

WASTE OILS

This fact sheet is part of a series of fact sheets to support the implementation of the environmentally sound management (ESM) of hazardous wastes and other wastes, in accordance with the obligations of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal.

The fact sheet provides information on the ESM of waste oils, also sometimes referred to as “used oils” or “spent oils”. It is primarily intended for those involved in the collection and management of waste oils.

This fact sheet should be read in conjunction with the **Technical Guidelines on Waste Oils from Petroleum Origins and Sources (Y8)**, and the **Technical Guidelines on Used Oil Re-Refining or Other Re-Uses of Previously Used Oil (R9)**, developed under the Basel Convention^(1,2).

Classification

Waste oil belongs to category Y8 in Annex I of the Basel Convention, and is further classified as A3020 in Annex VIII.

Waste oils are generally considered to possess hazard characteristics H11, H12 and H13 in Annex III. Waste oil commonly contains carcinogenic polycyclic aromatic hydrocarbons (PAHs); used motor oil, in particular, also contains heavy metals from certain additives and metal particles from engine wear.

It is worth noting that for the environmentally sound management of waste oil containing or contaminated with PCB, technical guidelines have been developed under the Basel Convention which in particular address waste oil with a PCB concentration above 50mg/kg^(30,31). Some countries have established stricter provisions. Chlorinated compounds can lead to corrosion of equipment and present a health hazard when incompletely combusted^(9, 10, 11).

Collection

A first step to implementing an effective collection system is undertaking a detailed assessment of existing collection practices and conditions (infrastructure, costs, legal framework, etc.). A situation and gap analysis could be used to help identify strengths and areas for improvement. Establishing clear goals and objectives (e.g. to increase the collection of waste oil; to promote investments in collection and processing infrastructure) aimed at solving these problems can help guide the subsequent planning process, and

¹ Provisional low POP content level established under the Stockholm and Basel Conventions above which destruction or irreversible transformation of the persistent organic pollutant content is required.

quantitative targets can be used to measure whether objectives have been met^(3,4,5).

Policy instruments: An appropriate mix of policy instruments (regulatory, economic and information-based measures) should be adopted, taking into account the political, social, economic, legal and cultural context (e.g. existence of informal collectors)⁽³⁾. Voluntary industry measures (e.g. take-back programmes) may be part of policy solutions⁽⁷⁾.

Regulatory instruments refer to direct government regulations such as technology mandates and performance standards. A basic feature of any regulatory framework is authorisation of related activities to ensure an environmentally sound operation, operators are known and report to the government on quantities handled. To make it easier for small-scale collectors to comply, a simplified licensing process could be applied to collectors under a certain threshold size.

Economic instruments may be used to encourage

Approximately 40 to 50% of the lubricants sold are consumed or lost during use; the remaining 60 to 50% of the oil is potentially recoverable⁽¹²⁾.

desirable behaviour (e.g. through subsidies) or to discourage undesirable behaviour (e.g. through taxes or charges), to guide actions towards sustainable production and consumption⁽⁶⁾. When planning economic instruments, the market realities should be carefully considered⁽³⁾. For economic instruments to work effectively, regulations need to be clear and the compliance enforcement capacity adequate⁽³⁾.

Economic instruments could include: product taxes; advance recycling fees; subsidies; tax differentiation; extended producer responsibility; deposit/refund schemes; green public procurement (giving preference to lubricants that do not contain certain hazardous substances).

Information-based policy instruments aim to raise the awareness by providing information e.g. practical guidelines for the environmentally sound storage, collection, transport, recycling and final disposal of waste oil could be developed. The awareness of the stakeholders should be raised about the risks of inappropriate disposal of waste oils, good management practices, the value of waste oil if not mixed with other fluids, collection options, and penalties for non-compliance with regulations⁽³⁾.

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Source: <http://www.ci.sauk-rapids.mn.us/>

Figure 1. Public used oil and filter drop site at the City of Sauk Rapids, U.S.A.

