animal fats and waste cooking since they are renewable in nature. The raw material for biodiesel production in this research work is Jatropha plant. The seeds of Jatropha plants are collected and oil is extracted from it. Catalytic cracking of Jatropha oil can be a feasible method for production of biodiesel. Energy is a basic requirement for every sector of economic development in a country. As a result, energy demands have been steadily increasing along with the growth of human population and industrialization. Common sources of energy are petroleum, natural gas and coal from fossil fuels. This growing consumption of energy has rapidly depleted non-renewable sources of energy. Rising price of fossil-based fuels and potential shortage in the future have led to a major concern about the energy security in every country. Many types of methods have been developed to convert vegetable oil such as Jatropha oil into biodiesel. The four main categories are the direct use of vegetable oil, micro-emulsion, thermal cracking and transesterification. Direct use of vegetable oil is not applicable to most of diesel engines as the high viscosity would damage the engine by causing coking and trumpet formation. Biodiesel obtained from micro-emulsion and thermal cracking methods would likely lead to incomplete combustion due to a low cetane number and energy content. Transesterification is the most common method for biodiesel production due to its simplicity, thus this method has been widely used to convert vegetable oil into biodiesel. Generally, vegetable oil or Jatropha oil is consisted of a series of saturated and unsaturated monocarboxylic acids with trihydric alcohol glycerides. Transesterification reaction without using any catalyst requires a high temperature above the critical temperature of alcohol and this is called as supercritical method. In this method, alcohol e.g., methanol is turned into a supercritical fluid state by applying extreme pressure and temperature. The common reaction temperature is more than 250°C, as the critical temperature of methanol is 240°C. In this extreme environment, liquid methanol will reach critical point where both gas and liquid become indistinguishable fluids, in which it would exhibit properties of both liquid and gas.

Fig.1 Biodiesel Experimental Setup, NIET

Biography

A K Tiwari a Researcher in the field of Combined Cycle Power Plant and Exergy Analysis. He is a passionate Researcher in developing the new projects to save the energy which is wasting from a system and able to utilize in production of combined power and refrigeration/air-conditioning with cogeneration. Energy conservation not only increases the efficiency of the plant but also save environment in many ways. Furthermore, his research has spread wings in the direction of Biofuels for existing conventional fuels like Diesel oil. To achieve the target, he is conducting the experiments in his Institute (NIET, India) lab on biodiesel experimental setup. He has published various papers in international/national journals and conferences. Presently, he is working as Professor and Head in Chemical Engineering Department of Noida Institute of Engineering & Technology (NIET) Greater Noida, India. He has built a team of young researchers to apply recent research findings to Bioenergy, Biomass and Biofuels.

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