Turning gas into gold

CNG Like mediaeval alchemists, many bold engineers pursuing financial reward in CNG shipping have been thwarted by scientific practicalities – several projects have been abandoned because of the prohibitive weight of predominantly metal-based containment systems. One company claims to have overcome this problem by using more modern materials

The marine transport of compressed natural gas (CNG) is an idea that works brilliantly in theory, but has not as yet made it into practice. The potential benefits are undeniable – unlike LNG, CNG bypasses the need for expensive liquefaction and regasification plants and is a more flexible alternative to pipeline transport, which is becoming increasingly unreliable as natural disasters and political situations interrupt the flow.

CNG is also being touted as an effective way of exploiting the world's stranded gas reserves, estimated to total approximately three quadrillion (million billion) cubic feet.

The latest company to attempt a CNG breakthrough is Canada-headquartered Trans Ocean Gas, which is currently half-way through testing its lightweight fibre-reinforced plastics (FRP) CNG containment system, expected to gain certification for marine transport by the end of the year with Det Norske Veritas (DNV).

"Half the gas in the world is considered as stranded," says Trans Ocean Gas president Steve Campbell. "CNG will be able to transport half of the world's stranded gas, which adds up to be right now some 1.5 million billion cubic feet. Whichever way you want to say it, it's still a quadrillion."

Steve Campbell

The figures are overwhelming: "That equates to somewhere between $10tr and $15tr," says Campbell. The world consumes almost 100tcf per year so this stranded gas, which could give global industry an extra 15 years' supply, is a very valuable resource. "That's our market and LNG and pipelines don't even have access to it – it's out of their economical range."

So far, $1.5m has been invested in the verification and certification of Trans Ocean Gas technology, funded by the Canadian government and public agencies. The figure also includes some $400,000 in industry contributions. Participants in the project include Composites Atlantic, SNC-Lavalin, BMT Fleet Technology, DNV and the Institute for Ocean Technology.

There is considerable interest in the technology. "There are numerous companies that we are currently working with for CNG projects around the world," says Campbell. "We also have two major LNG shipping companies interested." Trans Ocean Gas is also working with some major oil and gas companies and there is talk of Trans Ocean Gas providing natural gas to Caribbean tourist resorts transporting stranded east coast gas to the Canadian market.

There is also a lot of interest in south-east Asia: "That's where our efforts at the moment seem to be concentrated," says Campbell. The company is involved in several potential projects there, notably in the Philippines, Malaysia, Indonesia and Singapore.

Modular containment

Trans Ocean Gas' CNG containment system is modular in design and can be adapted to work in existing ships of various sizes. Each module is made up of a network of FRP pressure vessels held in steel frames, in an arrangement that Trans Ocean Gas calls a cassette.

"How big is a cassette? How big do you want to make it?" asks Campbell. "We have 5 m x 5 m x 5 m up to 8 m x 8 m x 8 m frames." The steel frame is the most flexible element of the design. "It is basically not a very expensive proposition as the frame can be made anywhere," says Campbell.

The FRP bottles, however, are what make the system different from those CNG concepts already on the market. "The bottles are made from fibreglass filament fibre," explains Campbell. A continuous length of fibreglass filament fibre is wound round a high density polyethylene (HDPE) liner rather like a thread onto a bobbin. The winder's operation is automated to ensure a high level of repeatability. "We use the exact same winders used to make fibreglass pipe," he continues. "There's not a lot to it, but the design inside the plastic bottle – the plastic liner and connection to our steel infitting – that's our secret."

The most suitable vessels for holding the cassettes are containerships and dry cargo ships, due to their relatively simple design. The CNG cassettes can be easily loaded on and ready to go. "You'll need a manifold system, safety systems and controls for environment," explains Campbell. "For larger ships that go from offshore locations, you'll need a turret loading buoy." On smaller vessels, the adaptation is somewhat simpler in that side loading arms or a nose buoy can be used.

If a company were to build a CNG carrier from scratch, Trans Ocean Gas recommends that its 1-BCF, 120,000-tonne vessel design be used. "That is our flagship carrier," explains Campbell. "We would have a significant amount of that design already done."

Trans Ocean Gas has a busy year ahead of it, not only in terms of getting its technology onto the market. CNG is a perennial at many gas conferences and events, and Campbell will be featuring as a speaker at several events. Later this month, he will present at the Atlantic LNG and CNG Symposium in Halifax, Nova Scotia. He will also appear as a special panellist at the Offshore Technology Conference (OTC) in May in Houston, Texas and is an unconfirmed speaker at the International Gas Convention in Caracas, Venezuela.

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