



Report of the Study for Life Extension Works of Estonian Icebreakers

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INTRODUCTION

With a view to using the icebreaker TARMO and the multi-purpose vessel EVA-316 for another 15 years, the Estonian Maritime Administration entered into a contract with SRC GROUP to perform technical evaluation of the two ships, evaluate their compliance with current requirements and prepare a feasibility study. The report by SRC GROUP summarises the possible technical risks that can have an impact on the performance of the vessels while working and brings out the approximate costs of the possible extension of the life span of both ships. This document is a summary of the report and brings out only the main findings. The report itself is available in the Estonian language.

EVA-316

Name of ship	EVA 316
Type of ship	Multi-purpose
Flag	Estonian
Port of registry	Tallinn
MMSI	276415000
Call	ESTF
IMO number	7917977
MMSI number	276415000
Operating region	The Baltic Sea A1
Year of construction	1980, conversion in 2006 by BLRT
Length max	59, 90 m
Width	12, 20 m
Gross tonnage	909
Summer DWT	276 tonnes
Class notation	None, technical supervision carried out by the state
Last docking	September 2015
Machinery	
Main generators	3 x Caterpillar 3516B, 1717 kW
Propulsion devices	2 x RR Ulstein Aquamaster, 2100 kW
Thruster	1 x Jastram BU 20F 140kW
Auxiliary generators	1 x Caterpillar Model 7.1, 129kW

Task:

The consulting company evaluated the current technical condition of the vessel and its compliance with contemporary requirements, taking into consideration the specifics of icebreaking. The objective was to give an opinion about the expected life span of the vessel and list the necessary works required in order to ensure that the vessel is operational 120 days per year for the next 15 years.

The approximate costs given in the report are based on the expert opinion and experience of the inspectors and their calculations, relying on the suppliers' estimates regarding the price of equipment.

Activities:

The multi-purpose vessel EVA-316 was inspected by way of observation while the vessel was berthed at the quay at Hundipea harbour, Tallinn, from July to October 2017, by Kristjan Valle, Toomas Hүүdma and Valmar Sink. During three visits, the technical condition of the vessel was evaluated and the crew were interviewed (18.08., 25.09., 04.10.). Also meetings with the Maritime Administration's Fleet

Department specialists were organised. In addition, all available documentation and reports on the repairs that have been carried out were studied.

During the abovenamed inspections, the shipboard installations and machinery were not working, and detection of technical defects was not carried out.

Findings:

In general, the ship’s hull and machinery are in good condition. The vessel is not in particularly intensive use. It is the experts’ opinion that without significant investments it can be used for the next five years.

International requirements and rules (SOLAS, MARPOL, etc.) for the existing ships are constantly changed and amended, and those rules have not been introduced on this vessel. It is estimated that in order to achieve compliance with the current SOLAS and MARPOL requirements investments in the amount of approximately 184,000 euro are needed (works relating to fire safety).

There are no big problems with the machinery and shipboard installations because those are all relatively new devices, but it is essential to draw up a maintenance plan to ensure smooth operation. All devices on deck are in good condition and no investments are required to replace or repair those; regular maintenance will be sufficient. Navigational and radiocommunication equipment is in good working order.

Recommendations:

While assessing the operation of the ship and possible expenses in the next 15 years it must be taken into account that presumably the ship is used 120 days per year. Considering the minimal hours of work, the benefits of replacing the existing installations and equipment with new ones must be carefully considered and weighed against the likely costs, as there may be no imminent need for replacement.

The renewal of the central ventilation system together with the installation of an air conditioner would improve significantly the working and living conditions of the crew; it would also modernise the system and ensure its compliance with the current requirements. The estimated cost would be 240,000 euro.

The estimates in the following table are approximate and the figures may vary 10 to 15 per cent due to changes in prices, the time of carrying out the required works and the necessity of unforeseen repairs.

TABLE 1 Estimated investment costs for EVA-316

No.	Item	Immediate investment	If necessary	Investment for 15 yrs
1.	General			
2.	Hull and decks of the vessel			30,000
2.1.	Repairs of the hull - frame 62			30,000
3.	Machinery on the deck			56,000
3.1.	Anchor cables			28,000
3.2.	LAMOR			28,000

