Prince Job I

Multi-purpose offshore support according to De Hoop's **'KISS'** methodology

Designed to operate in the Chevron offshore oil fields near Nigeria, Shipyard De Hoop's hull number 450 was handed over to her owners, Awaritse Nigeria Limited (ANL), at the end of March 2015. The vessel is intended to support all exploitation activities involved in the transport of liquid fossil fuel through a subsea pipeline, from the buoy to the mainland. One of those activities is the discharge of transmix liquids.

At present, the local discharge of transmix liquids is performed by means of tankers. However the maximum allowable draught for this operation area is not suitable for the tankers that are currently being used, moreover the use of these tankers only provides an adequate solution for one of the three major tasks, that have to be performed. Obviously, improvising with tankers that do not have the right characteristics for the complete job, have too much draught and can only perform one of the three required tasks, is not ideal.

It was therefore that, in March 2014, Shipyard De Hoop secured an order for the design and construction of a dedicated Intermix/Transmix Vessel. The vessel, named *Prince Job I* was launched on 31 December 2014, at their facilities in Lobith in the Netherlands. Departing from the yard to the sea port of Rotterdam on 10 February 2015, the 68 metre OSV (Offshore Support Vessel) commenced its sea trials on the next Saturday, 14 February. After the successful sea trials De Hoop spend a few weeks completing the final details, before the vessel started its maiden journey to Nigeria.

This newly designed OSV is developed by customising the proven De Hoop KISS-concept. The resulting straightforward design is competitive in overall costs (investment and running costs) and operational reliability. To further achieve enhanced flexibility and economical superiority, ANL chose a diesel-electric propulsion concept.

Liquid discharge tasks - transportation of transmix

Whilst its first work will mainly consist of the transportation of transmix liquids, this ship is designed for more than one purpose. Besides functioning as an outright (offshore) supplier, the vessel is suitable for a vast range of offshore inspection, maintenance and repair work (like subsea transport pipe cleaning). For these purposes, the full deployment of its cranes in combination with the large work deck is manifested.

Once an offshore site is in production, the pipelines connecting it to the mainland will, in general, transport different products into and out of the oil (or gas) reservoir. This observation, leads to the fact that it is almost impossible to avoid contamination between different liquids transported in the same pipeline. So, facilities will have to be provided to offload this contaminated mixture to be fractioned and refined at a suitable (alternative) location. Hence arises the primary task for *Prince Job I*: the transport of this contamination, called transmix, away from the offshore production site. This task, however, requires serious precautions, as some liquids (like contaminated diesel) have an extremely low flash point. A study, conducted in the past, shows that the addition of just 0.05 per cent (EGTL naphtha) contamination is enough to drop the diesel flash point below 60 degrees, down to as low as 43 degrees Celsius. So all tanks and pump equipment on board *Prince Job I* complies with the DNV-GL requirements for the transport of these liquids.

EXTREMELY **LOW** FLASH POINT

For that purpose and as a result of the propulsion configuration and lay out, most of the below deck space is given over to a large number of high-capacity (cargo) tanks for various liquids. The only exception being the pump and thrusters rooms, which take up a small volume of the available cubic meterage. From stern to bow in the centre cargo hold we find one flushing tank, two transmix tanks, two fuel oil tanks and six multi-purpose tanks for fuel/mud, fuel/transmix or transmix/brine combinations. The double hull and bottom further comprise of 17 drilling water tanks. The remainder of the (four)

For hose handling and loading duties the OSV is equipped with two offshore knuckle boom cranes

fresh water, dirty oil, sludge, bilge water tanks are to be found in the fore ship, below the superstructure.

Supplier tasks - transportation of deck cargo

Above main deck *Prince Job I* is designed to carry deck cargo, such as pipe, containers, palletised coiled materials, casing segments and other heavy items on its large 500 square metre cargo area. This cargo decking has a load rating of five tonnes per square metre, whilst it is also provided with container fittings and ample lashing points to accommodate a containerised cargo of 16 TEUs. With the accommodation located as far forward as possible, optimum use is made of the unobstructed deck length.

