



**1 year  
&  
1,000,000  
LNG miles later..**

**Bison Transport  
shares their  
experience  
with Liquefied  
Natural Gas.**

**It wasn't long ago** that Bison Transport first considered testing Liquefied Natural Gas (LNG) powered tractors as part of a pilot project with Shell Canada. Once the fuel supply deal was signed, Bison placed an order for 15 Peterbilt tractors featuring Westport HD natural gas engines. Those tractors were commissioned in January 2013, and have now surpassed the 1 million mile marker.

The use of LNG as a replacement for diesel is thought to be a game changer in the trucking industry. Not only is LNG cheaper than diesel, it emits fewer greenhouse gas (GHG) emissions and most importantly, it is readily available in Canada. It is widely believed that there is a 100+ year supply that could sustain our industry into the foreseeable future.

Bison expected some challenges testing with this new technology but the business case for LNG had too much potential to not pursue this alternative fuel source.

Bison Transport is proud to be one of only a few Canadian Transportation companies testing LNG and exploring the potential conversion from diesel to LNG. Bison is constantly searching for new ways to move freight more efficiently and to reduce costs for their customers.

### **Exploring LNG:**

LNG is simply natural gas converted into a liquid by cooling it to -160 degrees Celsius. This process allows more energy to be stored in a smaller volume by a factor of 600, similar to reducing the volume of a beach ball to the volume of a ping-pong ball. Also, using LNG to fuel vehicles reduces GHG emissions by 10%.

Bison Transport runs the largest Long Combination Vehicle (LCV) fleet in North America. LCV's consist of one tractor pulling two trailers. Compared to running two single tractors, LCV's reduce the amount of fuel consumed by 482 liters and the amount of GHG's emitted into the atmosphere by 1311 kilograms for every 1000 miles travelled. As a result, the business case is quite compelling when you combine the economic and environmental benefits of LNG tractors operating within Bison's LCV network.

### **What is LNG?**

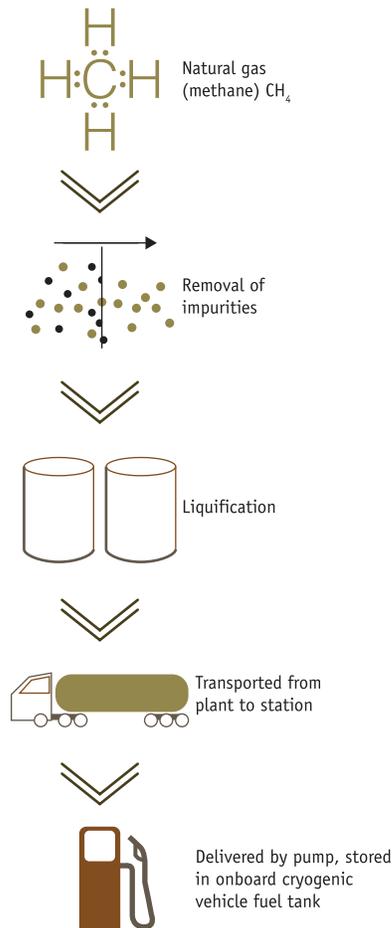
LNG stands for Liquefied Natural Gas. It is natural gas cooled to approximately -160 degrees Celsius at normal air pressure. It is odorless, non-toxic, non-corrosive and less dense than water. Essentially, it is the same as the natural gas more than half of Canadians use to heat and cool their homes, only in a liquid state so it is more easily transported than natural gas.

Produced at liquefaction facilities, it must be stored at -160 degrees Celsius to maintain its liquid form. It is converted to gas form when it is burned in the engine. In order to keep the LNG cold, LNG is stored on-board vehicles in thermally insulated storage tanks. When the engine in a Natural Gas Vehicle (NGV) is started, the LNG is heated, converting it back to a gas.

LNG is currently used across the residential, commercial and industrial sectors for purposes as diverse as heating and cooling homes, cooking, generating electricity and manufacturing paper, metal, and glass, among many others. LNG is increasingly being used to fuel heavy-duty vehicles and reduces greenhouse gas emissions by 10 percent versus conventional liquid fuels.

**The use of LNG as a replacement for diesel is thought to be a game changer in the trucking industry.**

## LNG from wellhead to fuel tank



## Challenges

There are a few challenges that Bison and the industry as a whole have to overcome before the true potential of LNG can be realized.

### Cost to Convert

Liquefaction plants are expensive as are the tractors capable of holding and burning LNG. Since Bison normally runs tractors in its LCV fleet for just five years, a quick payback is needed. At this point, return on investment is going to take longer than originally expected mainly due to low fuel economy and high maintenance costs.

Unlike other provinces, Alberta has not provided provincial funding programs to help stimulate the adoption of LNG as an alternative fuel source. That aside, Bison's investment in testing LNG has provided invaluable experience and insight that most carriers do not possess.

