ROMULO
A Powerful Shiphandler
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In February 2005 Astilleros Balenciaga delivered a powerful shiphandler to REPASA – Remolcadores de Puerto y Altrue. At 80 tbp ROMULO (hull no. 392) is one of the most powerful shiphandling tugs in the world.

Specifications for the new tugs to serve Tarragona were multiple: Oil terminal services, shiphandling, deepsea towing, fire-fighting, pollution prevention capability, oil recovery capability, maintenance work on offshore discharge buoys like SBM’s, anchorhandling, and the ability to transport 20-feet containers.

The owner’s requirements were translated into design by Cintranaval, Spain. The tug is constructed of steel throughout. The hull has a slight raked bow profile which extends vertically down below the waterline to provide additional lateral area resistance. This assists balancing the forces when in escort mode. The solid skeg forward joins a deep box shaped keel providing additional lateral resistance which runs the whole length of the vessel terminating aft in a hollow streamlined skeg.

Immediately aft of amidships the run of the hull rises to accommodate the 2,8 m diameter propellers ensuring an uninterrupted smooth flow of water to the props. The transition aft, from transom to bottom plating, has a forward raking incline to enhance the astern sailing characteristics.

The tug and sister REMO (hull no. 393), are destined primarily for operation at the Tarragona SBM and the two oil terminals.

Main dimensions of the tug are 33,00 m oa/28,65 m (bp) x 12,00 m (mld)/12,60 m oa. Depth is 5,60 m with a draught of 4,40 m (mld)/5,10 m (max).

The double chine hull is divided into five watertight compartments: Fore peak, engine room, stores, thruster room and aft peak. Frame spacing is 525 mm throughout. Hull plating is 20 mm in the forward and lateral pushing area and 16 mm in the bottom plating near the propeller area. The hull is cut away aft of frame 25, allowing a good clear flow of water to and from the propellers.

The hull is well fendered all-round at main deck level with further fendering at raised quarterdeck level. The tug has 6 deck levels: Tank top, intermediate deck forward, main deck with semi-raised forecastle deck, boat deck, wheelhouse deck and top deck. The tug is classed with Germanischer Lloyd, class notation 100A5, Active Escort Tug, MC-AUT, Fi-Fi 1, Oil Recovery.

Below the tank top are the fuel tanks as well as engine lube-oil tanks and hydraulic-oil tanks. In the sides of the engine room further fuel tanks are fitted forward and aft. The aft tanks are also used as recovered-oil storage tanks.

One of the MAN L27/38 main engines
Further tanks in the side are fresh water and foam tanks. Further fuel tanks are fitted forward of the engine room below the tween deck. Forward of these is the bow thruster room with the dry peak tank in front. At the aft end of the tug the thruster room is flanked by dry tanks with the aft peak tanks serving as recovered-oil tanks.

**Engine Room**

ROMULO and REMO are powered by a pair of MAN 7L27/38 engines, each developing 2,380 kW (3,236 bhp) at 800 rpm. Total output 4,760 kW/6,472 bhp. Both main engines are fitted at the front end with a Kumera step-up gear box. The starboard main engine is fitted with an integrated 1,600 kW front-end PTO. This drives the 2,800 m³/h Kvaerner Eureka fire-fighting pump as well as the hydraulically powered bow thruster arrangement.

The port engine is fitted with a similar 500 kW PTO. This drives the hydraulics for the deck winches, crane, towing pins and the bow thruster.

Electrical power is supplied by two Caterpillar 3306 gensets running at 1,500 rpm and fitted with SR4 alternators of 150 kW.

Bloksma box coolers were fitted, which serve the main and auxiliary engines and the propulsion units. The sea chests were fitted with an Impressed Current Anti-Fouling system (ICAF).

Forward a hydraulic driven bow thruster of 185 kW has been fitted to assist in manoeuvring and especially station keeping during fire fighting operations.

The engines drive Steerprop SP-35 azimuthing fixed-pitch propellers fitted with high-efficiency nozzles type HJ3-5. Diameter of the propellers is 2800 mm. Input is 2,380 kW at 800 rpm. Propeller speed is 239 rpm. Each Steerprop weighs in at 29 tonnes. During trials an average bollard pull ahead of 63.2 tonnes was recorded with peaks up to 85.5 tonnes. A speed of 13.2 knots was attained, with 12.5 knots astern.

