

# The Need for Separate Collection of Waste Oils and Petroleum Residues

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## Introduction

Waste oils and petroleum residues (WO&PR) originate from diverse sources where they have been used as fuels or lubricants, electrical insulating or others purposes (fossil fuel cargo residues in bulk carriers etc.). Through these processes their characteristics change and make them unsuitable for further use. Downgrade of their characteristic is mainly attributed to the presence of water, contaminants and/or impurities resulting in the loss of their original properties. Nevertheless, significant amounts of WO & PR can be processed and reused but only after they have been separated at source and their contaminants removed. Mixed WO & PR makes difficult and sometimes impossible to reuse and/or regenerate them because it is either too costly or the plants are limited in the technology and as a result, a major proportion of these quantities end up for final disposal through burning. It is estimated that in Greece, more than 200.000 tones (WO&PR) per year are produced (mainly in the port of Piraeus) but not enough data exists pertaining to their management process, cost or the total quantity actually produced.

This paper is going to present conclusions relating to the existing legislative framework in Greece addressing WO & PR derived within the context of the LIFE+ project titled “Integrated Life Cycle Analysis of Waste oil and Petroleum Residues” (ELINA <http://elina.org.gr> ) coordinated by Cyclon Hellas with partners ERS and ANEK Lines and co-funded by the EC. Basically, that there is a need for the development and adoption of legislation in Greece addressing separate collection of WO & PR especially those derived from ships and collected at ports. It will present the gaps that appear in the cohesiveness of the existing legislative framework, in order to fully address the issue of sustainable management WO & PR in Greece. Specifically many different legislative documents address their management at times according to their source of origin and at other times according to their characteristics. In particular, while the legislative framework regarding the management of Waste Lube Oils clearly identifies the preference for regeneration against energy recovery (through thermal treatment), and establishes regulations regarding their separate collection at source, this is not the case for the significant amount of waste oils mixed with petroleum residues originating from ships. Furthermore, the management of petroleum residues from ships is covered mainly by international conventions (e.g. MARPOL 73/78) and not by EU directives and subsequent national laws. Finally, as for the WO & PR from industrial sources, the legislative framework regulates the management of the

respective quantities as hazardous waste in general and not as separate waste streams that must be subjected to certain treatment because of their hydrocarbon's content.

The methodology used will be to first provide an overview of the conclusions of the project's Legislative Review examining approximately 260 international, European and national legislative documents. Secondly, it will elaborate on the main points brought forward by main stakeholders in Greece within the framework of the project's Forum where existing collectors and handlers, amongst other stakeholders, presented their views and opinions on the laws and contradictions and gaps found after their implementation in the field.

## **Materials & Methods**

The waste management of ship generated WO & PR is described in various legislative documents. The ELINA project gathered, presented and evaluated the most important legislative document in International, EU and National level.

### **Ship Generated WO & PR through International Maritime Law**

At the international level, the initial attempt to address this issue was with the "International Convention for the Prevention of Pollution of the Sea by Oil" - OILPOL54. Although important revisions were made, the convention failed to reach the goals that had been set. Afterwards, the international convention for Marine Pollution that was first signed in 1973 (MARPOL 73/78) and its respective protocols that followed, provided the general framework for the prevention of sea pollution. The Annexes of MARPOL include detailed regulation about pollution prevention for all types of waste that are produced from ships. In particular, Annex I covers issues related with marine pollution due to:

- Uncontrolled discharge of petroleum contaminated water originating from machinery spaces.
- Uncontrolled discharge of liquid and sludgeous phase petroleum residues originating from cargo spaces and
- Ballast tank arrangements regarding the use of a cargo tank as ballast water tank and vice versa (updated by Ballast Water Management Convention 2004).

