

Risk assessment of environmental pollution incident to oil management on fishing vessels

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Abstract

The paper presents theoretical analysis of risk assessment of environmental pollution resulting from oil management in the Baltic Sea fishing fleet. Risk assessment is an integral part of safety management, including the environmentally safe operation of vessels. The number of fishing vessels in Polish ports has also been presented. The probability and severity of accidents that could occur has been included as well – based on authors' experience.

Introduction

According to MARPOL Convention 73/78 and the Helsinki Convention – the Baltic Basin is considered to be the special area and the applied executive regulations refer to the m/a territory [1].

- Enclosure 1 MARPOL CONVENTION 73/78 contains regulations about prevention of pollution by oils from ships.
- Convention “Marine environment protection of the Baltic Basin” – the so called Helsinki Convention (1974/1992) defines the rules of co-operation of 9 Baltic states in terms of the Baltic Sea protection.

The executive body is the Helsinki Commission (HELCOM) which collects the information about the environment condition of the Baltic Sea and the pollutants thrown into it. HELCOM recommendations are directed to the signatory states and oblige them to follow specific activities for the environment protection and to limit the quantity of pollutants:

- European Parliament Directive and European Union Council No. 2000/59/EC dated 27th Nov. 2000 refers to port devices for waste collection and loading remains from ships;
- The bill dated 12th, Sep. 2002 about port devices for waste collection and loading remains from ships;

- Infrastructure Minister order dated 21st, Dec. 2002 about port plans for waste disposal and loading remains from ships.

Regarding territory, marine environment protection comprises sea internal waters (port waters included), territorial sea (12 miles from the shore) and exclusive economic zone (the remaining waters up to the border line dividing neighbour states) together with the sea bed and natural resources under it. All the surface of Polish sea area has been divided into 3 parts and is under administrative command of Maritime Offices in Szczecin, Słupsk, and Gdynia. They function according to law act dated 21st, March, 1991 on Republic of Poland sea areas and marine administration, Sea Transport And Marine Economy Minister order dated 7th, Oct., 1991 about the creation of maritime offices, their seats and the territory of their directors activity with later changes in annexes to the adequate minister's directives for the marine economy. The border lines between waters under the marine offices' jurisdiction lie along the meridians in positions: 150 23'24"E and 170 49'30"E. That is the area under administration of Maritime Office in Słupsk, the Maritime Office in Szczecin deals with the area from the m/a position to the western border of the state and the Maritime Office in Gdynia covers the area up to the eastern border of the state. Directors of Maritime Offices are regional marine administra-

tive bodies who are under the authority of the adequate marine economy minister and they have to obey all the orders issued by the ministry, with reference to the marine environment protection among other things. Marine Environment Protection Inspectorates deal with the marine environment protection within Maritime Offices [2].

The most important obligations for Poland arising from legally binding regulations are:

- expansion and organization of State Monitoring of the Environment, especially the monitoring of the inshore zone for the Baltic Sea;
- introduction of the best accessible technology and the best ecological practice;
- the supervision of obeying the regulations referring to marine environment protection for the Baltic Sea by the adequate minister of marine economy followed by directors from particular maritime offices.

Risk assessment

Risk assessment is an integral part of safety management (including safe for the environment ships operation). The system is designed to provide safety for people, environment and property against identified hazard and the risk of their occurrence. By risk assessment it can determine that [3]:

- its aim is to analyze the management of lubricating and hydraulic oils on fishing vessels to identify the hazard for people, environment and private property having the risk in mind and the analysis of the existing systems limiting the hazard;
- the subject of the risk assessment is to find procedures for the safety of people, environment and private property where the risk is to occur.

The International Maritime Organization (IMO) recommends the following formal components of the risk assessment procedure [4]:

- 1) definition (description) of the problem;
- 2) identification of the hazard for the accidents occurrence;
- 3) the assessment of probability and severity of their occurrence;
- 4) the assessment of the possible elimination or how to limit their occurrence;
- 5) cost analysis;
- 6) recommendations.

Risk assessment can be expressed in the simplest way by the following:

- What can be improper? – Hazard that leads to the accident.

