

Natural gas engines hit the roads of North America

By David Demers

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The International Energy Agency (IEA) expects that natural gas use in road and marine transportation will increase – a trend driven by abundant supplies and global concerns about oil dependency, climate change and air pollution. North America is witnessing this shifting dynamic in road transportation, with a growing number of trucking fleets now using natural gas to fuel light, medium and heavy-duty trucks.

This revolution stems from the growing abundance of relatively cheap natural gas, thanks to the exploitation of North American shale formations. The pace of the revolution is driven by the likelihood of a sustained and stable price differential with diesel, which at the time of writing was at an average price of US \$3.92 compared to US \$2.09 for compressed natural gas (CNG) and US \$2.76 for liquefied natural gas (LNG), for the equivalent amount of energy.

Westport, a Canadian company based in Vancouver, is at the heart of this change. Last year, Westport and our joint venture with US-based Cummins – Cummins Westport (CWI) – shipped over 3,500 units specifically to go into medium and heavy-duty Class 8 trucks in Canada and the US. This represents a market penetration of around 1.7 per cent of the overall Class 8 truck market in North America. We predict our share of this Class 8 truck market share will rise to approximately 3-5 per cent in 2014, almost triple the number of natural gas trucks on the road in 2013.

The engine that has caught the attention of many

transportation fleets is the Cummins Westport ISX12 G. We only began production of this 400HP engine in August 2013, but fleet operators such as UPS, FedEx and Seaboard have already adopted this revolutionary product, which is the only dedicated natural gas option currently available for Class 8 trucks. Westport and both of its joint ventures, China-based Weichai Westport and CWI, are experiencing growing demand for natural gas engines and fuel systems, and to date we have sold more than 120,000 natural gas engines.

In urban markets, our joint venture with Cummins, CWI, increased shipments by 52 per cent from 2012 to 2013. Over the same period volumes in the international market also increased by 38 per cent, as a result of large deliveries for fleets in China, South America and Russia.

Westport's first generation high pressure direct injection technology (Westport™ HPDI) created a viable market for natural gas engines, and demonstrated that when fueled with liquefied natural gas (LNG), heavy duty engines can offer equivalent performance to their diesel counterparts. Westport is now working with seven original equipment manufacturers with engine sizes ranging from trucks to trains at various stages of development on Westport™ HPDI 2.0, the next generation evolution of high pressure direct injection.

As the potential for natural gas is now evident in both on-road and off-road market segments, HPDI 2.0 will allow original equipment manufacturers to introduce high performance, fully integrated products that match state-of-the-art diesel performance. It signals a new

stage of commercialising natural gas engine production. For it enables reduced costs, higher volumes and better efficiency by leveraging economies of scale. A recently announced injector production agreement with Delphi Automotive, a leading global supplier of car and truck technologies, solidifies a key partnership to enable large scale production of medium and heavy duty engines.

Today, a diverse range of companies across Canada and the US are using either first generation Westport HPDI or spark-ignited engines from CWI, to carry a variety goods in vastly different climates and geographies. This can range from hauling hay and grass across the southern states of the US in temperatures up to 46°C, running a transit

With Westport technology, Fords run on compressed natural gas (CNG)





bus on Vancouver Island, or an Alaskan heavy duty truck fleet transporting LNG in winter climates as cold as -46°C.

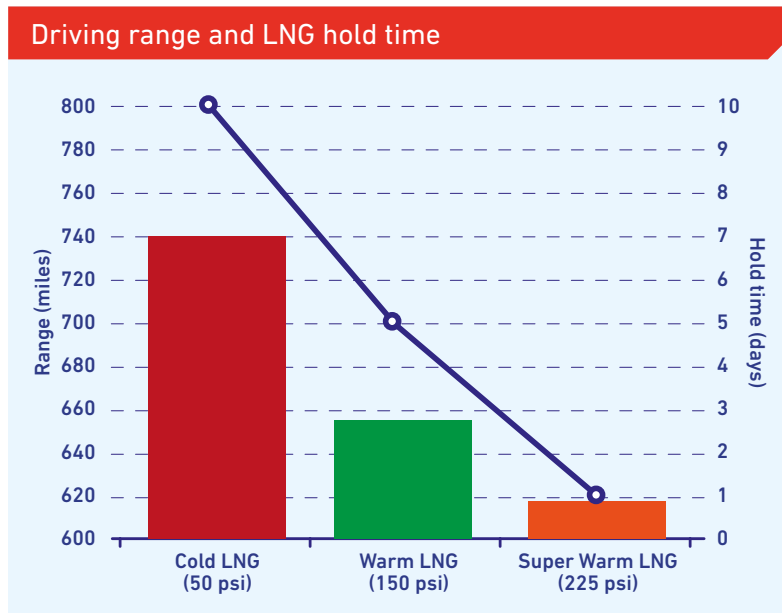
To meet the fuel demand produced by the growing number of new on-road natural gas vehicles, fuel providers are investing along a number of high traffic trucking routes. Shell has invested in LNG transport corridors in North America through small-scale liquefaction units. Other companies like Blu and Clean Energy are investing in stations, with 91 LNG on-road fuelling stations, and another 67 stations are planned. Westport has co-marketing agreements with Clean Energy, ENN and Shell.

LNG stations are being built in strategically positioned locations, particularly along major trucking corridors and the interstate highway system to enable the movement of freight across the US, as well as in major metropolitan areas. Permanent or mobile LNG stations, like the Westport JumpStart, are also being offered near natural resource extraction sites, such as natural gas fields, to supply fuel to local heavy-duty trucking fleets operations.

As LNG infrastructure develops, Westport believes heavy haul fleets will transition to cold LNG, thanks to its storage and range advantages compared to both warm LNG and CNG. The Westport iCE PACK™ LNG tank system, released in 2013, is designed to enable the growing number of fleets driving with the Cummins Westport ISX12 G to fill up with cold LNG and take advantage of its unique benefits. Cold LNG is stored at low pressure, 50 psi, and as a result it offers increased driving range, since it contains significantly more energy than warm or super-warm LNG. In addition, cold LNG is capable of being stored for five or six days longer than saturated LNG.

Westport technology is also available in the North American and European automotive markets. In the US and Canada, Westport is Ford Motor Company's largest qualified vehicle modifier. The Westport WiNG™ Power System is available on a range of Ford vehicles, from the dedicated CNG 3.7L V6 engine Ford F-150 to the bi-fuel 6.2L V8 engine Ford F-350.

Westport's bi-fuel system enables a truck to



run on CNG first, then once empty, it switches to gasoline, alleviating anxiety about lack of range and infrastructure. On average, CNG costs about US\$1.80 less than gasoline on a per gasoline gallon equivalent basis in North America and as a result an increasing number of fleets are purchasing natural gas vehicles to achieve significant operating cost savings. For instance, Dana Storey, fleet manager for the American Automobile Association in Oklahoma, calculates that the automotive club in her state is saving close to US\$400,000 annually on fuel, thanks to its fleet of 30 Westport-powered Fords.

Internationally, through our companies OMVL and EMER, Westport is the source for key components in the global light duty vehicle market, products sold and supported in more than 40 countries. All products are designed to meet Euro IV emissions standards.

In Russia, host of the 21st World Petroleum Congress, Westport and the GAZ group, leader in the Russian commercial vehicle market, are working together to design and develop spark ignited natural gas systems for GAZ's CNG buses, trucks, and commercial vehicles. Westport's new WP580 EMS will be applied to GAZ's YaMZ-530 4.4L and 6.6L diesel engines and will incorporate Westport proprietary components and technology. The first product is on track for commercial manufacture this year. ■