

NEW TECHNOLOGY FOR AUTONOMOUS SHIP NAVIGATION SYSTEMS

VTT Technical Research Centre of Finland is developing safe steering for the remote-monitored and controlled autonomous ships of the future. The new technology has been developed for navigation systems and ship autopilots, which steer ships automatically.

The ships of the future will largely be controlled by artificial intelligence. However, these autonomous vessels must be monitored and controlled on demand by land-based professionals. This trend sets new challenges also for navigation systems, which must be able to control ships in various situations.

"VTT has deep knowledge of autonomous ship research concerning especially reliability and safety topics. Such special expertise has now led to the development of navigation systems for autonomous ships," says Jussi Martio, a Senior Scientist at VTT. This requires an autopilot, which is used to control a moving vessel, including during evasive manoeuvres according to COLREGs (International Regulations for Preventing Collisions at Sea).

Apilot autopilot

The Apilot autopilot under development by VTT has three modes: track, heading and slow joystick control e.g. for docking situations. In the 'track mode', Apilot steers the ship along a previously agreed route.. If the ship detects another vessel, which must be avoided, the autopilot switches to 'heading mode'. This enables Apilot to avoid the other vessel with a small change in the ship's heading. Autopilot returns to track mode after the other vessel has been avoided.

In the 'joystick mode', control and propulsion equipment are adjusted to low speeds manoeuvrings. Apilot puts the ship into the desired operating mode, for example to manoeuvre sideways into a dock.

In all situations, the autopilot ensures that the ship remains within a set distance from the planned route. If the limits in question are exceeded, the autopilot gives a warning and remote control must be taken of the ship.

User-oriented navigation

Human factors must be taken of account when designing the remote monitoring and control systems. VTT has studied interaction between humans and technology and has developed new concepts for the bridges and remote shore control centres of the autonomous ships of the future. In such design activities, the aim is to make operations more safe, efficient and comfortable by seeking new solutions that enhance operating methods, as well as the usability and user experience of technologies.



CARGO TANK COATING REFINISHMENT

Safinah Ltd is widely recognised as a world leader in coating and corrosion consultancy in the marine, protective and yacht coating markets. Studies by Safinah have shown that owners typically over spend by 10 to 25% on dry-dock coating costs. This case reinforces the need for careful thought about the scope of coating works at dry-dock.

Introduction

Safinah was contacted the Owner, concerning his two sister vessels, one of which, "Ship 1", was already at the shipyard (the Yard) and the second which was scheduled to dry dock the following month "Ship 2".

There was an agreed work scope and budget price already in place between the Owner and Shipyard based on an original specification. The vessels were about 20 years old and the owner anticipated disposing of them in the next 3 to 5 years.

Based on this, the Owner's repair objectives at this dry-docking were agreed as:

- Tanks to be suitable for the carriage of a range of cargoes including veg oils
- Tank lining to give a minimum 3 years protection

Ship 1

Cargo tank work had already begun on 1 Port and 1 Starboard tanks, based on the original specification, prior to Safinah's arrival.

On arrival at the Yard Safinah's first action was to stop all work until:

- The Owners requirements were fully understood
- The original coating specification was reviewed and a revised specification agreed.
- All tanks were surveyed and repair areas agreed and marked up based on the revised specification.
- The Yard provided a fixed quotation based on the revised specification.

The Original specification:

- Spot and sweep blasting are not suitable for cargo tanks and will only give typically 6-12 months protection in this environment.
- There is a high risk of detachment of loose paint in sweep blasted areas and from non-feathered edges.
- High paint consumption.

The revised specification:

- Full blasting to Sa2.5 areas of heavier corrosion.

- No grit sweeping; areas with minor corrosion spots were not repaired.
- All edges feathered back to a firm edge.

Tanks were surveyed and marked up in accordance with the revised specification and costs fixed at \$738k for the revised specification versus the \$1024k for the original specification. Safinah fees for this contract were \$22,400 so a net saving of \$264k.

Ship 2

On discussion with the Owner it was agreed that the process and savings could be improved for Ship 2 by undertaking a pre dry dock survey of the cargo tanks to prepare a detailed diagrammatic tank plan of areas to be prepared and painted on which Yard(s) could quote and an accurate paint estimation made.

The following additional cost and productivity savings were realised on "Ship 2" versus "Ship 1":

Ship 2 cost savings versus Ship 1 (US\$ thousands)			
Activity	Ship 1	Ship 2	Saving
Yard actual cost	738	225	-513
Man power downtime	40	0	-40
Actual paint cost	91	45	-46
Total actual cost	869	270	-599
Safinah cost	21	37	16
Net costs	848	233	-615

