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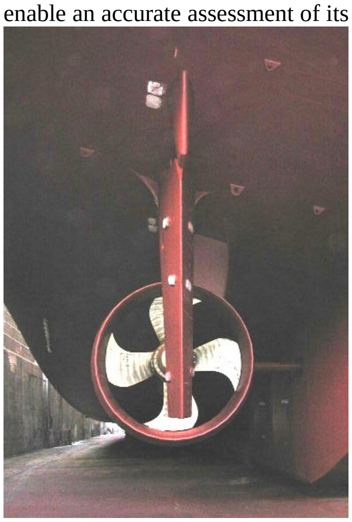
More agility and speed for *Agile*

Impact of cable layer assessed

Having undergone a major refit in mid 2001, the cable ship *Agile* has the accumulated miles to enable an accurate assessment of its improved operational performance. The principle objectives of the refit were to increase transit speed and change the maneuvering characteristics during cable laying operations.



After installing NautiCAN nozzles and propeller blades on Agile, the service speed increased from 10.5 to 12.5 knots

"The ship's handling characteristics were improved overall, it almost felt like a different ship" proclaims Alan Taylor, master of the *Agile* for the past three and a half years.

"The most noticeable change after the refit was definitely the ship's transit speed", he adds. By installing Nautican High Efficiency nozzles and matching propeller blades, and streamlining the skeg, the transit speed went from approximately 10 knots to 12.5 knots.

Owned by Secunda Marine Services since 1997, the *Agile* is an 8,300 DWT fibre optic cable laying vessel. A converted ro-ro vessel, it has laid cable all over the world. Some of the more difficult locations for the Agile have included off South America during the southern hemisphere's winter months, in the Taiwan Strait with its three to four knot current, and off Trinidad in strong currents.

After the refit, she was tested in the Atlantic, north of the Shetland Islands, in January-February, which, as Captain Taylor puts it, "is no place to lay cable, the weather is atrocious along with the currents."

The Agile is a 139.5m, twin screw ship with two SEMT Pielstick 2,350kW diesel engines turning Rolls-Royce KaMeWa cp propellers through reduction gears. It has twin 1,100 kW Rolls-Royce KaMeWa bow thrusters and twin 1,100 kW stern thrusters. During cable-laying, they are controlled by a Kongsberg SDP 11 dynamic positioning system. The ship has a cable capacity of 5000 tonnes in four cable tanks with one spare.

To meet a speed specification, Secunda approached Nautican Research and Development, to help them. Based in Vancouver, Canada, Nautican is well know for their High Efficiency Nozzle designs for tugs.

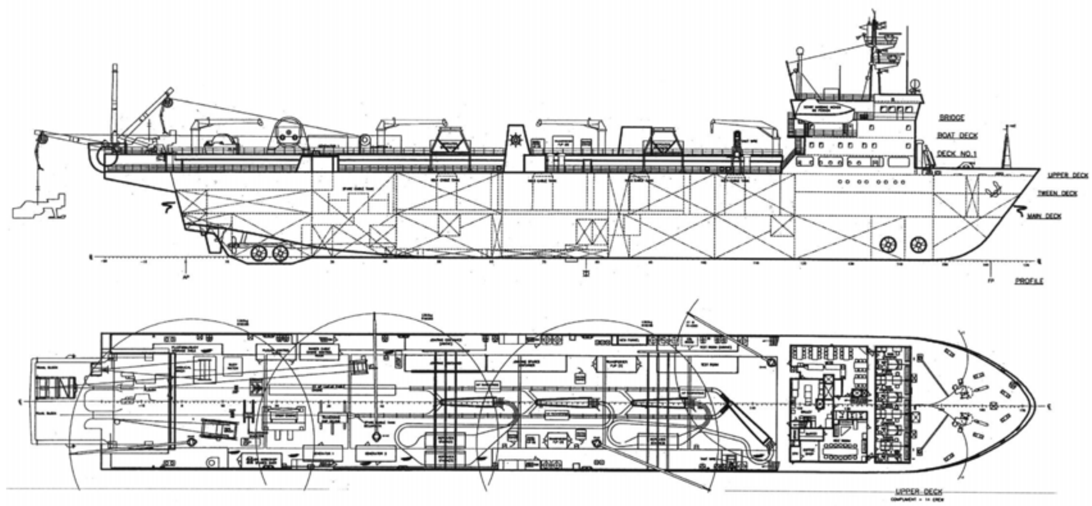
Besides the addition of the nozzles and new propeller blades, Nautican proposed streamlining the skeg, which housed the two aft thrusters, and extending and streamlining the transom. The changes to the skeg were made, but the transom modifications were not, as it was felt that they would interfere with cable-laying operations.

