



NAVNAUTIK'S PORTFOLIO ON TUGS





ABOUT US:

- NAVNAUTIK PTE LTD is a marine consultant company particularly catering for special application vessels. We specialize in the whole spectrum of varied market on specific customized application. Extensive effort is dedicated in the study of a project from technical and operational point of view.
- Such customized designs have taken place in many of our projects
- Over the past decade, we have successfully ventured into the offshore maritime industry also and delivered highly sophisticated vessels such as Ultra deep water pipe laying vessel (Lewek Constellation), Diving Support vessel, Accommodation Barges to support offshore oil rigs amongst other projects.
- We specialize in design of special application vessels. Our customized design solutions have ensured long-term fruitful relationship with our esteemed clients worldwide.
- Over the past decade, we have designed tugs (bollard pull 50-80) which have been built in many shipyards worldwide – bringing the total number of tugs being built as per our design to close to 80.
- NAVNAUTIK's work philosophy is "to design today what you will need tomorrow".



TYPES OF TUGS DESIGNED BY NAVNAUTIK & IN OPERATION

- 80T BOLLARD PULL (BP) ESCORT TUG
- 75T BP MULTI PURPOSE OFFSHORE TERMINAL TUG
- 70T BP ICE CLASS 1C VOITH TRACTOR TUG
- 70T BP ICE CLASS 1B ASD TUG
- 65T & 70T BP ASD TUG
- 75T BP ASD HYBRID ESCORT TUG
- 80T BP DIESEL ELECTRIC ESCORT TUG



LIST OF TUGS DESIGNED BY NAVNAUTIK & BUILT AT VARIOUS YARDS

Qingdao Qianjin Shipyard

| Hull NO. | Identification Type | Name of Vessel |
|----------|---------------------|--------------------|
| 6Z2016 | 80T BP LNG Escort | SVITZER GELLISWICK |
| 6Z2017 | 80T BP LNG Escort | SVITZER MUSSELWICK |
| 6Z2018 | 80T BP LNG Escort | SVITZER WATWICK |
| 6Z2019 | 80T BP Peru-LNG I | SVITZER CHINCHA |
| 6Z2020 | 80T BP Peru-LNG I | SVITZER CANETE |
| 6Z2021 | 80T BP Peru-LNG II | SVITZER PISCO |
| 7Z2022 | 80T BP Peru-LNG II | SVITZER MELCHORITA |
| 7Z2023 | 70T BP Ice-class | SVITZER TYR |
| 7Z2024 | 70T BP Ice-class | SVITZER TYRM |
| 7Z2025 | 80T BP Scandinavian | SVITZER THOR |
| 6Z20801 | 75T BP MSV | SVITZER ALFA |
| 6Z20802 | 75T BP MSV | SVITZER BRAVO |
| 7Z20803 | 75T BP MSV | SVITZER FOXTROT |
| 7Z20804 | 75T BP MSV | SVITZER ECHO |
| 8Z2026 | 80T BP Tug | SVITZER ANGOLA |
| 8Z2027 | 80T BP Tug | SVITZER ZAIRE |
| 8Z2028 | 80T BP Tug | SVITZER SOYO |
| 8Z2029 | 80T BP Tug | SVITZER PADRAO |
| 8Z2030 | 80T BP Tug | SVITZER PINDA |
| 8Z2031 | 80T BP Tug | SVITZER NEREID |
| 8Z2032 | 80T BP Tug | SVITZER NAIAD |
| 8Z2033 | 80T BP Tug | SVITZER NESO |
| 8Z2034 | 80T BP Tug | SVITZER NANA |
| 8Z2035 | 80T BP Tug | SVITZER NIXIE |

Keppel SingMarine Shipyard

| Hull NO. | Identification Type | Name of Vessel |
|----------|----------------------|----------------|
| 376 | 45 CYCLOIDAL TRACTOR | SEMAR 82 |
| 377 | ESCORT TUG | SEMAR 83 |

