

Research fishing vessel adapted to exploitation of fish fauna in coastal zone of the Baltic Sea

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Abstract

During of the political and economical transformation in Poland in the 1990s the optimal fishing vessel was developed for fishing in the Baltic Sea. The vessel was tested with respect to its exploitation and fishing capabilities. The ship is intended for research purposes but simultaneously can be utilized as a typical fishing vessel on the Baltic Sea. Construction and exploitation parameters were presented in this text.

Introduction

Since Poland regained freedom and independence, thus gaining the access to the sea, Polish State has put a great pressure on the development of fleet, including fishing fleet infrastructure [1, 2]. During several years we have emerged as one of the countries significant for its fishing economy, especially in fisheries. During post-war period Polish fishing vessels building technologists were ones among the best designers of this type of floating vessels. Incoming orders for projects and constructions in Polish fishing vessels shipyards were considerable, which was all the more significant because the customers included such countries as the Soviet Union and German Democratic Republic, as well as many other countries interested in fishing exploitation of waters. Polish fishing fleet developed dynamically from the pre-war period and after the II World War which means that built ships were adjusted with reference to exploitation and social conditions to geographic regions where they were used.

Fishing Baltic fleet, even if neglected, especially during post-war times, was present in many countries [3], as Baltic fleet was continuously modernized. The modernization included fishing boats up to 12 meters long, fishing in coastal zone, as well as fishing vessels called keelboats, from 12 to 26 m long. A detailed description of Polish fishing fleet

modernization can be found in work of Blady (2002) [2]. After Poland joined the EU the recession of Polish fishing fleet began, which was described by Groenwald (2014) [4], leading to the reduction of the fishing fleet to the smallest in the Baltic Sea basin, amount of vessels with 1274 in 2004 was reduced to 835 in 2013, the tonnage from 37 044 GT in 2004 to 16 635 in 2013 and engine power during few years was reduced from 137 077 kW to 66 796 kW. Such significant decrease in fishing capabilities of Polish fishing fleet led to the crisis in Polish fisheries [5]. This crisis is related to limitations to the fleet capacity and the amount of time that can be spent at sea by that fleet and the introduction of catch limits for some species of Baltic fish. It applies to the financial situation of fishermen.

Taking into consideration the economic and social crisis of Polish fishing fleet the Faculty of Food Sciences and Fisheries, former Faculty of Marine Fisheries and Food Technology, aimed to develop fishing vessel with optimal fishing conditions capable to catch fish for 2–3 days within Polish territorial and economical zone.

Description of the build and exploitation capabilities of the vessel

Multi-purpose fishing vessel intended for fishing with trawl, seine net, gill nets, drift nets and hook

equipment was developed at the Faculty of Food Sciences and Fisheries of the former Agricultural University in Szczecin (currently West Pomeranian University of Technology in Szczecin). The ship was constructed according to PRS (Polish Register of Shipping) regulations (Fig. 1, Phot. 1).

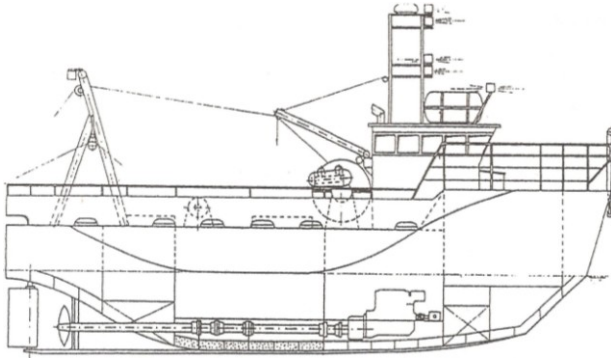


Fig. 1. Chart of NB AR fishing vessel adjusted to fishing in Polish Baltic coastal and economic zone, with shown position of rudder, engine and screw-propeller, net winch, gearing of net winch, rescue raft, navigation lights



Phot. 1. Research fishing vessel NB AR 1 sailing from Swinoujście seaport

Basic parameters of the shipping vessels are the following:

- total length – 12.40 m;
- width (beam) – 5.00 m;
- moulded depth – 2.60 m;
- draft – 1.70 m;
- engine *REKIN* – 70 kW;
- maximum speed – 8.5 knots;
- drag – 8.5 kN with trawl speed of 2.5 knots;
- drag on dolphin – 12.7 kN with 2000 rpm;
- capacity of the tanks;
 - main fuel tank – 1700 dm³;
 - working fuel tank – 105 dm³;
 - oil tank – 105 dm³;
 - hydrol tank – 460 dm³;
 - main freshwater tank – 800 dm³;
 - working freshwater tank – 50 dm³;
 - faeces collecting tank – 80 dm³.

