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**Agenda item 7: Draft Guide on the Environmental Sound Management of Waste Oil in the Mediterranean**

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## **Preface**

This technical guide has been prepared under the Medpartnership project. The Strategic Partnership for the Mediterranean Sea Large Marine Ecosystem (MedPartnership) is a collective effort of leading organizations (regional, international, nongovernmental, etc.) and countries sharing the Mediterranean Sea towards the protection of the marine and coastal environment of the Mediterranean. The MedPartnership is being led by United Nations Environment Programme (UNEP) Mediterranean Action Plan (MAP) and the World Bank and is financially supported by the Global Environment Facility (GEF), and other donors, including the European Union (EU) and all participating countries.

This guide has been developed by UNEP MAP with the support of the Regional Activity Center for Sustainable Consumption and Production (SCPRAC) on the framework of the project Sub-component 2.1 which aims at facilitating policy and legislation reforms for pollution prevention and control. This Sub-component seeks to develop and improve the legislative and institutional framework in the region and to implement National Action Plan (NAP) priority actions that will protect and reduce the inputs of contaminants to the Mediterranean marine environment from land based activities.

The guide is focused on providing possible steps to the environmentally sound management (ESM) of waste oils in Mediterranean countries. Due to the diversity of Mediterranean countries, this guide should be adapted to countries conditions in order to be successful. The final objective of this guide is to provide information to Mediterranean countries to establish a 100% regeneration system to recycle used oils in their respective countries.

This technical guide has been structured as a step by step document to the environmentally sound management of waste oils in any given country.

Chapter 1 provides background information, the scope of the document, information on ecolabeling for lubricants and alternatives to lubricants, in particular bio-lubricants.

Chapter 2 provides data and information on waste oils, associated environmental problems caused by waste oils as well as information on the main technologies for waste oil treatment.

Chapter 3 describes in plain and simple language the possible steps to the environmentally sound management of waste oils that can generally be applied to any given country that goes from stakeholder engagement to final re-refining/ recycling.

Chapter 4 shows several case studies on pollution prevention of waste oils.





## **Chapter 1. Introduction**

### **1.1 Prevention of pollution. Alternatives to mineral oils: Biolubricants**

Biolubricants, also known as biolubes and bio-based lubricants, apply to all lubricants that biodegrade rapidly and which are non-toxic for human beings, fauna, flora and aquatic habitats.

Biolubricants are made of vegetable oils such as soybean, canola, rapeseed, sunflower, palm and coconut oils. Biolubricants can also be made of synthetic esters manufactured from modified renewal oils.

The preferred application of biolubricants are those that might pose a risk for the environment, especially on aquatic, mountain, agricultural and forest environments, although they can be used in all applications.

This is the case for:

- Machinery or applications that directly loses oil in the environment such as chainsaw bars and chain oils, 2 stroke-engines, railroad flanges, cables, dust suppressants, marine equipment and release agents and greases.
- Machinery working on sensitive areas that may accidentally leak oil (in or near water bodies) such as hydraulic oils, oils for engines, gearboxes, axles, etc.

The key advantages of biolubricants are rapid biodegradability, low toxicity in the environment, environmental friendliness, good lubricating properties, high viscosity index, longer equipment life, contribution to improved water quality, reduction of greenhouse gases, increase on economic security and reduction of oil dependence.

The advantages of biolubricants compared to petroleum-based lubricants are the following:

- Safer for staff working with lubricant oils since it is cleaner, non-toxic, and generates less skin problems;
- Better safety since they have higher flashpoints, constant viscosity, and less oil mist and vapor emissions;
- Air emissions are lower due to higher boiling temperature ranges of esters.
- Rapid biodegradability;
- Costs are less over the product's life-cycle due to less maintenance, storage and disposal requirements. If spilled, environmental and safety penalties are less;
- Evaporate slower than petroleum lubricants; and
- Adhere better to metal surfaces.

The disadvantages of biolubricants during its use phase are:

- Some bad odors might appear if contaminants are present;
- High viscosity at low temperatures; and
- Poor oxidative stability at extreme high and low temperatures, although some specific additives (not biodegradable) solve this problem.

Approximately 85% of all lubricants presently being used in the world are petroleum based oils. Nevertheless, the market for more biolubricants has been growing at a slow but steady pace.

Europe has been leading the biobased lubricant market and it is expected to grow to 18% of the market in the coming years.

According to the study by Frost and Sullivan (2007) on the European Bio-lubricants Market, the estimated use of bio-lubricants in 2006 was 127,000 tons, with growth rates of 3.7%/yr between 2000 and 2006. This volume of growth is still modest, although revenue growth is larger because of the higher price of the bio-lubes (Frost and Sullivan, 2007).

## **1.2 Ecolabels for lubricants**

The European Union Ecolabel covers a wide range of product groups, from major areas of manufacturing to tourist accommodation services. Key experts, in consultation with main stakeholders, develop the criteria for each product group in order to decrease the main environmental impacts over the entire life cycle of the product. Because the life cycle of every product and service is different, the criteria are tailored to address the unique characteristics of each product type.

The European Union Ecolabel helps consumers to identify products and services that have a reduced environmental impact throughout their life cycle, from the extraction of raw material through to production, use and disposal. This ecolabel is a voluntary label promoting environmental excellence at European level.

One of these ecolabels is designed for lubricants. The products that can apply for the ecolabel cover hydraulic fluids, tractor transmission oils, greases, stern tube greases, chainsaw oils, concrete release agents, wire rope lubricants, two-stroke oils, industrial and marine gear oils, stern tube oils and other total loss lubricants for use by private consumers and professional users.

Manufacturers, importers, services providers, traders and retailers, may submit applications for the Ecolabel. Traders and retailers may submit applications in respect of products placed on the trade market under their own brand names.

On order to apply for the European Ecolabel, lubricants have to meet requirements for performance, show limited toxicity to aquatic organisms, have high biodegradability and low potential for bioaccumulation and contain a high fraction of renewable (bio-based) raw materials.

For more information, please visit the EU Ecolabel website: [www.ecolabel.eu](http://www.ecolabel.eu)

Other nationally and internationally recognized ecolabels for lubricants include the following:

- Blue Angel, Germany ([www.blauer-engel.de](http://www.blauer-engel.de));
- Swedish Standard, Sweden ([www.sp.se/km/grease](http://www.sp.se/km/grease));
- Nordic Ecolabel, Norway, Sweden, Finland, Iceland, and Denmark ([www.nordic-ecolabel.org](http://www.nordic-ecolabel.org)); and
- OSPAR Commission ([www.ospar.org](http://www.ospar.org))



## **Chapter 2. Waste oils and the environment**

### **2.1 Introduction**

"Waste oils" are all mineral or synthetic industrial oils or lubrication, which have stopped being suitable for the original intended use, such as used combustion engine oils, gearbox oils, turbines, hydraulic oils and lubricants (Directive 2008/98/EC of the European Parliament and of the council of 19 November 2008 on waste and repealing certain Directives Art. 3).

Waste oils are also priority substances to be taken into account for the contracting Parties to the Barcelona Convention when preparing programs and measures against pollution, according to the Land Based Sources (LBS) Protocol. Waste oil as a hazardous waste is also covered by the Basel Convention on control of transboundary movements of hazardous wastes and their disposal.

Waste oil is a dangerous polluting product, usually generated by its use as a lubricant in automotive vehicles and in industrial operations and classified as hazardous waste according to European environmental legislation.

Used oil mainly contains three types of dangerous pollutants:

- Polynuclear aromatic hydrocarbons (PAHs);
- Heavy metals; and
- Lubrication additives.

