

CATAMARAN PASSENGER FERRY 150/250 PAX



INTRODUCTION

This Catamaran Passenger Ferry for 150 / 250 passengers was developed by Conoship International B.V. for Wyker Dampfschiffs-Reederei in Wyk. The vessel, with an exterior design more closely related to yachts than to commercial ships, was designed by Conoship International in close cooperation with the owner, supported by specialists such as Van Oossanen, SiGu Design and the Vienna Ship Model Basin. The vessel has been built by Thecla Bodewes Shipyards in Harlingen and will be delivered in spring 2019.

This article highlights the design considerations of this innovative, compact, lightweight, shallow draught and fast aluminium catamaran. It presents how the owners' requirements, the embarking and disembarking possibilities of passengers and specific German Flag State Regulations led to the layout of the vessel. Another interesting feature was the development of the catamaran hull form to achieve a speed of 18 kn in the very shallow waters of the Northern German Waddensea with a limited amount of power.

CHALLENGE AND IDEA

Within the first meetings between yard, owner and Conoship the foreseen operational envelope of the ship was carefully discussed. The scheduled sailings within the timetable, short excursion trips, replacement of the Halligen-line in winter, details of the harbours, required luxury level for passengers and crew, foreseen environmental challenges as shallow waters, wind and waves were extensively discussed. Based on this challenging operational envelope a ship with minimal sailing power, minimal crew and maximal passenger experience was required.

PASSENGER CAPACITY AND USAGE OF THE VESSEL

The vessel was designed as a pure passenger ship without capacity for cars or Ro-Ro cargo. Aside being a passenger ferry operated as an additional ship in the regular WDR commuter ferry service, the vessel will also operate day excursion tours on the Wadden Sea with a duration of 1 – 3 hours. The passenger capacity inside the saloon on main deck level is 146 passengers, with a small counter serving the deck saloon. On the sundeck ample space is provided for 104 passengers to enjoy the views of the Wadden Sea in summer, bringing the total passenger capacity to 250 passengers in summer time.

MANOEUVRABILITY AND OPERATIONAL CONDITIONS

The ports to be called are partially exposed and situated in narrow and unsheltered waters. Careful checking of the dominating wind and current-directions at the various 'Anleger', resulted in the requirements for excellent manoeuvrability of the vessel. Because of the nature of a catamaran, both propellers and rudders are positioned quite wide apart from each other to Starboard and Port side. By controlling both propellers and rudders separately, an excellent manoeuvrability can be achieved, both at higher and at low speeds.

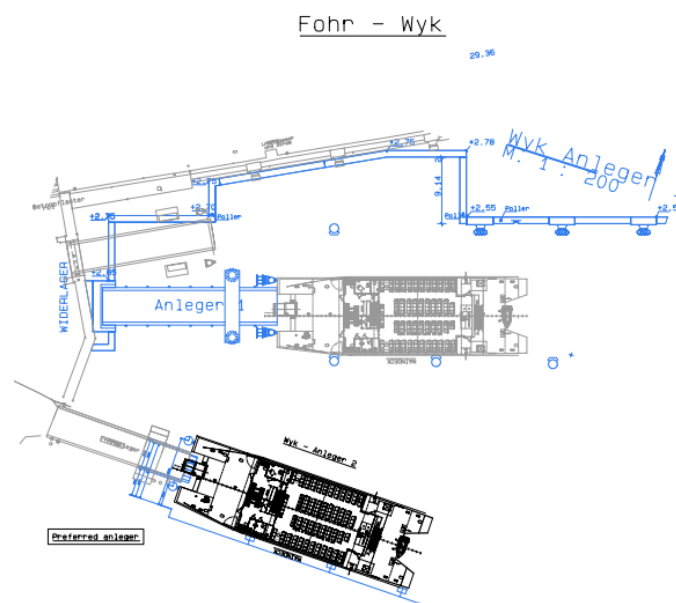
The aluminium built design is developed to achieve a Construction and Equipment Certificate as well as a Sailing Permit from BG-Verkehr in Hamburg, the competent German Authorities for national trade in the German Operation Zones "C" and optionally "B". In consultation with BG-Verkehr it was determined that the governing Flag State Regulations are defined by the EU Directive 2009/45/EC on Safety Rules and Standards for Passenger Ships, as amended. This is different from the existing German national regulations for ships sailing the Wadden Sea.

INITIAL DESIGN AND BERTHING

In the initial stage of designing a vessel for transporting 150/250 passengers, both a monohull and a catamaran were considered.

