

Naturally GASSED

The road transport jury may still be out on the benefits of natural gas, but south east Queensland company iGas is taking huge leaps forward with its CNG-powered Western Stars. Matt Wood reports



From this angle it just looks like your garden variety Western Star 4800



Clockwise: The hydraulic pump forces the CNG out of the fuel cylinders under high pressure; The Westport HD engine has its basis in the Cummins ISX; Simple no-fuss gas filler nozzle; The fuel tank houses both diesel and the CP-Therm hydraulic fluid in separate compartments that the system uses to inject gas into the engine

IT MAY just be a scathing indictment of my conversational skills but during a recent conversation I stumbled across a rather sad fact — there seems to be something about alternate vehicle fuels that makes people's eyes glaze over.

Like any acronym-heavy subject, the combination of jumbled letters

and figures showing projected savings can almost guarantee a distracted nod if not a full blown vague-out to the person on the other end of the conversation.

This is a shame, because it is an interesting subject before getting bogged down in pie charts and pictures

of distressed penguins. But at this point in time one thing is becoming very clear; globally or locally, there is no single solution, magic bullet or miracle panacea for finding a clean, cheap alternative to diesel as a source of fuel for the transport industry. Of course this is probably driving truck

manufacturers, fuel retailers and governments absolutely nuts.

Hybrid drives will no doubt make an appearance in heavy vehicles but weight and complexity may also hold them back. Biodiesel sounds great but it doesn't have the same green street cred it used to, especially after people started

pointing out how energy intensive it is to grow the fuel crop in the first place. Plus there are the emissions to consider.

Fuels from industrial by-products, such as Die-Methyl-Ether (DME) are

to why — environmental, economic, or both? It can be hard to find a fuel that ticks both boxes without requiring a massive leap of faith.

There's plenty of evidence though to

"You can't see a great deal that differentiates this Western Star from the multitude of others."

also great, if you actually have that industry nearby and on a large enough scale to provide enough fuel. The list goes on. There's also the question as

suggest that natural gas is a pretty good alternative for the Australian transport market for a pretty simple reason: we have bucket loads of the stuff and it's

cheap. Along with this it's a very clean fuel that some figures suggest burns 27 percent cleaner than diesel.

However, as with most things transport, it's not quite as easy as saying that gas is the way to go, because the down side of gas, as with most alternate fuels, is that the way you use, store, transport and ultimately burn the fuel starts to become quite application specific.

Traditionally, compressed natural gas (CNG) has been seen as having a lot of potential as a heavy vehicle fuel except for a couple of drawbacks. One of which is that virtually all CNG-powered

truck engines use spark ignition (spark plugs instead of diesel injectors) which usually comes with a horsepower penalty-affecting performance.

The second is that CNG can take up a lot of storage room on a truck chassis, which usually doesn't create a big deal for smaller capacity vehicles around town. But for heavy-duty, the large capacity and longer distance roles become difficult to get enough gas onto the truck to get any distance down the road. So, enter high pressure Liquefied Natural Gas (LNG) which having been cooled and liquefied, takes up less space than CNG giving the



Clockwise: The CNG fuel pack contains composite carbon fibre cylinders, the four cylinders on this truck giving it a range of 800km; An alternate display shows the distance to empty and system pressure; A dash-mounted digital menu shows fuel levels and which cylinder is active

truck more range, and with a high pressure injection-style LNG system, there's also no horsepower loss and it has a high substitution rate; 85-95 percent gas to 5 percent diesel.

There are also dual fuel type LNG systems that have a lower substitution rate of around 50 percent. The upside of these systems is that if the truck runs out of gas, it will revert to running on diesel but there can be ignition issues due to the uncontrolled delivery of gas into the combustion chamber.

However, one big issue with LNG is that if the vehicle is parked for an extended length of time, the liquefied gas warms, turns to gas and has to vent.

“The iGas system ... could quite easily slot into a line-haul shuttle role.”

Another side effect is that the methane and propane in the fuel can separate while parked, which can cause ignition problems.