Waste oil contains polynuclear aromatic hydrocarbons (PAHs), which are coming from the fuel combustion during the operation of the engine or equipment and concentrated in lubricant oil. PAHs concentration continually increases in the crankcase oil with operating time. In addition, used oils contain important quantities of heavy metals, such as lead (Pb), zinc (Zn), nickel (Ni), cadmium (Cd), arsenic (As), copper (Cu), chromium (Cr), etc. Lubrication additives such as zinc dialkyl dithiophosphates, molybdenum disulphide, and other organo-metallic compounds are also present and are dangerous to the environment and human health.

These are the reasons why it is necessary to consider used motor oil as an important pollutant, consider the effects on the environment and take action. Pollution due to used motor oil has not received much attention compared to pollution coming from petroleum.

### **2.2 Associated environmental problems**

As stated, used mineral oils are classified as hazardous waste. Inadequate waste oils management can have significant effects both on human health and the environment. These effects might be as follows:

#### **Effects on wetlands, rivers, marine and fresh water organisms**

Chronic pollution due to used motor oil coming from automotive traffic and industrial activity reaches millions of tons yearly. Motor oil pollution can damage the soil, aquatic environments and the water supply. When used oil is leaked, spilled or improperly managed or recycled might reach through stormwater runoff or direct discharge, water bodies causing adverse effects on the environmental health of ecosystems.

When oil is poured into the water, it forms a layer on the surface, which prevents oxygenation and it can suffocate and kill living organisms that inhabit the water. Four liters of used oil can generate a spot of 4000 m<sup>2</sup> on water. Also, petroleum hydrocarbons might usually be found in aquatic sediments and are associated with used crankcase oil. Spilled used oil may also result in higher concentrations of PAHs in wetlands, rivers, bays, oceans and sediments. Dumping used oil on water bodies can negatively affect fish and benthic macroinvertebrate communities even killing a large number of fish and other fauna.

### **Effects on air pollution**

Used oil pollution can also damage the atmosphere when waste oil is burned without high tech filtering measures. It has been calculated that 5 liters of burnt used oil pollute the air that a person breathes for three years. When used oil is burned without high tech filtering measures, toxic gases and harmful metallic dust particles are produced due to the presence of heavy metals and other organic compounds, sulfur, chlorine and aromatics.

The high concentration of metals (including heavy) that used oil contains such as lead, arsenic, nickel, cadmium, zinc, chromium, copper and magnesium can be very toxic to ecological systems and to human health. They are emitted from the exhaust stack of uncontrolled burners, furnaces or boilers. In addition, if other pollutants are present on the used oil such as PCBs, the air pollution might be even more dangerous, generating dioxins and other carcinogenic subproducts.

### **Human health effects**

Besides the content of hydrocarbons and additives (metals, detergents, etc.) in the lubricant oil, used crankcase oil contains contaminants that accumulate during the operation of the engine. Sources of contamination include additive breakdown products such as barium and zinc and heavy metal particles from engine wear such as lead, arsenic, nickel and cadmium and other metals such as aluminum, copper, iron, magnesium, silicon and tin. A particular attention should be given to heavy metals present on used oils due to their high concentrations and toxicities to humans, fauna and flora. If repeated or prolonged ingestion or dermal exposure occur, it is quite obvious that relevant health effects on humans will happen. All these compounds, especially heavy metals are highly toxic to organisms.

In addition, polycyclic aromatic hydrocarbons (PAHs) become highly concentrated from the combustion of lubricant oil and fuel in the engine cylinders. PAHs concentration increases in the crankcase oil with operating time. If used oil is improperly manipulated, people, therefore, might be exposed via inhalation to high levels of PAHs. Also, during the treatment and recycling of used oil with higher PAH levels may similarly result in higher exposures to PAHs of workers and manipulators. Additional exposure to PAHs in used engine oils might also occur from dermal contact while changing oil as well as from handling used oil for any use. PAHs, such as benzopyrene, are well known for their high carcinogenicity and mutagenicity.

Additionally, other contaminants might also accumulate in oil such as fuel, antifreeze, wear metals, metal oxides and combustion products that can affect human health.

### **Dangerous practices for human health and the environment**

As a hazardous waste, used lube oils should only be managed by authorized waste managers. Enforcement control campaigns should be developed to detect non-authorized practices.

### 2.3 Main technologies of waste oil treatment

There are two main options for the treatment of waste oil (see chart 1.)

One method is to reconvert waste oil into a material that can be used as base oil to produce new lubricants. This process is referred as regeneration (re-refining). According to the priority established by hierarchy of management of waste in the European Union (European Waste Directive 2008/98/CE art. 4.1.), the regeneration technology ensures the best environmental treatment for the management of waste oils because it is environmentally friendly and more respectful with the environment, air emissions and human health. This treatment will be covered in more detail at a later stage.

Another method to treat waste oil is as fuel (energy recovery). In order to comply with European legislation and international standards, a strict treatment is needed to remove contaminants such as organic compounds, chlorides and heavy metals and be treated in authorized plants for energy recovery. Waste oils can also be incinerated in large industrial plants or cement plants, where the combustion temperature is above 850°C and with 2 seconds of residence stage.

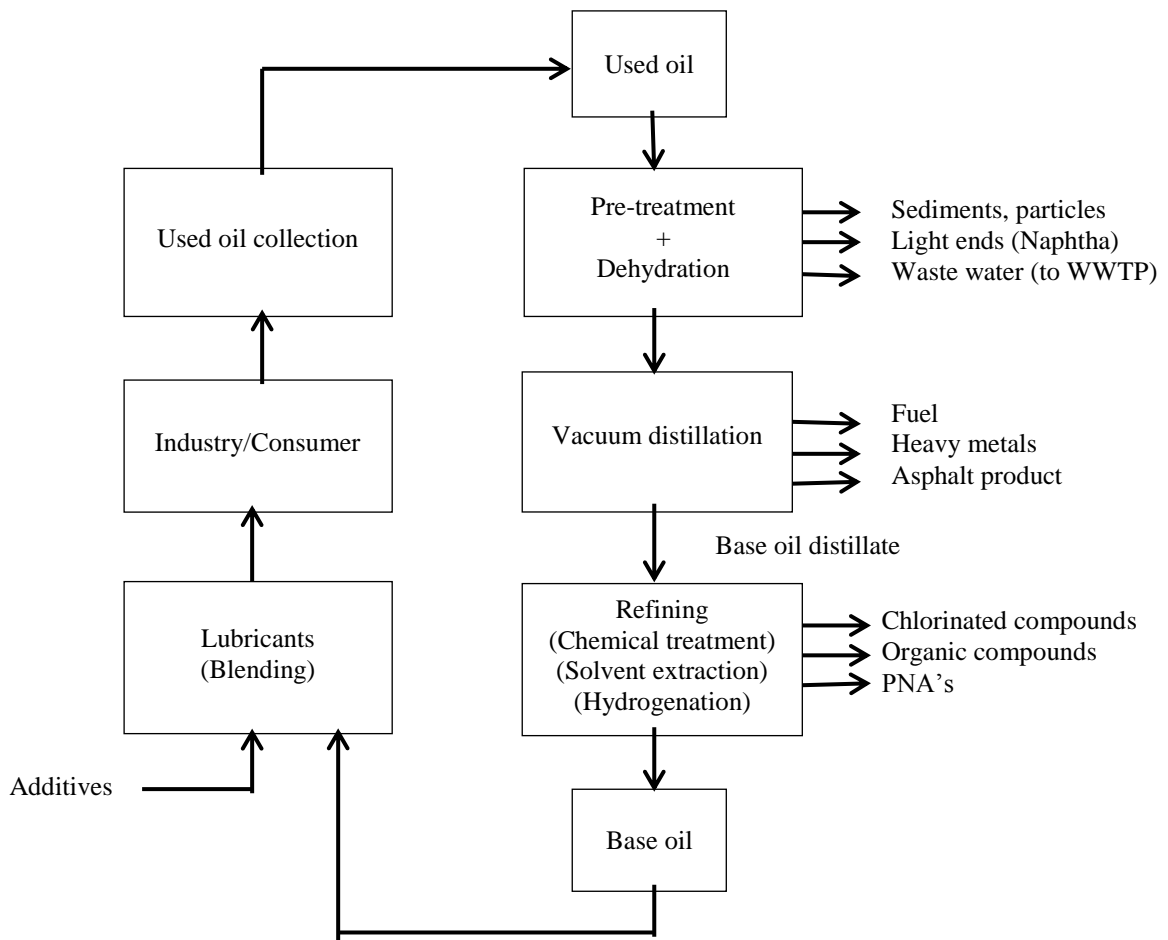


Chart 1. Regeneration (re-refining). Example of circular economy.