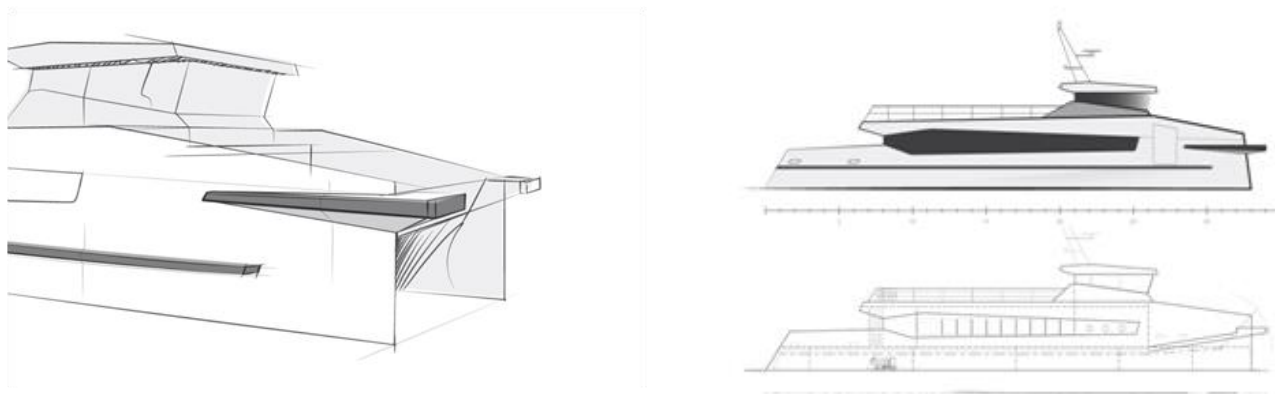
By generating, analysing and evaluating various design concepts in the initial phase of the design process, it appeared that quite a long and slender monohull would be required to achieve a speed of 18 knots, while a catamaran concept could be designed in a more compact vessel, based on 2 slender hulls. The catamaran concept also showed benefits on shallow waters and for accommodating the passengers and for embarking and disembarking of passengers over the bow. In combination with the possibility to use the existing Ro-Ro-bridges ('Anleger') for the (dis-)embarking of passengers, the catamaran concept was chosen for its great benefits.

Initially, the requirements for the bow-fendering were thoroughly investigated in close cooperation with the owner WDR, who provided detailed drawings and dimensions of all different 'Anlegers' which will be served. The various dimensions and distances between the supporting poles of the Ro-Ro-bridges and their relative position to the quays posed the challenge to design the "bumper" in order to tackle all possible encounters. The optimum solution was an asymmetric position of the 'bow-fendering-bumper' on starboard (SB) and portside (PS) which enabled the catamaran to reach all poles and quay-poles in the most efficient way.



Various drawings were prepared to show the berthing of the catamaran in the various harbours and 'anlegers', for instance here at Anleger 2 and 3 in Föhr - Wyk.

The 'bumper' design ensures that the bows and connecting foredeck will stay free from the Ro-Ro-bridge to prevent damage during mooring and manoeuvring. To enable this bumper design, the bow is stretched forward and the foredeck is recessed from the bow. This creates a gap enabling the catamaran to stay free from the anleger-construction. Within the design process the styling of the bow fenders was integrated into the exterior design of the vessel, based on sketches of the side and bow of the vessel.



The styling of the bumpers was taken into account from the initial design stage.

ARRANGEMENT OF THE VESSEL

With the berthing over the bow, passengers will embark over the bow onto the large foredeck. Ample space for luggage is immediately available as they enter the forward accommodation. Three (3) toilets are provided, one of which is accessible by wheelchair. The inner accommodation is fully provided on one continuous deck, allowing smooth transit for people in wheelchairs.

Entrance to the spacious saloon on main deck is provided by two doors in the front and two in the rear. The main focus of the interior design is to provide travellers with a comfortable environment which hints at luxury through its high quality details. This is achieved with wooden textures and a warm colour scheme in combination with smart lighting arrangements which highlight the space of the saloon. This is emphasized by different ceiling heights, especially in the main alleys and a darker colour in the central part of the ceiling. In the forward part of the saloon a bistro/bar has been arranged to provide passengers with drinks and snacks during the trip. An additional feature to the saloon is that all chairs are placed on rails, which enable the ship owner to modify the number and/or configuration of seats in order to adapt to all possible demands.



To create a nice atmosphere throughout the vessel, interior 3D renders were developed in close cooperation with the ship owner and interior builder.