Fixed-pitch propellers in a tug with this output are unusual. The advantage of the controllable-pitch propeller, however, has been taken over by the in-built idlespeed speed-modulating clutches of the Steerprop's thereby reducing the costs of the propulsion system.

This system allows a soft clutching of the propellers at idle and additionally is able to slip the clutch for limited periods of time during manoeuvring in closed quarters and where speed is to be maintained at a minimum.

Azcue was the main supplier of pumps for this tug. The compressors for engine starting are by Sperre. Both engine room fans, of 30,000 m³/h have been supplied by Sumivent.

A fuel oil and lubricating oil purifier each, of the self cleaning type, and in accordance with the unmanned machinery space notation have been supplied by Alfa Laval.

To meet the latest IMO requirements regarding pollution prevention the propulsion engines have been manufactured and have certificates of compliance with exhaust gas emissions criteria. Similarly a sewage treatment plant and bilge water separator have been fitted to meet IMO.

**Intermediate Deck**

This deck runs from aft of the peak tank till approximately frame 34. The deck sits on top of the bow thrusters room and fuel tanks. Aft of the peak tank are the chain lockers. This area opens up to a corridor with on the starboard side a three-berth crew cabin.
The cabin is fitted with cupboards and a desk. To port are a large store area and the laundry. Further aft is access to the engine room control-cabin. From the central corridor a staircase leads into the accommodation on the main deck.

**Accommodation**

The accommodation, for up to seven crew, is provided with air conditioning by means of fan coils, thus allowing temperature control in each individual space, with each unit having its own built-in heating resistance. At main deck level, two individual cabins, as well as the galley, mess/day room, office and communal wash room are sited.

**Semi-raised Forecastle Deck**

The foredeck houses the combined towing winch/anchor windlass, supplied by Norwegian Deck Machinery. The winch is fitted with a single drum with a capacity for 200 m x 60 mm synthetic (Dyneema) towing rope. Speed: 0-30 m/min (first layer/200 tonnes brake power. Furthermore the anchor chain gypsy are driven by the winch gear. The winch meets the escort notation requirements of the class society. The tow rope is guided through a stainless steel clad Panama chock fitted in the bulwarks directly in front of the winch thus creating maximum leverage in escort mode. The chock therefore is able to withstand forces off some 150 tonnes.

The accommodation block is situated on the forecastle deck, with the engine uptakes, and engine room ventilation sitting on the main deck. At the forward centre of the accommodation is a sanitary space with toilet, shower and wash basin. To starboard is the combined messroom/recreational area, seating six. Aft of the messroom is the galley. To port are two single-berth cabins each fitted with cupboards and a small desk. Aft of the cabins is the ship’s office. The central corridor opens up to the towing deck and staircases lead up to the boat deck and down to the tween deck.

**Main Deck/Towing Deck**

Aft of the accommodation the engine exhausts and the engine room ventilation sit on the main deck. The towing gear area between the uptakes houses the Norwegian Deck Machinery aft towing winch. The winch is fitted with a single drum with 600 m of 54 mm towing wire and an automatic spooling device. Brake load is 200 tonnes. To port a large-diameter warp head was fitted. The hydraulic pumps are driven through PTO’s on each of the step-up gear boxes on the main engines. The winches have both local and remote controls from the wheelhouse. Clutching in and braking of the drums is performed hydraulically.

Aft of the winch a double tow-bitt is fitted with an internal wire guide to be used by the hook to avoid entangling the hook and winch wires. The 90-tonne Mampaey tow hook is fitted offset to starboard aft of the winch. The hook has a pneumatic release which can be operated both locally and remotely triggered from the wheelhouse.

In addition an automatic release system was fitted which activates the release when a predetermined angle of heel is exceeded for a given period of time.

At the aft end of the towing deck the retractable Karm towing pins (200 tonnes swl) are fitted. The aft bulwarks are partly open and a 200 t. swl. stern roller (3.0 x 1.0 m diameter) was fitted to fa-
ciliate the handling of anchors, buoys and the deployment of oil booms.

