

Pressurised gas alternative



A new player on the gas powered truck scene is offering an alternative method for fuelling the new, popular LNG engines from Westport.

A number of factors in the past few years have seen a steady rise in interest from the trucking industry in alternative fuels, especially in gas powered trucks. Gas power, using some form of natural gas, appears to provide a solution that can offer lower fuel cost, engine reliability and a reduced carbon footprint.

A new start-up company, iGas Energy, based on the Gold Coast, has come up with an alternative method of getting the right type of gas at the right pressure for use in an LNG engine. The new system has been devised to deliver compressed natural gas (CNG) to the injection system at the same pressure as it is delivered by liquefied natural gas (LNG).

Operators investigating the use of natural gas as a vehicle fuel have, up until this point, been divided into two camps. Those involved in stop/start operation running low kilometres and returning to base regularly each day have been heading down the CNG route. At the same time, trucking operators covering large distances and running a high number of kilometres each day have been examining the LNG alternative.

CNG is stored at relatively low pressures meaning a large amount of space on a truck is taken up in fuel storage to ensure enough fuel is on board for a truck to do a full day's work. The storage vessels are big and have taken up a considerable amount of real estate on a truck chassis as well as needing to be stacked to the rear of the cab. This solution has been tried, to a certain degree of success, by a number of operators including concrete agitators and garbage collection. This form of CNG power has also seen considerable success in the bus industry.

Meanwhile, LNG has been making inroads in certain specialist operations. Both in Western Australia and Victoria, large operators travelling regular routes over long distances have bitten the bullet and installed the infrastructure needed to supply LNG powered trucks on some of their operations. They have seen considerable reductions in truck running costs and the Westport LNG engine has been reported as primemovermag.com.au/.../pressurise...

performing well in long-term and high mileage operations.

The idea behind the iGas project is to marry the improved accessibility of CNG refuelling with the power and reliability of the Westport LNG engine. They are supplying a solution for operators who may, or may not, have been asking the question about combining CNG accessibility with LNG power.

After many years working in the gas industry for the big energy companies, and after selling out his interest in a company called Energy Developments (EDL), Paul Whiteman, Managing Director of iGas, got together a group of former colleagues and came up with the concept for extra pressurising for CNG.

“In the past, and in very different applications, I had looked at the liquid compression of natural gas,” says Paul. “We did the research, we came up with the concept and patented it. We have patents in Australia and have lodged them in the US, Canada and the European Union. The concept of pressurising gases with water has been used in stranded gas assets in the past. If you’ve got a gas well and it’s not big enough or too far away to build a pipeline, you can pressurise it using water to get it into a container to transport it.

“We are a very strong technically competent organisation with lots and lots of experience in the gas industry. This stuff we’re doing now is, without demeaning it, pretty lightweight compared to a lot of the work we’ve done in the past. For us, there is a matter of getting credibility with the trucking industry.”



Normal CNG engines use the gas at a much lower pressure than LNG engines. With CNG, the gas is vented into the combustion chamber at relatively low pressures and is ignited using spark ignition. This requires a completely different kind of engine, specifically designed for use with CNG. The Westport alternative uses tried and trusted diesel technology and adds on a different kind of fuel injection system, no other changes are made to the ISX.

What iGas has come up with is a method of fuelling the vehicle with CNG but managing to deliver natural gas at 5000psi into the injection system of the Westport HPDI. When the truck starts using CNG from a tank, the pressure goes down. In the case of a CNG engine the pressure of the gas being delivered by the storage system gradually decreases until no gas is left. LNG requires the gas to be delivered to the injection system at the same higher pressure no matter how full the tanks are. The system developed by iGas overcomes this problem by pumping water into the CNG cylinders to maintain pressure levels within the system.

Stored in a tank on the chassis is enough water based liquid to fill one of the four cylinders strapped to the rear of the cab. As gas is taken from the first tank, it is replaced by the water. Once the gas has been used up, the second tank comes into play. The liquid is then transferred to this tank to maintain pressure as gas levels fall. This carries on from tank to tank as the fuel is used up.