ASL SHIPYARD

| Hull NO. | Identification Type | Name of Vessel |
|----------|-------------------------|-----------------------|
| 399 | 70T VOITH ESCORT TUG | SVITZER ODEN |
| 500 | 70T VOITH ESCORT TUG | SVITZER STANLOW |
| 507 | 65T BP ASD TUG | SVITZER HORMUZ |
| 508 | 65T BP ASD TUG | SVITZER MUSCAT |
| 517 | 65T BP ASD TUG | SVITZER CARONI |
| 518 | 65T BP ASD TUG | SVITZER ABADAN |
| 527 | 65T BP ASD TUG | SVITZER KHORAMSHAHR |
| 528 | 65T BP ASD TUG | SVITZER MAHSHAHR |
| 537 | 65T BP ASD TUG | SVITZER AHVAZ |
| 538 | 65T BP ASD TUG | SVITZER KASHAN |
| 547 | 65T BP ASD TUG | SVITZER HADD AL THEEB |
| 548 | | SVITZER AL MELIHAT |
| 557 | | SVITZER AMAZONAS |
| 567 | 65T BP ASD TUG | SVITZER HAWK |
| 568 | | SVITZER EAGLE |
| 577 | | SVITZER FALCON |
| 578 | | SVITZER CONDOR |
| 880 | 80T ASD TUG (FOR QP) | SVITZER DAWI |
| 881 | | SVITZER MELAIH |
| 882 | | SVITZER ONAIZA |
| 883 | | SVITZER ANBAR |
| 1052 | 75T HYBRID TUG | SVITZER EURO |
| 1053 | | SVITZER BOODIE |
| 1057 | | SVITZER DUGONG |
| 1058 | | SVITZER PERENTIE |
| 1091 | 80T Diesel Electric Tug | SVITZER KADALA |
| 1092 | | SVITZER DUGITE |
| 1093 | | SVITZER MULGA |
| 1094 | | SVITZER GWARDAR |

Jiangsu Zhenjiang Shipyard

| Hull NO. | Identification Type | Name of Vessel |
|----------|---------------------|-------------------|
| VZJ6173 | | |
| 801 | 65T BP ASD | SVITZER NASSAU |
| 802 | | SVITZER LUCAYA |
| 803 | | SVITZER ALBATROSS |
| 804 | | SVITZER HARRIER |
| 805 | | SVITZER KESTREL |
| 806 | | SVITZER ORYX |
| 807 | | SVITZER LYNX |
| 808 | | SVITZER OWL |
| 809 | | SVITZER SWIFT |
| 810 | | SVITZER HERON |

Jiangsu Suyang Shipyard

| Hull NO. | Identification Type | Name of Vessel |
|----------|---------------------|----------------------------|
| 1478 | 65T BP ASD TUG | OCEAN ELITE |
| 1479 | | OCEAN ENTERPRISE |
| 1480 | | ORCHID STAR |
| 1481 | | OCEAN EMPIRE |
| 1596 | 70T BP ASD TUG | KNK ASHIMA |
| 1597 | | ASD TOPEKA / TRANSKO GAGAK |
| 1622 | 70T BP ASD TUG | ASD MERRICK / KNK JYOTI |
| 1623 | | ASD MERRILL |



A. 80T BP ESCORT TUG

PRINCIPAL PARTICULARS

- Length Overall (excl fenders) 32.60 m
- Breadth Moulded 11.60 m
- Depth Amidship (mld) 5.70 m
- Design Draft 4.50 m
- Speed 12.5 knots
- Total Complement 6 persons

CLASS NOTATION

- LR + 100A1 Escort Tug Fire Fighting Ship 1 (2400 m³/hr with water spray) IWS + LMC, UMS
- Tug meets DNV criteria for towing vessels





- 2 nos. diesel engines (8L28HX Niigata) @ 2206 kw at 750 rpm
- 2 nos. Z-drive azimuth thrusters (ZP 41 Niigata) for direct diesel drive and equipped with a fixed pitch type propeller running in a nozzle.
- 3 nos. DG sets (280 kw 400 VAC 3 Ph 50 Hz)
- One (1) electro hydraulic telescopic foldable deck crane of marine type 2t at 8m SWL
- Two (2) AC anchors with U2 stud link chain
- One (1) hydraulic anchor windlass with one de-clutchable towing drum, two cable lifters and two warping ends.
- Aft of the main deck one stern roller with a minimum S.W.L. of 125 tons.
- One (1) Hydraulic towing winch 30t pull & drum brake holding 200T