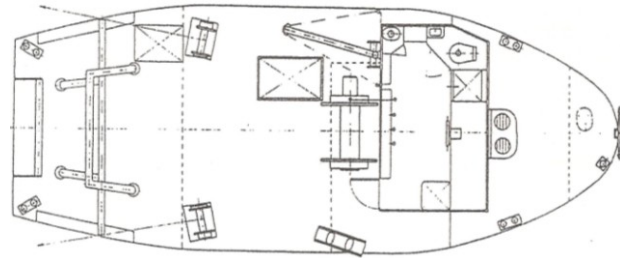


Fig. 2. Deck of the ship

The hull of the vessel is made of steel, fully welded, with transversal arrangement of welding joints.

The deck of the ship is flat with antislip surface, broken at the bow (Phot. 2). The vessel contains five watertight bulkheads separating the compartments: forepeak, playing a role of the container for oiled waters, crew cabin, power station, hold, magazine, lazarette, afterpeak. The bridge is located at the front above the power station and crew cabin. Crew cabin is isolated with mineral wool covered with aluminum foil and waterproof plywood painted with inflammable paint. Minimum members of the crew are 2 persons. Power station is isolated from the deck with inflammable mineral wool covered with galvanized metal sheet. The hold of the capacity of 16 m³ is isolated with stainless steel styrofoam (Fig. 3). The bridge is isolated with polystyrene foam and mineral wool finished with inflammable plywood.



Phot. 2. Deck of the ship

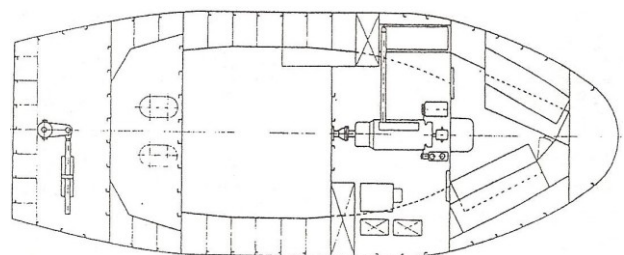


Fig. 3. Chart of the lower level

The vessel is propelled by “REKIN” engine with gearing 4 adjusted to transmit the power through the bilge and hydraulic pump clutches. Additionally, hydraulic generator of 11.5 kW is placed in the power station compartment.

Vessel installations and equipment are according to PRS and Maritime Office regulations.

The machine is steered hydraulically and can be steered manually or in autopilot mode. The helm is streamlined, buoyant, and in case of emergency can be steered with a tiller.

Freshwater installation is composed of truncated container covered with chemically cured paint certified for contact with food, manual pump, pipeline and working tank located in the bridge. Water from the washbasin and the toilet is drained into fecal collecting tank.

Fishing gear and deck equipment have a hydraulic drive from two sources: power transmission from main engine and hydraulic generator. There are two trawl winches on the deck (Fig. 2) enabling the average speed of hoisting trawl lines of 45 m per minute, net drum of ca. 1 m³ capacity, auxiliary winch and sonar line winch. Auxiliary winch is used for packing the dragnet and for other activities using the derrick. The steering of trawl winches, net drum and auxiliary winch is controlled from the bridge, but can also be controlled from the deck. On the starboard there is the standpoint for setting a net winch or line winch equipped with couplings enabling the connection of proper equipment to the hydraulic system.

Hydraulic system ensures that required parameters are reached when working with anchored gill nets or drift equipment and lines: drag, pulling speed and switching off from the power from the main engine. Additionally the hydraulic generator is used when trawl equipment is operating. Hydraulic system allows the regulation of the parameters for winches and net drum.



Phot. 3. Packet with fish

In the stern region there is a gate-like gallow construction for suspending blocks for trawl warps and for packing of fish (Phot. 3, 4 and 5). The block construction facilitates easy operations with dragnet (Phot. 5) and other fishing gear.

Electric installation uses 24 V. The source of energy comes from the alternator with 1.44 kW. The set of starting batteries has 185 Ah capacity, and two lighting batteries have 185 Ah capacity. In the dock the vessel is powered using mains electricity of 230 V.

Vessel was designed for fishing where conditions may exceed wind force 6 (Beaufort scale).



Phot. 4. Gate-like gallow construction of trawl blocks



Phot. 5. Stern of the ship with gantry during the release of the trawl

Conclusions

Fishing vessel NB AR was built in order to provide the optimal conditions for fishing in Polish fishing zone. It currently serves for fishing for scientific purposes and simultaneously is used as a research facility for students' training. The proofs that the vessel is adjusted to industrial fishing are photos 2, 3, 4 and 5. The fishing vessel is exploited

by the Faculty of Food Sciences and Fisheries as a research vessel, currently performing the studies on ichthyofauna resources in the Pomeranian Bay. The Faculty workers involved in vessel exploitation can make this ship available and develop this type of fishing vessel mainly for fishing purposes. Designed vessel compared to other commercial vessels is more versatile to catch different types of fishing gear (trawl, seine net, gill nets, drift nets and hook equipment). Research fishing vessel can be upgraded to commercial fishing on the Baltic Sea and innovations applied in this vessel introduce to others commercial fishing boats.

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