The towing deck is flanked by offshore type cargo rails which facilitate the stowage of cargo but also increases safety on the towing deck. Also, locks for three 20-feet containers were fitted in the deck.

**Fire Fighting**

FiFi Class was obtained with fixed pitch propellers without Modulating Clutch Drive (MCD) units. An interesting cost-saving solution was found for the external fire-fighting system by utilising ‘single-engine fire-fighting’. In this set-up one of the main engines drives the fire pump while the other takes care of propulsion and manoeuvrability on a single thruster.

The speed modulating clutch of the Steerprop unit improves station keeping and manoeuvrability in this operation.

The Fi-Fi pump is oversized allowing it to feed the fire monitors as well as the self-protection spray system. The latter consists of water-jet nozzles distributed along the superstructure providing protection against radiated heat from an external fire. The two fire monitors are fitted on the top deck. Each has a capacity of 1,200 m³/h. One is a water-only monitor, the other is a combined water/foam monitor. The tug stores 25 m³ of foam in tanks in the engine room.

The monitors are remote-controlled from a portable joystick panel fitted in the wheelhouse.

The internal engine-room fire extinguishing system and the galley-hood exhaust-conduit extinguishing system was supplied by Semco. Unitor supplied the portable fire extinguishers for the remainder of the vessel.

**Anti-Pollution Gear**

In order to attain the ‘Oil Recovery’ notation, the tug must be capable of carrying recovered hydrocarbon products. For this purpose, four tanks totaling 90 m³ have been installed. These are situated to port and starboard aft of the engine room, while the other two tanks in fact are the aft peak tanks.

To recover the oil, a skimmer will be placed on board. To facilitate unloading of recovered products a thermal oil tank heating system is fitted in these tanks. Also a thermal oil boiler was fitted. Furthermore an oil dispersant system with folding booms and a dispersant pumping system was fitted. 10 m³ of dispersant is carried in double-bottom tanks at the aft end of the engine room. On the towing deck to port an oil boom reel with 600 m of boom is fitted.

**Boat Deck**

The boat deck houses the Captain – to starboard - and the Chief Engineer. The cabins are fitted with cupboards and a desk and have en-suite sanitary spaces with shower, toilet and wash basin. The boat deck of course also is the location for the m.o.b. boat and the life rafts. A Palfinger crane capable of lifting 1,5 tonnes at 16 m reach is fitted aft of the starboard stack. The long reach was...
necessary as one of the duties of the tug will be buoy handling and buoy maintenance. All of the port-side stack the m.o.b. boat-handling crane is fitted. The m.o.b. itself is stored over the winch area.

Wheelhouse

The wheelhouse has split consoles, with a sliding revolving helmsman’s seat in between. The chart table is fitted underneath the GMDSS A3 communications console, with chart drawers below. The tug is steered from the central position between the consoles from which the Master has a clear view of the winches. The wheelhouse has excellent all round visibility, with windows down to floor level. Wynn pantographic wipers were fitted to the forward and aft facing windows. Windows and portholes throughout the tug were supplied by LAN. The exhaust stacks are cut-off at wheelhouse-floor level so as not to interfere with visibility and only the exhausts itself and the feeder pipes for the fire-fighting monitors run up to the level of the top deck. In addition, a CCTV system was installed with camera’s overlooking the engine room and the deck.

Included in the propulsion system controls is a joystick to control all propellers by means of a single lever. The winch control panels of the forward and aft winches have the additional possibility of control by a foot pedal.

As can be expected on a tug with this specifications a wide range of navigation and communications instruments have been fitted. Simrad supplied their radar type RA95P, with a radar plotter CR45 linked with GPS. The Differential GPS GN-33 is also Simrad made. Two sets were installed. Further Simrad equipment is the AI-70 AIS unit and a GDS 101 type echosounder 200. The autopilot is a Robertson AP-50 which is connected to a Robertson gyro type RGC-11. The fire-detection panel is by Autronica.

