

# Dual Fuel System

Dual Fuel Solutions  
for  
Power Generation

## EKTA ENERGY

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# This Presentation



Profiles **EKTA ENERGY**

Introduces **Duel Fueling**

Elaborates **Technology**

Concludes **Value proposition**

Enlists **Next steps**

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# Introduction



- **Ekta Energy** is a green energy startup promoting the use of Natural gas for Internal Combustion Engines.
- **Ekta Energy** has special expertise in the Dual Fuel (Diesel + Gas) Solutions for Power generation and PNG pipeline works

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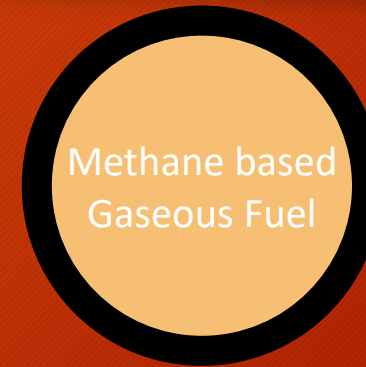


# Dual Fuelling

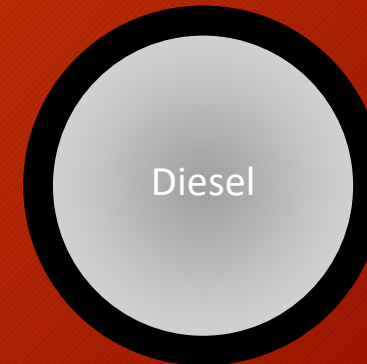


In simple terms Dual Fuel is simultaneous combustion of two fuels; methane based gaseous fuel is utilized in conjunction with diesel fuel to operate the engine.

After conversion, the engine is able to operate on either 100% diesel fuel, or alternately, on a mixture of diesel fuel and methane based fuels. At no time is the engine able to operate on gaseous fuels exclusively.



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During Dual Fuel operation, a reduced quantity of diesel fuel acts as the ignition source for the air-gas mixture. Dual Fuel System replaces diesel fuel with equivalent heat energy of the methane based fuels

Fuel cost savings vary according to the respective cost of each of the fuels. If there is a major cost differential between the cost of diesel fuel and of methane based fuels, for equivalent energy value, significant fuel cost savings would result.

Dual Fuel solutions are available for diesel engines, in constant speed application (equipped with ISOCHRONOUS DIESEL GOVERNOR), of rating 50 KVA upwards



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# System Advantages



No loss of power

Existing assets can be used for generating power economically

Low Capital cost

Low cost of generation by usage of cleaner and cheaper fuel

Rapid paybacks

Few moving components and hence low maintenance cost

Use of cleaner fuel – improves emissions.