Methods for collection

The more convenient and accessible the collection system, the more waste oil will be returned for recovery. Waste oil can be collected by commercial, private collectors and/or recyclers directly from the “point-of-generation” or it can be taken by the user to a drop-off location (e.g., retail stores, service stations, recycling centres, oil banks). Collecting used oil from non-industrial sources and local/small generators is very difficult and requires a well-established and efficient infrastructure to accomplish the task^(2,8).

In general, drop-off programmes consist of permanent tanks located at publicly accessible locations. The oil brought to these sites is poured into the tanks for later collection by a licensed hauler. Proper drop-off site management should include used oil acceptance protocols for contamination prevention. The use of a (handheld) halogen detector is suggested. As an extra precaution against contamination, some programmes require users to sign a log when they drop off their waste oil⁽¹³⁾.

Kerbside programmes generally allow residents to set used motor oil in sealed, non-breakable containers at the kerbside next to regularly collected garbage or recyclables. The waste oil obtained on the collection route is typically transferred to an intermediate holding tank at a central location, where it is tested for contamination before being transferred to a large aggregation tank for later collection, transportation, and processing.

Storage

Storage of waste oil above certain threshold quantities should require a licence, permit or authorisation. Tanks and containers should be under regular inspection and maintenance to keep them in good condition. Secondary containment systems for single storage tanks should have a volumetric capacity of not less than 110% of the tank volume. In cases where there is more than one tank within the bund, some environmental authorities require that the capacity should be at least sufficient to accommodate 110% of the largest tank’s maximum capacity or 25% of the total maximum capacities of all tanks, whichever is greater^(14,15).

Mixing waste oils with different characteristics, other wastes or substances should be prohibited in order not to compromise downstream treatment processes or prevent recovery; and stipulating allowable limit contents of chlorine and polychlorinated biphenyls (PCBs)⁽⁸⁾.

Transport

Transport of more than a certain amount of waste oil in a given year should require a licence, permit or authorisation.

The United Nations Recommendations on the Transport of Dangerous Goods, Model Regulations contains provisions for the packing, marking, labelling and placarding of dangerous goods, which may be considered in cases where there is no specific legislation. Wastes not otherwise subject to these Regulations but covered under the Basel Convention may be transported under Class 9⁽¹⁶⁾. Waste oil that does not meet the classification criteria of any other class (i.e., good practices were followed to prevent contamination) would be classified as Class 9, UN 3082, waste environmentally hazardous substance, liquid, N.O.S.

Emergency response information (e.g., European Chemical Industry Council’s ERICards) and hazardous waste tracking documents should be available with each shipment of waste oil (hard copy or electronic). In the event of a spill, the transporters should be required to contain the release and notify local emergency authorities.

Transboundary Movement

Transboundary movements of waste oils are subject to the Basel Convention control procedure and should be reduced to a minimum consistent with environmentally sound and efficient management and conducted in a manner which will protect human health and the environment. In addition, waste oils may be subject to additional restrictions and control procedures in certain countries.

Environmentally Sound Waste Management

Waste oils should only be treated in facilities that are properly licensed, permitted or authorised, and that practise environmentally sound management (ESM).

Waste oils should be managed in accordance with the waste hierarchy, as shown in Figure 2, and preference should be given to options that deliver the best overall environmental outcome. Priority should be given to recycling and energy recovery over final disposal. The main disposal options for waste oils are recovery for use as fuel (including thermal cracking) and regeneration (re-refining) to base oil^(2,13,17). Regeneration of waste oils and their use as fuel has comparable environmental impacts, therefore, a generic priority for any kind of regeneration technology is not necessarily compatible with the prioritisation of environmentally preferable technologies⁽¹⁸⁾. If the policy objective is to minimise the risk of environmental damage, rather than preferring any one recycling route over another, the priority should be maximising the collection of the recoverable proportion of lubricants⁽¹²⁾.

The regeneration of waste oil should achieve a yield higher than 60-65%^(19,20) on a dry basis. Waste oils suitable for regeneration must have a low content of PCDD/PCDF, PCBs and chlorinated additives. The admitted POP content may, according to national legislation or guidance, need to be lower than the provisional low POP content level established under the Stockholm and Basel Conventions.