For hose handling, loading and unloading duties the OSV is equipped with two Sormec offshore knuckle boom cranes, each with a lift capacity of ten tons at 15 metre outreach. Not only is this weather deck protected by the forward superstructure, it also features protective cargo rails at the

CHAMELEON WORKHORSE

sides. The cargo rails have openings with hose-rollers, on port and starboard side in the vicinity of the forward crane, for guiding cargo hoses on board. On the aft deck another hose-roller is provided for guiding cargo hoses on board over the stern by means of the aft crane.

Three tugger winches are provided behind the superstructure and another two on the aft cargo deck, to assist crew to operate heavy hoses or gear and for handling (dragging/towing) deck cargo.

Support tasks - inspection, maintenance and repair

As stated above, transmix liquids are created when changing from extracting one product from the storage to another. This not only creates a contamination between different liquids, but also pollutes the pipes through which they are transported. These pipelines, that lie on the seabed for the transportation of the various petroleum products (fuel, naphtha, condensate, GTL) are not coated. Furthermore, in this industry the pipelines are subject to extremely high pressures and leaks and blockages or constrictions are unacceptable.

To solve the issue of contamination and different liquids flowing through the same pipe, instead of one pipeline multiple pipes could be applied; as such each liquid would have its own pipe. However, seen from different perspectives, this would be an extremely expensive solution. So, when Chevron had to choose, they opted for the single pipeline to shore and as a result they have to keep that pipeline clean and in good working order. So cleaning and inspection at regular intervals became an

The aft facing area of the wheelhouse is where the DP assisted operations can be controlled

The forward facing part of the wheelhouse is used solely for transit sailing

For external fire-fighting purposes, monitors are fed with water from two dedicated electrically driven Fi-Fi pumps

issue of vital essence: testing for hydrostatic pressure, checking for dents and crimps on the sidewalls inside the pipe and conducting periodic cleaning and minor repairs.

When this would not be done, it could lead to serious accidents and explosions. Hence the requirement for this ship to also perform such relevant offshore support tasks.

The De Hoop OSV-concept

The latest De Hoop OSV has a length of 68.45 metres and a width of 15.77 metres, resulting in a deadweight of 2,300 tons. In close consultation with the yard, ANL opted for diesel-electric propulsion. Built for worldwide service, the vessel is of Germanischer Lloyd Classification with DP2 notation.

The design is, as usual, based on the proven De Hoop PSV/OSV-concept and their 'KISS' methodology, but once again evolved to a next level. The lines of the hull are further optimised and faired, enhancing the form for fuel efficient operations, during both transit and DP modes. Although the multi-chined hull is wider than previous generations of De Hoop PSV/OSVs, the revised shape leads to a considerable reduction in wave resistance. The overall result is a transit speed of 11.7 knots, a reduction in fuel consumption and excellent DP capabilities. The DP components are tuned to two tunnel bow and two azimuthing stern thrusters, to achieve high-accuracy station-keeping counteracting wind, waves and current forces in most weather conditions.

The generators, for the diesel-electric propulsion and other consumers, are located on the main deck, in the first superstructure layer. This is similar to the earlier KISS-designs and not only allows for much larger cargo volumes, but also facilitates easier access for maintenance. The resulting tank capacities make this vessel stand out in its size range.

Power cables and piping running through the longitudinal corridor between the pump rooms

Deck equipment - mooring, anchoring and safety

A full suite of anchoring and mooring equipment is provided as is appropriate for vessels of this type and size. The foredeck houses an electro-hydraulic combined mooring and anchor winch with two gypsy wheels and two warping heads: one of both on each side. The anchors are two stockless high holding power Pool-M items of 1,305 kilogrammes each, with 440 metres stud link chain cables of 36 millimetre diameter, as required by class. In addition, there is one bollard on either side and one at centreline of the foredeck.

Either side on the main cargo deck are two more bollards: one of which is just after the superstructure for the mooring spring, whilst the other is aft near the stern, integrated in the bulwark. Just forward of the aft bollards are two electro-hydraulic capstans, one on each side, for harbour mooring assistance.

