

Full steam ahead: Teekay is the world's largest operator of shuttle tanker tonnage

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# Shuttle tanker operations require customised approach

With a global fleet of 35 shuttle tankers in service and four newbuildings under construction, Teekay's shuttle tanker and FSO division is the largest operator of shuttle tankers in the world. Around two thirds trade in the North Sea, one is in Australia and the remainder are in Brazil.

The fact that the fleet is large does not mean it lacks agility, says the division's president, Kenneth Hvid. "What helps differentiate us is our widespread use of contracts of affreightment (COAs) in the North Sea," he says. For the present, bareboat and time charters are the norm in Brazilian waters.

Teekay has adopted an original business model, a pioneering environmental programme and innovative ship designs in its approach to the shuttle tanker market

COAs were introduced to the shuttle tanker segment by Navion. That company was established by Norwegian state oil major, Statoil, in 1997, and then bought by Teekay in 2003. Today, the shuttle and FSO division has 24 COAs in place with 20 oil companies. These cover 40

oilfields in the North Sea and 50 lifting points across the Norwegian, UK and Danish sectors. In 2008, Teekay completed some 600 offshore loadings in total, representing close to one million barrels/day here.

"Of course, it takes a certain critical mass to offer this kind of arrangement but I think this is exactly the type of flexibility that smaller oil companies and operators especially will be looking for in the years ahead. The uncertainty of what oilfields will be producing in the future makes this contract incredibly good value since users pay for what they use. Basically, it is a taxi-service style agreement where only the trips are



paid for, as opposed to leasing the vessel outright for 365 days a year."

This responsive approach to market conditions also permeates the company's environmental strategies. At this year's Nor-Shipping event the company won the Clean Shipping Award in the clean air category for its efforts to reduce the greenhouse gas emissions of its fleet. In particular, the company was commended for its work in developing an alternative method for negating volatile organic compound (VOC) emissions during loading.

These releases occur in the final stages of crude oil production processes, where gas needs to be separated from oil. At this point, a minor amount of gas will remain in the oil when it is discharged into tankers for transportation. Some of this gas will be emitted into the air during the loading process as well as during the voyage.

Teekay is the owner and operator of VOC reduction plants on a number of shuttle tankers in the North Sea under the VOC Industry Co-operation initiative. This unites 27 oil companies, which in an innovative industry structure, pay for their *pro rata* use of vessels with VOC equipment.

As part of this programme, Teekay has installed large scale VOC plants to condense this gas on 18 of its owned or operated shuttle tankers operating in the North Sea. However, although these plants are effective, it was Teekay's finding that they are large and expensive to build and operate. Consequently, in 2006, the company started to investigate alternative means of reducing emissions that would be more suitable for general application on oil tankers.

It was felt if oil could be transported at a pressure equal to or higher than in the last production stage separator, emissions ought to be limited. Oil tankers have always been designed for a pressure of 0.25 bar g but operations have usually been performed in the 0.04 to 0.14 bar g range. At the beginning of 2007, Teekay obtained approval to operate at up to 0.235 bar, utilising improved pressure/vacuum valves in the tanks.

In addition, it was necessary to control the pressure during voyage, and to be able to reduce it to zero, prior to discharge ashore. For this purpose it was decided to test a simple swirl absorption unit supplied by GBA Marine, intended for re-absorption of gas into the crude oil.

In 2007, several tests were conducted on the shuttle tanker, *Navion Hispania*. The use of increased pressures led to a noticeable reduction of 15 to 20 per cent in emissions during offshore loading. In addition, any emissions during a voyage were avoided, even when carrying highly volatile oil.

Teekay has now decided to transfer its findings to the four Amundsen class shuttle tankers that it has on order at Samsung Heavy Industries



*Kenneth Hvid (far left): "We are supportive of efforts to adopt a short phase-in period for the new EU sulphur directive"*

by increasing the cargo tank design pressure to 0.7 bar g. This value was chosen because it would bring the tank pressure rating above the separation stage pressure of most North Sea oils. Furthermore, the GBA Marine swirl absorption unit for pressure control and a KVOC increased diameter drop line will be installed. The latter will circumvent the siphon effect (or underpressure) in the drop line, which otherwise contributes to emissions during loading.

The exact effect of this initiative can only be measured once the first vessel is in service at the end of 2010. However, Teekay is confident that the reduction of emissions during loading of even the most volatile North Sea oils will be well above 60 per cent and that there will be no emissions during a voyage.

For standard crude oil tankers, the installation of a GBA gas absorption unit and modified pressure/vacuum valves, as well as operating at the increased pressure of 0.235 bar g, is sufficient to avoid any VOC emissions during a voyage. The saving translates as 2.5 million tonnes of retained cargo per day, which is sufficient to pay for the installation in less than five years at an average oil price of US\$70/barrel.

For all the plaudits that this work has drawn, Mr Hvid is not oblivious to the sizeable environmental issues that remain or the compliance issues posed by pending legislation. A particular issue at present is the European

Union requirement (Directive 2005/33/EC) entering into force on 1 January 2010, which requires ships at berth to burn only 0.1 per cent sulphur fuel.

He acknowledges that this directive has caused consternation across the industry, and there are safety concerns, especially if a company has not modified its boilers. The lack of available kits and technicians means very few have converted their boilers for this operation. Consequently, "we are supportive of efforts which aim to persuade the European Union to adopt a short phase-in period".

Another related concern is the tendency for regulators to regard shipping as a uniform entity "like the airline or trucking industry" and therefore try and impose 'one-size-fits-all legislation'.

Looking ahead from a market perspective, Mr Hvid perceives a growing market for floating storage and offloading units (FSOs).

"There is a general expectation that the industry will continue to see a number of new offshore fields being developed worldwide, and in particular in deepsea benign waters. These fields are becoming smaller and smaller. In light of this we see opportunity to combine shuttle tankers with FSOs. The beauty of this solution is that FSOs are flexible and can be re-used."

Earlier this year, Teekay was awarded a contract by medium sized oil company, Occidental, on a mid sized field, and in support of this is converting one of its existing shuttle tankers into an FSO. "This has been a real fast track project since it will run for between seven and nine years from December. We are taking an older shuttle tanker with dynamic positioning features, which already has a helideck."

In support, the company engaged a single subcontractor, Romania's Icepronav Engineering (ICE), to undertake detailed design work as well as to secure DNV class approval, to provide onsite engineering follow up and commissioning assistance. A special requirement was that the FSO be capable of handling crude oil with high hydrogen sulphide content. **TSI**



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