#### A brief description of the different processes that exist on the European market

Some of different processes to treat waste oils are quite similar, generally comprising a series of consecutive treatments such as pre-treatment, dewatering, vacuum distillation, deasphalting, demetallization and a final treatment where there are greater differences. This final treatment might includes solvent extraction, chemical treatment and hydrofinishing and is where waste oil contaminants (sulfur, chlorine, nitrogen, PNAs and oxygen) are reduced to desired levels.

This process produces base oils that are separated into different commercial fractions of viscosities in order to get marketable lubricants. These different fractions are often blend with additives. This process generates minimal waste.

The different base oil fractions obtained are the following:

- 80N-100N;
- 150N-200N; and
- 300N-350N.

The base oils obtained from different processes used in the European Union are of high quality.

Base oil qualities (API (American Petroleum Institute) Group I, Group II depending on technology) are similar or even better than primary products.

Modern technologies are differentiated by the type of final treatment implemented where most contaminants are eliminated or reduced, obtaining high quality base oils with high performance level and a minimization of generated waste.

Base oils are classified into different groups, according to American standard API, and must comply with the following requirements:

<b>Group</b>	<b>Saturation</b>	<b>Sulfur</b>	<b>Viscosity index</b>	<b>Process</b>
I	<90%	>0,03%	>80<120	Refined (classic)
II	<90%	<0,03%	>80<120	Hydrotreatment

According to the European re-refined base stocks supply, the production of re-refined base in Europe in 2011 was 74% for group I and 26% for Group II with the following quantities:

API Group I	385.000 t
API Group II	135.000 t
TOTAL	518.000 t

Source: Klime.

## **Group I**

### **1. Technology of the enhanced selective-refining plant**

The operating technology that meet and exceed parameters established for Group I is the technology of the enhanced selective-refining plant.

The enhanced selective-refining process applies the liquid extraction principle. Through the solvent NMP (N-metil-2-pirrolidona), that it is recovered and reused, it is obtained the following:

- High quality base oil;

- Removal, polycyclic aromatic hydrocarbons (PAHs); and
- High average base oil process yield.

## 2. Sotolub process

This process consists of a combined chemical treatment with an additive called Antipoll. The treatment with Antipoll is carried as pretreatment in the dewatering unit and it is mixed with used oil. This process generates the following:

- Antipoll is dosed in different distillates, according to the needs;
- Quality base oil; and
- Good efficiency.

## 3. Technology TBA (thermal deasphalting)

It is based on the use of propane, distilling and treating soils. This process might produce the following:

- Problems with the treatment, specially with used oil with PCBs higher than 25 ppm and high in chlorinated compounds;
- Quality base oil; and
- Good efficiency.

## 4. Interline technology

The process is based on the use of propane and it is improved by the contribution of a strong base, according to process needs. This process generates:

- High quality base oil; and
- Good efficiency.

## 5. Vaxon technology with chemical treatment

Vaxon technology, also known as VCFE (Vacuum Cyclon Flash Evaporator), uses cyclon evaporators for distillation and a final treatment with a strong base. This technology can treat used oil with high chlorine compounds. This process generates:

- High quality base oil; and
- High efficiency.

## **Group II**

Technologies belonging to Group II have better efficiency than those of Group I. These technologies are based on a hydrogenation treatment requiring a large investment, a processing capacity of about 60.000 to 80,000 tons per year, and a soft treatment to avoid destruction of valuable synthetic base oil fractions.

### 1. Ecostream

This used lubricant oil process is re-refining which uses an advanced hydro-finishing technology. It generates:

- High quality base oil Group II;
- High efficiency; and
- Generate minimum waste.

## 2. The hylube<sup>tm</sup> process

This technology is based on the use of catalytic hydroprocessing operating continuously (no batch-wise production). It generates:

- High quality base oil Group II;
- High efficiency; and
- Minimum waste.

## 3. Revivoil process

This process is based on the catalytic hydrogenation treatment with high pressure and de-asphalted thermal generating:

- High quality base oil Group II;
- High efficiency; and
- Low waste.

### **Chapter 3. Proposed steps to the Environmentally Sound Management (ESM) of waste oils**

This chapter describes proposed steps to the ESM of waste oils that can be applied to those Mediterranean countries that need to start or improve the management, efficiency and finance of the waste oil recovery and recycling.

It is proposed that this step by step process should be based first on the establishment of a legal framework to improve the environmental management of waste oils in order to reduce its environmental and human health impacts.

The waste oil legal framework should guarantee the collection of the 100% of generated waste oil and contemplate all necessary measures to achieve that milestone. We recommend the use of 100% of recovered used oil for regeneration purposes (use as raw material for new lubricant oil production) due to economic, environmental and social reasons, as mandatorily stated in the European legislation. Despite this ecological objective, some of the recovered oil might not be used for regeneration due to its low quality and can be used for thermal use (energy recovery) or other uses, if authorized facilities are in place.

In order to establish an effective step by step process, the strategy might be based on the following principles:

#### **Legal framework**

An existing legal framework is crucial in order to be successful with the implementation on an ESM of waste oils in any given country. This is necessary to establish clear “rules of the game” for all stakeholders including their rights and obligations, mandatorily establishing that all logistic operations should be implemented through authorized hazardous waste management and transport companies while gathering official data, statistics and control documents.

#### **Transparency**

It is also important for the government to collect official data, statistics and documents and publicly inform on waste oil quantities and efficiency and compliance ratios. The gathering of data should include information such as:

- Quantity of sold lubricant on the market (tons);
- Potential quantity of waste oil to recover (in tons and % of sold lubricants) (\*)  
(\* ) It is estimated as 40% of total sold lubricant;
- Recovered quantity of used oil (tons);
- Final destination of recovered used oil (final use); and
- List of waste oil producers/generators.

#### **Environmental objectives**

Clear environmental objectives should be established by the government. It is recommended these environmental objectives include the following:

Valorization of recovered used oil: 100%;

Recommended type of valorization of used oil: 100% regeneration-recycling (except for low quality used oil, about 5%, which can be used for energy recovery or other uses).

### **Transitory period until proper infrastructure is available**

In the case, there is no proper infrastructure to regenerate or recycle used oil in the country, recovered used oil could be sent out of the country for proper management until needed infrastructure is in place, taking into account Basel Convention procedures and recommendations.

### **Dialogue and partnership with stakeholders**

Stakeholder opinion, collaboration and partnership are important during the used oil legal framework elaboration and approval as well as on the implementation and attainment of project and environmental objectives.

### **Management**

Waste oil management should be based on the environmental responsibility of the pollution producer or the “Pollution Pays Principle (PPP)”, which implies as stated for example in the EU Environmental Law, the “allocation of costs to polluters of pollution prevention and control measures to encourage the rational use of scarce environmental resources and to avoid distortions in international trade and investment”.

