Preliminary ACP-Max tanker and bulk carrier design

Diseño preliminar de un petrolero y un granelero ACP-Max

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Resumen
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SUMMARY

Preliminary ACP-Max Tanker and Bulk Carrier Designs for Autoridad del Canal de Panama carried out by SSPA and SALTECH

A feasibility study was carried out and preliminary designs were developed for a crude oil tanker and a bulk carrier with maximum dimensions in accordance with the projected enlarged lock chambers of the Panama Canal. The available maximum ship dimensions would be: Length over all 365.76m (1200ft.), Beam 56.388m (185ft.) Draft in tropical freshwater 15.240m (50 ft.), Draft in saltwater 14.85m (48.7ft.). The vessels in the study should be fully laden at their maximum draft in the Canal.

The study comprises the typical parts of an initial design, i.e. design of hull form, resistance and engine power prediction, choice of arrangement and subdivision, calculation of lightweight and deadweight, freeboard, tonnage, design of midship section and steel weight estimation, calculation of typical loading conditions including hull longitudinal strength and stability for intact and damaged conditions. The hull design was evaluated in accordance with ABS SafeHull Phase A procedures for the longitudinal hull members. Stability evaluations and other calculations were made according to the IMO Conventions on Load Lines, Tonnage, SOLAS and MARPOL. The navigation bridge sight regulations of the Panama Canal were considered. Typical machinery and equipment were proposed. Building costs and market prices of the vessels were estimated. Technical and price comparisons with standard vessels were presented.

A hull form was designed for these shallow draft vessels for possible speeds up to 17 knots. A hull length at the design water line of Lpp equal to 352m was chosen.
The displacement in salt water with the given dimensions and the chosen hull form is about 247,000 metric tonnes.
The engine power required in calm weather conditions at 17 knots would be about 23,000 kW and at 15 knots about 16,000 kW. The main engine fuel oil consumption at a service speed of 17 and 15 knots respectively, including 15 percent sea margin for average weather conditions, was estimated to 76 and 105 tonnes per day.

The arrangements were chosen very similar to the current typical double skin VLCC for the tanker and a typical single skin arrangement for the bulk carrier.
This would make it possible to compare the results of the study with modern standard ships.

The tanker was designed with a moulded depth D to upper deck of 22m, providing a cargo volume of approx. 260,000cubm. The deadweight was estimated to 203,000 tonnes. The gross and net tonnage would be GT 123,000 and NT 66,000 respectively.

The Bulk carrier has a depth D of 23m, a cargo volume of approx. 279,000cubm, and a deadweight of 203,000 tonnes. The tonnage would be GT 131,000 and NT 64,000.

These wide body and shallow draft vessels would have a high intact stability with very high GM values. They would fulfil all relevant damage stability requirements. The bulk carrier could be assigned either a type B or a type B-60 freeboard.

Due to the great length of the vessels, chosen with respect to the length of the Canal lock chambers, the class requirement for longitudinal strength of the vessels are very high. These requirements are independent of selected classification society. Furthermore, shallow draft vessels with a large beam to depth B/D ratio require a great amount of longitudinal steel in the midship section in order to fulfil those strength requirements.
The longitudinal strength demands are therefore decisive for the steel weight and total weight of the vessels. They would, at the same time, provide good structural margins with respect to local hull strength and corrosion.
The total lightweight was estimated to approx. 44,000 tonnes, whereof steel weight is about 39,000 tonnes. Those figures are high compared to standard design vessels with deadweight of about 200,000 tonnes.

The current newbuilding market price for an ACP-max tanker ordered at an Asian shipyard was estimated to approx. 70 million USD, which is close to the price level for a VLCC 300,000 DWT tanker. The expected market price for an ACP-max bulk carrier was estimated just below 60 million USD due to less costly equipment compared to the tanker. The steel weight represents more than 50 percent of the shipbuilding costs of the ACP-max vessels.

The deadweight in the Canal is restricted by the shallow draft. Enlarging the moulded depth to the upper deck (i.e. larger than D=22m or 23 m mentioned above) would provide the vessels with a greater cargo volume and would also increase the possible deadweight in ocean going conditions at a low cost. Such changes would make the vessels more similar to standard designs. Canal transit would then be made in partially laden condition.

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