

ESNAAD 221



Photo by Flying Focus

A plethora of Arabian support provided by royal-orange coloured PSV

At the beginning of 2013, Abu Dhabi National Oil Company (ADNOC) issued an invitation to tender for the design, build and delivery of ten Platform Supply Vessels (PSVs). Following a technical prequalification, the group of tenderers was rapidly reduced to a shortlist of candidates, with different nationalities. However, during the final (commercial) round, the prestigious contract was won by Dutch Shipyard De Hoop as a result of their technically advanced design and competitive terms. The complete production of the ten vessels is split between the two shipyard locations of De Hoop, Lobith and Foxhol.

In June the first vessel, yard number 470, named *ESNAAD 221*, was delivered to operating company Esnaad, which is a member of the ADNOC Group. In the meantime, the steel hull of yard number 471, the second vessel in the series, is assembled in Foxhol and outfitting has started. On the slipway of the Lobith facilities, the hull of yard number

472 is currently being assembled. Whilst the construction of the block sections for the next two vessels is also at an advanced stage, even the steel cutting for the sixth PSV has commenced. The delivery of the ten vessels is spread over almost two year, with the last PSV to be handed over in 2017.

The PSV, having main dimensions of 70.4 times 15.8 metres (L x B), heralds another evolution of the proven De Hoop PSV designs. Meeting the stringent operational and environmental requirements for working in the Arabian Gulf, the vessel has a DNV Environmental Regularity Number (ERN) score of 99/99/99/98. This represents the

optimal use of all thrusters and the effect of a single-thruster failure or a worst-case single failure(s). Once operational, all vessels will be active in the United Arab Emirates, supporting ADNOC's exploration and exploitation activities of the national offshore oil and gas fields.

In meeting ADNOC's aspirations, the Esnaad series of vessels are designed to operate at maximum efficiency and optimised cost with minimum impact on the environment, whilst at the same time avoiding harmful implications to people.

Being one of the world's leading oil companies, ADNOC carefully and with much professional expertise composed a set of criteria, to which the design of the PSV had to comply. With this set of requirements as starting point ADNOC and De Hoop, in close collaboration, jointly developed the specification according to which the vessel was to be built. As such, although based on previous De Hoop designs, a dedicated and profoundly customised PSV was created, under guidance of ADNOC specialists.

The hull form below the waterline is optimised to reduce (wave) resistance. To further improve the resistance during transit, the hull is fitted with a specially developed bulbous bow. The bulbous bow has the additional advantage of providing sufficient width for fitting a through tunnel

General concept

The Esnaad vessels are a series of PSVs dedicated to the provisioning of offshore oil and

gas platforms. Although primarily designed for offshore supply purposes, they can also serve as a basis for a wide array of other offshore support services, such as stand-by services or firefighting.

for accommodating the forward bow thruster. The propulsion components are tuned to three tunnel bow and two azimuthing stern thrusters, to achieve high-accuracy station-keeping and allowing for a transit speed of 13.5 knots, both at the lowest possible power requirements.

Furthermore, the resulting impressive deadweight of 2,050 tons at the restricted draught of 4.85metres is testament to the optimised cargo volume at the given low resistance hull shape. As a consequence of this configuration and the dedicated ADNOC lay-out, most of the hull volume is dedicated to high-capacity (cargo) tanks for various liquids.

In close consultation with the yard, ADNOC opted for a diesel-electric propulsion configuration, to achieve enhanced flexibility and economical superiority, whilst at the same time remaining environmentally friendly. However, unlike a number of recently delivered De Hoop PSVs, the generators, for the diesel-electric propulsion and other consumers, are located below the main deck, in the fore ship underneath the superstructure. This was done to accommodate the preferred generators with medium speed engines, which are larger than previously used generators with high-speed engines.