Lubricant producers and importers should be responsible as individual companies or through industry associations with the strict attainment of used oil environmental objectives by using an Integrated Management System (IMS) as well as providing monthly and annual information and statistics to the national government as well as to the regional and local government (if applicable). In the case of Spain and Italy (as shown in the case studies section), SIGAUS (integrated management system of used oils in Spain) and COOU (Consortium for the mandatory management of used oil of Italy) are IMS non-profit organizations in charge of managing used oils in their respective countries.

Lubricant producers and importers should finance all costs associated with the proper management of used oil by paying a specific quantity per new lubricant sold in the national market.

The following proposed steps are suggested for the ESM of waste oils in any given country:

Table 1. Proposed steps for the ESM of waste oils

<b>Proposed Steps</b>	
Step 1	Appointment of Ministry/Department responsible for waste oil management
Step 2	Initiate a dialogue, awareness and training campaign and partnership with stakeholders
Step 3	Pass a law on used oil management and financial plan
Step 4	Create database of consumption of new lubricant oils
Step 5	Create a database of recovered used oil, ratios and objectives
Step 6	Initiate used oil collection logistics
Step 7	Establish used mineral oil transfer centers
Step 8	Establish regeneration/re-refining plants of waste oil

#### **3.1 Step 1: Appointment of Ministry/Department responsible for waste oil management**



The consumption of industrial oils and auto oils is directly linked to the production of used oils. Non proper waste oil management can generate relevant impacts on the environment and human health. It is therefore, necessary to take steps to minimize the production of waste oil and encourage that all generated used oil is environmentally sound managed.

The first step to assure a proper management of waste oils is to appoint the Ministry or public administration and department responsible for the management of waste oils in the country, which should ensure the following:

- Development, adoption and enforcement of laws and specific environmental regulations for the management of waste oils; and
- Generation of statistics on established objectives and degree of objectives compliance.

### **3.2 Step 2: Initiate a dialogue, awareness and training campaign and partnership with stakeholders**

Stakeholders can be defined as any individual, group of people, institutions or firms who have a significant interest and/or role on the success or failure of a project. In general terms, these stakeholders might be the following:

- Implementers: those who implement the project;
- Facilitators: those who help or facilitate the implementation of the project;
- Beneficiaries: those who benefit in whatever way from the implementation of the project; and
- Adversaries: those who might be against the implementation of the project.

It is crucial in order to be successful on the implementation of the environmentally sound management of used oils in any country that the government dialogues and partners with all key stakeholders. Key stakeholders might vary depending on local conditions. Generally, the main stakeholders to engage in the project might include:

- National Government
- Regional Government
- Local Government
- Lubricant Manufacturers Association
- Used Lubricant Producers
- Hazardous Waste Management Companies Association
- Hazardous Waste Transport Companies Association
- Consumers Association
- Workers Unions
- NGOs (Non-governmental Organizations)
- Academia
- Media

The economic, environmental and social benefits of establishing an environmentally sound management of used oils in any country must be maximized while minimizing the potential negative effects such as stakeholder conflicts. Led by the government, it is recommended first to initiate a dialogue, awareness and training campaign and eventually a partnership with all different stakeholders that can contribute to the success of the project.

In order to attain this objective, the following methodology is recommended to implement:

First, we could identify all stakeholders that have a significant interest and/or role in the project;

Second, we could identify for each stakeholder, its respective role, interest, power and capacity to participate in the project; and

Third, we could identify actions to address stakeholder interest and involvement in the project for its success.

Before initiating the project, as a starting point, the following stakeholder analysis matrix could be developed.

Table 2. Stakeholder analysis matrix

Stakeholder and basic characteristics	Interests and role in the ESM of used oils	Capacity and power to participate on the ESM of used oils	Possible actions to involve stakeholder
National government...			
...			

Source: Adapted from Aid Delivery Methods: Project Cycle Management. European Commission, 2004.

After conducting the stakeholder analysis exercise, specific dialogue, awareness and training activities could be organized with key stakeholders for wise stakeholder engagement and partnership.

As an example, specific awareness and training activities for stakeholders might include the following:

- Development of an awareness campaign on management of waste oils (leaflets, brochures, workshops, TV and radio advertisement, website, social networking, etc.);
- Development of training courses for relevant stakeholders on:
  - Legal framework of waste oils (rights and obligations);
  - Logistics and collection of used oils;
  - Final treatment of waste oils; and
  - Other related courses.

### 3.3 Step 3: Pass a law on used oil management and financial plan

Historically, improper waste oil management has caused and continues to cause relevant environmental pollution due to illegal discharges on land and water bodies polluting soil, groundwater and surface water. In addition, improper use of waste oil as an alternative fuel due to its high calorific value on unregulated facilities and industries has caused dangerous and carcinogenic air pollution emissions affecting the environment and human health.

Waste oil management should be subject to the law of supply and demand if there is no clear rule. Defined responsibilities and a financing system should be established to ensure the full collection and improved environmental management of waste oil.

In an unregulated waste oil management market and lacking of regeneration plants and waste oil treatment and decontamination infrastructure, the common use of waste oil is as fuel, generally without any environmental and legal control. In this case, if the price of fuel is high compared to used oils that can eventually replace, the waste oil is usually collected from large producers and sold for example to consumers with large and small boilers, and to bakeries, brickworks and other industries. If fuel prices are low, waste oil is not usually collected and mismanaged.

When used oil is collected in significant amounts by illegal or non-regulated collectors, waste oil collection statistics will not be accurate, making it difficult to wisely manage waste oils in the country.

Therefore, in order to properly manage waste oils, the legal framework should be based on the following principles:

1. The principle of “Extended Producer Responsibility” (EPR), or the “polluter-pays principle” should be applied as regards responsibilities and funding;
2. Definition of ecological objectives to be achieved;
3. Management could be based on Waste framework Directive 2008/98/EC of the European Union on Article 4. Waste hierarchy as priority order and Article 21. Rules for Used oil Management.

#### **1. Extended Producer Responsibility (EPR)**

Makers and importers of oils and lubricants placed on the market should have the obligation of securing financing to assure the wise management of waste oil in the country, individually as a company or through a National Integrated Management Systems (IMS).

Lubricant manufacturers and importers are responsible for the production of waste oils while producers and holders must ensure its delivery to an authorized waste manager to its recycling. They are also responsible for compliance with ecological objectives.

It is recommended for example that, before April 1st of the following year of waste oil production in any country, lubricant manufacturers and importers, usually through IMS should provide to the government with at least the following information:

- The total amount of oil that has been placed on the market by Integrated Management Systems and final use of waste oil; and
- A performance report on attained environmental objectives.

The economic agents involved on different operations should inform about the managed amount and final use of waste oil.

2. **Ecological Objectives.** Ecological objectives should be established by law. If a 100% regeneration objective is established, it should comply with the following:
  - Collecting 100% of oil produced (corresponds to 40% of new lubricating oil consumed annually);
  - Regeneration of about 50% of collected oil, which is usually reviewed every five years; and
  - Energy use. Using as fuel once waste oil has been treated in plants and by authorized consumers such as cement plants and incinerators.

3. **Management based on Waste framework Directive 2008/98/EC of the European Union.** Fulfilling with the principle of waste hierarchy as priority order of Article 4 and rules for used oil management of Article 21.

In European legislation, the regeneration option of waste oil has higher priority than other recovery options (including production of secondary fuels or direct incineration).

The priority order from best to worst solution to waste oil is the following:

- Prevention (no production of waste oil);
- Preparing for re-use;
- Recycling meaning regeneration/ re-refining;
- Other recovery such as energy recovery (burned after treatment as secondary fuel) and incineration (burning of used oil); and
- Disposal.

