

**EVERY  
ALTERNATIVE.**

## **Technical Bulletin 15.11.2009:**

### ***Subject: Natural Gas Fuel System-CNG***

Compressed Natural Gas (CNG) is natural gas that has been compressed at a fueling facility to 2500 psi (pounds per square inch) or more. Gas can originate from a pipeline supply or a storage facility. CNG is typically odorized and a methane detection system is recommended or may be required by law.

The basic function of the vehicle fuel system is to store gaseous fuel and deliver it to the engine inlet connection within Cummins specifications for quality, temperature and pressure under all operating conditions. All vehicle fuel systems must be designed and comply to the requirements of various regulatory agencies and no Cummins requirement should be interpreted to contradict or override these requirements.

Fuel pressure delivered at the engine inlet may vary with engine load conditions, tank pressure conditions, and fuel flow rates. However, fuel pressure at the inlet must be stable within +/- 10 psi in response to transient engine operating conditions, and it should always be within the minimum and maximum values indicated on the engine datasheet. For example, the ISL G inlet fuel pressure at rated conditions is minimum 70 psi, and maximum 150 psi.

The CNG system must be capable of maintaining acceptable engine inlet fuel pressure at maximum power conditions as the tank pressure varies from the maximum fill pressure down to 10% of the maximum rated tank fill pressure.

Vehicle fuel tank designs vary widely and all tank installations should follow the tank manufacturer's recommendations for mounting, protection and inspection requirements. The fuel system supplier should provide technical and installation recommendations for the intended application that meet the specific recommendations of both the OEM (original equipment manufacturer), vehicle manufacturer, and Cummins.

### **Fill Connections and Plumbing**

The vehicle fill connection may be any one of a number of standard fittings specifically designed for this service. A tank pressure gauge is normally provided for the fuel station operator to indicate the "fill" condition. Fitting and line sizes between the tanks and the fill connector must carry the flow rate of the fueling station with a minimal pressure drop to avoid heating the fuel during fill. Flow capacity of fast fill stations will exceed engine flow requirements and require larger plumbing. Recommendations of the fueling station supplier should be followed.

A manual, quarter-turn shutoff valve that is clearly marked is required for positive shutoff of the fuel supply to the engine and low pressure fuel filter for service and emergency use.

### **Electric Shutoff Valves**

The OEM should install a high pressure electric solenoid valve to create a redundant gas shutoff in case of system leaks or damage. The shutoff should be as close to the storage tanks as possible to minimize the amount of plumbing that remains pressurized when it is closed. This OEM solenoid valve should be of normally closed design and energize only when the ignition key is in the ON position. Additional switches may be used to control this valve such as oil pressure,



methane gas detectors, etc. Care should be taken to allow this valve to open during cranking and initial startup, or to warn the operator of a condition that is preventing fuel flow.

### **High Pressure Filter**

This filter acts to prevent fuel contamination from damaging the high pressure regulator. Some systems may place another filter between the tank and fill connection if fill flow rates can be accommodated. The fuel system from the outlet of the high pressure regulator to the engine inlet connection must have a maximum flow restriction of 25 psi with a clean filter, when measured at peak power conditions on the engine datasheet. Provisions should be made to ensure that the pressure source can be shut off and relieved for the service of all filter elements.

### **High Pressure Regulator**

This regulator reduces vehicle fuel system tank pressure to required engine pressure levels. Cummins recommends regulator settings to be at 90 to 120 psi. These regulators usually require warm coolant to prevent the freezing of the regulator as the gas expands to lower pressure.

### **Low Fuel Pressure Lamp**

Cummins requires that the vehicle OEM provide a low fuel pressure indicator lamp in the dash. This lamp is controlled by the engine ECM (electronic control module). It is illuminated when the fuel inlet pressure to the engine is critically low. **Many low power complaints can be attributed to low fuel pressure.**

### **Low Pressure Fuel Filter**

Cummins provides a low-pressure fuel filter for use with all engine installations. The filter acts to prevent fuel contamination from damaging the engine fuel system components. Provisions should be made to ensure that the pressure can be shut off and relieved for service of the filter element. The filter must be accessible to allow daily maintenance which involves the draining of the filter. The filter should not be placed to drain on electrical components.

### **Engine Fuel System**

Cummins engines have an electronic fuel system that delivers fuel based on demand to provide precise fuel mixture and speed control. There is an engine-mounted electric shutoff valve in this fuel system to provide quick fuel shutoff if certain engine protection parameters are exceeded, such as overspeed and stopped engine (no speed detected). This valve is controlled by the engine electronic control module.

For further information on CNG fuel systems see Cummins AEB 21.25

Cummins Westport manufactures and sells the world's widest range of low-emissions alternative fuel engines for commercial transportation applications and has over 20,000 alternative fuel engines in service around the world.

For further information contact a Cummins Westport representative, or visit [www.cumminswestport.com](http://www.cumminswestport.com)

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