99/99/99/98
ERN SCORE



The three main generator sets of 1480 kW each, are driven by medium speed engines



The bridge comprises an extensive package of nautical, navigation and communication equipment



The below deck space is given over to a large number and variety of cargo tanks

To achieve enhanced comfort levels in the high-standard accommodation, Shipyard De Hoop drew on their knowledge and experience in luxury cruise vessels. This includes meeting the low noise and vibration levels required by Lloyd's Rules for Crew Accommodation Comfort (CAC), for which the PSV will be assigned with the CAC3 class notation. To obtain this, 'floating' interior floors, ceilings and walls are applied throughout the accommodation, whilst the doors are acoustically dampened with integrated ventilation grills.

Liquid cargo below deck

As stated above, the below deck space, between the thruster room and the engine room, is given over to a large number of cargo tanks. This cargo area is stocked with dry bulk tanks, brine tanks, cargo fuel oil tanks, drilling water tanks and liquid mud tanks with agitators for keeping the liquid slurry from separating. The usual fuel oil, fresh water, sewage, sludge and bilge water tanks are to be found in the fore ship, where also the foam and dispersant tanks for firefighting and oil spill rescue actions are accommodated.

Deck cargo and disaster control facilities
In addition to the liquid cargo, *ESNAAD 221* will transport deck cargo, such as casings or drummed materials on pallets. The vessel boasts a large 515 square metre main deck: a work-cum-cargo deck, which is designed to accommodate loading up to five tons per square metre. The design of the deck permits large quantities of various offshore requisites to be transported. At the same time, the main deck is provided with container fittings and ample lashing points to accommodate a containerised cargo. Furthermore, the main cargo deck features integrated recesses in which struts can be affixed when transporting drill pipe casings as deck cargo. The casings will be stacked to starboard and portside in between the struts and the bulwark.

A tugger winches is provided behind the superstructure at the starboard side cargo deck, to assist crew to operate heavy towing gear and for handling (dragging/towing)

deck cargo or hoses. A quick release towing hook on centreline, for emergency towing purposes, is remotely controlled and can be released from the bridge with a push button. The towing hook has a safe working load of 50 tons.

For loading and unloading duties, *ESNAAD 221* is equipped with a Sormec offshore crane. Braced into the bulkhead of the workshop, it is based on a foundation pedestal on starboard side. This TL series crane is a fully hydraulic telescopic boom type, with a lift capacity of 15 tons at 2.5 metre or 0.5 tons at 25 metres outreach.

External fire-fighting is performed with the aid of two remotely controlled monitors on top deck. This installation includes a self-protection deluge (water/foam spray) system, fed with water from the dedicated Fi-Fi pumps, in combination with foam from the integrated storage tanks. The extinguishing jet is created in the monitor outlet by pressing water/foam through the monitor nozzle. Furthermore, the PSV is fitted with two six metre spray booms, enabling crew to effectively apply dispersant to the water surface in case of an oil spill.

Anchoring, mooring and safety

Either side on the main cargo deck are two mooring bollards: one of which is amidships on deck for the spring, whilst the other is aft near the stern and integrated in the bulwark. For handling of the aft mooring ropes, each side of the aft deck features an hydraulic capstan.

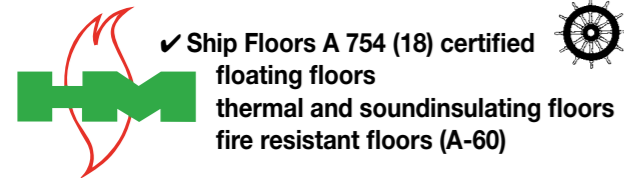
The foredeck houses an electro-hydraulic anchor winch with two gypsy wheels and two warping heads: one of both on each side. In between the two sets is another rope drum for handling mooring wires over the bow. The anchors are two stockless high holding power Pool-M items of 1,305 kilogrammes each, with 470 metres stud link chain cables of 32 millimetre diameter. The anchor and mooring winches are delivered by Machine- & Lierenfabriek Kraaijeveld from Sliedrecht, whilst the anchors and chains are provided by Wortelboer from Rotterdam. In addition, there are four bollards, two on either side of



External fire-fighting is performed with two remotely controlled monitors on top deck. Photo by Flying Focus

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the foredeck, and a warping roller for guiding bow mooring ropes to the drum.

