

Escorts - the Voith perspective

Voith Water Tractors (VWTs) and Voith Schneider Propellers (VSP) are names that go hand in hand with the evolution of escort tugs. It is a rich history

Voith Water Tractors (VWTs) have established a reputation for providing a safe and reliable ship handling service. There are now more than 800 VWTs in service worldwide and their proven performance record, including in emergencies, led to the first interest in the use of such vessels as "escort tugs for tankers" over 10 years ago. A number of major tanker accidents in the US, including Exxon Valdez, was the catalyst.

Five VWTs have been serving the Puget Sound in Washington state for more than 15 years, operating in the past as tanker escort vessels without being named as such. Also the Panama Canal Commission has operated five similar vessels, employing the proven VWT concept as a safeguard for escorting merchant vessels, for many years. More recently, the Panama Canal Authority has put three additional VWTs, completed at Halter Marine in the US, into service on the waterway.

When the US Oil Pollution Act of 1990 (OPA 90) was implemented, oil companies and tug operators investigated the potential for enhanced escort vessels, based on the then existing escort experiences of VWTs. As part of this effort, Glostén Associates of Seattle studied the design of such vessels in cooperation with Voith and on behalf of the oil company Arco and tug operator Foss Maritime.

At the same time the Louisiana Offshore Oil Port (LOOP), the largest oil import terminal in the US Gulf, concluded that it should be provided with an emergency response vessel to minimise the risk of a tanker spill accident similar to the Exxon Valdez grounding. It was agreed that such a vessel should be a VWT and Loop Transponder was built to serve the offshore terminal.

Independently, Voith carried out its own investigation of the viability of using VWTs for tanker escort duties, comparing their performance with other tug concepts in the process. The result of this R & D work was presented at a number of international conferences in the early 1990s.

To verify Voith's model testing work, Shetland Council and Shetland Towage Ltd cooperated with Voith in carrying out full-scale tests of the concept using measurement devices in the towing gear. This effort confirmed the model tank test results and the viability of the concept.

Following these trials, Shetland Towage ordered two VWTs at Ferguson Shipbuilders in Scotland for use at Sullom Voe. There are now four VWTs - Tystie, Dunster, Tirrick and ICS Shalder - handling tanker escort and other duties at the Shetland Islands terminal.

Based on similar tests which they carried out, tug operator Buksér og Bjergrning A/S built Bess for use in Norwegian waters in 1994. This was the first European VWT purpose-built for tanker escort duties. At that time Buksér, together with Röda Bolaget AB of Sweden, formed the Neptun Marine Contracting A/S tug group. Buksér did not decide to specify VWTs for tanker escort services until it had made comparative tests with its own stern-driven pushers and tractor tugs with Z-drives. Buksér concluded that for its applications, involving the active escorting of large tankers at speeds of 10 knots and above, VWTs provided the highest levels of safety. Buksér carried out extensive tests at the Marintek model-testing tank in Trondheim to optimise the hydrodynamic design of the VWT under escort conditions. The aim was to achieve the required free running speed of at least 14.5 knots in the "skeg first" direction as well as a steering force of at least 100 tonnes on the tanker in the indirect mode at 10 knots. When Bess underwent full-scale trials, the performance

figures calculated using computer simulation and recorded in the model tests were exceeded.

As detailed in the commentary on Buksér escort tugs in the accompanying main article, the tug operator went on to build several other escort class tugs in addition to Bess, which itself was employed at Statoil's Mongstad terminal in Norway.

The success of these pioneering tugs led Statoil to specify VWTs for the next generation of escort tugs to serve at Mongstad. Buksér won the bid and Boxer, the fourth purpose-designed escort tug, was built for this terminal. This VWT is equipped with a propulsion system based on the 32 GII/250 Voith Schneider Propeller (VSP) propulsion system and is designed for a free running speed of 15 knots and a bollard pull of 70 tonnes. The tug has one of the highest certified steering pulls of escort vessels on the Det Norske Veritas (DNV) register with 148 tonnes at 10 knots.

Buksér is currently building an even more powerful VWT for Mongstad; it will have a steering pull of 160 tonnes and will go into service in December 2003.

The most powerful European VWT in tanker escort service is Ajax, delivered in 2000, which Østensjø Rederi operates at Sture, another Norwegian oil terminal. The tug was designed by naval architects Robert G Allan of Vancouver, and the new building project also involved extensive consultations and testing, including at Voith's own model tank test laboratory. Østensjø is currently engaged in a new project involving the development of an enhanced escort VWT with a Voith Turbo Fin (VTF).