Also, in European legislation, in regards to disposal, Article 21 exposes about the rules for used oil management stating the following:

- Used oils have to be collected separately, where this is technically feasible;
- Used oil must be treated in accordance with the waste hierarchy;
- Prohibition of mixing used oils with other kinds of waste or substance if this impede its right treatment; and
- Measures (technical, organizational, economic) should be applied to ensure separate collection and proper treatment.

The waste oil regulation should also include:

- Object and scope of application;
- Definitions;
- Business plans prevention and reuse;
- Obligations regarding storage and treatment of waste oils;
- Delivery system of waste oils;
- Management priority;
- Ecological objectives;
- Material valuation. Regeneration;
- Energy use of waste oils. Burning;
- Integrated Management Systems;
- Financing of Integrated Management Systems;
- Information to the public administration;
- Information campaigns and awareness;
- Penalties;
- Annexes;
- Documents which have to be delivered by economic agents to the public administration;
- Document for controlling and monitoring of waste oils; and
- Document controlling the transfer of waste oil of small producers and workshops to authorized collectors (annual quantity collected less than 5000L) and document for large producers (annual quantity collected more than 5000L).

## **Financial plan**

As stated before, lubricant makers and importers should be obliged to secure financing to assure the sound management of waste oil in the country, individually as a company or through an Integrated Management Systems (IMS).

Integrated Management Systems are usually financed by an amount per kg of oil or lubricant sold on the market. Integrated Management Systems will finance then all costs associated with the proper management of waste oils including a reasonable profit for all companies involved in the process (usually 8% for Spain).

In the case of Spain, the profitability of the waste management system including used oil regeneration is guaranteed by the IMS as established in the Real Ordinance of used industrial oils number 679/2006.

In regards to a regeneration plant, the plant is profitable at an oil bases price of about 750 €/t according to index ICI (Independent Chemical Information), the maximum price of used oils at 250 €/t and with a government subsidy for regeneration of 125 €/t.

The IMS will usually finance the collection, transport, storage and analysis of waste oils. No funding should usually be devoted for waste oil use for energy recovery, incineration, or any other option which involves its use as a fuel.

#### **3.4 Step 4: Create database of consumption of new lubricant oils**

The next step is to create a national database of consumption of lubricant oil in order to have available (monthly and annual) information on the amount and types of lubricants which are consumed (sold) across the country by domestic producers and importers.

This information must be provided by lubricant manufacturers and importers, individually or through industry associations to the government.

Waste oil generated from lubricant consumption in any country is usually estimated to be the following:

- (A) From all sold lubricants, it generates 40% of used oils; and
- (B) From all sold lubricants (excluding the types that do not generate used oil (types 3, 7 and 10 according to Europalub classification and coding, see annexes), it generates 44% of used oils.

A proposed control sheet is included below as an example of what this database should look like.

LUBRICANT CLASSIFICATION EUROPALUB AND  
CONSUMPTION (SALES) ANNUAL

YEAR

Kind of products that are not collected as used oils		YEAR												Cumulative total
Ref	Product Group	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
1	Engine oils													0
10	Additives and brake fluids													0
2	Gear oils and transmission													0
3	Greases													0
4	Metal working oils													0
5	Highly refined oils													0
6	Other oils													0
7	Processing oils													0
9	Marine and aeronautic oils													0
<b>Cumulative</b>		0	0	0	0	0	0	0	0	0	0	0	0	0

Total oils which generate used oil **0** (B)

Ref	Product Group	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Cumulative total
A	Automotive (G1+2A+2A1+2B+2B1-1D)													0
G	Greases (G3)													0
I	Industrial (1D+2C+2D+2D1+G4+G5+G6+G10)													0
M	Marine and aeronautics (G9)													0
P	Process (G7)													0
<b>Cumulative</b>		0	0	0	0	0	0	0	0	0	0	0	0	0

Total oils which generate used oil **0** (B)

- (A) From all new sold lubricants, it generates 40% of used oils  
 (B) From all sold lubricants (excluding the types that do not generate used oil (types 3, 7 and 10, in blue); it generates 44% of used oils.



### 3.5.1 Efficiency ratios and environmental compliance objectives

The result of the disposal of used oils is shown on efficiency ratios and environmental objectives achieved once established. Efficiency ratios and environmental compliance objectives are key indicators needed to measure the Integrated Management System (IMS) performance. The following table is shown as an example of needed information for wise management of waste oils in any country.

RESULTS OF USED OIL MANAGEMENT		Quantity (tons)		
		2013	2014	2015
<b>NEW LUBRICANT OIL AND GENERATED USED OIL</b>				
1	Consumption of new oils (no types 3, 7, and 10)	0		
2	Products that are not collected as used oil (types 3, 7 and 10)	0	0	0
3	Total consumption of new oils 1+2	0	0	0
4	Used oil potentially generated (tons / %) (est. 44%) 3 of 1	0	0	0
<b>USED OIL COLLECTED</b>				
5	Used oil collected and sent to recovery	0	0	0
<b>RECOVERED USED OIL FINAL DESTINATION</b>				
6	Regeneration/ re-refining	0	0	0
7	Combustion (burning)	0	0	0
8	Other uses recycled	0	0	0
9	Total recovered 6+7+8	0	0	0

EFFICIENCY RATIOS AND COMPLIANCE OBJECTIVES		FORMULA	PROPOSED OBJECTIVES	CURRENT RATIOS		
				2013	2014	2015
E1	Collection rate	E1=5/4	95%	0	0	0
E2	Regeneration/ re-refining	E2=6/5	100%	0	0	0
E3	Combustion rate	E3=7/5	0	0	0	0
E4	Other uses recycled rate	E4=8/5	0	0	0	0
E5	Total recovered rate	E5=9/5	100	0	0	0



### **3.6 Step 6: Initiate used oil collection logistics**

In order to establish the collection logistics of waste oil, several issues should be previously organized:

#### **List of producers**

A list of waste oil producers should be identified, indicating the location of all workshops and industries, which acquire or consume lubricants and industrial oils. The government should provide an identifying code number for each producer.

#### **Territorial organization**

Establish whether the control of waste oil management will be at national or regional level.

#### **Producer**

The waste oil producer should have an individual code as well as drums to store waste oil. These drums should be located in a covered place with easy access and secondary containment. Storage drums should be labelled with the product identification as toxic and hazardous materials according to local environmental legislation. Producers should be required to deliver waste oil to an authorized hazardous waste management company.

Producers should also sent to the appropriate public administration, an annual statement on generated and delivered waste oil to authorized hazardous waste management company and transporters, maintaining official registration documents.

#### **Transport for oil collection**

The collection of waste oil is usually implemented by trucks of 4 to 12 t. useful load. These trucks are equipped with a pump allowing draining used oil from containers or drums located in workshops and industries.

The waste oil truck driver will pick up used oils from producers and fill-out the official collecting form. This official document includes detailed information about the transporter, producer, date of collection, amount collected and the final destination or the transfer center.

#### **Transfer centers**

A transfer center is the facility for waste oil reception, analysis, classification and temporary storage of collected waste oil in a territorial area of work.

Transfer centers receive the collected waste oil within a radius of 150 km and once analyzed and classified, it is sent to authorized end-use plants either in the country or abroad.

#### **Collection business model**

The collection business model can be public, private or a public-private partnership. The collection process could be organized and authorized to one or several collectors if the collection is regional.

If the collection of waste oil is awarded by public tender to a collector by region for a certain time (5 years for example), it will ensure greater control of producers and transporters as well as better compliance with environmental objectives. In this case, the collection contractor should have a transfer center.

### **Existence of uncontrolled collectors**

In the case, there are small collectors of used oil present who are not controlled; this is usually due to the existence of a network of potential consumers which replace fuel by waste oil for economic reasons. This situation might cause significant environmental and human health impacts caused by air pollution.

