



**Integrated Green Life-Cycle Management  
of Waste Oils and Petroleum Residues**



**‘GREEN’ PRACTICE GUIDE for  
WASTE OILS & PETROLEUM RESIDUES  
MANAGEMENT**

**– Executive Summary –**

**ECOLOGICAL RECYCLING SOCIETY**

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## Executive Summary

The sustainable and environmental friendly perspective regarding Waste Oil & Petroleum Residues (WO&PR) management must be present in every single phase of the respective managerial chain, namely, during temporary storage at source, during collection and transportation, during transshipment (potentially), during processing and also, during the management of the residual fractions after the processing phase. Furthermore, based on the European Waste Catalogue (EWC) encoding, WO&PR are all considered hazardous. To this end, the applied practices for each one of the aforementioned managerial phases should be in compliance with the best available techniques and fully harmonized with the guidelines that have been set by the currently applied legislative instruments at national, European and international level. To this end, the main scope of Deliverable D4.3 titled 'Green Practice Guide' is the formation of a list of those subsequent procedures that compose each phase of WO&PR managerial chain. In some cases, these procedures are further analyzed in their relevant activities. In addition, for each procedure the means and the required equipment and humans resources, required for its successful completion are described. The 'Green Practice Guide' focuses on the prerequisites for environmental friendly separate collection, temporary storage and transportation prior to processing at centralized facilities, and also lists the respective subsequent procedures.

In this framework, the formation of a 'green practice guide' regarding WO&PR management is essential. Given the fact that, WO&PR are consisted of a great variety of waste streams which are also differentiated according to their originating sources, the formation of a 'green practice guide' must be customized so as to apply to the respective managerial demands. For this reason, WO&PR must be analyzed according to their originating sources and also, in relation with the proven and existing technological approaches that are considered as best available techniques for WO&PR management. To this end, this 'green practice guide' underlines



currently applied ‘best available techniques’ in order to incorporate them onto the Greek case towards an integrated WO&PR management.

More specifically, the methodology for developing a ‘green practice guide’ for WO&PR management divides the respective waste streams in three (3) main categories, namely, Waste Lube Oils (WLO), ship generated WO&PR and WO&PR from industrial applications. The 2<sup>nd</sup> Chapter of the ‘green practice guide’ reports briefly the basic qualitative characteristics of each category. In addition, the current situation regarding the management of each WO&PR category is also reviewed in order to clarify means and equipment that are applied in every single phase of WO&PR management. In this framework, the currently applied practices during the logistics’ chain (collection, transportation, temporary storage) and during the processing of WO&PR management at centralized facilities are presented, in the respective Annexes. The mapping of the current situation is important in order to clarify certain procedures that form WO&PR management. At a later phase, these procedures will be reformed – optimized in order to comply with the basic principles of environmentally acceptable WO&PR and will be merged in order to form the ‘green practice guide’. In particular, the respective Annexes include:

- Annex I: Logistics’ Chain of WLO
- Annex II: Logistics’ Chain of Ship Generated WO&PR and
- Annex III: Logistics’ Chain of WO&PR from Industrial Applications

Furthermore, given the fact that ship generated WO&PR are considered as the quantitatively dominant category of WO&PR, the legislative framework that regulates the operation of port reception facilities and the subsequent transportation of the respective quantities at the centralized processing facilities is presented. It is noted that port reception facilities are intermediate entities among collection – temporary storage and transportation – processing of WO&PR. In this framework, the terms and condition regarding the operation of port reception



facilities are presented in Annex IV titled 'Management of Ship Generated WO&PR at Port Reception Facilities'.

The 'Green Practice Guide' stands as a list of subsequent procedures that cover the entire range of WO&PR management for each main category, namely, WLO, ship generated WO&PR and WO&PR from industrial applications. These procedures are further analyzed into the activities that must be accomplished during each managerial phase (temporary storage at source, collection and transportation, transshipment (potentially), processing and management of the residual fractions after the processing phase). The mapping of the respective activities also includes interaction among the involved stakeholders, namely, during delivery/ reception among producer – collector, collector – transporter and transporter – processor. Each activity may be differentiated according to the WO&PR specific category. In this framework, for each subsequent procedure, the infrastructure and equipment that are used along with the human resources that are required for their successful completion is described. It must be noted that the listing of infrastructures, equipment and human resources that are needed are indicative given the fact that their quantitative characteristics depend on the exact WO&PR managed quantities.

As for the processing phase, the applied technologies are strongly related with the exact WO&PR originating sources given the fact that the efficiency and effectiveness of the processing procedures depend on the physical and chemical characteristics of each WO&PR fraction. In particular, for WO&PR streams that consist of organic molecules with medium and high molecular weight (such as WLO and ship generated WO&PR), the processing techniques focused on the re-use of the respective quantities through regeneration. For example, WLO- through the regeneration process- can be 'cleaned' by extracting their contained impurities and can return to the respective markets as readily available lube oils of high added value. In addition, the processing of WO&PR from ships through distillation can produce readily available fossil fuels. On the contrary, for WO&PR streams produced in a mixed state (oily phase residues and emulsions), the primary concern during processing is the



extraction of the relatively predominant aqueous phase and, as a by-product, the formation of a condensed mixture for further processing. These practices are commonly considered as a pre-processing phase prior to re-use, recycling and/or energy recovery of WO&PR with relatively high molecular weight. The best available techniques that are followed for WO&PR processing are described in the framework of Annex V titled 'WO&PR Processing Technologies'.

The basic guidelines regarding WO&PR management and in particular, the proper methods for collection, best available techniques for processing and the legislative imposed quantified targets for environmental friendly and sustainable management by means of re-use, recycling and energy recovery are determined by the currently applied international, European and national legislative instruments. In some occasions, the respective framework is differentiated in accordance with the exact type of WO&PR and the respective source of origin (e.g. WO&PR from ships, WLO from inland applications etc.). These legislative instruments include:

- International conventions that regulate ship generated WO&PR and deal with water environment protection issues.
- National legislative instruments that incorporate the content of international conventions and furthermore, specify means and technologies that require per managerial phase of ship generated WO&PR.
- EU legislative instruments such as Directives, Regulations and Decisions that set-out certain guidelines for WO&PR management and especially those that are considered as WLO.
- National laws, ministerial decisions and presidential decrees that incorporate the content of EU legislative instruments and furthermore, specify means and technologies required for environmental friendly and sustainable management of WO&PR as hazardous waste streams.



The currently applied legislative instruments along with an analysis of their main points are described in the framework of Annex VI titled 'Legislative Framework of WO&PR Management'. Further information on this topic is available as the content of the Deliverable D.2.1 titled 'Review of European and National Legislation on Waste Oil & Petroleum Residues Management'.

Overall, 'Green Practice Guide' presents a comprehensive list of procedures that must be accomplished in order to ensure environmental friendly and sustainable management of WO&PR along with the required means, equipment, infrastructures and human resources. Given the fact that centralized facilities are already present and fully operational, the 'Green Practice Guide' focuses on those procedures that must be accomplished for the source separation of different WO&PR fractions. As a result of dividing WO&PR streams in three (3) main categories, namely, Waste Lube Oils (WLO), ship generated WO&PR and WO&PR from industrial applications, 'Green Practice Guide' is also available in Greek, in three (3) short versions specialized for each main category.

