In 1999, Spanish shipyard S.A. Juliana Constructora Gijonesa, member of the Astilleros Españoles group, won an order to build a new hospital ship for the Instituto Social de la Marina (ISM), part of the Spanish Labour Ministry. MARTIN VAN HEES reviews the tests conducted by MARIN to assess the ship's seaworthyness and propulsion system.

Spanish fishing fleet hospital ship put through its paces by MARIN

Workers in the Spanish fishing business will feel substantially safer in future as the vessel takes up station covering Mediterranean waters, the Atlantic and even Arctic waters, providing health care facilities, featuring a fully equipped operating-room and providing helicopter support to the Spanish fishing fleet.

The vessel has a waterline length of 89.3 m with a design speed target of 17.2 knots, resulting in a Froude number of 0.3. A conventional propulsion system is used - two FP propellers on open shaft lines, each supported by one V-strut. An auxiliary propulsion unit in the form of a retractable azimuthing thruster is installed.

MARIN was contracted for a comprehensive scale model testing program, consisting of both an off-the-shelf and a purpose designed propeller program. Before performing any tests, hull lines were optimised through a series of calculations with the non-linear potential flow code RAPID. Special attention was paid to the design of the fore and aft body to reduce bow, shoulder and stern waves as much as possible. RAPID calculations led to the final selection of hull form with very favourable wave system and smooth pressure distribution. The stock propeller test program subsequently performed, comprised a paint test, resistance and propulsion tests and a wake survey. The propulsive performance appeared to be very favourable indeed and speed requirements were well exceeded.

Low speed sailing condition

In the propeller design performed by MARIN, particular attention was paid to a low speed sailing condition in which one propeller drives the ship and the other one operates in trailing or 'wind-milling' mode. A series of calculations and propulsion tests were performed to establish the design pitch in relation to the main engine operational envelope, the resistance of the ship and that of the trailing propeller. Models of the designed propellers were manufactured and tests were conducted to confirm propulsive performance, design pitch and cavitation performance. MARIN set out to attain optimum calm water performance for the hospital ship and it deployed a variety of tools and systems to ensure this was the case. These included:

- hull form optimisation using CFD tools prior to model experiments,
- careful assessment of the quality of the hull form and appendages based on model test results,
- good propeller design and
- close co-operation between MARIN and the yard during the optimisation process.

Wave pattern at 17 knots.

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