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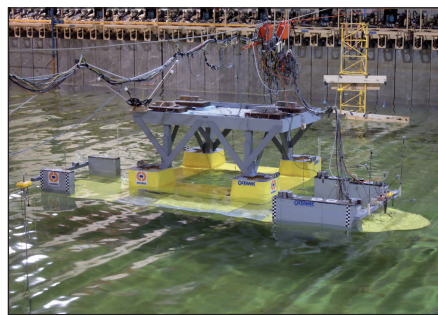
Bowless *Vanguard* adds new strings

Deepwater discharge of major offshore structures and dry-docking FPSOs while still attached to their turret moorings are among the more exotic possibilities now under serious consideration for the huge, bowless marine transport vessel Dockwise is building in Korea. **David Morgan** reports.

Representing a \$240 million investment by Dutch-headquartered Dockwise, the *Dockwise Vanguard* is under construction at the Hyundai yard and due to complete sea trials early December in readiness for its maiden assignment – collecting the 50,000t hull of Chevron's Jack/St Malo semisubmersible hub production facility from the neighbouring Samsung yard and delivering it to Kiewit's Corpus Christi facility on the US Gulf Coast.

Key features of the new semisubmersible heavy transportation vessel are its cargo carrying capacity – a staggering 110,000t in addition to some 7000t of consumables; 275m length end to end and 70m beam; 27MW of power; two retractable azimuth thrusters forward for heading control and two controllable pitch propellers aft for redundant propulsion; and a 14 knot maximum transit speed, which translates to average service speeds in the 11-13 knots range with cargoes.

There are also some heavyweight industry names associated with the project, among them DeltaMarin, which undertook the detailed design and model testing; Newfoundland's Oceanic



Offshore discharge model testing.

Consulting, which handled further model testing at Chevron's behest, and serial offshore innovator Leen Poldervaart, who is serving as a consultant on the vessel's construction and marketing.

But the standout feature of *Dockwise Vanguard* remains its innovative bowless design, with the steering room and accommodations starboard and moveable casings that will allow maximum flexibility for cargo loading over the side, bow or stern (*OE* September 2011). Offering around 50% greater lifting capacity and 70% larger deck area than Dockwise's current flagship, *Blue Marlin*, the new vessel will be capable of dry-towing floating production units of just about any shape or size, including a new and much larger generation of deepwater spars, semis and tension leg platforms.

The unobstructed deck will allow cargoes to protrude fore and aft, bringing FPSOs up to 325m in length within range. That particular facility will not be tested by the vessel's second confirmed contract – the mid-2013 delivery of Hyundai's 52,000t Sevan-type cylindrical floater to the Eni Norge Goliath field in the Barents Sea – but Dockwise sees plenty of potential with the more conventional ship-shape FPSOs too, both in transporting them and servicing them on station.

In March this year, ABS lent its Approval in Principle to the concept of using *Dockwise Vanguard* for offshore drydocking. This emerged following a technical concept review during a Hazid (hazard identification) study meeting reportedly also witnessed by two unnamed oil & gas majors. Uniquely, the concept envisages anchor lines and



risers remaining connected to an FPSO's internal or external turret mooring while drydocked at location, enabling the *Dockwise Vanguard*/FPSO combination to freely weathervane while inspection, maintenance and repair work is under way.

'We think this is a really big market for this vessel going forward,' said Robb Erickson, Dockwise vice president of sales, heavy marine transport, during the recent OTC show in Houston. 'We are now able to bring the drydock to the floating production system. For example, if you have an FPSO working offshore Brazil that needs some maintenance, certification or inspection work that might previously have involved disconnecting the turret, towing the FPSO to a yard some distance away and taking it offline for maybe three or four months. Now we can come to them and lift the FPSO out of the water while operations continue and the work is carried out.'

With three contracts for the new vessel near enough in the bag – the third remains a letter of intent (LoI) for the time being – 'we feel like we're doing pretty good already', Erickson said. The LoI is for transporting the first Norwegian spar platform, destined for 2015 installation in 1300m of water at Statoil's Aasta Hansteen (*ex* Luva) field in the Vøring area. But the details of this contract – notably whether it will be coming to Norway from Korea or Finland – will not be firmed up until the outcome of the current platform FEED competition between Aker Solutions and Technip is declared.

