

# Dynamic Oval Towing System

## Seeing is Believing

The Innovation Prize was awarded on 17th of April by the chairman of the panel and Dutch Member of Parliament, Mr Aptroot. He is convinced that the DOT system is going to be used worldwide. "It is only a matter of time before this system becomes the world standard in the towing industry."

"Winning an award in a competition against so many other highly innovative companies is an achievement of the entire company," said Gerard Mampaeij. "For us, this prestigious award signals a well-earned recognition for our efforts to continuously improve our product range, to fulfill our customer expectations. And while winning an innovation award is a great feeling, the real awards come from our customers. That is why we are proud that we will be supplying the first DOT system

later this year, to the Scottish Macduff Shipyard. The DOT system improves the safety, efficiency, flexibility and controllability of any tug. The innovative system meets the demand for 360° around towing systems and offers sufficient flexibility for the design of the tug."

### Working Principle

The towing system consists of a 360° heavy oval deck mounted rail with free running carriages on which the towing hook is fitted. The oval shape offers a range of flexible parameters to adapt to most tug designs, allowing the width, length and specific curvature to be chosen to meet the owner's



*In a competition organized earlier this year for innovative Dutch entrepreneurs, Mampaey Offshore Industries B.V. walked away with the prestigious award for most innovative company of the Netherlands. Real "Dutch Glory", was the reaction of the enthusiastic panel who selected Mampaey Offshore Industries as the number 1 of the Innovation Top 100 of 2007. In particular, the Dynamic Oval Towing (DOT) System, Mampaey's latest innovation, was hailed as with acclaim.*

requirements. This flexibility provides advantages not only for new buildings but also for retrofitting on existing tugs. The towing system has a large area inside the oval shape, offering sufficient space for a full accommodation, machinery exhaust and vent piping, cranes and workboats. The oval shape offers the solution to connect the distance between the towing points for sailing ahead and astern. The shape of the oval rail positions the pull force in the forward towing point when sailing ahead and in the aft towing point when sailing astern. The close match of the towline forces above the water and the hydrodynamic forces below enable an optimal maneuvering performance with full control during towing operations, even at assisting higher speeds. Towing operations can be freely changed from any direction; either from bow to stern use or vice versa with one integrated towing system. The main advantage of this is that the tug operator can be flexible in deciding what mode to use to assist the ship and maintain the connection to the tow at all times. The radial support of the towline attachment prevents the tug from capsizing due to towline forces, an effective safety measure.

### Oval Rail

The Dynamic Oval Towing System consists of a heavy deck mounted rail and the DOT system itself. The rail forms an integrated part of the ship's structure. The DOT system attaches the Mampaey Disc Type Towing Hook to the rail. The tow forces are equally distributed to the rail by means of a spreader bar, the two carriages and the rollers. The whole structural design and integration with the ship design has been analyzed with Finite Element Method calculations and optimized for strength and costs. All the components are designed for a range of rail radii; they are connected by a double hinged construction and allow relative large building tolerance on the rail shape and alignment. The design also allows for increasing tolerances due to wear of the rail and rollers and guarantees proper rolling over a prolonged period of use. All components are based on a modular approach and can be interchanged for both a hook and a



winch version. The DOT system can be integrated in various designs. A typical example of a tug conversion has been illustrated by a 20 meter scale model of a small harbor tug featuring a bollard pull of 25 ton. In this oval shaped accommodation arrangement, safe access on deck is achieved in combination with daylight accommodation space below decks.

### Operational Tests

Prior to its introduction on the market, the DOT system underwent thorough testing, in accordance with the commitment to excellence and high standards for which





Mampaey is known. After the detailed engineering, the DOT system was subjected to a number of real-life tests. First, a scaled steel prototype was produced and the system was mounted on a scaled model tug to simulate realistic circumstances. The model successfully passed a series of in-depth testing in harsh operational conditions. Second, the first DOT system was mounted on the deck of a pontoon and tested with a double workload of 60 ton. The excellent results from this test demonstrated that the design requirements were met successfully. This initiated the official start of the delivery of the 30 ton SWL DOT system equipped with a tow hook, and was quickly followed by the introduction of the 15 ton SWL DOT system. Larger size systems are currently under development.

Mampaey DOT system. With a bollard pull of 9 tons, a deck crane, and an additional 'A' frame for plough dredging, this multifunctional vessel will be capable of performing a wide range of harbor duties. Two Scania marine diesel engines rated at 350 hp each will give the vessel a free running speed of 9 knots.