To meet the safety requirements, four inflatable life rafts are provid-

ed, two on port and two on starboard side, with a capacity of 25 persons each. The rafts are gravity-launched and stored in racks on the third superstructure deck against the aft side. The SOLAS/IMO required Man-Over-board-Boat (MOB) with outboard engine and a slewing davit is available on starboard side. Furthermore, complete with its own dedicated davit installation, a heavy-duty workboat with an aluminium hull and an inboard diesel engine is to be found on port side on B-deck. Both MOB and workboat with their launch-and-recovery systems are provided by Palfinger of Barneveld in the Netherlands.

For external fire-fighting purposes, two monitors with a total capacity of 2,400 cubic metres per hour are installed forward on the superstructure on D-deck aft. The installation is fed with water from two dedicated electrically driven Fi-Fi pumps, with a capacity of 1,530 cubic metres each. The extinguishing water jet is created in the monitor outlet by pressing water through the monitor nozzle. The pumps, water monitors and the water spray system are in accordance with the DNV-GL requirements for Fire Fighting Vessel Class 1.

Propulsion and machinery

The propulsion system of the vessel consists of two azimuthing Z-drive thrusters in the stern and two bow thrusters. In the aft propulsion room (or aft peak) are the stern thrusters: two Veth units with fixed pitch propellers operating at variable speed within a nozzle. The propellers, driven by freshwater cooled electro-motors of 900 kW each, are capable of producing their max-imum thrust throughout a full 360 degree steering range.

Forward of the aft thruster room is pump room number one, the bulk of which is occupied by the hydraulic power pack unit of the aft crane, the seawater supply pumps for the foam extinguishing system on deck, as well as the liquid foam supply pumps and the liquid foam storage tanks, the ballast system and bilge pumps. Directly against this pump room is the dedicated cargo pump room.

Below the main engine and switchboard rooms, which are situated on the first accommodation deck, are the forward pump room and the bow thruster room. This pump room is mainly taken up by the hydraulic power pack unit of the forward crane, the seawater supply pumps for ex-ternal fire-fighting monitors, the freshwater pumps, sewage pumps and the bilge/ballast system.

In the bow, two transverse tunnel thrusters, also delivered by Veth and driven by air-cooled e-motors of 450 kW each, are fitted. These thrusters, also fixed pitch propellers operating at variable speed and controlled by a variable frequency converter, are predominantly used in DP-mode and when mooring.

Power generation comprises of four diesel alternators, which can be run parallel in any combination, whilst load sharing is ar-ranged by the power management system. Two diesel generator sets are Caterpillar C32 (995 bkW at 1,800 rpm) and two are Caterpillar C18 units (570 bkW at 1,800 rpm), all delivered by PON Power. These freshwater-cooled sets are located in the engine room on the main deck in the first superstructure layer.

The actual electrical power distribution is split in two circuits, fed by two times 950 and two times 550 kW from the generator sets, to obtain the redundancy required for DP2 certification. The main distribution power is three phase 60 Hz 480 VAC, whilst all lighting and small consumers are on a 230 VAC circuit.

The emergency/harbour generator set, an air-cooled Caterpillar C4.4 of 94 bkW, is located high on top of the wheelhouse deck in a dedicated compartment.

Wheelhouse and accommodation

The superstructure is located as far forward

The freshwater-cooled generator sets are located in the engine room on the main deck in the first superstructure layer

as possible and comprises of 4.5 levels. The wheelhouse is separated into two effective bridges: the forward facing part, used solely for transit sailing and the aft facing area, where the DP (Dynamic Positioning) assisted operations can be controlled during loading or unloading. Between the two bridge parts there are the radio console/chart table and the stairs to lower decks.

Furthermore, the interior is designed to the current standards in the 24/7 offshore industry and provides accommodation for a total of 30 persons. Each cabin has access to internet, radio, television and individually controlled air-conditioning. The crew accommodation is divided over two single berth, two double berth and six quadruple berth cabins.