Another problem in this circumstance is that the waste oil collection service is not guaranteed to all producers, only to large producers. In addition, the fall in the price of fuel can prevent the collection of waste oil as it becomes non-economically profitable.

The final destination of waste oil should be controlled to prevent the delivery by producers (workshops and industries) to unauthorized collectors.

The use of waste oil as fuel should be avoided in any unauthorized facility which does not comply with minimum pollution prevention requirements for waste oil burning such as brickworks, ceramic factories, bakeries, workshops or other industries.

Also, the reception of waste oil in transfer centers from small collectors should be promoted to ensure high collection rates and proper management.

### **3.7 Step 7: Establish used mineral oil transfer centers**

The objective should be implementing regional transfer centres to receive, analyze and store the oil collected from small collectors. In the case of large collectors, they should have their own transfer centres.

Transfer centers should cover waste oil collection within a radius of 150 km. The stored waste oil should be sent to the authorized final use facility.

In the case, ecological objectives are established, the final use of the waste oil will be in accordance with the established percentage:

- % regeneration;
- % pre-treatment and used as fuel in authorized plants; and
- % burned on cement or similar facilities.

A transfer center should have laboratory equipment to analyze received waste oil and then sent it to final destination. This waste oil analysis should include:

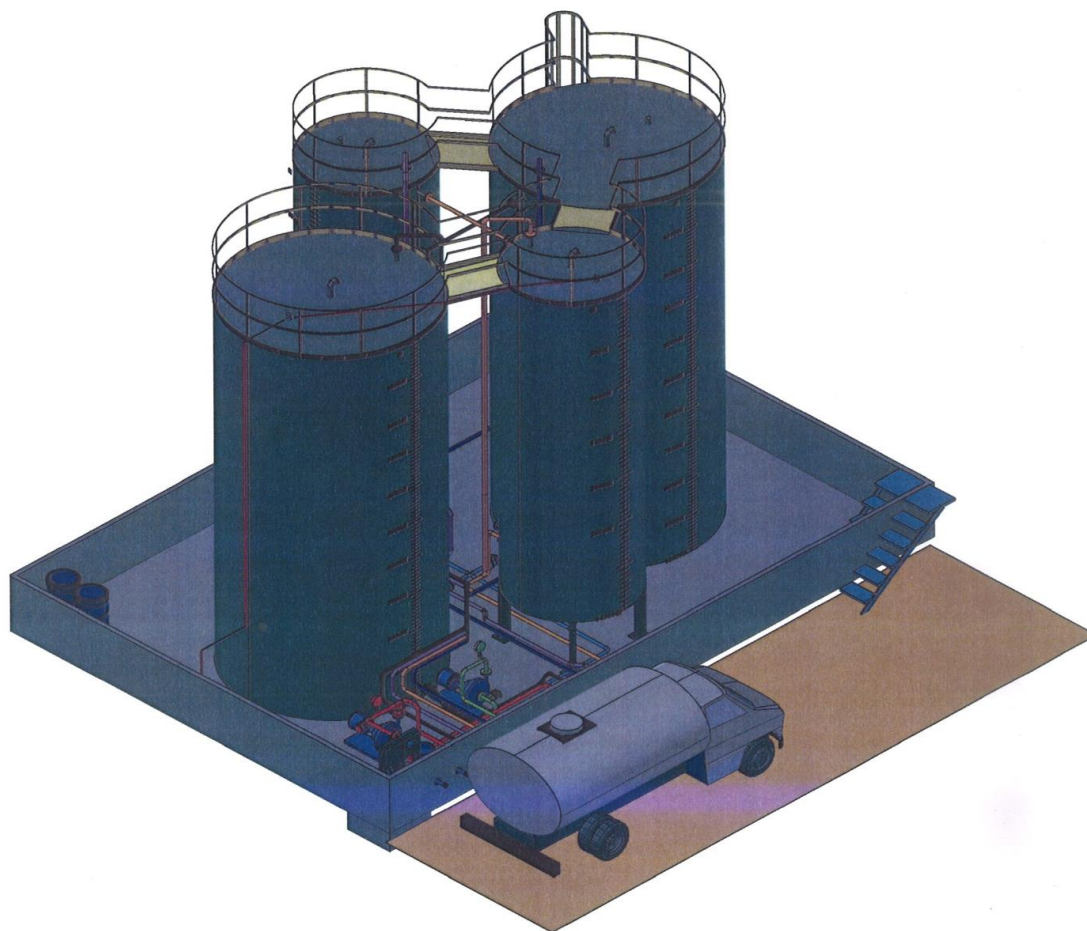
- Chlorine levels;
- PCBs;
- Water; and
- Sediments.

In addition, the transfer center should have the following minimum equipment:

- Two circuit suction pumps, with reversible loading and unloading, with filters and sampling;
- A minimum of 3 tanks to store 35 m<sup>3</sup> and a tank of 8 m<sup>3</sup>

All tanks should have secondary containment to avoid soil contamination.

A transfer center, which satisfies the above characteristics, can manage about 10,000 t of waste oil per year.



Example of transfer centre with a storage capacity of used oil of 260m<sup>3</sup>

### **3.8 Step 8: Establish regeneration/re-refining plants of waste oil**

In order to establish re-refining/regeneration of industrial used oil (mineral and synthetic) plant, a process is necessary which allows the elimination of contaminants (toxic and dangerous substances) so waste oil regains the original characteristics of lubricant oil.

This process should be based on the Best Available Techniques (BAT) for the re-refining of waste oil. In order to develop this process, it should comply with the definition what is meant by “regeneration - re-refining”.

We can define “regeneration-re-refining” of waste oil as the process which generates industrial base oil, by refining and combining distillation with a physical-chemical process eliminating contaminants, oxidation products, spent additives and heavy metals. The objective is to make waste oil suitable again for the same initial use, according to quality standards and technical specifications.

With the purpose to attain such objectives, regeneration plants should have the following units:

- Dewatering unit for water and sludge treatment.
- Distillation unit to treat different viscosities of oil bases.
- Elimination of asphalt and metals through the distillation unit or by treatment with propane.
- Final treatment unit for the removal of contaminants, through a chemical and hydrogenation process, removing any residual oxidation product such as chlorates and sulphates.

A specific treatment is also used to improve the color and odor of bases. This physical treatment does not eliminate contaminants in the waste oil.

It is considered as a regeneration process, when the yield of base obtained is superior to 60%, considering the yield on dry basis, by applying the best BAT.

In addition, the process must comply with environmental authorizations as well as local legislation on air emissions, wastewater discharges, spills, odors or other applicable environmental legislation.

In regards to establishing a regeneration plant to make it economically feasible, the government should guarantee an annual collection of 15,000 to 20,000 tons of waste oils at a reasonable used oil price.

## **Chapter 4. Pollution prevention case studies**

### **4.1. Extended Producer Responsibility for waste oils: SIGAUS (Integrated Management System of Used Oils), Spain**

#### **Introduction**

In Spain, like in many other European countries, used oil management has been regulated by a producer extended responsibility system, requiring lubricant makers to guarantee and finance the sound management of waste oils in the Spanish market. This system is in line with the different EU Directives demanding measures to assure the collection and sound management of waste oil including economic mechanisms such as incorporating in the lubricant price, the cost of its management at the end of its useful life.

SIGAUS is the Integrated Management System (IMS) organization in charge of collection and sound management of waste oil. SIGAUS is a non-profit organization which started operation 2007, when Spain applied the Producer Extended Responsibility substituting a less efficient system of grants applied to finance waste oil collection and treatment companies.