The sundeck can be accessed through two staircases, one interior and one exterior. The sun deck is fitted with 104 chairs, partly protected from the wind by the wheelhouse and wind screens. Gangway positions are provided on both sides of the sundeck to provide embarkation in other harbours with low tide. The wheelhouse, located in the forward part of the sundeck provides seating for 2 crew members. The very large front looking window provides an excellent view of the sea and foredeck. On the aft part of the sun deck, a Marine Evacuation System (MES) is fitted to ensure evacuation in a minimum amount of time with a limited crew

Surrounding the hull is a continuous fender used, for berthing and mooring on the supporting poles of the 'Anleger' in the various ports of call which are also used by the larger Ro-Ro ferries.

The engine room houses two Volvo D16 engines with 478 kW of power each. The auxiliary power is supplied by two Hatz 4M41 generator sets of 35 kVA each. The exhaust lines from the main engines and auxiliary engines run inside the tunnel between the hulls. This is designed to avoid exhaust fumes on the aft-deck and sun-deck.

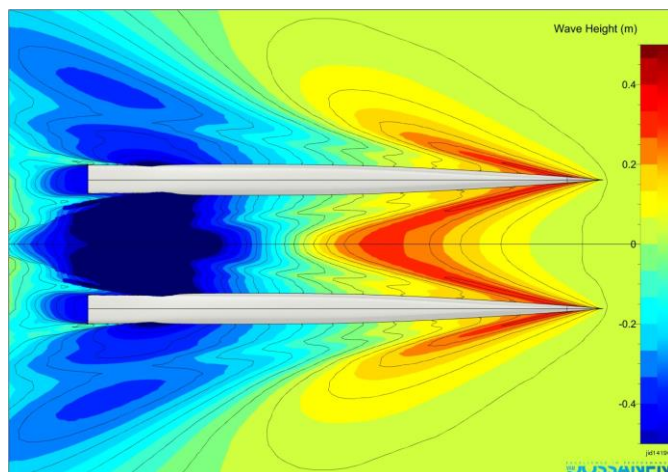
ENVIRONMENTAL STANDARDS

The vessel is designed according to the strictest environmental standards, minimizing ecological impact. For example non-biocide coating is applied, tanks and disposal facilities are fitted for sewage, oil residues etc, and as far as practicable the design complies to Blauer Engel „Umweltfreundliches Schiffsdesign“ and Blauer Engel „Umweltschonender Schiffsbetrieb“. The innovative hull of the catamaran was designed and optimized to reduce ship resistance, keeping fuel-consumption to a minimum.

HULL OPTIMIZATION

The owner WDR pointed out that a maximum speed over ground of 16 knots -the maximum allowed in the Wadden Sea area- must be reached at 85% MCR. With a tidal stream of up to 2 knots this translates into a speed of at least 18 knots through the water. The main initial target of the Conoship optimization of the hulls and propulsion train was to keep the combined output of the main engines below 750 kW at this speed.

In catamarans, the influence of displacement and hull spacing on ship resistance and required power is very large. The slender hulls have a small waterplane area which quickly increases in draught with a weight increase. Conoship investigated various solutions during a process of weight reduction, focussing to achieve the speed of 18 knots (under trial conditions at deep water) for an engine output of 750 kW at a draught of only 1.4 meters.



Hull shape and hull spacing were optimised to reduce the wave pattern and required power at 18 knots, as shown here for an intermediate hull-form. Pictures and CFD analysis by Van Oossanen.

The hull optimization was performed by generating a number of alternatives for the arrangement of the catamaran, considering combinations of hull length, displacement and longitudinal position of centre of gravity (LCG) and corresponding longitudinal position of centre of buoyancy (LCB). The resulting speed – power calculations showed promising values for the required power, fuel consumption and exhaust emissions that were later verified in the model test at the Vienna Ship Model Basin.



The hull form was extensively tested in the Vienna model basin, covering resistance and propulsion tests at both shallow and deep water and seakeeping tests

In Vienna model test runs were performed at various water depth levels, both in calm water and in waves, showing really encouraging results, especially at shallow water depths: the innovative catamaran hull did indeed show exceptionally good results at shallow water depths.

The weight of all outfit items, for example passenger chairs, interior linings and exhaust lines, was considered very carefully during the selection process, by owner, shipyard and Conoship for reasons of weight management and speed/power requirements.

The full-scale test trials will be performed by Thecla Bodewes Shipyards Harlingen with the newly built catamaran in spring 2019, after which the vessel will start its ferry service by the beginning of the new tourist season at the isles of Föhr, Amrum, Sylt and the 'Halligen' in the Northern German Waddensea.



The vessel after launch in Harlingen at Thecla Bodewes Shipyards.

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