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Economics of biodiesel production from jatropha oil

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Department of Unconventional Energy Sources and Electricity Engineering, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, AKOLA (M.S.) INDIA Email : samodininevase@ rediffmail.com ■ Abstract : Present research work was undertaken to study economic feasibility of biodiesel production from jatropha oil. The biodiesel was prepared by the process of transesterification of the unfiltered jatropha oil, in presence of three per cent of KOH catalyst. Ethanol was added to oil by 30 per cent volume basis. The reaction temperature was kept at 60 ± 5 °C for 1 h. The developed batch production unit of 5 l capacity at Central Institute of Agricultural Engineering, Bhopal was used for biodiesel production from jatropha oil. The 90.20 per cent of biodiesel recovery was obtained. The economic feasibility of prepared biodiesel was calculated by calculating the various economics of jatropha plantation, jatropha oil extraction, jatropha ethyl ester production. The cost of oil per kg and JEE production cost per litre was found to be Rs. 25.34 and 28.64, respectively.

Key words : Biodiesel, Transesterification, Jatropha oil, Economics

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nergy is the driving force in the development of any country. There exist a strong relationship between economic growth and energy consumption. The socioeconomic indicator drives the pace of economic development of any country. With regard to population, India is the second largest country in the world and has 17 per cent of the world population. The huge population, from 300 million in 1947 to over one billion people today, is putting strain on environment, infrastructure, employment and natural resources (Lodha and Singh, 2006). A programme for the development of energy from raw material, which grows in the rural areas, will go a long way in providing energy security to the rural people (Naik et al., 2004). Even though many options like fuel cell run by hydrogen, electric vehicles etc. are being explored, use of biodiesel as replacement of petro diesel and ethanol in place of petrol are frontline alternatives as they can be used without any modification or change in the existing engines avoiding major additional investment. Recently, biodiesel has been receiving increasing attention due to its less polluting nature and because it is a renewable energy resource as against the conventional diesel, which is a fossil fuel leating to a potential exhaustion. Mostly biodiesel is prepared from oils like soybean, sunflower, safflower, rapeseed groundnut, and mustard etc. these oils are essentially edible in nature. Attempts have been made for producing biodiesel with nonedible oils like karanja and jatropha especially available in

India. Considering the above facts, the present study was undertaken with the following objective to test the economic feasibility of biodiesel from jatropha oil.

Dorado et al. (2006) studied and approach to the economics of to vegetable oil based biofuels in Spain. This study identified that the price of the feedstock was one of the most significant factors. Also, glycerol was found to be a valuable by-product that could reduce the final manufacturing costs of the process up to 6.5 per cent, depending on the raw feedstock used. Biodiesel can only compete with diesel fuel prices. Planning Commission of India (2004) has calculated the cost of biodiesel for jatropha biodiesel considering seed at Rs. 6 per kg. and worked out the cost to be Rs. 20 per lit. (Which is expected at least after 4 years of plantation from then). Dindorkar (2006) studied production and energy balance of biodiesel and its performance in CI engine. Economics were calculated for biodiesel production using small scale domestic PKV Biodiesel processor. The cost of biodiesel was found Rs. 29.31 per lit of biodiesel considering seed cost Rs.5/kg.

METHODOLOGY

Mechanical oil expelling was done for jatropha oil extraction. CIAE, mini oil expeller was used for small-scale oil extraction of jatropha. Ethanol (C_2H_5OH) was selected as alcohol, as ethanol is produced from biomass and less