To meet the safety requirements, six 'Viking' inflatable life rafts are provided, three on port and three on starboard side. The rafts are gravity launched and stored in racks on B-deck (second superstructure layer) against the aft side of the superstructure. Additionally, also a SOLAS/IMO required Man-Overboard-Boat (MOB) with a 35 hp outboard diesel engine is provided.

Furthermore, complete with its dedicated davit installation, a Palfinger rigid fast rescue craft (FRC) with a planing deep-V hull and

two inboard diesel engines driving water jet propulsion units, is to be found on starboard side of B-deck. The FRC is equipped with an automatic offload release hook with which it is deployed and recovered by the hydraulic pivoting A-Frame davit, also delivered by Palfinger.

Propulsion and machinery

The vessel has three main generator sets of 1,480 kW each, driven by medium speed engines, to power the propulsors and other consumers. The high level of redundancy guarantees the vessel remains fully operational, even with one complete generator set out of service. All generator sets consist

of freshwater-cooled Wärtsilä diesels with dedicated alternators, which can be run in parallel. The power management system arranges the load sharing as such that each set is equally loaded. Furthermore, for each usage scenario the optimal combination of generators is configured by this system, resulting in an impressively low NOx emission at each sailing pattern, be it at DP or when in transit. At the same time the daily fuel consumption is very favourable compared to similar vessels, requiring significantly less (propulsion) fuel on board.

In the aft side of the engine room on centreline is a harbour generator set, a water-cooled MAN of 238 kW, for use when moored along the quayside. In accordance with SOLAS and Class requirements, an emergency or auxiliary generator is located above main deck to portside aft on the C-deck. This set is powered by an air cooled MAN, coupled to an alternator delivering 250 kW.

The actual electrical power distribution is split into three circuits to obtain the redundancy required for DP2 certification. The main distribution power is three phase 480VAC/60Hz, whilst all lighting and small consumers are on a 220VAC/60Hz circuit. For shore power use, cable connection facilities are provided.

The propulsion system of the vessel consists of two Azimuthing Z-drive thrusters in the stern and three bow thrusters. The stern thrusters are Schottel units with fixed pitch propellers operating at variable speed within a nozzle. The propellers are driven by freshwater cooled electro-motors of 1,250 kW each. The speed control of the thrusters is by means of a variable frequency converter.

In the bow, three transverse tunnel thrusters, also delivered by Schottel and driven by water-cooled e-motors of 600 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.

Eekels of Kolham in the Netherlands are responsible for the complete electrical installation, including the design and installation



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Shipyard De Hoop concentrates on designing, engineering and building custom vessels, for both the inland and seagoing markets. The yard has all the core disciplines in house to provide clients with creative and innovative solutions, both in design and production. De Hoop is committed to a customer-oriented, goal-based approach in which quality and flexibility are paramount.

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of all switchboards, drives, converters, the power management system and the alarm/detection systems.

Wheelhouse and accommodation

The forward located superstructure offers accommodation to 28 people in six single-berth cabins on the C-deck and eleven two-berth cabins on the B-deck. All cabins feature en suite bathrooms and have optimised (individually controlled) air treatment units, radio, television and access to internet, providing a level of comfort, which is well within the current standards in the 24/7 offshore industry.