According to MARPOL 73/78 and especially Regulation 9 of Annex I (Control of Discharge of Oil), oil and/or oily mixtures from internal combustion engines and/or cargo residues are prohibited from discharge at sea considering concentrations that are exceeded 15ppm of petroleum traces in aqueous phase. In particular:

- Oil tankers must have in operation oil discharge monitoring and control systems along with slop tanks for the retention of oil on board (for oil tankers with tonnage over 150 tonnes). For bilge waters, oil tankers must have in operation oily phase – water separating equipment and oil filtering system.
- Ships (other than oil tankers) with tonnage over 400 tones must have in operation oil discharge monitoring and control systems, oily phase – water separating equipment, oil filtering system and a slop tank with separate collection of WO & PR.
- Ships with tonnage less than 400 tones must have proper installations for the collection and retention on board of WO & PR.

All the above mentioned ships must deliver the quantities of WO & PR to the ports and especially at port reception facilities. If a port does not have such facilities, then the ships are obliged to carry these quantities until they reach to port with reception facilities that can receive WO & PR.

Besides MARPOL 73/78, international maritime law regulates issues regarding the collection, temporary storage and transportation of WO & PR through other international conventions (Mediterranean Pollution: MEDPOL Convention 1965, London Dumping Convention 1972, Ballast Water Management Convention 2004 etc.). Nevertheless, MARPOL 73/78 and its respective and periodically revised Protocols is the most dominant since it has been signed by many countries across continents.

Overall, the means and equipment regarding the separate collection and storage of WO & PR that are generated from ships, either as bilge waters or as oily phase cargo residues, is differentiated according to the gross tonnage and the type of each ship. Generally, maritime law that regulates sea pollution foresees not only slop tanks for the retention of WO & PR on board, but also, the necessity for port reception facilities that can receive these quantities.

### **Ship Generated WO & PR through European Law**

European Law addresses the management of WO & PR residues mainly by covering issues related with port reception facilities and by incorporating the content of MARPOL 73/78 as part of the European legislative framework, valid for all Member States. The European Directives highlight the necessity for cooperation among Member States in issues regarding the environmentally sound and sustainable management of WO & PR generated from ships by focusing on European ports.

In particular, considering the petroleum residues from liquid state fossil fuels, Directive 2000/59/EC underlines the obligation of delivering this waste to port reception facilities, incorporating partially the content of MARPOL 73/78 in the European legislative framework. The Directive sets the obligations that ships, as well as the port facilities, should fulfil in the scope of sea pollution prevention. Sanctions in the event of non-compliance are set in the directive.

The Directive 2002/84/EC sets to improve the European legislation about prevention and minimization of sea pollution from waste disposals from ships. This directive includes amendments for the following directives 93/75/EC, 94/57/EC, 95/21/EC, 96/98/EC, 97/70/EC, 98/18/EC, 98/41/EC, 99/35/EC, 00/59/EC, 01/25/EC, 01/96/EC

The integration of MARPOL Convention in different Member States is the subject of directive 2005/35/EC. At the EU level, MARPOL and especially its revised protocols which includes Annex I were adopted in a unified form among Member States in the European legislative framework with Directive 2005/35/EC in relation with the prevention of discharging petroleum contaminated water at sea and by incorporating the content of MARPOL's Annexes. MARPOL sets international standards for ships to avoid pollution and sanctions for the ones that do not comply. Furthermore Directive 2005/35/EC points out the need for cooperation between Member States in order to implement a common protection strategy to all territorial sea borders (Oceana, 2003). Also the cooperation is important to monitor if the ships are in coherence with international convention provisions.

### **Ship Generated WO & PR through National Maritime Law**

At the Greek national level, the legislation has integrated the International Marine Organization and European Union legislative framework through law, presidential decree, ministries decisions etc. MARPOL which was intergraded by Law 1269/82, presidential decree 88/97, 233/01/, 346/03 setting the

ship inspection in order to prevent pollution. The presidential decree 82/04 sets the measures and conditions for the alternative management lubricant oil.

WO & PR are dangerous waste so provisions about their management are included to the relevant legislation Common Ministerial Order 13588/725/2006, 8668/2007. Conditions about their transportation by road are defined in the European Agreement about International Transportation of Dangerous Cargos (ADR) and by sea are defined to International Maritime Dangerous Good Code (IMDG). In order to safeguard their transportation, provisions about their packages, labeling and means of transport should be made according to the relevant legislation.