SIGAUS covers 90% of the lubricant market representing almost 200 companies and operating in all economic sectors marketing lubricants. SIGAUS is authorized to operate in all Spanish regions having an effective management network by means of contracts with third-party companies and covering all phases of the waste oil process, from collection to final treatment.

#### **Economics**

As non-profit organization, SIGAUS uses 100% of its revenues to the recovery and recycling of waste oil, financing all life-cycle waste oil operations and implemented by contracted companies. As stated in the law, this financing comes from lubricant makers participating in SIGAUS (and materialized by a 0,06 € per kg canon on lubricant sold in the Spanish market). Through this system, lubricant makers and importers fulfill their obligations for the management of lubricants once they become waste oil.

In addition, the Spanish legislation has been more stringent than others in the EU, being one of the few European countries adopting specific environmental objectives on the recovery and regeneration of waste oils. In the case of regeneration, the European legislation settles that regeneration is the most favorable treatment, and commends to the States members to take measures to prioritize regeneration as the final destination of waste oil.

SIGAUS system has demonstrated to be an effective mechanism to reach the environmental legal objectives which include recovering more than 95% of the used oils, valorize 100% of them and use for regeneration more than 65% of total waste oil (not all waste oils can be regenerated). Since SIGAUS operates, these objectives have been attained without exception, producing high collection and regeneration rates for the first time in the waste oil management history in Spain, being one of the European leaders in this sense.

Based on these objectives, in 2014, SIGAUS recovered 126.089 tons of used oils in Spain, of which 85.438 tons were devoted to regeneration. Regeneration engenders a double benefit. One benefit is economic by saving scarce and expensive raw materials use such as petroleum. On the other hand, the benefit is environmental, avoiding pollution impacts in the environment as well as CO<sub>2</sub> emissions savings (related to lubricant production refined from petroleum and used oil utilization as fuel).

The attainment of these objectives has been possible thanks to a solid and extensive network of 130 contracted companies authorized in all Spanish regions and operating in all life-cycle phases of waste oils such collection, transport, storage, analysis, pre-treatment and final treatment. In regards to collection, SIGAUS has created more than 60.000 points all over Spain (including Balearic Islands, Canary Islands, Ceuta and Melilla) providing a collection service including rural areas, independently of used oil volume to collect and distance to transfer or management centers. It is therefore ensured that waste oil doesn't have a negative impact especially in natural protected areas.

Once waste oil has been collected, two treatment processes are possible: regeneration and energy recovery. As mentioned, the regulatory scheme demands that at least 65% of used oil must be used for regeneration. On the other hand, used oils that are not regenerated are subjected to physical-chemical treatment to obtain a fuel similar to fuel oil that can be used in power plants, cement plants, paper mills or other industrial facilities.

Related to the market, SIGAUS represents 90% of lubricants sold and consumed in Spain, which is the proportion of SIGAUS associates sales in the Spanish market. This proportion is applied when financing waste oil management operations by contracted companies, assuming its responsibility (on behalf of its member companies) on 90% of used oil generated in Spain. Out of this quota, 2,89% of used oil is sold by not identified and not associated to any IMS companies being in a fraud situation. SIGAUS assumes its management voluntarily, as the major IMS in the Spanish market.

Besides collection and treatment operations, SIGAUS also works on prevention and mitigation of environmental impacts associated to the consumption of industrial oils. Since 2010, SIGAUS has promoted among lubricant makers to implement prevention measures related with the design process and application of lubricants and training on best use practices. The idea is reduce the volume of waste oil produced, thanks to wise product use, increase in the life cycle time, as well as improving performance characteristics while reducing their polluting potential and later treatment. These actions are presented in the Prevention Business Plans developed by SIGAUS whose current version has validity from 2014 to 2017.

One of SIGAUS commitments refers to guarantee the security and reliability of information coming from all waste oil management operations. On that regard, SIGAUS develops periodically through an external and independent entity, the revision and verification of waste oil declarations done by lubricant makers and companies, checking the accuracy of data. This revision guarantees the same conditions for companies participating in the system, which are competitors in the market, showing the objectivity and neutrality of SIGAUS as an IMS entity.

Another important issue for SIGAUS is communication. SIGAUS informs all stakeholders about its activity, as well as the environmental benefits derived from its mandate. In this sense, SIGAUS informs to all stakeholders along the life cycle of used oil such as lubricant makers waste oil management companies, waste oil producers and the public administration. In addition, SIGAUS carries out awareness campaigns for civil society about its work and environmental benefits coming from waste oil recovery, through different channels such as the website [www.siga.us](http://www.siga.us), social networks, publications and media campaigns.

### **Sources of information**

For more information, please contact SIGAUS: Avda. Europa 34 - D, 3ºB. 28023 Madrid (Spain). Website: [www.siga.us](http://www.siga.us)

## **4.2. 100% regeneration: the Catalan Waste Oil Treatment Company (CATOR, S.A.)**

### **Introduction**

Catalonia is an autonomous region in Spain. It occupies an area of around 32.000 sq. Km and has a population of almost 7 million. Catalonia consumes around 20% of lubricants of the Spanish market.

In 1992, before CATOR started operation, the situation of waste oil (WO) management of waste was as follows:

- Regulations were in place. Priority was given to the regeneration rather than the combustion. A subsidy was available for WO pre-treatment and regenerating as well as using WO for fuel;
- Low percentage of collection. Less than 15% of sold lubricants were collected;
- Regeneration of waste oils was not working. Despite regulations, only 6,000 tons out of 480.000 tons of sold lubricants in Spain were regenerated;
- Using as fuel. WO was used as fuel with little environmental control;
- Use and illegal dumping. Much of the WO was not managed in a legal and controlled manner;
- Lack of producer census. There was not specific census of WO producers (workshops and industries); and
- Lack of statistics. Statistics were incomplete and no institution was in charge of them.

In view of this situation, the Catalan government declared the management of used oil a Public Service and established the obligation to collect and regenerate 100% of used oil generated in its territory. By an open tender, the Environmental Department awarded to the private company CATOR, the management of waste oils in Catalonia with the objective of achieving:

- Census of producers. Making a census and coding of all WO producers (workshops and industries);
- Collecting 100% of the WO produced. Having a collection strategy and a fleet of trucks to ensure its collection throughout the territory;
- Analysing and sampling. The objective is to ensure that collected waste oil is as clean as possible and there is not appearance of other pollutants such as solvents, PCBs, glycols, etc; and
- 100% regeneration of oil collected. A regeneration plant was designed and build with treatment capacity for all WO generated, having a clean and efficient process with best available technologies, recovering products extracted from WO and producing high quality bases.

The public administration began to pay a subsidy per kg of oil collected and per every kg of regenerated oil. From 2006 and through an IMS (Integrated Management System), these subsidies were paid by producers, based on the Polluter Pays Principle (PPP) and the Extended Producer Responsibility (EPR).

The success of this WO regeneration model is primarily due to the political will of the government and competent authorities to pass regulations and ensure their enforcement.



CATOR has collected almost 100% of WO generated in Catalonia. It represents about 40% of the total annual consumption of lubricants, reaching a peak of up 30,000 t per year while regenerating 100% of collected oil.

CATOR also designed and implemented an awareness campaign on WO management to public administrations, private sector associations, trade unions, environmental groups, schools and population. This awareness campaign includes the explanation of the environmental hazard generated by the mismanagement of W.O. in the environment and human health. In addition, benefits and obligations of each party involved in the generation, collection and regeneration of WO and the benefits for society and the environment were also presented. Explained benefits included optimizing resources as oil, which is a limited and non-renewable resource, preserving the environment, avoiding pollution soil, groundwater and air and fighting against climate change.