Principal particulars

Builder	Shipyards De Hoop, Lobith & Foxhol, the Netherlands
Owner	Abu Dhabi National Oil Company, Abu Dhabi, United Arab Emirates Esnaad, Abu Dhabi, United Arab Emirates
Length oa.	70.40 m
Length wl.	67.84 m
Length bpp.	65.26 m
Beam mld.	15.77 m
Depth mld.	6.00 m
Draught summer	4.85 m
Speed max.	13.5 kn
Complement	28 persons
Cargo capacities	
Deadweight (T = 4.85 m)	2,050 t
Deadweight (T = 3.70 m)	1,000 t
Deck area	515 m ²
Tank capacities	
Fuel oil	660 m ³
Fresh water	412 m ³
Drill water	1,028 m ³
Liquid mud/brine/fuel oil	789 m ³
Dry bulk	202 m ³
Foam	26 m ³
Dispersant	10 m ³
Lubrication oil	10 m ³
Hydraulic oil	4 m ³
Sewage	10 m ³
Dirty oil/sludge	6 m ³
Oily bilge water	11 m ³

Furthermore, the superstructure features a changing room, laundry/linen storage, hospital, fitness room, galley, freeze/cold provision stores, various offices and an Islamic prayer room. The combined mess/dayrooms are split into an officers area on portside and a crew area to starboard side.

Starboard and portside against the aft bulkhead of the superstructure, feature the funnels/casings with the generator exhaust lines and ventilation ducts. Further aft, behind the casings, on main deck are a workshop to starboard and a deck storage to port side.

The full width navigation bridge on the E-deck, with a 360-degree enhanced visibility, comprises an extensive package of nautical, navigation and communication equipment. The wheelhouse is separated into two effective bridges: the forward facing part, used 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. The bridge wings are enclosed, whilst a portable navigation unit with joystick controls is available with which the vessel can be operated.

CAC3 CLASS NOTATION

In between the accommodation 'layers' and the wheelhouse is the reduced-height D-deck, comprising a technical space, the air-treatment room and a sanitary space. The air-treatment room and the sanitary space are to starboard side, arranged around the central staircase, whilst all dedicated wheelhouse electronics and junction boxes are accommodated to port side.

ADNOC, Esnaad & De Hoop

ADNOC, established in 1971, is one of the leading oil and gas companies with substantial business interests in upstream and downstream activities in Abu Dhabi. Their exploration and exploitation activities are concentrated on realising undiscovered reserves and optimising hydrocarbon recovery by improving reservoir management. ADNOC are committed to sustainable developments, ensuring a harmonious balance between the people's needs and the earth's resources, whilst at the same time its track record in HSE (Health, Safety and Environment) sets the standard for the Arabian Gulf.

ADNOC has 14 subsidiary companies and Esnaad is one of the 100 per cent owned subsidiaries. The Arabic word 'esnaad' means 'support' or 'service' and this is exactly what this company does: support the national oil and gas industry. With the purchase of *ESNAAD 221* and the nine PSVs to follow, ADNOC/Esnaad made a statement confirming their HSE policy. In collaboration with Shipyards De Hoop they made a contribution to their sustainable attitude.

Tom Oomkens & Joost Konert

Subcontractors and suppliers of equipment fitted on board the *Esnaad 221*, YN 212