### Fuel Economy

Bison entered the project expecting a fuel economy degradation of about 10% when moving from diesel to LNG. Today Bison is tracking around 5 mpg on the LNG tractors and around 6.8 mpg on comparable diesel tractors, a difference of 17-18%.

Bison has yet to reach the mile range that had been predicted. This affects the lanes that Bison is able to run, although the goal of running LNG's on core lanes from Calgary to Edmonton was achieved. Bison is hopeful fuel economy can be improved as more experience with LNG technology is gained. It is expected that subsequent generations of LNG technology will be able to overcome these initial challenges.

### Maintenance Costs

The maintenance costs of the LNG tractors have been about double compared to diesel tractors, but work is being done to reduce these costs. Equipment reliability issues have been appropriately dealt with by the equipment suppliers, and appear to be moderating as more miles are generated.

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**There currently is a 75% premium to convert diesel tractors to run on LNG.**

# Highlights

## Distribution of Fuel

When Bison started running LNG tractors in January 2013, they were fueled using a temporary ORCA fueling station. LNG has a better energy conversion when distributed from a permanent facility rather than the ORCA. In March, Shell installed the first public LNG fueling station in Calgary which improved fuel efficiency and range. Another public fueling station is set to open in Edmonton in 2014. This will lead to even greater fuel efficiency and range of Bison's LNG tractors.

## Training of Drivers

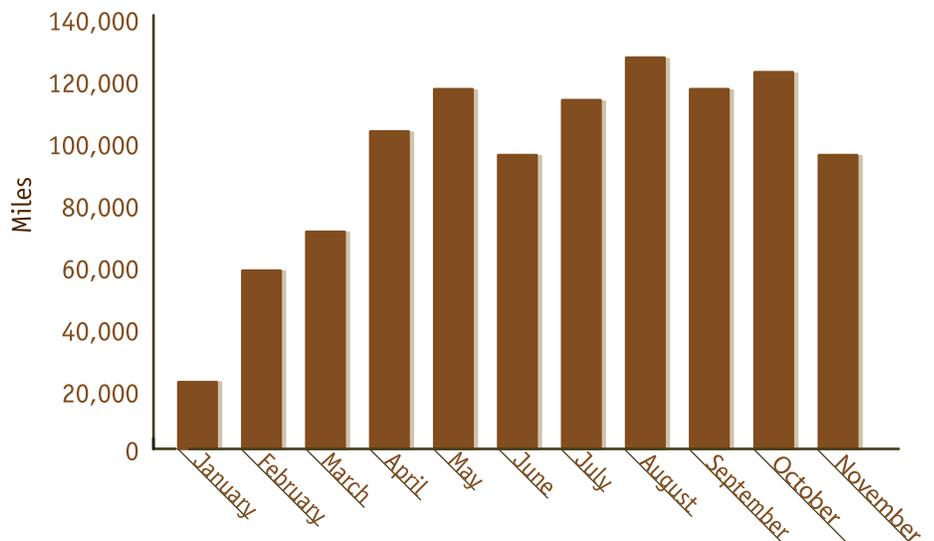
The operation of LNG tractors is not overly different from regular tractors, but there were some assumptions and perceptions about using natural gas that had to be addressed. Bison did this through an extensive education program consisting of online and physical training. As part of the rollout plan, several Driver Mentors (DMs) were trained to be experts in operating the equipment. They assisted with the introduction of each of these tractors to an assigned Driver. The DMs have been paramount in testing the equipment and facilitating fellow Driver training.

## Driver Response

Driver response has been very positive. With great training and dedicated support from Bison's Operations and Maintenance teams, the transition has been very successful. In the end, much of the feedback was very positive as Drivers didn't notice much difference in comparison to their regular diesel tractors. Bison is fortunate to have a dedicated group of Driver Mentors and professional Drivers who are engaged and committed to this project. They are proud to be a part of this project and a pioneer with this new fuel technology.

**When you consider  
100% of Bison's  
1 million LNG miles  
were achieved  
on Long Combination  
Vehicles (LCVs),  
the 1 million mile  
milestone equates to 2  
million trailer miles!**

Growth of LNG Miles



**“There is a strong value proposition for natural gas in certain parts of our industry. To the extent that those are realized is going to depend on a number of factors: infrastructure build out (US is probably about 5 years ahead of Canada), technology upgrades, cost efficiency gains, and commodity pricing are among a few of the factors that will have a hand in how this plays out”**

**Trevor Fridfinnson, Senior Vice President  
Bison Transport**

## **Bottom Line**

Bison's venture into LNG has been met with various challenges and learnings. To date, the net result of the financial performance of the LNG equipment has been relatively modest, when compared to diesel. However, Bison remains committed to this project, and is proud to be at the forefront of testing this new fuel technology and to help move the trucking industry forward with LNG. Outside of this LNG project, Bison will continue to invest in new technologies and alternative fuels to reduce GHG emissions, improve safety, and ultimately reduce costs to their customers.

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