B. 75T BP MULTI PURPOSE OFFSHORE TERMINAL TUG

PRINCIPAL PARTICULARS

- Length Overall 45.64 m
- Breadth Moulded 13.20 m
- Depth main deck 6.00 m
- Design Draft 5.00 m
- Speed 13 knots
- Complement 22 (10 crew)

CLASS NOTATION

- BV Maltese Cross I 3 /3 E + Tug
Maltese Cross MACH FI-FI I, AUT-
UMS, Inwater Survey, Unrestricted
Navigation





- Two (2) units NIIGATA 6L28HX - 2206 kw x 750 rpm engine including operational accessories
- Two (2) units Rudder propeller - 750 rpm – Z-peller Type : ZP-41 (Niigata)
- Three (3) units main generators each of 280 kw @ 1500 rpm (CAT 3408 C Dita)
- One (1) electric-hydraulically operated heavy marine type deck crane with 5t @ 12 meter
- One (1) electric-hydraulically telescopic operated marine type deck crane with a SWL of 2 tonnes at an outreach of 6m
- One (1) Electric Driven - Bow thruster of 3.5 t
- Two (2) Tugger winch of 5T @ 15m/min
- A combined anchor windlass (FWD) / towing winch with 2 rope drum, 2 cable lifters, 2 warping heads 400 mm dia
- One (1) Shark Jaw / Towing Pin 200T





C. 70T BP ICE CLASS IC VOITH TUG

PRINCIPAL PARTICULARS

- Length Overall (excl fenders) 37.50 m
- Breadth Moulded 13.50 m
- Depth Amidship (mld) 5.30 m
- Draft of Hull 3.30 m
- Max Draught 6.05 m
- Trial Speed 15 knots
- Total Complement 8 persons