One of the key milestones in the evolution of tanker escort services in Europe was the publication by DNV in the early 1990s of the first rules for escort tugs. Focusing on dynamic ship handling requirements, the rules served to highlight the capabilities of VWTs. Further major class societies have since adopted the DNV rules.

In the US Foss Maritime had the VWTs Lindsey Foss and Garth Foss built at the Trinity yard in 1994. The design of the tugs is based on the early US development work which commenced in the 1980s and had been further refined based on experience. Both vessels provide marine service, fire fighting, offshore salvage and emergency assistance towing services in Puget Sound.

Another US towing service provider, Crowley Marine Services, followed suit, ordering two powerful VWTs equipped with VSP 32 GII/200. Known as the Protector class, these tugs are based on the Boxer design and are operating successfully in tanker escort service in Alaska. The tugs are named Nanuq and Tan'erliq.

The Department of Environmental Conservation in Alaska has stated that purpose-designed VWTs equipped with VSP systems represent the best available technology (BAT) for tugs engaged in tanker escort duties. The Protector class escort tugs are the most powerful VWTs in the world. Each tug displaces 1,460 tons and is equipped with a VSP 36 GII/270 developing 10,000 hp.

The latest VWT new building for US service is Response. Once again based on the Norwegian design, the 7,260 hp tug is providing an escort service in the Strait of Juan de Fuca at the head of Puget Sound. Response is classed with ABS as an A1 escort vessel.

On the Atlantic coast of North America two escort VWTs have been built for Newfoundland Transshipment Ltd of Canada. The tugs escort the shuttle tankers bringing oil from the offshore Hibernia field to the Placentia Bay transshipment terminal in Newfoundland, as well as the larger laden tankers departing Placentia Bay for nominated refineries.

Turkey is another country which has applied VWT technology in the cause of safe tanker handling. The oil and gas company Botas has been operating VWTs along the Mediterranean coast for handling ships and on tanker escort duties since 1985.. Also, three VWTs are used to handle LNG carriers entering the Dardanelles enroute to the Marmara Ereğlisi gas import terminal and on the return journey.

In addition, the VWT Petkim 1 has been used to escort chemical tankers at Aliaga since 1991. Last year the VWTs Mersin, Izmir and Haydarpasa 1 entered into service

for the Turkish Railways Authority at the Turkish ports of Iskenderun, Mersin and Bandirma, respectively.

Finally in Turkey, Kiyi Emniyeti has used two VWTs for escort and salvage operations along the Bosphorus for some time. The client and Voith have been investigating how the level of service can be improved and, as a result of these deliberations, two 65-tonne bollard pull VWTs are under construction for the same customer and for the same area of operation.

The Bosphorus Strait is about 16 miles long, and at its most critical point, in the middle of Istanbul, narrows down to only one mile in width. Also, there are 12 points along the route at which vessels have to change course. Along with the extreme traffic density, the Bosphorus presents a special challenge for tugs on escort duty.

Similar investigations and full-scale tests have been carried out by the Suez Canal Authority and Voith with a view to the use of VWTs along that waterway at some stage in the future.

Full-scale tests have also been undertaken recently at the Shell gas terminal at Braefoot Bay in Scotland using the VWT Fidra. Although Fidra is a conventional harbour class VWT, it has a 50-tonne bollard pull and has shown good dynamic ship handling capabilities when escorting large gas carriers. Similar tests, with similar results, have been carried out recently using the VWTs belonging to SERS at Ravenna in Italy.

"When evaluating the basic requirements for tanker escort operations, our experience has shown that for the tug it is not simply a question of bollard pull any more but of dynamic ship handling forces over the entire speed range," states Dr Jens-Erk Bartels, chief executive of Voith Schiffstechnik GmbH in Heidenheim, Germany. "Based on this understanding, we have established three basic escort rules that we believe are essential to safe tanker escorts."

These rules are as follows:

Rule I

Each tanker to be escorted must have a certificate onboard showing the steering forces versus the ship's speed.

Rule II

An acceptable tug escort vessel must have a certificate onboard confirming the steering capability versus ship's speed, always bearing in mind the need to maintain acceptable levels of residual stability.

Rule III

The steering capability of a chosen escort vessel according Rule II has to incorporate sufficient safety margins above the steering capability of the tanker under escort.

Research at Voith over the years has been concentrated on Rule II to find the best available technology in the balance between the escort tug design and its propulsion system. This translates into providing the best steering capability with the highest degree of safety in the smallest size of tug possible.

"Besides the three basic rules, we have also established the "10 Commandments" for escort vessels," adds Dr Bartels. "These lay down the most essential requirements for safe and practical escort operation. Further criteria are explained in our assessment criteria for VWTs as escort safeguard vessels."