### **Census of producers**

As part of the WO logistics system, it was developed a register of all producers and holders of WO (workshops and industries) including its location. This census has reached about 16,000 WO producers. The most relevant information included in the census is the following:

- Name and identification of producer;
- Allocation of the corresponding WO producer codes;
- Address, coordinates, town, telephone, postal code and other related information;
- Annual estimate of waste oil produced;
- Type of waste oil produced (Higher consumption);
- Temporary storage;
- Capacity and type of drums for WO storage;
- Type of access to facility (on-site and around site); and
- Type of truck needed for efficient collection.

### **Collection strategy**

Much of the regeneration success is attributed to the collection process. A good design and implementation on logistics produces an efficient collection in quantity and quality, avoiding the mixing with other wastes such as glycols, solvents, PCBs, water, etc.

Another important aspect is to implement the waste collection by pumping directly from producers drums eliminating the absorption of dirt and transport of contaminated containers. This system allows:

- Sectoral planning of territory, areas, provinces, towns, populations, etc;
- Design and scaling up the fleet of collecting vehicles according to needs;
- Provide monthly and annual producers and management statistics;
- Plan for efficient routes for collection; and
- Prepare documents and labels in advance for each waste oil collection and sampling.

### **Transfer centers**

Design and install transfer centres that can receive collected WO and send it to the regeneration plant. The transfer centers provide service in areas within a radius of 300 Km. These centers has a minimum storage capacity of 120m<sup>3</sup> and has the following:

- Lines of loading and unloading with suction pumps and a sampling system, and
- One (1) container of 1m<sup>3</sup> for water purge of tanks.

These installations have secondary containment for any leaking.

CATOR has storage capacity in the regeneration plant, besides two transfer centers with capacity of 120m<sup>3</sup> each and an annual turnover of around 10,000 tons of waste oil.

### **Transitional period**

During the construction of the regeneration plant, WO was sold and sent to other authorized regeneration plants. In the case there are no regeneration plants in the country, the export of waste oil to abroad regeneration plants allows to get revenues based on the oil quality and expected performance in the regeneration process to compensate collection costs.

### **Analysis**

CATOR has a laboratory for collected oil analysis and for quality control of the regeneration plant. All collected oil is analyzed from a taken sample taken from each producer, being the limits of acceptance the following:

- Water <8%;
- Chlorine < 2000 ppm;
- PCBs < 50 ppm; and
- Flashpoint >150°C.

The plant can receive waste oil with a higher content of water, chlorine and glycols but the producer must pay for a previous pretreatment.

### **Regeneration plant**

The process at CATOR is based on an improved Vaxon technology. The plant has a treatment capacity of 42.000 tons of waste oil per year. The most important treatment units are:

- Pre-Treatment;
- Distillation;
- Final treatment; and
- Water treatment plant.

As a result of treatment, three different base oils are obtained: 100N, 150N and 300N, which are sold to oil producers to manufacture new lubricants of the same quality as the first refining oils. In addition, Spindle oil and other end light oils are obtained and used in the treatment plant as fuel. Asphalt flux is also produced and used as asphalt product (waterproofing materials and asphalt for roads). The obtained base oil is marketed as REGENOIL and has obtained the approval certificates ACEAS\_98, API SH/SJ and CF-4CG4

The plant is equipped with the following additional environmental measures:

- There is no discharge of industrial wastewater;
- The water generated is treated and reused in the refrigeration process; and

- Emissions comply with air pollution regulations.

The company is also certified with ISO 14001:08 y ISO 9001:04. The continuous improvement of processes allows to process all used oil from Catalonia, Spain and import additional waste oil. CATOR has accomplished a high efficiency, producing high quality products while generating minimum of waste.

**Sources of information/related web links**

For more information, please contact: CATOR. C/ Puig i Cadafalch, 17. Polígono Industrial Rubí-Sud. 08191 Rubí (Barcelona), Spain. Tel. +34 93 4882467. [info@cator-sa.com](mailto:info@cator-sa.com). Website: [www.cator-sa.com](http://www.cator-sa.com)

## Annexes

### A1. Bibliography and sources of information

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- European Re-refining Industry section of UEIL (Independent Union of the European Lubricants industry): <http://www.ueil.org/en/>
- European Renewable Resources and Materials Association: [www.errma.com](http://www.errma.com)
- Eurolub: [www.eurolub.org](http://www.eurolub.org)
- GEIR (Groupement Européen de l'Industrie de la Régénération): <http://www.geir-rerefining.org/>
- Lube Media: [www.lube-media.com](http://www.lube-media.com)
- Lubes and Greases Magazine: [www.lubesngreases.com/magazine/](http://www.lubesngreases.com/magazine/)
- Lubes and Greases Magazine – Europe Middle East Africa: [www.lubesngreases.com/magazine-emea/](http://www.lubesngreases.com/magazine-emea/)
- Lubrication Management and Technology Conference: [www.lubmat.org](http://www.lubmat.org)

## **A2. List of acronyms**

**As** arsenic  
**API** american petroleum institute  
**CATOR** catalonian company for the treatment of industrial oils  
**Cd** cadmium  
**COOU** consortium for the mandatory management of used oil of Italy  
**Cr** chromium  
**Cu** copper  
**ESM** environmentally sound management  
**EU** european union  
**EPA** environmental protection agency (United States of America)  
**EPR** extended producer responsibility  
**IMS** integrated management system  
**ICI** independent chemical information),  
**ISO** international standards organization  
**LBS** land based sources  
**MAP** mediterranean action plan  
**NAP** national action plan  
**NGO** non-governmental organization  
**Ni** nickel  
**NMP** n-metil-2-pirrolidona  
**PAHs** polynuclear aromatic hydrocarbons  
**Pb** lead  
**PCBs** polychlorinated biphenyls  
**PNAs** polynuclear aromatics  
**PPM** parts per million  
**PPP** pollution pays principle  
**SCPRAC** regional activity center for sustainable consumption and production  
**SIG AUS** integrated management system of used oils in Spain  
**UNEP** united nations environment programme  
**VCFE** vacuum cyclon flash evaporator  
**WWTP** waste water treatment plant  
**Zn** zinc

### A3. EuropaLub lubricant classification

The following table shows the EuropaLub ([www.europalub.org](http://www.europalub.org)) lubricant classification and coding.

<b>1) Engine oils</b>	<b>Europalub</b>
Gasoline or diesel engine oils for passenger cars	1 A
First fill gasoline or diesel engine oils for passenger cars	1 A1
Diesel engine oils for commercial & industrial vehicles (excluding marine and aviation)	1 B
First fill diesel engine oils for commercial & industrial vehicles	1 B1
Universal diesel engine oils for tractors (agricultural , road construction, ...)	1 B2
Two-stroke engine oils	1 C
Other engine oils	1 D
Marine engine oils (national) *	1 E
Aviation engine oils and turbine oils	1 F
<b>2) Gear oils and transmission</b>	
Automatic transmission fluids	2 A
Automotive gear oils	2 B
Industrial gear oils	2 C
All hydraulic transmission oils, inc. Fire – resistant fluids	2 D
Shock absorbers oils	2 E
<b>4) Metal working oils</b>	
Quenching oils	4 A
Neat oil for metalworking	4 B
Soluble oils for metalworking	4 C
Rust prevention products	4 D
Rolling mills oils	4 E
<b>5) Highly refined oils</b>	
Turbine oils, excluding aviation applications	5 A
Electrical oils	5 B
<b>6) Other oils</b>	
Compressor oils	6 A1
Compressor oils	6 A2
General machine lubricants (incl. slide-way, pneumatic tool ...)	6 B
Other industrial oils for non-lubricating purposes	6 C
<b>7) Processing oils</b>	
Process oils, technical white oils, medicinal white oils, aromatic oils, waxes and paraffins	7 A, 7 A1, 7 A2, 7 B, 7 C
<b>8) Basic Oils</b>	8 A