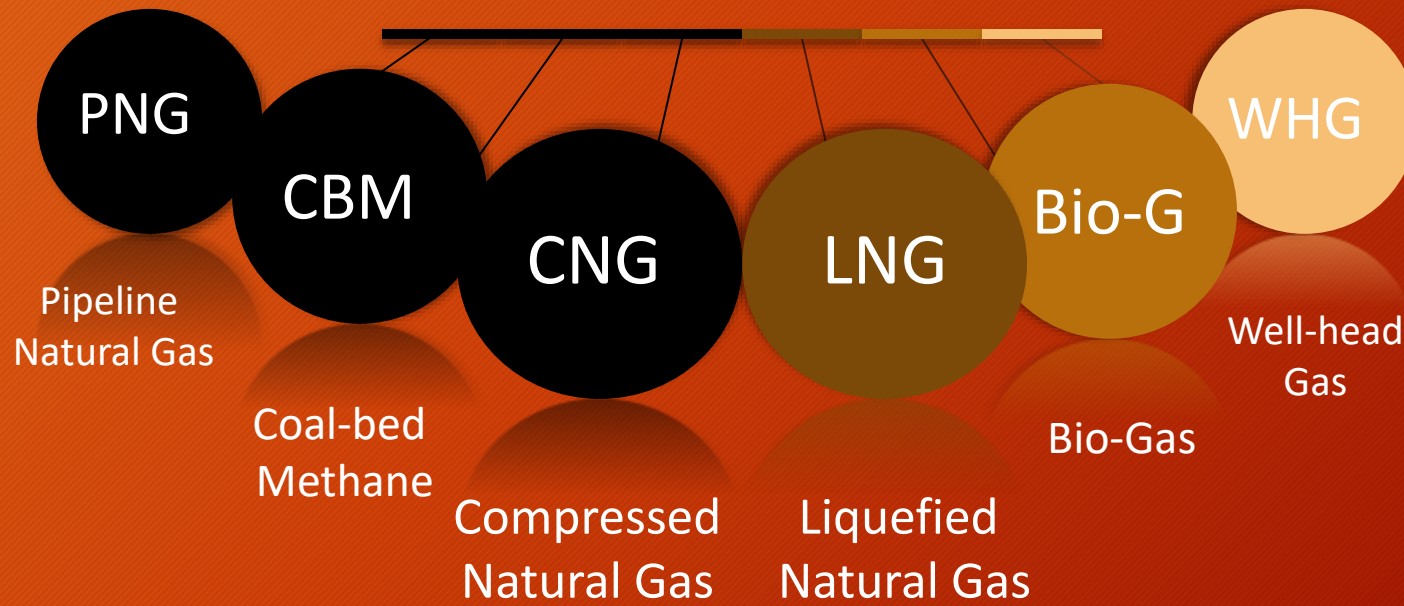
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# Compatible Fuel Gases



## Methane Based fuels



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PNG

CNG

Gas quality and composition are critical factors for Dual Fuel operation. PNG (Piped Natural Gas); CNG (Compressed Natural Gas); LNG (Liquefied natural gas); CBM (Coal Bed Methane) have a high concentration of methane and calorific value close to Diesel; resulting in optimization of substitution. For lower quality gasses substitution rates are lower.

Compatible Fuel Gases

LNG

CBM



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# Compatible Fuel Gases



The Gas quality required is of Fuel Grade. Sufficient filtering means must be installed to ensure particulate and liquid contents are kept to a level approximating fuel grade standards.

It is also important to determine the caustic compounds, if any, present in the fuel which may potentially cause harm to the engine and/or gas components of the System.

The bio-gas fuels derived from landfills, waste treatment facilities, etc., may have high levels of caustic compounds such as sulfur ( $H_2S$ ), which when combined with small amounts of water can form damaging acids. These gasses need to be scrubbed to make them fuel grade.

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# Comparison



## Diesel – GAS – Dual Fuel



- Low CAPEX
- **Only Diesel**
- Fast response
- **Higher Emissions**
- High Power Density