The refit work was done at A&P

Secunda Marine's cable ship Agile "like a different ship" after refit

Falmouth in England The nozzles were supplied by Nautican and the propeller blades were designed by Nautican and made by Osborne Propeller in Vancouver, Canada.

The Nautican nozzle is a type of accelerating nozzle. Often known



Twin thrusters bow and stern

as Kort Nozzles, the standard nozzle shapes are the 19A and 37, developed at MARIN in the Netherlands. It is well known that nozzles can increase the efficiency of a heavily loaded propeller substantially. Usually, they are shaped so that in the bollard condition they produce thrust, along with the propeller and as such are quite useful on tugboats. It is generally accepted that their advantage decreases as the vessels speed increases, due to the drag of the nozzle. However, Nautican has had success using different section shapes for nozzles to gain more efficiency over larger speed ranges.

Principal particulars	
Length OA	139.5m
Beam	20.2m
Drought (Summer)	7.7 m
Deadweight	8,300 dwt
Propulsion	2 x 2,350kW medium-speed SEMT Pielstick diesel engines driving 2 CP propellers
Thrusters	2 x 1000kW Bow thrusters
	2 x 1000kW Stern thrusters
Crew complement	60
Cable capacity	5000t
Flag/registry	Barbados

The major difference between the Nautican nozzles and the standard ones is in the cross-sectional profile of the nozzle itself. The MARIN ones have structurally simple shapes, the difference between the 19A and the 37 nozzles being the 37 nozzle has a rounder and thicker trailing edge for better astern performance. In contrast, the Nautican nozzles have an foil section optimized for turbulent flow. A measure of this difference, as found in tests undertaken at the Vienna Model Basin, is a drag coefficient of 0.17 for the 19A nozzle and 0.012 for the Nautican nozzle.

Skeg modified, transom unchanged

By installing the nozzles, Josip Gruzling, P.Eng. of Nautican estimated that the Overall Propulsive Coefficient (OPC) at 12.5 knots would be 0.57. A better perspective of the effect of the nozzle might be by comparing propulsive coefficients at one speed, the original speed of 10.5 knots. He estimated the OPC would go from 0.42 for the existing open propeller to 0.52 with the nozzles, a 23% gain in overall efficiency. This in efficiency gain is readily seen in the increased transit speed.

In heavy weather, the ship's speed before the refit was 8 knots in about 20-25 knots of headwind, after the refit it increased to 10 knots. Captain Taylor says, "After the refit we can maintain our speed for a longer period of time in any amount of headwinds". Mr. Gruzling says that the propeller-nozzle combination is less sensitive to the loss of thrust due to pitching because, as he puts it, "the nozzle always makes the prop see straight flow".

However, there was not much of a change in the fuel consumption after the refit, even a slight increase during transit. The reason given is, with the cp propellers, the rev/min can be varied so that full power is always being taken out of the engines.

The ship's handling characteristics also improved. Captain Taylor reports that the Agile is more maneuverable in Low Speed Auto Track while under Dynamic Positioning (DP) control, has faster response especially during DP operations, and that much less rev/min is required from the main engines and thrusters in heavy weather and current, to do the same job.

Captain Taylor goes on to say, "Before the new props and nozzles were installed, you would have to use the aft thrusters, along with the forward thrusters to move the ship sideways. Now using the engines (splitting the sticks) and rudders along with the forward thrusters you can accomplish the same thing."

This greater maneuverability is a result of the nozzles effect on the propeller race column. The diameter of the race column is now about the same as the nozzle exit diameter, instead of approximately half the propeller diameter, which is the case for an open propeller. "There is now faster flow hitting more rudder area" says Gruzling.

The faster response that Captain Taylor mentions is also due to the increased rudder area in the propeller wash, as well as the thrust from the nozzle. The increased thrust effect, mainly produced by the nozzle, is more noticeable at lower speed for any type of accelerating nozzle.
Although not actually measured, Grzling estimates that the Bollard Pull would go from 114,000 lbs (51.7t) to 176,000 lbs (79.8t), more than a 50% gain. He suggests that this will either increase the cable laying speed with the 17 t cable trench plow, or decrease the fuel costs at lower speeds.

Captain Taylor sums up, "The ship was never difficult to maneuver before, and always accomplished the job at hand. Following the refit everything concerning the ship's handling characteristics improved and it was a pleasure getting used to that."

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