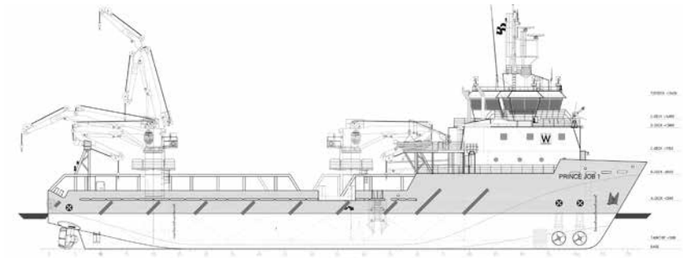
Additionally, the superstructure features a changing room, combined mess/dayrooms, galley and various freeze/cold provisions stores. The starboard and port side aft corners feature the funnels with the generator exhaust lines. The half-height D-deck comprises the air-treatment room and the gyro compartment.

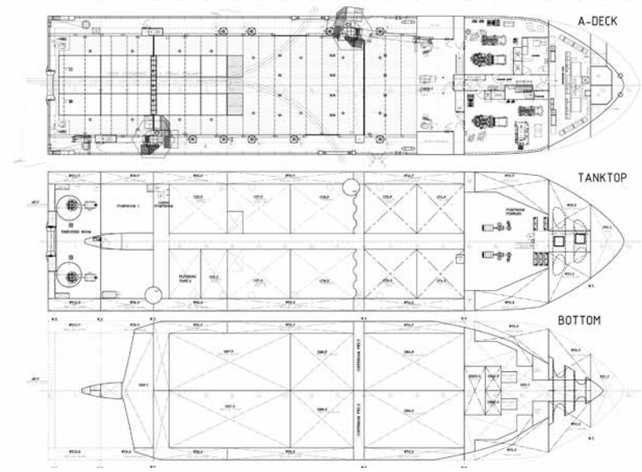
From FPSO to dedicated intermix/transmix OSV

The owners as well as Chevron eagerly welcomed this latest addition to the ANL fleet, as is understandable after reading above issues, that arise when using a single pipeline to transport various liquids from buoy to shore over longer distances.

The synergy between De Hoop and ANL has led to an all-round, though cost efficient, workhorse. As such, the vessel awaits a grand welcome in Nigeria and will have a productive future performing a wide range of offshore duties.

Tom Oomkens





Principal particulars

Builder
Shipyard De Hoop, Lobith, the Netherlands

Owner
Awaritse Nigeria Limited, Lagos, Nigeria

Length o.a.	68.45 m
Length bpp.	62.58 m
Beam mld.	15.77 m
Depth mld.	5.50 m
Draught summer	4.62 m
Speed max.	11.7 kn
Complement	30 persons
Cargo capacities	
Deadweight (T = 4.62 m)	2,300 t
Deck area	500 m^2
Tank capacities	
Fuel oil	520 m^3
Fresh water	240 m^3
Transmix fluid	800 m^3