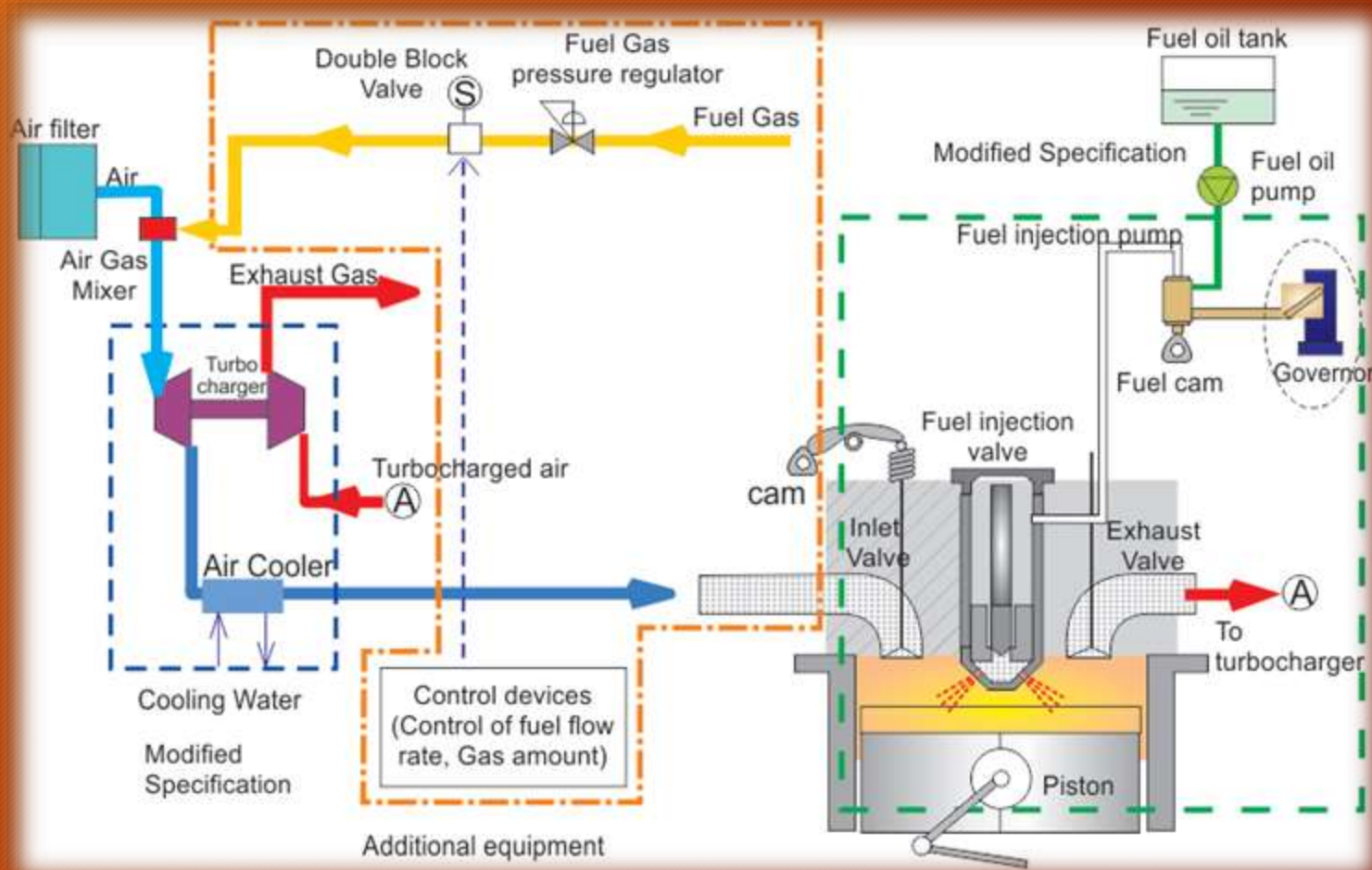
- **High CAPEX**
- Only Gas
- **Operation in Narrow Window**
- Higher O&M costs
- **Lower Power Density**

- Add. CAPEX with fast payback
- **“Fuel flexibility”**
- Diesel like engine response
- **Reduced Emissions**
- Reduced O&M costs
- **Smaller physical “footprint” vis-à-vis output**

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# Duel Fuel Technology





# Dual Fuel Technology



The gas used for Dual Fuelling is sourced from either piped gas or from local storage. It is injected into the combustion air stream via a Gas Train consisting of a gas filter, a gas pressure regulator and a solenoid valve. A throttle valve at the end controls the proportion of the gas injected. The gas train is designed to accept input gas at low pressure and deliver it to the engine at a slightly negative pressure.

Dual Fuel System delivers fuel gas to the combustion cylinders via the Gas Train into a special Air-Gas Mixer. The mixer is installed on the engine air inlet before the Turbo charger. Combustion is commenced by Diesel as the ignition source and followed by ignition of the Gas.

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# Duel Fuel System Components



## Air Gas Mixer (AGM):

- Ensure total mixing of Gas into Air
- Located between the Air Filter and the Turbocharger

### Salient features:

- Regulated ingress of Gas for different loads
- Cost effective and maintenance free, No moving parts.
- Very low pressure drop
- Applicable for wide range of gasses: Natural Gas, Landfill Gas, Bio Gas
- Available in: 50, 100, 140, 200 and 300 mm



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# Duel Fuel System Components



- **GAS TRAIN:** Condition and control the gas supply to the Air Gas Mixer
- - Receives fuel grade gas at a low constant pressure and supplies to the Air Gas Mixer at atmospheric / slightly negative pressure.

