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Feeding the beast

Container feeder vessels are expected to be the subject of the next major ordering bout as ageing feeder vessels in the fleet will need replacing. Knud E. Hansen is gearing up for the expected orders with a couple of new designs, including an innovative concept vessel

As back of the envelope designs go, Knud E. Hansen's 3,000TEU trimaran, or more accurately 'stabilised mono-hull', offers a solution to the perennial problem for feeder vessels, that of stability with loaded vessels requiring the stability of a wider hull and lightly loaded ships requiring only the slender hull shape.

Knud E. Hansen's solution to the question of stability is to design an open top carrier with triangular outriggers, as seen in cross-section, that can stabilise the vessel when loaded.

Jesper Kanstrup, senior naval architect at Knud E. Hansen says: "The vessel essentially has three hulls so it will be more expensive to build, but it is an example of what you can do." He added: "Many have proposed an open top container vessel, but to prevent water from being shipped over the sides of the vessel and into the open holds when the vessel is rolling in bad weather, the hull depth must be very high. And with a deep hull, the handling time for the containers will be increased because of the increased vertical travelling distance."

This problem is solved by the narrow main hull which allows the sides of the open-top holds to be lower, and increases the speed of container handling as a result.

Kanstrup concedes that the possibility of this vessel being built remains slim, as "it might be too expensive and too novel," he says.

A more significant design is the naval architect's 3,800TEU geared container feeder ship, which is fitted with a larger diameter, slower-turning propeller that offers "propulsion efficiency which is not that far from the efficiency of a counter-rotating solution, but for a much lower cost," says Kanstrup.

Stability with this vessel type can be an issue, explains Kanstrup, with a greater proportion of cargo on deck; however, unlike the Bangkok-Max vessel, which was largely designed four years ago as a showcase for ABB electric power technology, draught can also be greater at 11.5m, and, with the new locks in the Panama Canal now open, the vessel can add stability through greater width.

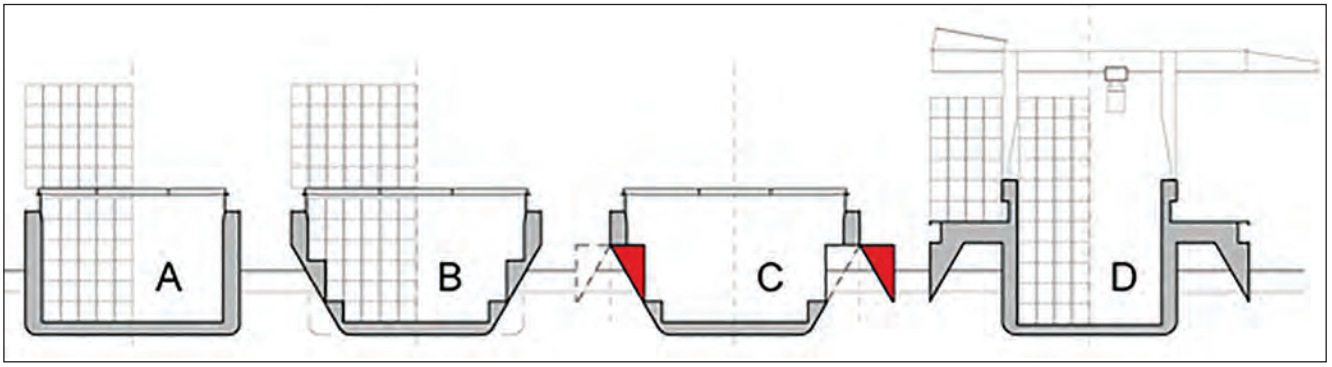
"Small [containerships] have a problem with stability", said Kanstrup, "but with the deck house further forward more cargo can be stacked on deck and stability becomes a problem; however, with the 3,800TEU ship, we have designed it with a wider beam at 35.2m, which is wider than the old Panamax limit, but we're considering making the design another 2.5m wider, further adding to its stability."

Kanstrup adds: "it also has to do with roll accelerations. In lightly loaded conditions, the container stacks will not be very high. Therefore, the so-called mass moment of inertia around the longitudinal axis through the ship will also be low. If the stability in this condition is too high, while the mass moment of inertia is low, that would lead to unwanted high roll accelerations. So in the lightly loaded conditions you do not want more stability than absolutely necessary.