It has been recommended that the following be preferred for regeneration: engine oils without chlorine; hydraulic oils without chlorine; and non-chlorinated mineral diathermic oils⁽²¹⁾. Thermal oxidation should be used to reduce VOC emissions⁽²⁰⁾. The base oil produced can be certified as meeting certain performance standards (i.e., certification that it meets the same high quality standards as oils from crude) to enhance its market acceptance⁽¹³⁾. To implement regeneration as a priority, some form of

Environmentally sound management (ESM) of hazardous wastes or other wastes (as defined in the Convention) means taking all practicable steps to ensure that hazardous wastes or other wastes are managed in a manner which will protect human health and the environment against the adverse effects which may result from such wastes.

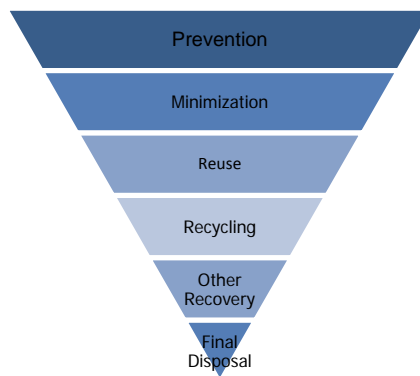


Figure 2. Waste management hierarchy

subsidy may be necessary because intrinsic market forces are not sufficient to stimulate priority for regeneration⁽¹⁸⁾.

The use of waste oil as fuel is generally done via two different routes, namely, direct burning without any pre-treatment or burning after some degree of pre-treatment. In all applications, emissions to air and the disposal of residual wastes should be considered carefully to ensure they are not harmful to human health and the environment. A quality assurance system should be in place to guarantee the characteristics of the waste fuel

produced (e.g., measurement of the chlorine content to prevent the introduction of PCB-contaminated waste oils)⁽²⁰⁾. Performance standards can be set for waste oils that are used as fuel to ensure that the proposed use does not result in equipment failures (e.g., erosion-corrosion) or in higher emissions⁽³⁾. Waste oil specifications can be used to describe the quality, or specify the maximum levels of particular contaminants, in waste oil (e.g., U.S. “used oil specifications” in Table 1, see also⁽¹¹⁾). Such specifications provide a high degree of certainty (i.e., if there is certainty over what goes into a burner, and the burner is operated and maintained correctly, the operator can be fairly sure of the content of the emissions). Properly controlled co-processing of waste oils in cement kilns can provide a practical, cost-effective and environmentally sound recovery option⁽²³⁾. Open burning of waste is listed as an inadvertent source of persistent organic pollutants in Annex C, Part III of the Stockholm Convention, and it should be prohibited^(3,21). Open burning can also include incineration devices that do not control the combustion air to maintain an adequate temperature and do not provide sufficient residence time for

Constituent/Property	Allowable Level
Arsenic	5 ppm maximum
Cadmium	2 ppm maximum
Chromium	10 ppm maximum
Lead	100 ppm maximum
Flash Point	100 °F (~37,7°C) minimum
Total Halogens	4000 ppm maximum
PCBs	Less than 0.2 ppm

Table 1. U.S. waste oil specifications for energy recovery⁽²²⁾

Waste oil that is not mixed or contaminated with hazardous waste and meets all specification levels, otherwise known as “on-specification used oil”, is not subject to any restrictions when burned for energy recovery. In fact, “on-specification used oil” is comparable to product fuel in terms of regulations. “Off-specification used oil” may also be burned for energy recovery, but it is strictly regulated.

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complete combustion.

In some developing countries and in particular in rural areas, waste oils are being used for domestic uses including: polishing of new floors; animal skin treatment against ticks; use as herbicides to kill weeds; use for rust treatment; suppressing of dust on floors or roads; waterproofing and treatment of termites within wooden fences and gates posts. These uses are largely inappropriate from an environmental perspective and should be discouraged⁽³⁾.

