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# Experimental investigation on dairy scum biodiesel on CI DI Engine Performance and pollutant Characteristics at different injection pressures

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**Abstract - The aim of the present investigation is to extract the biodiesel from dairy scum oil and to evaluate the performance and emission parameters with standard diesel fuel. Dairy scum oil is treated with an adequate measure of CH3OH which required and quantity of sodium hydroxide as a catalyst which is accessible in bio-chemical laboratorics. Transesterification process was adopted to produce biodiesel under an optimized reaction temperature of 60 $^0$C , the reaction time of 85 minutes, the quantity of methanol to oil ratio (1:3), the concentration of sodium hydroxide (0.6% v/v). Experimental investigation were conducted in CI DI engine to check the performance and pollutant characteristics of methyl esters of dairy scum oil by varying the injection pressures as 160 bar, 180 bar, and 200 bar. The essential performance parameters such as specific fuel consumption, BTE and emission parameters such as CO, CO$_2$, HC, NOx are found out and contrasted the results of biodiesel with the regular diesel fuel. The dairy scum biodiesel can be used as an alternative fuel and the properties obtained were within the ASTM standards.**

**Keywords:** ***Biodiesel, Dairy scum oil, Diesel engine , Emission, Performance, Transesterification.***

## I. INTRODUCTION

The trends in global energy consumption surveys depict that a main chunk of overall energy consumed is obtained from combustion of fossil fuels. Predominantly among fossil fuels liquid petroleum-based fuels contribute significantly due to their distinct physico-chemical and combustion properties. But, the major concern here is liquid fuel reserves are limited and may exhaust any time, and their economic utilization is the fact bothering all researchers [1, 2]. Biodiesel is a renewable fuel obtained from anima fat or vegetable oil through a complex chemical process and can be employed as any direct substitute, extender or as an improver to fossil diesel fuel in CI engines [3]. The important factor is that biodiesel fuel could be directly used in existing automobile engines with a minute or no hardware modifications in engine design. These biodiesels are produced through a chemical reaction of animal fat or vegetable oils with methanol/ethanol in the occurrence of a catalytic agent to make glycerol as a main byproduct [4-8]. Biodiesel chemical name is methyl or ethyl ester. Sivakumar et al. [9] used dairy scum oil with an alkali-catalyzed transesterification process to produce biodiesel of waste dairy scum oil by using gas chromatography test and obtained maximum biodiesel yield of 96.7% by using 6:1 molar ratio, KOH of 1.2% wt at a stirring speed of 350 rpm, 30minutes of reaction time and a reaction temperature of 75 $^0$C.The measured physicochemical properties are within the ASTM standards.Banapurmath et al. [10] BTE for methyl esters of pongamia oil, sesame oil jatropha oil, and conventional diesel fuel was 29.51%, 30.4% and 29% and 31.25%.Emissions for HC and CO were more than that of traditional diesel fuel. Canakci et al. [11] by using the methyl esters of canola oil and waste palm oil, the brake power lowered by 4% to 5%, BSFC increased by 9% to 10%. Emissions such as THC 17% to 26% depressed, CO2 reduced by 5% to 8%, smoke opacity reduced by fifty-six to sixty-three percentage, NOx increased by eleven to twenty-two percentage over conventional diesel fuel. Buyukkaya et al. [12] concluded that by using rapeseed biodiesel blends there was a reduction in peak pressure by 55 bar, maximum HRR reduction by 14%, IDT (ignition delay time) found to be a

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