Subcontractors and suppliers of equipment fitted on board the *Prince Job I*, YN 3450
Air Products Nederland, Amsterdam: marine nitrogen generator; **Alphatron Marine,** Rotterdam: *JRC* navigation and communication equipment; *NAVIS DP2* system with integrated manual thruster controls; **Amnitec,** Rotterdam: stainless steel flexible hose nitrogen gas system, metallic hoses UFBX; **Anko Piping,** Dordrecht: piping; **Axces,** Tholen: exhaust silencers; **Ayles Fernie,** Kent, England: sprayboom system; **Boer Staal, De,** Uitgeest: steel; **C-Nautical,** Sappemeer: deck equipment, anchor winch, chain stoppers, capstan, tugger winches; **Caru Containers,** Rotterdam: containers; **Chemetall,** Oss: anodes; **Datema Nautical Safety,** Delfzijl: medical chest, nautical publications; **De Jong & Lavino,** Geldermalsen: steel plates and profiles; **Delade,** Doetinchem: furniture, upholstery; **Deno Compressors,** Krimpen aan den IJssel: work air compressor and air vessel; **Distrimex,** Doetinchem: pressure boosting set; **DNV GL,** Rotterdam: classification; **Droste Elektro,** Tolkamer: sound system, navigation lights, gas detection and alarm electrical installation ; **Econosto Nederland,** Rotterdam: valves, air whistle, fittings; **Electrolux Professional,** Alphen aan den Rijn: laundry equipment; **EPS,** Ridderkerk: cargo pumps transmix system; **Facet International,** Almere: bilge water separator; **Famos,** Gdansk, Poland : bulkheads, ceilings, doors, panels; **FFS,** Moss, Norway: external firefighting System; **Franklin Offshore,** Rotterdam: ropes; **GEA Westfalia Separator Nederland,** Cuijk: separator; **Gevierdales,** Doetinchem: sanitary; **Global Marine Decking,** Hardinxveld-Giessendam: flooring; **Hatenboer Water,** Schiedam: *Dimitec* desalination unit, fresh water hydrophore; **Imtech Marine,** Rotterdam: heating, ventilation and air conditioning installation; **Intercontrol,** Arnhem: flow meters; **Jac de Vries Gesta,** Middenbeemster: hot-water boilers and heaters; **Kieboom-Werkendam,** Werkenboom: wheelhouse chairs; **Kongsberg Maritime Holland,** Spijkenisse: *RADius* relative position reference system; **Kroon,** Hoogezand: bottom plugs; **Leroy Somer,** Soesterberg: generators; **MacGregor,** Germany: container fittings; **MarteQ,** Rotterdam: gangway; **Metos,** Amsterdam: galley equipment ; **Minimax,** Almere: internal fire-extinguishing installation; **MKB Machinefabriek,** Rotterdam: towing pin system; **National Oilwel Varco,** Groot-Ammers: mud pump; **NRF,** Mill: box coolers, Impressed Current Anti-Fouling (ICAF) system; **Palfinger Ned-Deck,** Barneveld: hydraulic slewing davit and a fast rescue boat ; **PCN,** Vlaardingen: piping; **Pharos,** Waltham, U.S.A.: engineering services; **PON Power,** Papendrecht: *Caterpillar* harbour emergency generator, *Caterpillar* main and emergency diesel generator set; **Pres-Vac Engineering,** Allerød, Denmark: pressure, vacuum valves; **Reikon,** Spijkenisse: *Azcue* pumps; **Rubber Design,** Heerjansdam: flexible mounting system exhaust silencers ; **Scanjet Marine,** Götenburg, Sweden: tank monitoring system; **Schutte,** Stadskanaal: manholes and manholecovers; **Sigma Coatings,** Amsterdam: paint ; **SKF,** Ridderkerk: *SKF Vibracon* chocks for *Wolfer* electro motor; **Skid Piping,** Ten Boer: seamless tubes, pipes; **Sormec,** Alcamo, Italy: deck and telescopic cranes, pedestal; **The Green Machine Industrial,** Maarssen: garbage compactor; **Trinoxx,** Hardinxveld-Giessendam: watertight doors, steel firedoors, portholes, windows; **Theunissen Technical Trading,** Malden: *Aqua Signal* EX-lighting; **Uittenbogaart, Technisch Bureau,** Ridderkerk: *BioCompact Environmental Technology* sewage treatment plant, *Jets™* vacuum toilet system, *Honeywell* hermetic gauging and sampling equipment; **VAF Instruments,** Dordrecht: flow meters, liquid filters; **VDI Isolatie,** Ridderkerk: insulation plan; **Veld Koeltechniek,** Groenlo: air-cooling and compressors; **Verhagen IT Group,** Lobith: CCTV system, satcom system; **Veth Propulsion,** Papendrecht: *Veth Z*-drive, *Veth* tunnel thruster; **Viking Life-Saving Eqipment,** Zwijndrecht: lifesaving equipment, firefighting equipment and life rafts; **Wetcab Sp. Z.o.o.,** Gdansk, Poland: wet units; **Winel,** Assen: tank vent check valves, watertight hatches, gastight doors and hatches; **Wortelboer,** Rotterdam: anchor and chain cables.