- How often does that situation take place? – probability.
- What will happen if there is such a situation? – consequences.
- How serious are the consequences? – if they are.
- What to do? – How to eliminate the hazard, reduce it or limit its effects?

Fishing fleet, the analysis of the situation

The fishing fleet can be divided into the Baltic fishing fleet and the deep sea fishing fleet. The Baltic fishing fleet can be divided into the cutters fleet and the boat fleet.

It is assumed that cutters are fishing vessels of the length more than 15 meters and the fishing vessels of the length less than 15 meters are called fishing boats for the coastal fishing [5].

Fishing vessels of 50(40) are used in deep – sea fishing, operating beyond the Baltic Sea.

There are 881 registered as operating, Polish fishing vessels catching in ports located on Polish sea waters. They are of different age, size and technical condition. Their location along the Polish coast is unequal too. Table 1 shows the quantity of fishing vessels registered in the biggest Polish fishery ports.

Table 1. The quantity of fishing vessels in the biggest Polish fishery ports [6]

No.	Fishery port	Number of vessels	No.	Fishery port	Number of vessels
1	Ustka	79	7	Trzebież Szcz.	36
2	Władysławowo	74	8	Świnoujście	31
3	Kołobrzeg	62	9	Dziwnów	30
4	Jastarnia	52	10	Kuźnica Morska	30
5	Darłowo	44	11	Piaski	28
6	Łeba	36			

There are many organizations for fishing ship owners in Poland yet, they are mainly associations, not fishery companies with business activity on the fish product market. Some organizations of fish producers are ranked high because they are in the registry acknowledged by the minister. They play a key role in the common organization of the market because their aim is to provide higher supply and improve the quality of the offered product, and by means of that they strengthen the producers' position on the market and make the market more stabilized. Apart from that, the organizations are to function as guards for reasonable and permanent use of the resources, properly directing the production activity of their members and encouraging them to apply fishing methods supporting the preservation way of fishing.

The following organizations of fish producers are entered in the registry at present [5]:

- The North Atlantic Organization of Producers, Limited Company, in Warsaw, the year of acknowledgement 2003, associates the ship owners dealing with deep sea fishing;
- The Domestic Chamber of Fish Producers in Ustka, the year of acknowledgement 2004, associates the Baltic Sea fishermen;
- The Association of Sea Fishermen – The Organization of Producers in Gdynia, the year of acknowledgement 2005, associates the Baltic Sea fishermen;
- The Organization of Fish Producers Władysławowo, Limited Company, in Władysławowo, the year of acknowledgement 2005, associates the Baltic Sea fishermen;
- Kołobrzeg Group of Fish Producers, Limited Company, in Kołobrzeg, the year of acknowledgement 2005, associates the Baltic Sea fishermen.

The absolutely necessary condition to assess the influence on the environment of Polish fishing craft, catching in Polish ports, especially taking into consideration the risk assessment of the environment pollution by lubricating oils management – is the knowledge of Polish fleet structure and their age. Data referring to the Baltic Sea fishing fleet are presented in tables 2, 3, 4 and 5.

Table 2. The condition of fishing fleet from 01.01.2007 [6]

Fishing vessels length [m]	Fishing vessels number	Gross capacity in total [GT]	Power in total [kW]
Below 10	534	2,003.46	19,289.53
10 – 14.99	123	1,968.09	11,510.86
15 – 19.49	113	4,189.13	17,659.90
19.5 – 25	46	3,931.00	12,728.00
Over 25	65	19,501.00	38,669.60
Total	881	31,592.68	99,857.89

Table 3. Polish fishing craft age using Polish ports [6]

No.	Craft age	Craft number	Year of building
1	up to 5 years	52	2002
2	5 – 10 years	66	1997–2001
3	10 – 15 years	88	1992–96
4	15 – 20 years	140	1987–91
5	20 – 25 years	68	1983–86
6	25 – 30 years	130	1997–82
7	over 30 years	331	to 1976

The obtained data show that more than 50% of Polish fishing craft is over 25 years old and 38% is over 30 years old.

