



Liquefied Natural Gas (LNG)
as a
Motor Fuel
for Class 8
Tractor / Trailers

The Technology

- Currently there is only one manufacturer (Westport) that makes a 15 liter engine suitable for a large tractor / trailer.
- It is designated by Westport as the GX engine.
- The backbone of the Westport GX LNG engine is a Cummins ISX diesel engine.
- The original diesel injectors are removed and replaced with an injector that is capable of injecting 2 fuels; natural gas and diesel fuel.

The Technology

- LNG tank(s), cryogenic vessel(s) much like a thermos bottle are installed on the chassis to store the natural gas in liquid form.
- From a combustion process perspective, the injector first injects a small amount of diesel fuel into the combustion chamber.
- A diesel combustion event occurs which ignites natural gas, also injected into the combustion chamber.

The Technology

- This differs from other natural gas powered engines that would use a spark plug for ignition purposes and necessitates the installation of a small diesel fuel tank to facilitate the combustion process.
- This 2 fuel injector is the basis of the Westport LNG technology.
- Although called an LNG engine, in reality this is a CNG (compressed natural gas) engine. LNG will not burn and because of that, vaporization of the LNG must occur. LNG then, really refers to how the fuel is stored on the vehicle.

Exhaust Emissions

- From the perspective of the EPA (which mandates the emissions of Particulate Matter and NOX), emissions of a 2010 EPA compliant diesel engine are equal to that of an LNG engine.
- In fact, current 2010 LNG technology uses the same diesel particulate trap and an SCR emission system as a diesel engine to meet the 2010 emissions regulations.
- However, the CO₂ output is less (the natural gas molecule is very simple, with only 1 carbon atom per molecule compared to a diesel fuel molecule which can have up to 20 carbon atoms per molecule) giving the LNG engine a smaller carbon footprint.

Why Consider LNG?

1.) Fuel Cost

- All in fuel cost of LNG compared to Diesel is 35 – 40% less.

2.) Lower Carbon Footprint

- EPA mandated emissions are the same as a diesel engine engine but the CO₂ output is less giving it a smaller carbon footprint.

3.) Grants

- Some jurisdictions / utilities offer grants or programs to offset the cost of re-fueling equipment and /or the up-charge for the LNG option.

Regulatory Challenges

- Regulations are many, complex and differ significantly by jurisdiction.
- Regulations within the same state or province can vary.
- Regulatory bodies include Federal, State, right down to individual county/city groups.
- These regulations apply to the tractor facilities repairing the tractor, technicians repairing the tractor, repair managers of repair facilities and the vehicle refueling station.
- A full awareness of the relevant regulations will prevent unpleasant surprises.

Training

1.) Drivers

- Must be trained to gain an understanding of the use of LNG as a motor fuel as well as how to refuel tractors.

2.) Dispatchers

- Need to have some level of understanding of LNG so that they can understand the operational differences of LNG powered tractors.

3.) Repair Staff

- All must have the requisite amount of training so that they can diagnose and repair LNG powered tractors

Technical Support

- Repair support
- Parts Support
- Breakdown Support

- All support activities need to be in place before you launch your first vehicle. This is not the place to “learn on the fly”

LNG Anomalies

1.) Evaporative Loss of Fuel

- Over a period of a week to 10 days, a full LNG tank will become empty because, over time, the liquid natural gas absorbs heat and vaporizes to the atmosphere.

2.) Battery Drain

- The methane detection system is powered continuously, even when parked. Because of that, truck batteries will completely discharge in 3 to 4 days unless a supplementary charging system is used.

3.) Reliability

- The technology behind the LNG is very complex and with complexity comes the potential for problems.

4.) Leak Detection

- Because LNG as a motor fuel is not odorized, methane detectors are installed under the hood and in the cab to monitor the system for leaks.

The End