



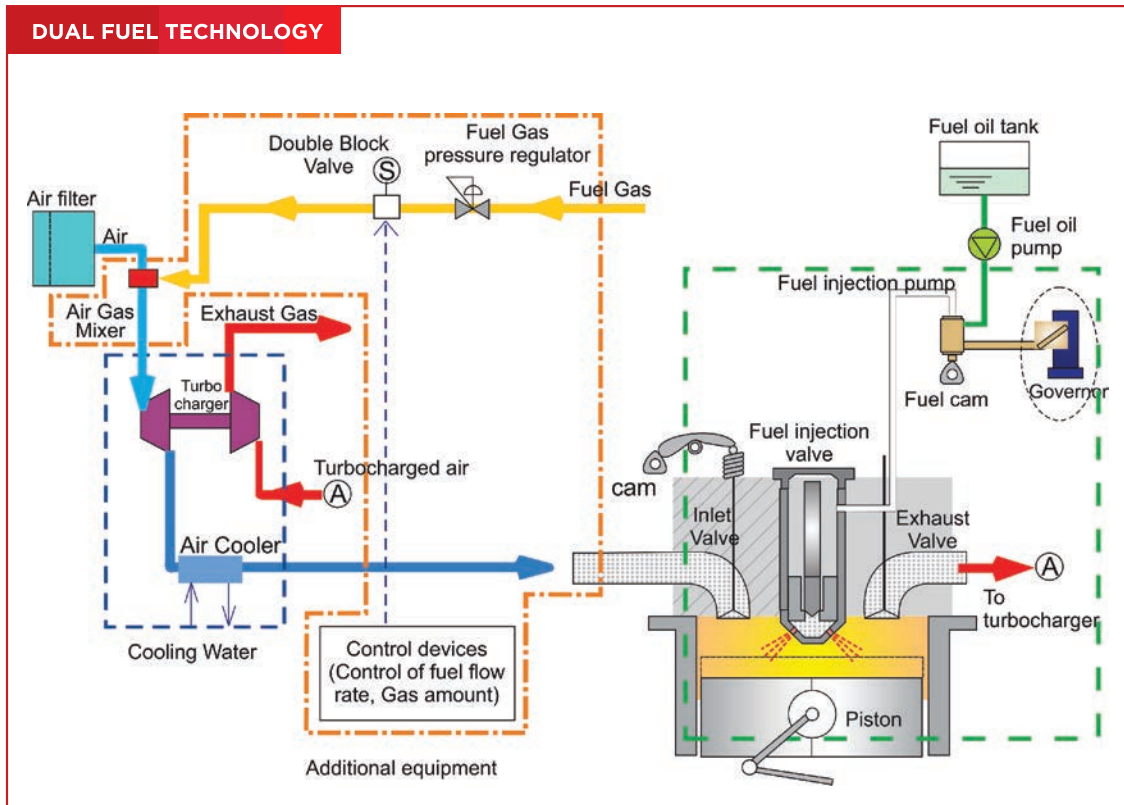
Dual Fuel Solutions for Diesel Engines



WHAT IS DUAL FUELING?

Dual Fueling is simultaneous combustion of two fuels. Cummins Dual Fuel solutions comprise of special kits that can be retrofitted on existing high speed diesel engines to allow use of a mixture of Methane rich gas (most often Natural gas) with Diesel as fuel. After conversion, the engine can continue to operate with only Diesel also. However, a 'Gas only' operation is not possible.

During Dual Fuel operation, a reduced quantity of diesel fuel acts as the ignition source for the air-gas mixture. The Methane rich gas mix replaces significant proportion of Diesel to produce equivalent heat energy during combustion in the cylinder. The emissions from such engines see an order of improvement. In the current market conditions this also means significant reduction in cost.



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.

DUAL FUEL CONTROLLER

A state-of-the-art electronic controller continuously monitors critical engine parameters through the operation and transitions seamlessly from 'Dual fuel' to 'diesel only' mode if they cross the preset limits. It provides complete safety to the engine while operating in the Dual-fuel mode.

Engines converted to Dual-fuel functionality exhibit diesel-like performance in critical areas such as efficiency, stability and load acceptance.

COMPATIBLE FUEL GASES

- PNG-Pipeline Natural Gas
- CNG-Compressed Natural Gas
- LNG-Liquefied Natural Gas
- CBM-Coal-Bed Methane
- Well-Head gas
- Bio-gas (landfill, wastewater)

SYSTEM ADVANTAGES

- No loss of power
- Existing assets can be used
- Low Capital cost
- Rapid payback
- Reduced cost of generation
- Low or no maintenance cost
- Cleaner fuel improves emissions
- Improved engine condition monitoring

SYSTEM CHARACTERISTICS

- Non engine intrusive simple construction
- Available for different sizes of high speed engines
- Simple and easy to operate
- Safe engine operation
- Exhaust Temperature and Engine Knock monitoring
- Few moving components
- Fuel Flexibility
- Seamless switching between operational modes

CONTROL SCHEME



CONTROLLER



SENSORS & ACCESSORIES



Thermocouple, Pressure Transmitter VIB Sensor, Wiring Harness

Cummins has the entire range from
62.5 kVA - 3000 kVA in Dual Fuel Kit portfolio.

COMPARISON

Diesel Engine



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

Dual Fuel Engine



- Quick Payback
- Fuel Flexibility
- Diesel like response
- Reduced Emissions
- Small Footprint

Gas Engine



- High CAPEX
- Only Gas
- Inflexible Loading
- Large Footprint
- Higher O&M costs



Towards a Greener Planet

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