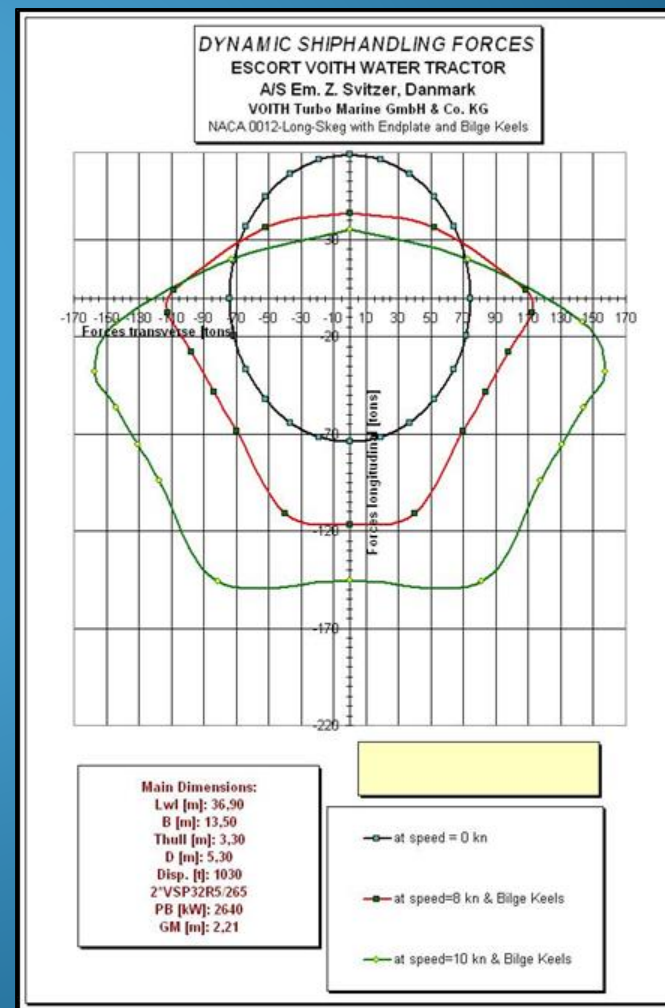
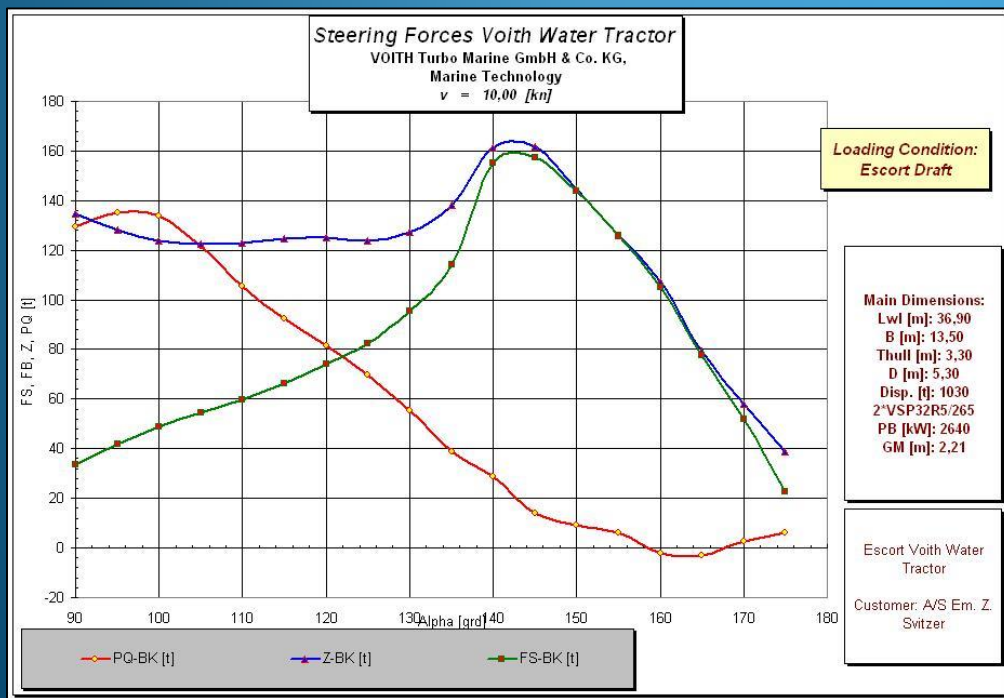
CLASS NOTATION

- LR + 100A1 Escort Tug (140, 150, 10,30), IWS, Fire Fighting Ship 1 with water spray, Ice Class 1C, Unrestricted Service





- Two (2) medium speed diesel engines connected to two (2) Voith Schneider propellers via shafting.
- Two (2) diesel generator sets each consisting of one diesel engine directly coupled to one alternator for each set.
- One (1) electro hydraulic knuckle boom deck crane
- Two (2) anchors with U2 stud link chain
- One (1) set of tugger winch of single drum type
- One (1) hydraulic towing winch



INSIGHT INTO VOITH TUGS

THE VOITH WATER TRACTOR AND THE VOITH SCHNEIDER PROPELLER³

Figure 2 (see end of paper) illustrates when and where assistance from the shiphandling tug may be necessary. The efficiency of a ship's rudder increases approximately in proportion to the square of the speed. Conversely, its steering capacity falls rapidly as the speed of the ship decreases. Depending on the size and type of ship, and on wind and current conditions, or conditions in a particular area, it may be necessary to provide assistance at relatively high speeds of as much as 6-8 knots. The Voith Water Tractor (see Figures 3 and 4) covers all the above aspects. Thanks to the two possible methods of operation – direct and indirect – the VWT can assist a ship safely over a wide range of speeds. The introduction of the Voith Turbo Fin (VTF) has further improved the indirect capabilities of the Voith Water Tractor at lower speeds.

The distinguishing feature of the Voith Water Tractor is that the propellers are located in the bow section, where they are protected by an integrated guard plate.

Figure 2: Speeds at which assistance may be required.

