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Performance and emissions of a bio-electricity generating system

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Abstract

The performance and emissions of a 4.5 kW bio-electricity generating system comprising a down-draft gasifier, diesel engine and a generator were studied when fuelled with producer gas-biodiesel (BDPG) and producer gas-high speed diesel (DPG) in dual fuel mode and was compared with those when operated with high speed diesel (HSD) and biodiesel (BD) in single fuel mode. The biodiesel was obtained from Jatropha oil and producer gas was obtained from the gasification of briquettes made from de-oiled Jatropha seed cake. The cost of generating kilowatt hour of bio-electricity was found to be 0.84$ and 0.75$ for BD and HSD in dual fuel mode, respectively as compared to 0.69$ and 0.5$ in single fuel mode of the same fuels with a saving of pilot fuel up to 48%. The system efficiency (SE) and brake thermal efficiency (BTE) of the power generating system increased with increase in system load to a maximum of 30.58 and 33.98%. However, these values were reduced by 25-32% when operated in dual fuel mode as compared to in single fuel mode due to the lower calorific value of producer gas. Significantly lower NO_x and higher CO, CO_2 and HC emissions were obtained under the dual fuel mode of operation for both pilot fuels compared to the single-fuel mode. Over all the developed power generating system can be recommended for remote rural areas where grid supply is not available.

Biography

Hifjur Raheman is a Professor in the Department of Agricultural and Food Engineering, Indian Institute of Technology, Kharagpur. He has published more than 50 papers in reputed international journals and is member of various professional societies of repute. He has two patents to his credit and handled several projects sponsored by CSIR, DST, PCRA and ICAR.