The global leader in natural gas engines.

Powering transportation.

Driving change.

Westport LNG Tank Initiative
Introduction to Westport LNG Tank System

Westport Announces Advanced LNG Tank System for Natural Gas Trucks

New System Improves Performance, Extends Range and Reduces Costs, Begins Shipping by mid-2013

VANCOUVER, Nov. 26, 2012 /CNW/ - Westport Innovations Inc. (TSX: WPT) (NASDAQ: WPRT), the global leader in natural gas engines, today announced a unique on-board storage solution that provides best in class performance for vehicles using liquefied natural gas (LNG). The new Westport™ LNG Tank System, will be available in 120 and 150 gallon capacities, is optimized for spark ignited (SI) engines and begins shipping by mid-2013. The Westport LNG Tank System features proprietary Westport technology and is expected to provide customers with the ability to fuel even the largest SI engines on a single tank and deliver extended range.

Key characteristics of the new Westport LNG Tank System:

- Current industry standard systems require two LNG tanks to operate effectively with larger SI engines and require warm (saturated) LNG. The Westport LNG Tank System is optimized for trucks running even the largest SI engines, reducing the overall fuel system costs and weight dramatically with the single-tank option.
- The 120 gallon or 150 gallon single-tank systems can run for approximately 350 to 450 miles, respectively, on cold (unsaturated) LNG fuel. Those ranges double for dual-tank configurations.
- Fuel-flexibility with the ability to carry both cold and warm LNG.
- By carrying fuel as cold LNG, the Westport LNG Tank System can increase fuel storage times and improve vehicle range by up to 10 percent.
- Universal system design allows for any original equipment manufacturer (OEM) to integrate.
- Compared to existing compressed natural gas (CNG) options, a single 150 gallon Westport LNG Tank System takes the place of three standard CNG tanks, lowering fuel storage costs and reducing overall vehicle weight by approximately 600 lbs. Additionally, LNG has shorter refuelling times compared to CNG.
- Customers receive a two year / 250,000 mile warranty along with access to field service from Westport-trained personnel.
- Westport Active System Management features proprietary control algorithms and connects with standard engine controllers to allow fuel delivery to match driving patterns.
- An advanced driver display that indicates not only the LNG fuel levels, but also status and diagnostic information about the tank and integrated pumps.
The Landscape is Changing

- **Launch of the CWI ISX12G** engine moves SI engines into regional haul truck segment where range, weight and fuel storage increase in importance – **LNG more suitable**
  - Customer vehicle choice expanding

- **Infrastructure Roll out**: Supporting both “warm and cold” LNG adds cost and complexity as fuel companies build stations

- **Technology** that can accommodate both fuels will accelerate LNG adoption
Natural Gas Moving into Trucking in Meaningful Way

- 2012
  - Significant build out of LNG infrastructure
- 2013
  - CWI launching ISX12 G with most OEMs
- 2014
  - Volvo launching 13L HPDI product (LNG)
- Westport expects greater adoption of LNG (vs CNG) in trucking:

<table>
<thead>
<tr>
<th>Trucking Applications</th>
<th>LNG</th>
<th>CNG</th>
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</thead>
<tbody>
<tr>
<td>Fuel System Cost</td>
<td>☑</td>
<td>higher</td>
</tr>
<tr>
<td>Weight</td>
<td>☑</td>
<td>+650 lbs</td>
</tr>
<tr>
<td>Refuelling Times</td>
<td>☑</td>
<td>~3 x longer</td>
</tr>
</tbody>
</table>
In the Past - Technology drove LNG Type

- Customer’s technology decision drove LNG requirements
  - warm (saturated) vs cold
- Fuel provider challenged to supply both in a cost effective manner
Background - Today’s LNG Challenge

- Tanks used with Westport HD15 and Volvo HPDI engines better suited for cold (blue) LNG
  - extended range & hold times

- Until now, all tanks used with CWI spark ignited (SI) engines have required warm (saturated or green) LNG
  - lesser range & hold times

- Traditional LNG tank systems susceptible to pressure decay with the larger displacement SI engines
  - Insufficient fuel pressure will derate or shut down engine
**Reminder: LNG Lifecycle**

- LNG at the plant is stored at <1 psi, -280°F
- Current LNG solution for SI engines warms the LNG from delivery temperature/pressure to ~ 125psi

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**Diagram:**
- **LNG Plant:** LNG starts very cold.
- **Transport:** LNG remains cold.
- **LNG Station:** LNG warms b by saturation process.
- **Dispensed to Vehicle:** LNG is dispensed at higher pressure and temperature.

**Graph:**
- PSI on the y-axis.
- Degrees F on the x-axis.
- **Cold** and **Warm** lines showing the temperature change from LNG plant to dispensed to vehicle.
Fleets Can Benefit from Cold LNG

**Range Advantage**

- Cold LNG
- Warm LNG

**Hold Time Advantage**

- Cold LNG: 6 days
- Warm LNG: 9.5 days

**Relief Pressure**

- 230 psi

**Tank Capacity**

- 120 gal LNG

**Hold Time**

- **90% full**

Source: Westport Fact Sheet
Standardizing on Cold LNG

- Single LNG type allows fleet to purchase right engine for the right application
- Standardize industry on **COLD LNG** simplifies fuel decision for end users
- Common LNG tank simplifies serviceability (spare parts & training)
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System Overview
New Westport LNG Tank System

**Highlights**

- Same LNG tank & pump as used with Westport 15L & Volvo 13L systems
- Electrically powered hydraulic pack mounted on rail near LNG tank

*Hyperlink to detailed technical specification*
Westport LNG System on Truck
Westport LNG System

- 120 gal LNG tank
- Diameter: 26”
- Length: 85”
- Can flow tank vapor to engine at idle

- P20 LNG Pump
- Vaporizer in tank shroud
- Retains all features of Westport tanks
Westport LNG System

- Hydraulic Pack
- Weight: ~125 lbs (dry)
- Can utilize DEF tank mounting brackets

- Integrated Gas Module (IGM)
- Pressure sensor
- Temperature sensor
- Pressure Relief Valve
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System Attributes
Eliminates Venting - Provides Fuel Flexibility

- Plumbing allows tank vapor pressure to flow directly to engine when:
  - Tank pressure is higher than predefined set point
  - Low flow operation, i.e. idle, bobtail

- Maximizes system efficiency - *pumps only run when needed*

- System capable of handling warm or cold LNG

* Unique to Westport technology / patents
Refuelling Advantages

- Single hose connection
- Tank pressure drops during operation and therefore no need to equalize (vent back) with station pressure
- No fuel loss back to station
- Faster fill times
Single vs Dual Tank: Range

- WPT ranges – Cold LNG
- Tradition ranges – Warm LNG
Driver Display

- LNG system information, diagnostics & messages relayed through driver display
- Example of Display and Messages
  - Fuel Level
  - Enhanced Diagnostics
  - Faults (active / inactive)
- Compatible with multiple engine and truck platforms
Service & Warranty

- Dealer/Fleet technician training programs available
- Westport online warranty system servicing 48 dealers today
- 9 dedicated Westport field service technicians in NA
- Spare parts warehouses in both US and Canada

Base Warranty: 2 year / 250,000 miles
Summary

- Fleets benefits from system attributes:
  - Extended range and hold times with cold LNG
  - Minimized venting
  - Single tank option provides reduced weight and cost
  - Fuel flexibility allows for use with cold and warm LNG

- Benefits of standardized tanks:
  - Minimize inventory and service complexity

- Fuel flexibility provides more second use opportunities
  - Higher residual value

- LNG station design, construction and operation simplified and more cost effective