The Westport HPDI engine is based on a well-regarded performer in the Australian market. The Cummins ISX 15 litre is the mainstay of many large long-distance fleets and is regarded as a known quantity by the industry. The engine is taken from Cummins by Westport and its fuel injection system is replaced by the sophisticated diesel and gas injection system it developed in Canada. Natural gas is injected into the combustion chamber at 5000psi along with a small amount of diesel. When the fuel comes under compression the diesel ignites, as it does in a normal diesel engine. This then ignites the natural gas which is present in the combustion chamber at a proportion of 95%, compared to the 5% of diesel.

Operations using LNG are limited by the accessibility of infrastructure with which to refuel the trucks. LNG is produced in specialist primemovermag.com.au/.../pressurise...

plants and has to be stored cryogenically at -120°C in special tanks. Operators using this fuel need to have a specialist LNG refuelling facility sited en route to make the system work. On the other hand CNG is available anywhere there is a gas pipeline to supply industrial and domestic gas users. A number of different gas compressor systems are available, from sophisticated fast flow installations to smaller, cheaper and slower compressors.

“At the moment, it’s an engineering prototype, we’ve now got to fill it up with gas and run it,” says Paul. “We will then be working on the packaging and the engineering. We’ve already been through the basic principles and know it works. Now, we are in the process of making it work on a truck, on the road.”

The model on display at the ATA Convention earlier this year was fitted with a four pack CNG which is believed by the company to have an effective range of around 900km. The extra weight of the gas storage and pumping equipment is expected to equate to an additional 300kg when up against a comparable diesel fuelled engine.

iGas could benefit if concessions were made in truck regulations for technologies which reduce carbon footprint and can demonstrate an environmental benefit. An extra 500kg on the front axle limit was allowed in recognition of the extra weight imposed at the front of the prime mover with the new technology needed after the introduction of ADR 80/01, but there has been a lower level of lobbying from within the truck industry to gain further concessions for improved environmental performance since that was achieved.

“Looking at the trucking industry, we realise it’s a matter of offering them a reliable technology which saves them money,” says Paul. “There are a few barriers to entry, and probably getting access to gas refuelling points is a major one. But there are a number of strategies that we can adopt.”

“When you look at a location like Tarcutta, where there’s 1000 trucks coming in every night from Melbourne and Sydney, there is a gas supply nearby so that is an opportunity to set up an interchange point where gas storage modules could be swapped. However, that’s a little bit down the road for us.”



The company is developing a similar concept to the Swap N Go system now being used by consumers when buying barbecue gas bottles. The idea is to set the gas bottles into a frame which can be slid on and off the truck chassis. An empty set of CNG tanks could be replaced with a full set in a matter of minutes at the appropriate facility.

“The truck owner might not be the right entity to own the gas bottles,” says Paul. “This equipment is designed for a 20 year lifetime, maybe someone else could own the fuel tanks and simply sell the gas to the truck operator while retaining ownership of the tanks which are being swapped.”

Refuelling at a normal CNG service station would take around 30 minutes. Although the availability of such CNG refuelling facilities in Australia is increasing, the number is still quite limited. Any operator considering using a system similar to the one being proposed by iGas would be limited by the availability of refuelling facilities or have to develop their own infrastructure to refuel vehicles. A simple CNG compressor could be based in a transport yard if an underground gas supply was available.

Big companies like Boral have already invested in CNG refuelling infrastructure in places like Brisbane where they are running CNG powered agitators. None of the CNG engines go above around 320hp.

They would have the option of improving the utilisation of the refuelling

infrastructure by extending their interest into higher horsepower trucks, unavailable as pure CNG spark ignited engines. Currently the

Westport HPDI engine is available in a rating up to 580hp.

The Western Star truck fitted with the prototype system is to be used by the company as a test bed over the next couple of years. In order to work out the best way to develop the CNG system, iGas intends to work the prime mover as a tow operator. This will place the truck in a real-world environment and this will give iGas the opportunity to iron out issues before any operator needs to commit to investing in such an untried solution.

“I would expect that by the end of this year we will have a second and maybe a third truck on the road,” says Paul. “It depends on how things go and fuel sources. In the meantime, next year we will be ironing out any technical difficulties. We will also be going out and looking at the market, we’ve got to look at America, there are people over in the US pushing for the trucking industry there to go over to gas.”

There has been a considerable amount of interest in the use of natural gas as a fuel in recent years. Often, operators are put off by the hurdles they need to clear before they can get access to the kind of cost savings these trucks can achieve. This technology, if it works, could be a way of removing one of those hurdles, access to natural gas for high horsepower applications.

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