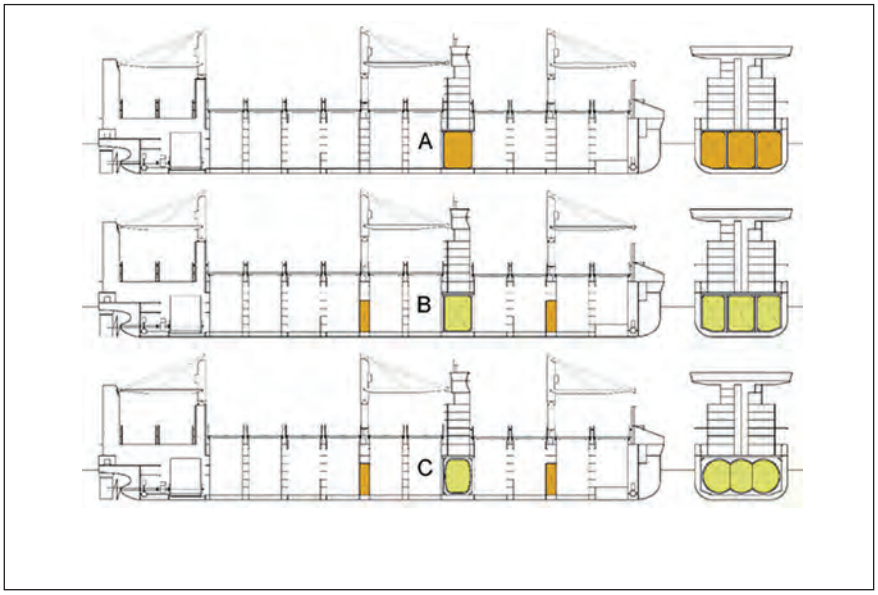
"In the fully loaded conditions, you need all the stability that you can get, but the mass moment of inertia is also higher, so the roll accelerations are still kept below acceptable limits. Everything is a fine balance between displacement, draught, stability and roll accelerations. In the trimaran, you can optimise this by optimising the shape of the inner surface of the outrigger hulls, which does not have to be straight, but could also be convex, concave or S-shaped."

The forward position of the deckhouse also allows the vessel to

Cross section of the 3,000TEU open top Trimaran showing the triangular outriggers with the vertical sides facing the quay



The Trimaran offers greater stability but extra capital costs mean it is unlikely to be built



The 3,800TEU containership - Sketch above shows options for conversion
A: Fuel tanks arranged below the deck house
B: Converted for dual-fuel – Membrane LNG tanks installed in former HFO tanks
C: Prefabricated tri-lobe C-type LNG tank installed in former HFO tanks

The 3,800TEU wide beam feeder vessel adds stability and flexibility with its LNG power capability

meet IMO requirements for the line of vision from the bridge, along with the extra stability, which means that the added number of slots can be utilised in real-life loading conditions.

According to Knud E. Hansen, this arrangement has additional benefits: "This prepares the vessel for LNG and dual-fuel propulsion – attributes that are becoming increasingly sought after. Here, we have a square block below the deckhouse, in which we can either have [large] HFO tanks or LNG tanks. What's more, the vessel can be built with HFO tanks and easily retrofitted for LNG the day the infrastructure for LNG is sufficiently developed if a dual-fuel engine is installed in the first place." Kanstrup believes that LNG conversion would be fairly straight forward with work taking around two to three weeks to complete. Conversion would need to take place if the ship was operating within emission control areas for significant periods of time.

Terminal cranes could also be an issue, according to Kanstrup, as many of the smaller terminals may not have cranes with sufficient reach to handle the wider feeder vessel. With this in mind prospective owners of the 3,800TEU New Panamax vessels will need to consider the operational profile of the vessels carefully.

"Before the Panama Canal was widened, only very few container ships were wider than 32.3m. Therefore, the terminal cranes were generally designed for this breadth. This vessel is 35.2m wide, which corresponds to one row of containers more. However, on deck you have one row of containers more on each side than in the holds. Therefore, terminal cranes, which are designed for the old Panamax breadth, will still be able to reach all containers below deck," explains Kanstrup.

The width of the vessel is added to as the 3,800TEU ship is designed to carry four rows of wide bodied containers in the centre line, which adds a further 300mm to the width of the ship.

For a geared vessel like this, this is not an issue, but for a gearless version, a ship owner will have to consider if the terminal cranes in the ports that are relevant for him have outreach enough to reach all containers on deck.

In addition to the dual fuel main engine the vessel would need to be 'LNG ready', which for DNV GL, who is in consultation with Knud E. Hansen on its design and is expected to give the design an Approval In Principle, would mean that all auxiliary engines will need to be dual fuel, there will need to be double walled piping and space for LNG bunkering and tanks. A sketch (middle left) shows how the vessel can be converted. *NA*

GA of 3,800TEU wide beam feeder ship