The Gas train components are:



Gas Filter



DMV Double Solenoid Valve



Zero Pressure Regulator



Main Adjustment Screw

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# Duel Fuel System Components



Gas Filter

- The filter is designed for installation in interior gas lines and compressed air lines to protect downstream fittings. Filter element is made of random laid non-woven polypropylene fabric and metal support frame with pore width of  $\leq 50 \mu\text{m}$ . Dust, chips and rust as well as other physical gas-accompanying materials and fouling are retained using the random laid non-woven fabric. If the dust storage capacity is exceeded or if there is an excessive pressure difference, the filter loses its protective function.

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# Duel Fuel System Components



DMV Double Solenoid Valve

- It is a two single-stage solenoid valves normally closed, slow opening – to maintain engine stability and fast closing – to safeguard the engine. Opening time setting with fast stroke section at valve 2. Manual limitation of flowing gas volume by main volume setting at valve V1. The valve is supplied 24 volts DC from the Control Panel. The control panel operates the valve within the set engine parameters. The valve is closed instantly if any of the control or safety parameters is breached. The Solenoid valve is suitable for gases of families 1, 2, 3 and other neutral gaseous media. Does not contain any non-ferrous metals, suitable for gases of up to max. 0.1 vol. % H<sub>2</sub>S, dry.

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# Duel Fuel System Components



Zero Pressure Regulator

- The regulator operates according to the differential pressure between the inlet and outlet ports in order to maintain the set delivery pressure. It detects changes in engine vacuum, as engine load increases or decreases and adjusts gas flow rate in order to maintain the set outlet pressure. The regulator supplies gas to the engine at approximately atmospheric pressure. The Zero pressure regulator is suitable for gases of families 1, 2, 3 and other neutral gaseous media. Does not contain any non-ferrous metals, suitable for gases of up to max. 0.1 vol.% H<sub>2</sub>S, dry.

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# Duel Fuel System Components



Main Adjustment Screw

- The Screw valve is utilized to optimize the gas flow while commissioning.

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# Dual Fuel Control System



- The system is supplied with appropriate Transducers; Sensors; Thermocouples and wiring harness.
- The Dual fuel operations are enabled in closed loop environment to ensure engine safety. The Control panel is programmable to set operating limits for the safety - Exhaust Gas Temperature; Engine Vibration and control parameter - Manifold Air Pressure. It continuously monitors these to operate the engine in controlled environment, while in the Dual fuel mode. The Panel opens the solenoid valve when all the parameters are within the set limits and closes it when they are not.
- The additional programmable and monitored safety parameters are Air Filter restriction; Gas Supply pressure; Manifold Air Temperature and Regulator Output Pressure. The level of control and monitoring varies with engine size and Methane based fuel being used; the panel is suitably sized for these applications.

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# Dual Fuel – FAQ's

## Engine Durability:

Because natural gas burns with virtually no large particulate residues (unlike diesel which produces carbon particles during combustion), cylinder liner and ring wear are reduced and lubricating oil is kept cleaner during dual fuel operation. This leads to longer average intervals between engine overhauls. In addition, the clean burn characteristics of natural gas decrease engine wet-stacking at lighter loads and prevent the build-up heavy carbon deposits in the combustion chamber and exhaust system.

## Engine Emissions:

Dual fuel operation will typically reduce production of nitrogen oxides, Sulphur oxides, reactive hydrocarbons, Carbon dioxide and particulates. The exhaust opacity levels are reduced.

## Engine Operating Temperatures:

Engine heat rejection rates while operating in dual fuel mode are largely similar to 100% diesel performance. The engine exhaust gas temperature, coolant temperature, oil temperature and intake air temperature levels remain within the limits set by the engine manufacturer.



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# Photo Gallery



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# Installation



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Thank You