Top Deck

The top deck is the foundation for the navigation mast. The Cassens & Plath magnetic compass is situated at the forward end of the deck. Two remote-controlled powerful search lights were fitted fore and aft. The two fire monitors are at the aft end of the deck between the engine exhausts.

Thanks are due to Astilleros Balenciaga for allowing us to visit the tug and the yard as well as for their help with the technical details. Thanks also to Steerprop for explaining some of the details of the propulsion system and to MAN Diesel & Turbo for details on the main engines.
Jason-Eureka fire fighting monitors

Staircase

Mampaey tow hook

Main engine monitoring panel

Steerprop control panels

Azcue cooling water pump

75 kW Caterpillar genset

ROMULO - General Arrangement Plan
MAN Diesel & Turbo

In 1912, Burmeister & Wain of Copenhagen, Denmark began a revolution in marine propulsion, which continues to this day, with no signs of abating into the future. This former licensee of Rudolf Diesel, installed two 1.050 hp engines into the oceangoing vessel Selandia, thereby introducing to the maritime world the tremendous advantages of a diesel-based propulsion system. It is ironic that the contribution of Burmeister & Wain lives on today as the B&W part of the MAN Diesel & Turbo group, which is wholly owned by the giant MAN SE of Munich, whose origins fostered Rudolf Diesel's invention.

Today, MAN Diesel & Turbo is the world’s leading supplier of large marine engines and propulsion systems. MAN Diesel (2007) contributed 1.4 billion euros of the nearly 15 billion euros sales of the entire MAN Group. In fact the statistics as to the success of MAN Diesel & Turbo are astounding. Consider the following:

- Every other ship at sea is powered by a MAN or MAN B&W engine.
- In the low speed, two-stroke engine sector for large ocean going vessels, they have a 75% market share.
- In 2003 MAN Diesel had a market share of 20% in all vessels exceeding 100 gross tons.
- In ship capacity exceeding 2000 GT their market share increases to 23%.
- In the medium speed segment their market share is 40% for marine propulsion and auxiliary engines!

This level of success in the ultra-competitive marine propulsion business can be readily understood when you see the product in operation and the performance of not only the engine, but its support system as well. While speaking with a representative of the tug owner, it was expressed to me that their prior experience owning and operating MAN engines in both tugs and tankers led them to choose these engines for their newbuilds Romulo and Remo. Specifically they were very impressed with the fast response and high level of customer service they had received previously from MAN Diesel & Turbo.

The medium speed engine product lineup comprises 13 separate models spanning a power range from 800 kW (1.072 hp) to 21.600 kW (28.965 hp).

The L27/38 engine’s model designation indicates that it has a bore of 270 mm and a stroke 380 mm. This common sense model designation exists throughout the medium speed engine line. This L27/38 series is available in inline configurations of 6, 7, 8, or 9 cylinders, with a power range of 2.040 kW (2.775 bhp) to 3.285 kW (4.465 bhp) at 800 rpm.

When examining the “exploded” view of the MAN engine the modular design is immediately noticeable. Cooling water pumps, lube oil pump, thermostatic valves, automatic lube oil filter and lube oil plate cooler in a closed circuit are all practical as well as aesthetic benefits, permitting the removal of each cylinder assembly (cylinder head, piston, connecting rod and liner) as a complete individual unit. This vastly reduces the time required for maintenance or replacement. Additionally this well conceived design has only a minimal overhead height requirement.

In addition to engines MAN Diesel & Turbo also supply complete propulsion systems consisting of gearbox, CPP propellers, and electronic control systems. There is a large tug completed in Dubai for Seaways International, this tug has a complete MAN propulsion system of 7.400 hp.

MAN Diesel & Turbo announced earlier that Shanghai Salvage Co. Ltd. had selected 2 x 8S35MC two-stroke engines, which will produce 11.840 kW (15.877 bhp) at 173rpm! All of this power will be delivered to a complete MAN propulsion package of 2 Alpha VGS 1080 controllable pitch propellers and an Alphatronic 2000 propulsion control system which should enable this 90 m super tug to attain a speed of 16 knots and a bollard pull of 188 tons. With this kind of deliveries, it appears that MAN Diesel & Turbo have no intention of relinquishing their wellearned position as the biggest company in the big engine business.