AAGE Hempel, Rhoo: communication and navigation equipment wheelhouse; **Anomalie**, Nibbixwoud: floor construction; **Atlas Copco Nederland**, Zwijndrecht: starting and working air compressor and accumulator tanks, air dryers; **Axces**, Tholen: silencers main engine and emergency generator sets; **Ayles Fernie**, Kent, England: spray boom systems, *ClearSpray* electric dispersant spray system, nozzle downpipes; **Carlsen Group**, Krimpen aan den IJssel: dry bulk tank, dry bulk dust collector, air compressor, air dryer, mulching eductors, dry bulk handling system; **Chemetal**, Oss: anodes; **Damen Marine Components**, Hardinxveld-Giessendam: bottom wells; **Datema Nautical Safety**, Delfzijl: Fi-Fi equipment, rescue and safety equipment, medical equipment, ECDIS system; **De Boer Staal**, Uitgeest: steel; **Delade**, Doetinchem: interior; **DESMI K&R Pompen**, Utrecht: fuel oil transfer pump; **Distrimex Pompen & Service**, Doetinchem: fresh water hydrophore booster set; **Eekels TBI**, Kolham: electrical installation, including the design and installation of switchboards, drives, converters, e-motors, the power management system and the alarm/detection systems; **Engineered Pumps**, Hoofddorp: fuel oil transfer pump; **Facet International**, Almere: bilgewater separators; **Famos Spolka z.o.o.**, Gdansk, Poland: walls, interior doors, ceilings; **Fast RSQ**, Barneveld: fast rescue boat; **FFS**, Moss, Norway: Fi-Fi monitor, external firefighting system, control cabinet; **GEA Westfalia Separator Nederland**, Cuijk: fuel oil separator; **Green Instruments**, Brønderslev, Denmark: emission monitoring systems; **Hatenboer Water**, Schiedam: fresh watermaker; **Heinen & Hopman Engineering**, Bunschoten: heating, ventilation, air conditioning and provision cooling; **Helder & May**, Rotterdam: *Nautec* wheelhouse deck floors; **Holland Air Pumps**, Oirschot: bilge pump; **Imtech Marine Netherland**, Rotterdam: nautical, communication and navigation equipment; **Jac. de Vries Gesta**, Middenbeemster: hotwater boiler; **Kieboom Werkendam**, Werkendam: chairs; **Kongsberg Maritime Holland**, Spijkenisse: DP system with motion reference units; **Kraayeveld C, Machine & Lierenfabriek**, Sliedrecht: hydraulic; **Landuwasco**, Vlaardingen: washing machines, tumble dryer; **Lloyd's Register EMEA Marine**, Rotterdam: international tonnage certificate; **MacGregor**, Germany: twistlock, lashing ring, bow; **Mampaey Offshore Industries**, Dordrecht: pneumatic remote control, towing hook; **MAN Rollo**, Zoetermeer: emergency and harbour generator; **Mar-in Contols**, Krimpen aan den IJssel: model tests; **Marine Service Noord (MSN)**, Hoogeveen: pipework; **MarteQ**, Rotterdam: gangway, safety net, hoisting sling; **Metos**, Amsterdam: galley and mess rooms; **Minimax**, Almere: fire extinguishing systems engine room and technical spaces; **Noordhof Schilderwerken**, Kropswolde: paint work; **NRF Nederland**, Mill: marine growth prevention system, box coolers, seawater cooler; **Palfinger Ned-Deck**, Barneveld: fast rescue boat, automatic offload release hook, A-Frame davit; **Power specialities LLC**, United States: mud/brine pumps; **PPG Industries**, Utrecht: paint work; **Rubber Design**, Heerjansdam: flexible suspension, compensators; **Schottel**, Spey, Germany: azimuthing Z-drive (stem) thrusters, transverse tunnel bow thrusters; **Sigma Coatings**, Amsterdam: paint; **Sormec**, Alcamo, Italy: telescopic boom offshore crane with pedestal; **The green machine**, Wrexham, Wales: waste compactor; **Trinnox**, Hardinxveld-Giessendam: steel doors, ship windows; **Uittenbogaart**, **Technisch Bureau**, Ridderkerk: bollards, chocks, guide swage unit, vacuum pumps, inlet tank; **VDI Isolatie**, Ridderkerk: insulation materials; **Viking Life-Saving Equipment**, Zwijndrecht: inflatable life rafts; **Wärtsilä Nederland**, Zwolle: generators, diesel engines, c.w. heater engine; **Wetcab Sp. Z.o.o.**, Gdansk, Poland: prefabricated wet-units; **Winel**, Assen: *Albatros* watertight sliding doors; **Wortelboer**, Rotterdam: anchor and chains; **Xylem water solutions**, Dordrecht: agitators; **Zwets, SKB Group**, Werkendam: expansion tanks;