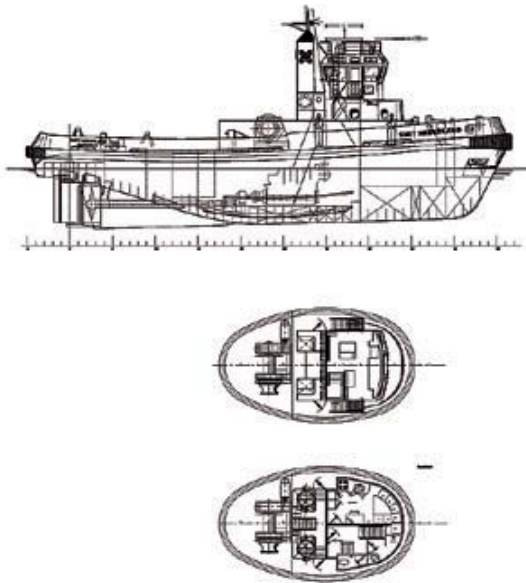
Macduff Ship Design acts as the owners' consultant and project manager and is responsible for the complete vessel design package. The engineering and structural integration of the DOT system has been carried out by Rotterdam based International Maritime Consultants (IMC). The vessel will be built by Macduff Shipyards on the north-east coast of Scotland.

Also in this tug the Mampaey Dynamic Oval Towing system integrates the towing points for sailing ahead and astern into one system. The system adds safety, controllability and, above all, flexibility to the performance of tug, enabling it to rotate in all directions in a safe and controlled manner irrespective of the heading of the assisted vessel. In exposed conditions, this capability will always allow the tug to meet waves safely with

### First Application

Meanwhile, the first Mampaey DOT-system has already been sold. Peterhead Port Authority has signed a contract for the construction of a new 13 meter harbor tug equipped with the





the raised bow. In confined spaces, assisting vessels is much safer as the 360° all-round towing system means that the tug's full power is available in any direction. This was an important consideration in deciding on the DOT system, according to Peterhead Port Authority.

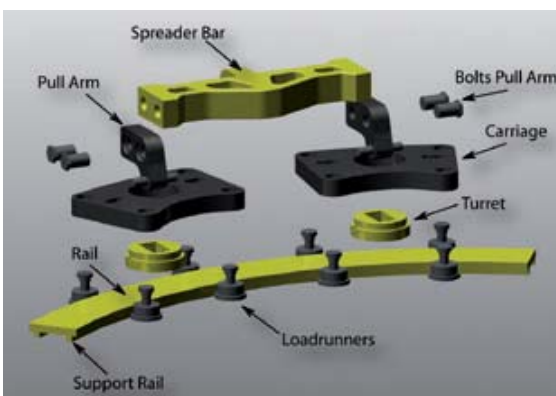
To cope with the dynamic forces, the DOT system features a safe working load of 15 tons and the rail on which the system travels is optimized for easy integration and low costs. This new build tug is the first offspring from what is rapidly proving to be a successful collaboration between Macduff Ship Design and Mampaey Offshore.

### Summary

Tug operators are constantly facing a dilemma between ever increasing assistance speeds and the safety of the tug and

crew. The DOT system solves this dilemma and makes towing at low and higher speeds safe and controlled. When towing sideways, the tug cannot capsize. The optimal balance achieved by the oval shape minimizes the need of propulsion power to control the tug. Significant improvement is offered in ship assistance and the safety of crew and vessel is assured. In summary the main benefits of the DOT system are:

- optimum crew safety
- ability to assist vessels at higher speed
- controllability at minimum propulsion power
- all towing points integrated in one 360 degree all around towing system
- full utilization of hydrodynamic forces
- sufficient accommodation area due to the oval shape
- new building, retrofit and conversions are all possible
- a minimum number of moving parts
- easy maintenance and long life cycle



The main advantage of a tug fitted with a DOT system lies in the fact that it has a different towing point when towing over the stern and when towing over the bow. Only an oval shape is able to integrate both towing points into one towing system, which cannot be achieved by any other existing tug boat. This enables a tug fitted with a DOT system to assist ships at higher service speeds in all directions safely. The DOT system meets the demand for 360° around towing systems and offers sufficient flexibility for the design of the tug. The oval-shaped accommodation ensures that all deck operations can be performed safely. Immediately available for delivery is the version with a safe working load of 15 and 30 ton, which can be installed on both new and existing tugs. Extensive research and testing has resulted in a product that meets the high level of quality and crew safety demanded in this area today.