4.	Navigation, GMDSS			175,000
4.1.	GMDSS A2 equipment			30,000
4.2.	Radar S-Band			30,000
4.3.	Radar X-Band			20,000
4.4.	Modernisation of DP 0 system			35,000
5.	Propulsion system			521,800
5.1.	Geometry of two Aquamaster blades			80,000
5.2.	Full maintenance of two Aquamaster propulsion devices			116,000
5.3.	Spare parts for two Aquamaster propulsion devices			231,000
5.4.	Maintenance of two Aquamaster electrical motors			26,800
5.5.	Maintenance of Jastram BU 20 thruster			68,000
6.	Main and auxiliary generators	6,000		150,000
6.1.	Testing of diesel generators (3 pcs)	6,000		
6.2.	Maintenance of diesel generators 12 000 h			150,000
7.	Systems and auxiliary mechanisms	9,000		102,400
7.1.	Atlas Copco compressors			32,000
7.2.	Grundfos boiler pumps			10,000
7.3.	Repair of EVAC			10,800
7.4.	Hydraulic station oil cooler	9,000		15,000
7.5.	Renewal of piping			20,000
7.6.	Replacement of fire pump			11,800
7.7.	Improvement of sanitary system			2,800
8.	Electrical equipment	7,800	50,000	750,000
8.1.	Replacement of controllers			
8.2.	Replacement of inverter system		50,000	
8.3.	Inverter modules cooling system cleaning	7,800		
8.4.	Replacement of main switchboard			750,000
9.	Ventilation, heating			240,000

9.1.	Installation of central air conditioner			240,000
10.	Interior spaces, galley			25,000
10.1.	Modernisation of galley ventilation system			25,000
11.	Isolation			16,250
11.1.	Control room bulkhead A60 standard			16,250
12.	Saving equipment			
13.	Fire-fighting equipment			92,000
13.1.	Fire alarm system			92,000
14.	Tanks			
15.	Spare parts			
	€	22,800	50,000	2,158,450
			TOTAL	2,231,250

TARMO

Name of ship	TARMO
Type of ship	Icebreaker
Flag	Estonia
Port of registry	Tallinn
MMSI	276158000
Call	ESZA
IMO number	5352886
MMSI number	276415000
Operating region	The Baltic Sea, GMDSS A2
Year of construction	1963
Length max	84,5 m
Width	21,2 m
Gross tonnage	3916
Summer DWT	1585
Class notation	None, technical supervision carried out by the state
Last docking	September 2016
Machinery	
Main engines (diesel)	4 x Wärtsilä 8MH51; 4 x 2530 kW
Main generators	4 x Strömberg GTKML 155/355; 4 x (2 x 1200) kW
Steering gear	CG70/40 Type T-8981
Propulsion motors	Bow 2 x Strömberg GTKM 2 x (2 x 1100) kW Stern 2 x Strömberg GTKM 2 x (2 x 1700) kW
Auxiliary diesels	4 x Wärtsilä 614 T;
Auxiliary generators	4 x Strömberg HSSJL II/405B2; 4 x 380V;420 kVA

Task:

The consulting company evaluated the current technical condition of the vessel and its compliance with contemporary requirements, taking into consideration the specifics of icebreaking. The objective was to give an opinion about the expected life span of the vessel and list the necessary works required in order to ensure that the vessel is operational 60 days per year for the next 15 years.

The cost estimations given in the report are based on the expert opinion and experience of the inspectors and their calculations, relying on the suppliers' estimates regarding the price of equipment.

Activities:

The icebreaker TARMO was inspected by way of observation while the vessel was berthed at the quay at Hundipea harbour, Tallinn, from July to October 2017, by Kristjan Valle, Toomas Hүүdma and Valmar Sink. During four visits, the technical condition of the vessel was evaluated and the crew were interviewed (17.07., 17.08., 29.08., 04.10.). Also meetings with the Maritime Administration's Fleet Department specialists were organised. In addition, all available documentation and reports were studied regarding the repairs and detections of defects in mechanisms carried out during the period that the vessel has been in the Estonian ship register.

During the abovenamed inspections, the shipboard installations and machinery were not working, and detection of technical defects was not carried out.

Findings:

International requirements and rules (SOLAS, MARPOL, etc.) for the existing ships are constantly changed and amended, and those rules have not been introduced on this vessel. The general condition of the ship is satisfactory, considering that it is used rarely. The greatest risk factor is the state of the isolation made of asbestos in the living quarters. Using asbestos on ships is prohibited today. On the existing ships where asbestos has been used, a risk analysis must be carried out and the possibility of asbestos getting in the air that is inhaled must be precluded. Such a risk analysis has not been carried out. It can be presumed that while the ship's machinery is working, particles of asbestos spread in the interior spaces. There is a considerable risk of crew members filing claims regarding permanent damage to their health.

In autumn 2017, a test was carried out during operation at seven locations in the corridors and engine spaces to determine the existence of suspended particulates of asbestos in the air, during which suspended particulates were identified in the stern engine room, but the result did not exceed the norm. We find that the number of locations for measuring the particles of asbestos in the air was too small and this result does not give an accurate overview of the actual situation. It is necessary to carry out more extensive measuring and draw up a plan for handling asbestos.

Recommendations:

While evaluating the operation of the ship and possible investments in the next 15 years it must be taken into account that presumably the ship is used 60 days per year. Considering the minimal hours of work, the benefits of replacing the existing installations and equipment with new ones must be carefully considered and weighed against the likely costs, as there may be no imminent need for replacement.