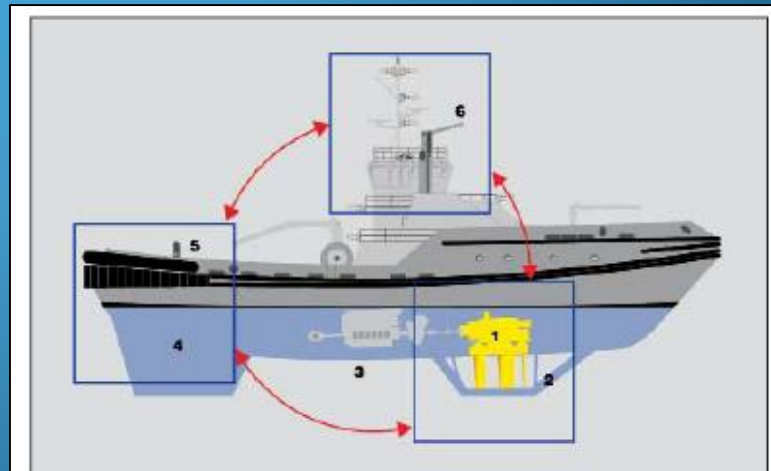
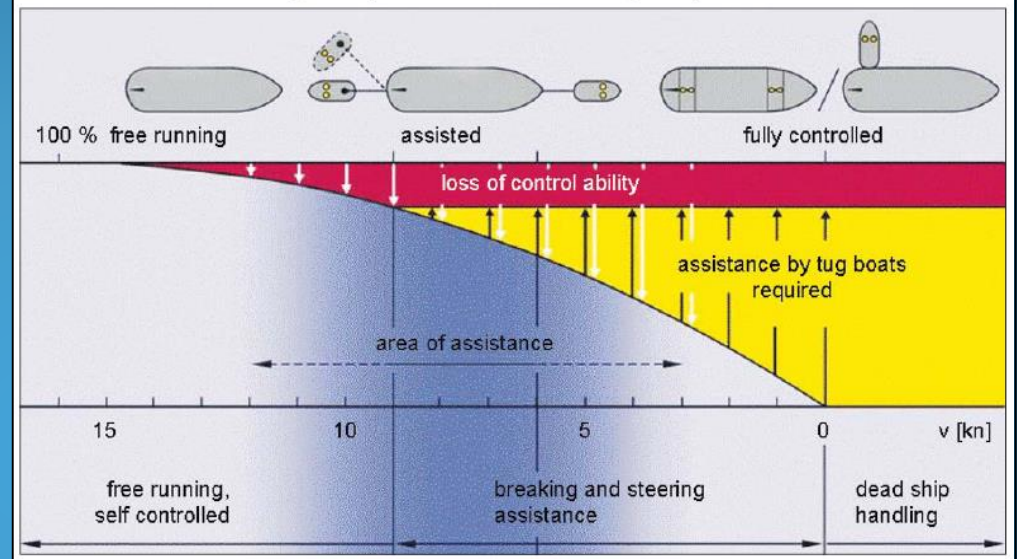


Figure 3: Characteristic features of the Voith Water Tractor.



D. 70T BP ICE CLASS 1B ASD TUG

PRINCIPAL PARTICULARS

- Length Overall 33.30M
- Length Waterline 28.60M
- Breadth Moulded 13.00M
- Depth Moulded 6.10M/5.70M
- Design Draft 5.00M
- Speed 12.5 knots
- Total Complement 6 Men

CLASS NOTATION

- Lloyd's: + 100A1 Escort Tug, Fire Fighting Ship 1 (2400 m³/hr with Water Spray), IWS, <ICE CLASS 1B FS>, WDL (5 t/m² from aft to Fr.15), + LMC, UMS





- Two [2] diesel engines 2022KW x 750rpm connected to azimuth FP propellers via shafting.
- Two (2) diesel generator 400KW x 1500rpm and one(1) 200 KW x 1500rpm sets
- One[1] hydraulic towing winch
- One (1) set of tugger winch of single drum type\
- Bow thruster with 5 tons thrust





