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New lines for LNG carrier set future standards

MARIN recently supported French naval engineering company Gaztransport & Technigaz (GTT) in the development of a new set of lines for LNG carriers. Report relates how computational tools such as RAPID for wave making calculations in calm water and SHIPMO for seakeeping, were used in the preliminary stages before performing model tests. This in an effort to optimise and quantify the performance of the hull form.

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In a bid to optimise cargo capacity, GTT developed a new shape of cargo tank which facilitates a significant gain - more than 20% compared to classical shapes - for the forward tank. Such a gain however, involves some modifications to the design of the actual hull bodylines, especially in the forebody so GTT then asked MARIN to step in. The French company requested MARIN to adapt its set of lines to this tank, with special care to both the hydrodynamic and seakeeping characteristics.

RAPID start

The process started with RAPID calculations in order to design an efficient form for calm water performance. Close attention was paid to the design of the bulb and the aft body in order to reduce bow, shoulder and stern waves as much as possible. After several optimisation loops, the final configuration was tested in the Deepwater Basin with the stock propeller. Another series of tests was conducted with the design propellers showing that the carrier met its target speed in calm water.

More volume in the forward tank also meant a fuller bow form, yielding a lower deadrise angle for the bow flare. MARIN also paid close attention to the risk of slamming at the bow and sustained speed in waves. Information about slamming at the bow was gathered thanks to both panel force transducers and a grid of small pressure pick-ups around one of the panels. The goal of this technique was to obtain the exact pressure pulse travelling over the shell during an impact and allow future investigation on the dynamic response of the structure after an impact. The vessel proved to behave very satisfactory in all tested climates, from mild to severe wave conditions.

Internal fluid motion

In order to prevent sloshing effects, GTT pays attention to liquid motion inside the cargo tanks. Influence of this motion on the response of the ship motions is also investigated in the course of the study, by GTT using the Diodore / Diocuve program from PRINCIPIA and MARIN's time domain SHIPMO tool combined with 3D-VOF model.

In view of the present investigation, its favourable results and GTT's effort in research and development, MARIN is hopeful that this new hull form will become the new standard for the future generation of LNG carriers.

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