L. 4042/2012 defines when a substance or an object is not waste but a byproduct and sets the prerequisite and the end of waste criteria. In this scope archives are kept with data from the collection, transfer and management of waste. The law also requires from waste producers to develop and deliver a Waste Management Plan to the relevant ministries.

Overall, the national legislative framework has incorporated the content of the most dominant International Conventions (MARPOL 73/78, Barcelona Convention for pollution prevention in the Mediterranean basin etc.) in the framework of preventing and dealing with sea pollution due to oil leakages, spills and/or uncontrolled discharges. In particular, the periodical revisions of MARPOL 73/78 protocols are incorporated into national maritime law in short term basis given the fact that Greece is characterized by intensive commercial maritime activity. Furthermore, the Greek legislative framework has set prerequisites regarding technical specifications of the equipment that is used for the separate collection of ship generated WO & PR.

As for the national framework that regulates the development and operation of port reception facilities, laws and decrees clearly state the rules and terms of receiving WO & PR and also incorporate these rules into Official Port Operational Regulations. Moreover, the most important Greek ports (Piraeus and Thessalonica) have also establishing an Environmental Regulations concerning their operation and thus, the management of ship generated WO & PR.

### **Industrial WO & PR through European Law**

Apart from the management of waste (or used) lube oils and oils with certain dangerous substances (PCBs & PCTs), European legislative framework considers WO & PR from industrial sources as hazardous waste and not as a separate waste stream that needs special treatment due to its hazardous content (light, medium or heavy weight petroleum fraction). Exception from this rule is a certain stream of light weight petroleum fraction known as 'organic solvents'. The main reason that WO & PR from industrial sources are not managed as a separate stream is the fact that the hazardous nature of most liquid state industrial waste lies on the relatively small concentrations of hazardous substances in a quantitatively predominant aqueous phase. Furthermore, WO & PR as part of industrial waste are generated as soluble light weight petroleum fractions (for example the organic solvents) (Monier et al.,2001).

Generally, European Law covered the management of industrial WO & PR as part of hazardous waste through Directive 91/689/EEC since its abrogation by the framework Directive 2008/98/EC. At present, the management of industrial WO & PR is covered by Directive 2008/98/EC and the exact type of this waste is identified by the European Waste Catalogue through Commission Decision 2000/532/EC and its amendments (Decisions 2001/118, 2001/119 and 2001/573EC). In addition, the transportation of hazardous waste and among them, industrial WO & PR, is regulated by the Basel Convention and its incorporation into European Law through the Decision 93/98/EC and its amendments (Decision 97/640/EC).

Finally, the processing of industrial WO & PR is addressed indirectly through Directive 2012/75/EU. This Directive sets the acceptable limits regarding the atmospheric pollution from industrial infrastructures and, among them, facilities that are utilizing WO & PR as alternative fuels for energy recovery purposes.

Overall, European legislative framework does not specialize the industrial WO & PR as for its collection, transportation, processing and disposal. The managerial chain is regulated by the general prerequisites that are valid for any type of liquid state hazardous waste. To this end, separate collection of industrial based WO & PR is not foreseen even in member – states that are characterized by relatively high industrial activity (e.g. in Germany). The only stream that can be considered as industrial WO & PR is liquid waste originated from organic solvents. The management of this waste is regulated as for its emissions through processing via Directive 2004/42/EC and its amendment (Directive 2010/79/EU).

### **Industrial WO & PR through National Law**

Regarding the management of hazardous waste, the national framework generally follows the European Law by incorporating into national laws and ministerial decisions the content of EU Directives. In particular, the content of Directive 91/689/EEC is incorporated into national law by the Ministerial Decision 13588/725/2006. This Decision, its complementary Decision 24944/1159/2006 and their amendments (Ministerial Decision 8668/2007 and Law 4042/2012) are crucial for the management of hazardous waste since they provide a cohesive framework of technical specifications regarding the available techniques and technologies for the processing of hazardous waste.

