
 <p>Products for Engines and Gensets</p>	<p><b>Document:</b> Information  <b>Version:</b> V1  <b>Status:</b> Valid  <b>Author:</b> dh    <b>Date:</b>  <b>Approved:</b> xy    <b>Date:</b>  <b>File:</b> pc</p>	<h2>Calculation of Dual Fuel</h2>	 <p>HUEGLI TECH LTD SWITZERLAND  Tel.: +41-62-916 50 30  Fax: +41-62-916 50 35  www.huegli-tech.com</p>
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## Payback Calculation

The basic calculation for the dual fuel is based on engine manufacturers and own experience.

We therefore consider that the engine with the generator in order to operate it self needs approx: 7-10% of the max load electrical to operate it self.

Before calculation, a few values:

*Exothermic value of Diesel:*                      200gr/kWh  
*Exothermic value of Gas:*                         approx 200gr/kWh

*Density of Diesel:*                                    0.85kg/ltr  
*Density of Gas:*                                      0.77kg/m<sup>3</sup>

*Efficiency constant:*                                4.1868

*Exchange to US\$ = 45INR)*

*The ratio of Diesel and Gas will be approx: 30/70*

Following example shall help to understand:

### **Gen Set capacity: 500kW**

Therefore the engine consumption of Diesel Fuel in no load condition is: 10ltr at an average of 8.5% and a density of 0.85 with 200 gr/kWh

This **figure is important** and always has to be implemented in to the calculation.

### **Diesel consumption at 100%:**

$$500kW * 200gr/kWh / 1000 / 0.85kg/m^3 = 117ltr/h$$



### **Gen Set Efficiency:**

$$(500kW * 3600) / (117ltr * 10500kcal/kg * 4.1868) = 34.9\%$$

### **Diesel Consumption at 30% Load:**

$$30\% \text{ Load} = 150kW * 200gr/kWh = 30000gr/kWh / 1000 = 30kg/kWh / 0.85kg/m^3 = 35.29ltr$$

$$\text{Additionally the no load fuel} = 10ltr + 35.29ltr = 45.29ltr$$

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The remaining 70% of the load therefore has to be taken by the gas, which is 350kW, what is the volume?

$$350kW * 200gr/kWh = 70000gr/kWh / 1000 = 70kg/kWh / 0.77kg/m^3 = 90.9m^3/h$$

Assuming this is a Cummins engine and is based in India, the cost of conversion to Dual Fuel will be approx: 12-13000 US\$. The engine is operating at 12 hours a day and 6 days a week.

**Pay back of Investment based on Indian Rupees.**

**Diesel cost at 100% Diesel:**

$$500kW * 200gr/kWh / 1000 / 0.85 * 72hours = 8470lt / Week$$

Cost per litre of Diesel in India: 24INR

$$8224lt * 24INR = 203294INR = \dots\dots\dots US\$ 4517.64.-$$

**Diesel cost at 30% Diesel:**

$$45.29lt * 72 * 24INR = 78261.12INR = \dots\dots\dots US\$ 1739.13.-$$

**Gas Cost at 70% Gas:**

$$90.9m^3 * 72 * 24INR = 52358INR = \dots\dots\dots US\$ 1163.52.-$$

**Difference:**.....US\$ 1614.99.-

**Cost of Investment:**.....US\$ 13'000.-

**Break Evan:**.....8.17 Weeks

**Return of Investment:**.....16 Weeks

**Savings per year:**.....US\$ 83'928.-