If you park an LNG-powered truck for the weekend with full tanks you'll most likely lose most of your fuel. Another big drawback that everyone is usually quick to raise is the lack of refuelling infrastructure on the road for either CNG- or LNG-powered vehicles.

So to put it simply, LNG is great for a hub and spoke, double shift operation where the truck returns to the depot to refuel and change drivers with very little down time. Dairy co-op Murray Goulburn's Victorian fleet is a good example of this. Conversely, CNG has traditionally been great for light commercial vehicles and urban roles where smaller capacity engines and shorter distances mean fuel storage on the vehicle and power isn't as much of an issue, but maybe that is, until now.

DIESEL SQUIRT

Queensland-based company iGas has come up with a unique way of overcoming CNG's heavy vehicle disadvantages, using the charmingly named (acronym alert) Pressurised Liquid Injection and Gas Transfer System (PLIGATS). Using the already established Westport HD550 High Pressure Direct Injection (HDPI) LNG engine as a basis, iGAS has managed to adapt the Westport concept to CNG, with the same 95 percent substitution rate as the engine achieves in LNG form. Some of the advantages of running the already impressive performing HD550 on CNG are pretty clear.

In general, CNG is considerably cheaper than LNG, you don't have to dress up like an astronaut in protective clothing to refuel the vehicle, and you can park the vehicle without any fuel dissipation.

The Westport HD550 is based on the 15-litre Cummins ISX engine and it uses a pilot squirt of diesel to ignite high pressure, hydraulically-injected gas into the engine which gets the combustion cycle moving.

iGas' CNG application is the same, but that's where the similarities effectively come to an end. With iGas the CNG is stored in composite carbon fibre cylinders mounted behind the cab of the prime mover; the gas is forced from these cylinders using a water soluble fluid called CP-Therm which will stay liquid in temperatures all the way down to minus 40C. The hydraulic pressure is created by a pump which in turn is driven by the Vickers 20/20



power steering pump on the prime mover.

As mentioned earlier, the gas is injected into the fuel system at very high pressure (5,000psi), meets up with a fine mist of diesel and ... bang! We have ignition. The end result is a 550hp 1,850ft-lb torque engine running on CNG, one that's meant to retain all of the driveability and power characteristics of a 15-litre diesel engine.

FLEET FIRST

I was able to visit iGas' Stapylton headquarters in south east Queensland recently to take talk to Jim McDonald, one of the company's directors. It also provided an opportunity to take one of iGas' two CNG-powered Western Star 4800 FX prime movers for a drive.

iGas Managing Director Paul Whiteman, a veteran of the gas and energy industry, is the man behind the company while fellow directors Derek Fekete and McDonald are also from an energy industry background.

Interestingly, the board has thrown themselves into developing its CNG technology by effectively starting its own transport company. It has taken that aforementioned leap of faith, proving it's prepared to put its money where its mouth is, rather than try and trial the technology in another company's fleet. The result is an iGas-powered day cab Western Star prime mover that is towing a B-double full-time out of Brisbane over the Toowoomba range to the Darling Downs area, five days a week.

The company also has its own CNG refuelling station at the Brisbane Truck Centre. A back-up vehicle in the form of an auto shift-equipped iGas-powered Western Star is also on hand, and it was this vehicle that I looked at and took for a spin.

Approaching the vehicle from the front, you can't see a great deal that differentiates this Western Star from the multitude of others that ply our highways and byways. But once you have a look from behind, the iGas system is plain to see — vertical bottles encased in their module fill the space within the truck's aero kit behind the cab, taking up 800mm of chassis space.

This set-up should give the truck a range of around 800km. However, a new tank configuration currently being manufactured should extend that range to 1,000km. Just in case you're wondering, HD550 engine supplier Westport Innovations is fully abreast of iGas' developments and has given iGas original equipment manufacturer (OEM) status. Western Star has given the company local OEM status as well.

The left-hand side of the tank module houses the plumbing for the CNG system, while a second battery box has been installed to house the hydraulic heart of the system. The fuel tank on the right-hand side of the truck houses the small diesel tank, as well as a reservoir for the hydraulic fluid.