The Greek legislative framework incorporates into national law the content of the Framework – Directive 2008/98/EC by the Law 4042/2012. At this point, the national law is differentiated from the European Law. In particular, Greek legislative framework does not incorporate the management of hazardous waste in a unified framework along with non hazardous waste (as Directive 2008/98 does). On the contrary, Greek Law through Ministerial Decisions 13588/725/2006 and 24944/1159/2006 specializes the management of hazardous waste by proposing discrete technological approaches for the neutralization of certain hazardous waste streams and among them, WO & PR from industrial sources. Moreover, Greek Law has incorporated the content of the Basel Convention considering the transportation of hazardous waste through Law 2203/1994 and its amendment (Law 3835/2010). In addition, national legislative framework is harmonized with European Laws regarding the aerial emissions that are emerged due to processing of the organic solvents by incorporating the content of Directive 2010/79/EU through Ministerial Decision 437/2005/2006 and its amendment (Ministerial Decision 120/2012/2012).

For the Greek case, the utilization ratio of industrial WO & PR is zero to none mainly because of the low industrial activity (comparing to the north EU countries secondary sector) as well as the decentralized nature of the respective infrastructures. There is not only a lack of separate collection of WO & PR but also, absence of procedures regarding the monitoring of the produced quantities and securing their controlled and proper management. One of the main reasons of downgrading the life quality in areas with industrial activity is the ground and atmospheric pollution due to the uncontrolled disposal of liquid state hazardous waste. Considering any large capacity industries, the hazardous waste and among them WO & PR are handled in situ by using mostly chemical techniques such as solidification and/or neutralization of the hazardous substances.

## **Results**

National legislation about WO & PR divides in two axes in relation of their source, if they originate from ship or industry. In relation with ship management it should have a storage tank for the collection of WO & PR and then deliver the WO&PR to port facilities. It is important for the port facility to collect separate waste streams in order to deliver them separately. Issues arise, sometimes, when wastes are categorized and delivered according ship legislation to the port facilities that they have different legislation framework to comply with. Another problem that some port facilities have to face is that they are noticed to receive a specific waste stream but when they arrive to waste management plant they find out that the waste composition is not the one that was told. When this happen they cannot just return them to the ship because the legislation do not have such provision and they still should manage it no matter the cost. ELINA project promotes the separate collection to ship and a pilot application has been made to two ANEK ships. If the WO&PR are collected separately the port facilities will be able to manage them properly and regenerate them, when this is possible (Ecological Recycling Society – ELINA Project, 2013).

The WO & PR that originate from industries are collected to storage tanks then sent to a waste management facility in order to manage them. Terrestrial management is easier and less problems arise because the industries and the waste facility comply with the same legislation framework. The industries do not produce great quantity of WO & PR in comparison with ships but still the separate and proper collection is helpful to their sustainable management. Common practice in industries is to mix lubricant waste oil with other waste oil fractions. When mixing of WO happens, lube oil cannot be regenerated due to the impurities from other WO. The mixing can be a result of insufficient employ training or lack of facilities for temporary storage.

## **Conclusion**

Separate collection of WO & PR at the moment, is not mandatory by legislation but is up to the producer to implement it. Legislation sets the collection framework only for lube oil. The ELINA project has concluded that the separate collection of WO & PR would benefit the lube oil regeneration and can also lead to recycling of other WO & PR fractions.

The legislative framework for the separate collection is important in the purpose of the establishment of such practices. There is a need for new legislation aimed at establishing separate collection of WO & PR. This will arise in environmental, social and economic benefits. In the environmental sector resources will be protected since an amount of WO & PR are going to be regenerated and reused. Also when wastes are separated it is easier to attribute a UN number (united nation number for hazardous substances) and then follow the instructions for their proper storage, packaging, transportation, management and/or final disposal.

Concerning to the WO & PR management, when there are collected separated the quality of the input stream, to a management chain, is better and without many impurities and as a result is easier to manage. From an economic point of view, it is more economically efficient to recycle wastes and produce secondary raw material that can be sold. In parallel this creates new jobs and opens a new market area.

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