E. 65T BP ASD TUG

PRINCIPAL PARTICULARS

- Length Overall (excl fenders) 30.80 m
- Breadth Moulded 11.00 m
- Depth Amidship (mld) 6.10 m
- Design Draught (mld) 4.40 m
- Trial Speed 12 knots
- Gross Tonnage below 500 t
- Total Complement 8 persons

CLASS NOTATION

- Lloyds + 100A1 Tug, Fire Fighting Ship 1 with water spray, +LMC, UMS, IWS





- Two (2) units NIIGATA 6L28HX, 1838 kw x 750 rpm engine
- Two (2) units Rudder propeller 1838 kw x 750 rpm – Z-peller Type : ZP-41
- Two (2) units main generators each of 150 kw x 1500 rpm
- One (1) unit harbour generator of 60 kw x 1500 rpm
- Two (2) anchors with U2 stud link chain
- A combined anchor windlass / towing winch, electric-hydraulically, single split drum type installed. The winch to be provided with two de-clutchable cable lifters, one de-clutchable towing drum and two warping heads of 400 mm diameter.
- One (1) electro hydraulic telescopic foldable deck crane of marine type.





F. 75T BP ASD HYBRID ESCORT TUG (for GORGON LNG project, Australia)

PRINCIPAL PARTICULARS

- Length Overall (excl fenders) 32.60 m
- Breadth Moulded 13.00 m
- Depth Amidship (mld) 6.60 m
- Design Draught (mld) 4.95 m
- Trial Speed 12.50 knots
- Total Complement 10 persons

CLASS NOTATION

- Class Notation : Lloyds : 100A1 Escort Tug, Fire Fighting Ship 1 (2400 m³/h) with water spray, *IWS, <ECO (A, GW,IHM,NOx2, OW, P, R Sox)>, WDL (5t/m² from AFT to Fr 21) <<* LMC, UMS>>





Propeller and Shafting

- Two (2) units Rudder propeller Schottel SCD 4000 SRP
2300 kW , 800 rpm

Electrical Generating Plant for Hybrid Propulsion

- Two (2) units main generators each of 1800 kw x 1000 rpm (Wartsila)
- One (1) unit main generators each of 1600 kw x 1000 rpm (Wartsila)
- One (1) unit harbour generator of 150 kw x 1500 – 1800 rpm
- **One (1) set Lithium Batteries of type LiNMC for low speed propulsion duty for transit between deck and working area during which no diesel engine is allowed to run.**

Others

- Two (2) anchors with U2 stud link chain
- A combined anchor windlass / towing winch, electric-hydraulically, single split drum type to be installed. The winch to be provided with two de-clutchable cable lifters, one de-clutchable towing drum and two warping heads of 400 mm diameter.
- One (1) electro hydraulic telescopic foldable deck crane





G. 80T BP DIESEL ELECTRIC ESCORT TUG (for Wheatstone LNG project, Australia)

PRINCIPAL PARTICULARS

- Length Overall (excl fenders) 32.60 m
- Breadth Moulded 13.00 m
- Depth Amidship (mld) 6.60 m
- Design Draught (mld) 4.95 m
- Trial Speed 12.50 knots
- Total Complement 10 persons

CLASS NOTATION

- Class Notation : Lloyds : 100A1 Escort Tug, Fire Fighting Ship 1 (2400 m³/h) with water spray, *IWS, <ECO (A, GW,IHM,NOx2, OW, P, R Sox)>, WDL (5t/m² from AFT to Fr 21) <<* LMC, UMS>>





Propeller and Shafting

- Two (2) units Rudder propeller Schottel SCD 4000 SRP 2600 kW , 800 rpm

Electrical Generating Plant for Propulsion

- Three (3) units main generators each of 2240 kw x 1800 rpm (Wartsila)
- One (1) unit emergency / harbour generator of 107 kw x 1500 rpm

Others

- Two (2) anchors with U2 stud link chain
- A combined anchor windlass / towing winch, electric-hydraulically, single split drum type to be installed. The winch to be provided with two de-clutchable cable lifters, one de-clutchable towing drum and two warping heads of 400 mm diameter.
- One (1) electro hydraulic telescopic foldable deck crane





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