Table 4. The comparison of the installed engines power – depending on the size of the craft [6]

Fishing vessels length [m]	Mean power installed [kW]	Maximum power installed [kW]	Minimum power installed [kW]
up 7	24.2	88.3	1.47
7 to 9	41.26	187	7.4
9 to 10	58.83	192	14.7
10 to 15	93.94	318	22
16 to 20	164.81	441	88.3
20 to 30	356.7	588	165
over 30	2074.6	3530	588

Table 5. Comparison of the installed engine power and the number of the inventory craft [6]

Installed power [kW]	Craft number [-]	Installed power [kW]	Craft number [-]
0 – 10	49	100.1 – 200	148
10.1 – 20	71	200.1 – 300	65
20.1 – 30	138	300.1 – 400	15
30.1 – 40	96	400.1 – 500	53
40.1 – 50	40	500.1 – 600	6
50.1 – 60	43	600.1 – 1000	2
60.1 – 100	143	1000.1 – 4000	4

Analyzing the Polish Baltic Sea fishing fleet situation based on the shown comparisons and the Ministry of Marine Economy study “The strategy of Fishing Development 2007–2013” it should be stated that:

- the fishing fleet requires extensive modernization;
- there is lack of infrastructure in smaller ports and berths;
- there is serious risk of marine environment pollution and its influence on fish health because of the fishing craft technical condition at present and their way of operation;
- the age of fishermen is advanced;
- there is insufficient number of young qualified fishermen;
- there is no systematic solution for education and reconstruction of crews in the fishing fleet.

Probability comparison of accidents and their severity if they occur.

Final comparison of risk assessment can be done taking into consideration the analyzed environmental hazards of oil management on cutters and fishing boats, the technical condition of the fleet, fishing fleet qualifications, lack of “pro-ecological” approach of the m/a fleet and the existing infrastructure in ports and fishing berths. It has been presented in table 6.

Table 6. Comparison of risk assessment [7]

Identified hazards	Probability to occur	Results of the influence on environment	Risk of environmental pollution
Air pollution with harmful substances from lubricating oils emitted with exhaust gases	Very high	Very harmful	Very high
Sea pollution with used oils	Very high	Very harmful	Very high
Sea pollution with hydraulic oils	High	Very harmful	Very high

Generally speaking, the risk of environment pollution resulting from oil management on fishing cutters is assessed as “very high”.

In the situation of “high risk” means of *active, reactive and pro-active* policy are to be introduced in order to achieve very low or low, or medium level of risk [8].

That is the only way to eliminate the risk, reduce it, or limit its effect.

Conclusions

In order to improve the situation and reduce the risk of marine environment pollution, active and reactive policy of risk management should be introduced:

- Effective expansion and organization of State Monitoring of the Environment, especially the monitoring of the coastal zone for the Baltic Sea.
- Effective introduction of the best accessible technology and the best ecological procedure.
- Introduction of the effective supervision to obey the bills regulations referring to the Baltic Sea environment protection by the adequate minister of marine economy followed by directors from particular maritime offices and pro-active policy.
- Introduction of pro-ecological education for fishing crews.

- To scrap old craft unable to be modernized.
- To modernize the rest of the fishing craft to match the eco-friendly standard.
- To modernize or exchange the propulsion engines to meet the requirements of ecological criteria of emissions. It is extremely important to use proper constructions and materials for different sealing in engines in order to limit the negative influence of lubricating oil on natural environment. The choice of elastomers used for sealing has to be exceptionally careful – having the working temperature in mind and the chemical composition of the used oils. Up-to-date elastomers used at present provide correct interaction with mineral oils.
- Introduction of disposal of the used oils, bilges polluted with lubricating or hydraulic oils and the improvement of fishing ports and berths to match the standards determined by conventions.
- To exchange or modernize the existing hydraulic systems on the crafts – if applicable.
- The use of lubricating oils following the criteria EKO and Energy Conserving, biodegradable.
- Introduction of understandable to fishing crews, ecological procedures for each operating situation and emergency procedures as well.
- Introduction of clear and effective control procedures for wastes and their waste management by state administration.

References

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