Navigational and radiocommunication equipment is in good working order. The only risk factor is the age of the equipment. For efficient icebreaking, ice searchlights must be replaced entirely. As navigational and radiocommunication equipment has been duplicated, replacement and repairs can

be carried out on an ongoing basis, as malfunctions occur. It is necessary, however, to replace the propulsion shaft stern tube seals, and in order to ensure the reliability of piping, renew the main components of important systems. There is no sewage treatment device on the vessel, so installation of such a device ought to be considered, in order to ensure compliance with environmental requirements.

The greatest risk factor of electrical equipment is its age. It must be decided whether old pipes thermal insulation renewal or installation of new propulsion motors is more feasible. An alternative to replacement of various installations is renewal of the propulsion devices, energy and control systems in their entirety – the existing diesel generators can be replaced with 4 new AC diesel generators that would produce enough energy for propulsion motors and auxiliary mechanisms. Propulsion motors should also be replaced with AC motors. Accordingly, control and alarm systems as well as navigational and radiocommunication equipment shall also be renewed.

The estimates in the following table are approximate and the figures may vary 10 to 15 per cent due to changes in prices, the time of carrying out the required works and the necessity of unforeseen repairs.

TABLE 2 Estimated investment costs for TARMO

No.	Item	Immediate investment	If necessary	Investment for 15 yrs
1.	General			
2.	Hull and decks of the vessel		200, 000	262,975
2.1.	Rebuilding the existing open type bridge wings as close type bridge wings			92,000
2.2.	Replacement of bridge clear view screens			24,000
2.3.	Hull repairs		200,000	
2.4.	Cleaning and painting of hull			146,975
3.	Machinery on the deck		68,000	110,000
3.1.	Replacement of anchor cables		48,000	
3.2.	Repairs of machinery on the deck		20,000	
3.3.	New 8000SWL deck crane			110,000
4.	Navigation, GMDSS			2,138,000
4.1.	GMDSS			30,000
4.2.	Radars			50,000
4.3.	Gyrocompass			20,000
4.4.	Ice searchlights		35,000	
4.5.	Navigation lights			38,000

4.6.	Kongsberg control system			2,000,000
5.	Propulsion system		400,000	220,000
5.1.	Establishing initial propeller geometries			160,000
5.2.	Replacement of Cedervall shaft seals		400,000	
5.3.	Pintle repair			60,000
6.	Main engines, diesel		96,000	8,200,000
6.1.	Check-up of main generators		96,000	
6.2.	Replacement of main generators			8,200,000
7.	Auxiliary engines, diesel		300,000	2,088,000
7.1.	Full service of auxiliary engines (4 pcs)		300,000	
7.2.	New auxiliary engines (2 pcs)			2,000,000
7.3.	New harbour generator			88,000
8.	Systems and auxiliary mechanisms			812,500
8.1.	Replacement of heating pipes			4,500
8.2.	Maintenance of plate heat exchangers (8 pcs)			48,000
8.3.	New bilge separator			72,000
8.4.	Replacement of sea-water pipes, incl. pumps			460,000
8.5.	Replacement of sea-water armature			75,000
8.6.	Sewage treatment system			73,000
8.7.	Replacement of air compressor			32,000
8.8.	Replacement of bilge pump (2 pcs)			48,000
9.	Electrical systems		8,000,000	22,000,000
9.1.	Complete overhaul of main electric motor (4 pcs)		8,000,000*	
9.2.	Replacement of main electric motor (4 pcs)			20,000,000*
9.3.	Modification of main switchboard (4 sections)			2,000,000
10.	Ventilation, heating			52,900
10.1.	Installation of a new boiler			44,500
10.2.	Replacement of circulating pumps			8,400
11.	Interior spaces, galley			25,000

11.1.	Modernisation of galley ventilation system			25,000
12.	Isolation, asbestos	7,500	2,000,000	
12.1.	Asbestos audit	7,500		
12.2.	Removal of asbestos and restoration of isolation		2,000,000	
13.	Life-saving appliances			
14.	Firefighting equipment			602,400
14.1.	Fire alarm system			116,400
14.2.	Sprinkler system			486,000
15	Tanks			18,500
15.1.	Construction of bunkering station			6,800
15.2.	Replacement of fuel system pneumatic valves			24,500
15.3.	Tanks ventilation pipes on deck			33,750
	€	7,500	11,099,000	36,595,325
			TOTAL	39,701,825

*Items no. 9.1 (8,000,000 € life extension for 5 years) and 9.2 (20,000,000 € life extension for 15 years)
– the shipowner can choose the suitable variant

Note: If the shipowner chooses the variant in 9.2, the investment for life extension of the ship will be 39,701,825 €. (36,595,325 + 11,099,000 - 8,000,000 + 7500 = 39,701,825)

If the shipowner chooses the variant in 9.1, the investment for life extension of the ship will be 27,694,325 €. (36,595,325 - 20,000,000 + 11,099,000 = 27,694,325)