The time came to take the Star for a drive with a counterweighted single trailer following on behind. There's no mistaking the quiet engine mumble

of a gas-powered motor and the iGas unit doesn't disappoint. Apart from forgetting to put my foot on the clutch when coming up to the first intersection (it's been a while since I last drove a three-pedal auto-shift transmission), the rig motored along very nicely indeed.

On the road there's very little to differentiate between the iGas CNG application and the original Westport LNG set up of this motor. That is pretty much saying that the truck performed like a Cummins ISX-equipped vehicle except much quieter and smoother.

But while rolling along the Gold Coast hinterland the HD550 proved to be a peaky performer while running at close to legal weight. On the dash was a simple digital menu that gave all of the gas system information on fuel levels, hydraulic pressure and so on. Otherwise, apart from some gas leak detectors, the interior was pretty much as it was when it left the factory.

Another characteristic of gas engines is their cleanliness. The inside of the exhaust pipes stay shiny for a long time as they don't tend to create much in the way of soot. And the engine itself tends to stay clean as the small amount of diesel being burnt means the engine doesn't tend to get greasy and oily over time.

There is however, a weight penalty for the system which adds another 1.5 tonnes to the prime mover's tare weight, which puts it in the same ballpark as the Westport LNG system weight wise.

Given the long life cycle of heavy-duty trucks in Australia, a common argument against gas-powered prime movers is the hit the owner takes on resale values as well as the outlay for the equipment in the first place. It's a fair argument when our trucks can fill a variety of roles over a number of years. After all, who wants to buy a clapped-out gas-powered truck second-hand that nobody understands?

One of the interesting possibilities with the iGas system is that it's a modular set up. It's quite conceivable that a transport company could use their iGas truck in a specific role for the first few years of its life before removing the iGas tank module and the Westport engine, as well as the tanks and pump system. That company could then repower the prime mover, add some fuel tanks and either move the truck onto a different role within the fleet or sell it.

IN THE PIPELINE

McDonald says the iGas tank module will have a working life of 15 to 20 years, enough to wear out more than a couple of trucks in its lifetime. It is true, however, there is an extra cost in purchasing this or any other gas system.

iGas predicts a premium of \$100,000 on the purchase price of the truck. While this isn't exactly peanuts we're talking about here, iGas' numbers also predict substantial cost savings. Using 250,000km a year for one truck, and a diesel price of \$1.30 a litre for 150,000 litres as a yard stick, the total fuel bill would come in at \$195,000. The gas bill ex-pipeline for that amount of kilometres would be in the vicinity of \$60,000 to \$70,000.

Development continues on the iGas product, as the company finds ways of reducing the complexity of the system. For example, a new valve block has



The myriad of pipes, valves and dials that hides under the side cover of the fuel pack

been developed to take away the need for the myriad of pipes and taps that are mounted on the system at the moment. A new tank module will also be available to extend the range of an iGas vehicle.

Not to be content with just developing a CNG engine solution for heavy transport, the company is also developing portable refuelling stations or a 'virtual pipeline' capable of being trailer mounted and trucked to a convenient location. The company is also in talks with APA, the largest pipeline group in Australia, to negotiate possible re-fuelling points on natural gas pipelines. iGas is also using the PLIGATS system to develop a cooled system for high pressure and fast CNG delivery at a retail level.

So, with a couple of units working full time in Australia, plus another working for Carbon Cutter Transport in the United States running between Los Angeles and Salt Lake City with success, the future could be looking bright for iGas.

From my brief stint at the wheel, there's certainly nothing lost in terms of power and performance. The iGas system, as it stands, could quite easily slot into a line-haul shuttle role or even a mining role where the vehicles would have access to stable refuelling points. It remains to be seen as to whether the system could be squeezed onto a sleeper cab-equipped truck for line-haul duties which will be an OH&S sticking point for some east coast operators and drivers. However, this clean and green Aussie innovation could prove to be one to watch in the future. ■

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