The kind of stresses and strains to which the new vessel will be subjected as its cargo weights and dimensions start to

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Onno Peters



approach design capacity can be judged from its deck construction. For the most part this is in the order of 20t/m² but in certain critical portions this increases to 45t/m² and the vessel's side shell will be further strengthened to 90t/m².

Erickson pointed to another key aspect of the *Dockwise Vanguard* design – its maximum submersible draft of 16m. 'Having 16m of water above deck, compared with *Blue Marlin*'s 12m, will be very important in terms of transporting deep draft structures,' he noted. It has also persuaded his company to start thinking the hitherto unthinkable: discharging fully integrated structures in remote deepwater locations.

'Currently the tendency is to discharge in a sheltered location close to shore, in the kind of water depths where, if the ship sank for some reason, you wouldn't have to go far to retrieve its cargo,' explained Erickson. 'But where people in the Gulf of Mexico want it these days is anything from 25 to 30 miles out and in 8000ft of water. Can't you just drop it off out there! The problem is that when your vessel has 50,000t in the water and a wave comes along you really don't want those two bodies to meet each other.'

'But we've figured out a way to get separation between the two quickly enough and safely enough to make deepwater discharge an option,' he added. 'This is a big deal because they don't have to go inshore to do all this stuff and then tow it back out again – they can just have the whole marine spread there on site.'

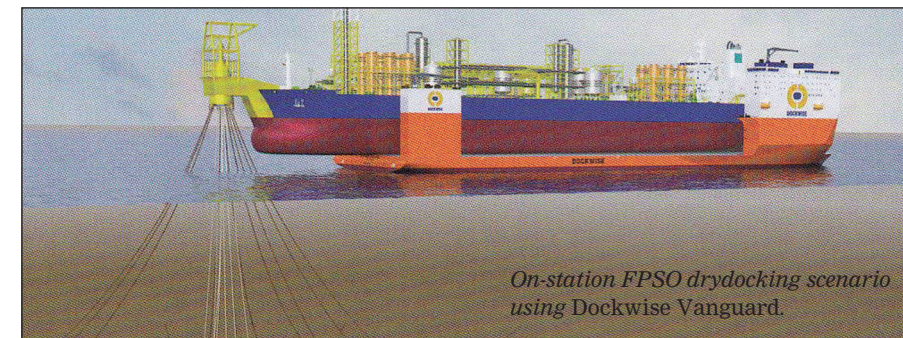
Erickson's grounds for optimism are to be found in the 'promising findings' of one of the technical papers (OTC 23329: *Hydrodynamic behavior during offshore loading and discharge*) presented at the

2012 conference by a team from Dockwise Shipping and TU Delft. Following substantial lab work and fundamental model testing, an extensive model test campaign was recently undertaken with a heavy transport vessel (HTV) and a large semi-submersible to simulate an offshore discharge operation in northwest Australian conditions.

Co-author Onno Peters, Dockwise's senior marine engineer, pointed out that as offshore discharge operations are sensitive to environmental criteria, this has consequences for workability. 'Currently safe conditions are based on long-term operational experience. No proven numerical methodologies are available in the market today to assess the hydrodynamic behavior of submerged HTVs in rough seaway, in short offshore loading/discharge. Both the basic design (of both HTV and systems) and hydrodynamic behavior have been investigated.'

According to Peters *et al*, problems had been encountered in past R&D projects focusing on offshore loading/discharge, especially in the area of predicting the relative behavior of floating structures above a HTV.

'Investigations have shown that inaccuracy is mainly caused due to the narrow gap between cargo and HTV. Development of an accurate and cost-effective method to predict hydrodynamic behavior of a cargo floating above a HTV is in progress,' he added. Cargo handling system performance is also being investigated. 'Also here, as industry software has its limitations, new methods may need to be developed to be able to satisfy safe operation and handling of equipment.' **OE**



On-station FPSO drydocking scenario using Dockwise Vanguard.