

# Dual Fuel Performance of a Diesel Generator Using Compressed Natural Gas

<b>Project Reference</b>	:	<b>No. DAERS/CASR-211/R-01/2008/DR-56(40) dated 27/7/08</b>
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<b>Project Tenure</b>	:	<b>November 2008 – October 2009</b>
<b>Current Status</b>	:	<b>In Progress</b>

## Background :

Small and medium scale standby generators are widely being used in to cope up with power failures in Bangladesh. Petrol generators are used for low power level, while the mid level is mainly being served by Diesel generators using a range of technologies. The market share of small and medium scale Diesel engines used in Bangladesh is shifting significantly towards standby power generation from conventional use in irrigation. The demand of Diesel fuel in Bangladesh is further increasing, resulting in increased dependency on fuel imports. On the other hand more use of natural gas as an alternative fuel (CNG) in many petrol run vehicles is reducing the demand of petrol, often creating imbalance in crude oil import situation. Dual fuel operation of a diesel engine using natural gas replaces diesel requirements significantly (as high as 80%). This is economically advantageous and improves the level of engine pollution. Line supply of natural gas is often not available at the location of power generation. The use of CNG cylinders as a gas source allows flexibility of transportation and operation but involves extra cost of gas storage and depressurizing hardware. The optimum proportion of natural gas replacement in a 20 kW diesel-generator run in dual-fuel mode, the thermal effect on the engine and comparative cost analysis would be the parameters of prime concern.

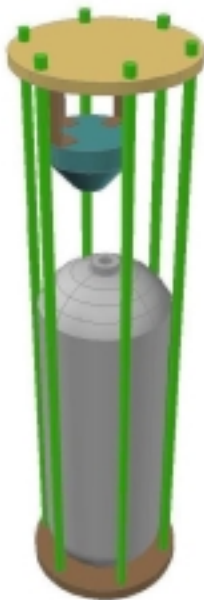
## Objectives :

- To study the performance of a CI engine directly coupled with a generator producing a rated 20 kW electrical load capacity, using diesel fuel. This type of engine-generator set is widely used for low scale standby power generation in Bangladesh.
- Running the same engine-generator set with dual fuels - natural gas and diesel. Natural gas from a CNG cylinder will be used as the main fuel and diesel as pilot fuel.
- To study the performance of the same unit under dual fuel mode. This would quantify the optimum replacement proportion of diesel with natural gas at various loads.
- Compare the performance and costing for operation of the engine-generator unit with diesel and with dual fuels.

- e. The results would give a good comparison between the performance as well as the economic feasibility of dual fuel operation of a diesel engine of this category using CNG.
- f. The results would justify the feasibility of running a small pilot project for providing standby electric power to about 50 shops in Palassey Bazar Dhaka, at lower cost, using dual fuel operation with CNG.

### Experimental Setup:

An experimental test rig is under construction to carry out performance of a single cylinder water cooled diesel engine coupled with an alternator of 20 kW rated electrical output. Instrumentation for measurement of main performance parameters will be installed.



**Low Pressure CNG  
Refilling System**



**20 kW Diesel Genset**

The unit could be switched to run on dual fuel mode, using compressed natural gas available in CNG cylinder as main fuel and diesel as pilot fuel. A low pressure CNG system with an integrated pressure reduction device is being developed. Easily de-touchable low pressure hosing will be used for gas delivery, while standard high pressure dispensing nozzle can be used for refilling CNG. This will allow easy and safe refilling of the system without disturbing the generator-set. Gas fumigation technique will be used to run the unit with minimum possible hardware modifications. A bank of electric heaters will be used to simulate electrical loads. Performance tests will be carried out for the entire range of engine loads running the engine with diesel only and in dual fuel mode. Comparison of the performance results and optimization of the natural gas replacement in dual fuel mode will be carried out. A cost analysis will be made for both the modes of operation in order to investigate the economic feasibility of dual fuel conversion of diesel engines of this category.

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