Extended Producer Responsibility

Extended producer responsibility (EPR) extends a producer's responsibility for a product to the post-consumer stage of its life cycle. There are a number of countries that have implemented EPR schemes covering waste oil; see reference section for examples of existing schemes^(24,25,26).

Certification and Auditing Systems

Environmental management systems (EMS) can help organisations identify and manage their environmental impacts as well as compliance with environmental legislation. Facilities can become certified (e.g. using ISO, EMAS or industry standards) by demonstrating to an accredited, independent third-party auditor that they meet specific standards to safely manage waste lead-acid batteries. An organization can, however, achieve the same benefits from an EMS whether or not it pursues certification. Non-standardised systems can in principle be equally effective if properly designed and implemented.

General guidelines and recommendations to help small and medium-sized businesses develop an EMS have been published by the European Environment Agency⁽²⁷⁾, the U.S. Environmental Protection Agency⁽²⁸⁾, and the Bureau of International Recycling⁽²⁹⁾, among others.

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- (9) European Commission (2001) Critical Review of Existing Studies and Life Cycle Analysis on the Regeneration and Incineration of Waste Oils. Final Report. http://ec.europa.eu/environment/waste/studies/waste_oil.htm
- (10) As an example, in Netherlands, the maximum permissible organohalogen and PCB content in waste oil that is intended for regeneration (re-refining) is set at 1000 mg/kg (calculated as chlorine) and 0.5 mg/kg per congener (PCB-28, 52, 101, 118, 138, 153 or 180), respectively; waste oils with higher organohalogen levels can only be used for energy recovery, provided the PCB concentration remains below 0.5 mg/kg per congener. Ministry of Infrastructure and the Environment (2014), National Wastes Management Plan 2009-2021, Appendix 6. <http://www.lap2.nl/sectorplannen/> (available only in Dutch)
- (11) In Germany, waste oils with concentrations of PCB in excess of 20 mg/kg or a total halogen content of more than 2000 mg/kg cannot be regenerated according to the German waste oil ordinance. http://www.gesetze-im-internet.de/alt_liv/ (available only in German)
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<http://chm.pops.int/Implementation/BATBEP/BATBEPGuidelinesArticle5/tabid/187/Default.aspx>
- (22) Title 40 of the Code of Federal Regulations (CFR) Part 279, Standards for the Management of Used Oil. http://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title40/40cfr279_main_02.tpl
- (23) Technical Guidelines on the Environmentally Sound Co-processing of Hazardous Wastes in Cement Kilns.
<http://www.basel.int/Implementation/Publications/TechnicalGuidelines/tabid/2362/Default.aspx>
- (24) European Commission (2014) Development of Guidance on Extended Producer Responsibility (EPR). Final Report.
http://ec.europa.eu/environment/archives/waste/eu_guidance/index.html
- (25) In the European Union, waste oils are mostly managed through EPR schemes where the responsibility of waste management is left to municipalities and the financial responsibility is left to producers. The role of Producer Responsibility Organisations (PROs) is mainly data aggregation, both from producers and waste operators. Whenever costs are not covered by the secondary oil market value, PROs reimburse collection costs based on a declaration presented by licensed operators ⁽²⁴⁾.
- (26) For further information on extended producer responsibility see:
- UOMA, <http://usedoilrecycling.com/>
 - California Used Oil Recycling Program, <http://www.calrecycle.ca.gov/usedoil/Recycle.htm>
 - Australian Product Stewardship for Oil Program, <http://www.environment.gov.au/protection/used-oil-recycling/product-stewardship-oil-program>
 - Ecopneus, <http://www.ecopneus.it/>
 - The Rose Foundation, <http://www.rosefoundation.org.za/>
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- (31) Technical guidelines on the environmentally sound management of wastes consisting of, containing or contaminated with polychlorinated biphenyls, polychlorinated terphenyls, polychlorinated naphthalenes or polybrominated biphenyls including hexabromobiphenyl [was adopted by the thirteenth meeting of the Conference of the Parties (BC-13/...)].
[http://www\[...\]](http://www[...])