Reduction of Unintentionally Produced Persistent Organic Pollutants (UPOPs) emissions by improving waste management practices at landfills

Management of waste oils

GEF Project ID: 5558 – Component 2 - Development and Implementation of a Sustainable Management Mechanism for POPs in the Caribbean

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BCRC CARIBBEAN
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Management of Waste Oils

Waste oils and oil contaminated waste

Definition and sources

Oil containing products and common use

- Fuels
- Lubricants
- Hydraulic and transmission fluids
- Heat transfer fluids
- Insulants
- Other

Waste oils: Semi-solid or liquid used product consisting totally or partially of mineral oil or synthesised hydrocarbons (synthetic oils), oily residues from tanks, oil-water mixtures and emulsions

Waste oils and oil contaminated waste

Definition and sources

Common sources of waste oil and oil contaminated wastes:	
	Tank bottom sludge from storage of oil and oil-based products
	Residues from oil/fuel or lubricating fluids purification
	Separated waste from oil and fuel filtering equipment
	Waste hydraulic and lubricating oils
	Waste oil collected in drip trays
	Absorbent materials contaminated with oils
	Contaminated fluids from installations and storage vessels, or accident cleaning operations
	Oily bilge and ballast water from ships

Waste oils and oil contaminated waste

Definition and sources

Content: various hydrocarbons + additives (5 – 25% of the base oil) +impurities and contaminants collected during use

Additives: anti-corrosion, anti-foam, antioxidants, anti-wear, detergents, dispersants, viscosity modifiers, etc.

During use, the composition of the oil will change due to the breakdown of the additives, the formation of additional products of combustion and unburnt fuels, the addition of metals from wear and tear on the engine and the breakdown of the base oil itself.

High metal levels and contamination by flammable solvents, giving a higher flashpoint is prevalent in waste oils.

Waste oil management practices in the Caribbean

Current management practices include:

- Reconstitution to Diesel
- Combustion in distillery boilers
- Land-farming
- Temporary storage, often in improper conditions
- Comingled in landfill
- Spread on landfill as “insect suppressor”
- Poured in Unlined liquid waste pits

Current management practices

Photos: RWA Group, 2019

Current management practices

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Current management practices

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Current management practices

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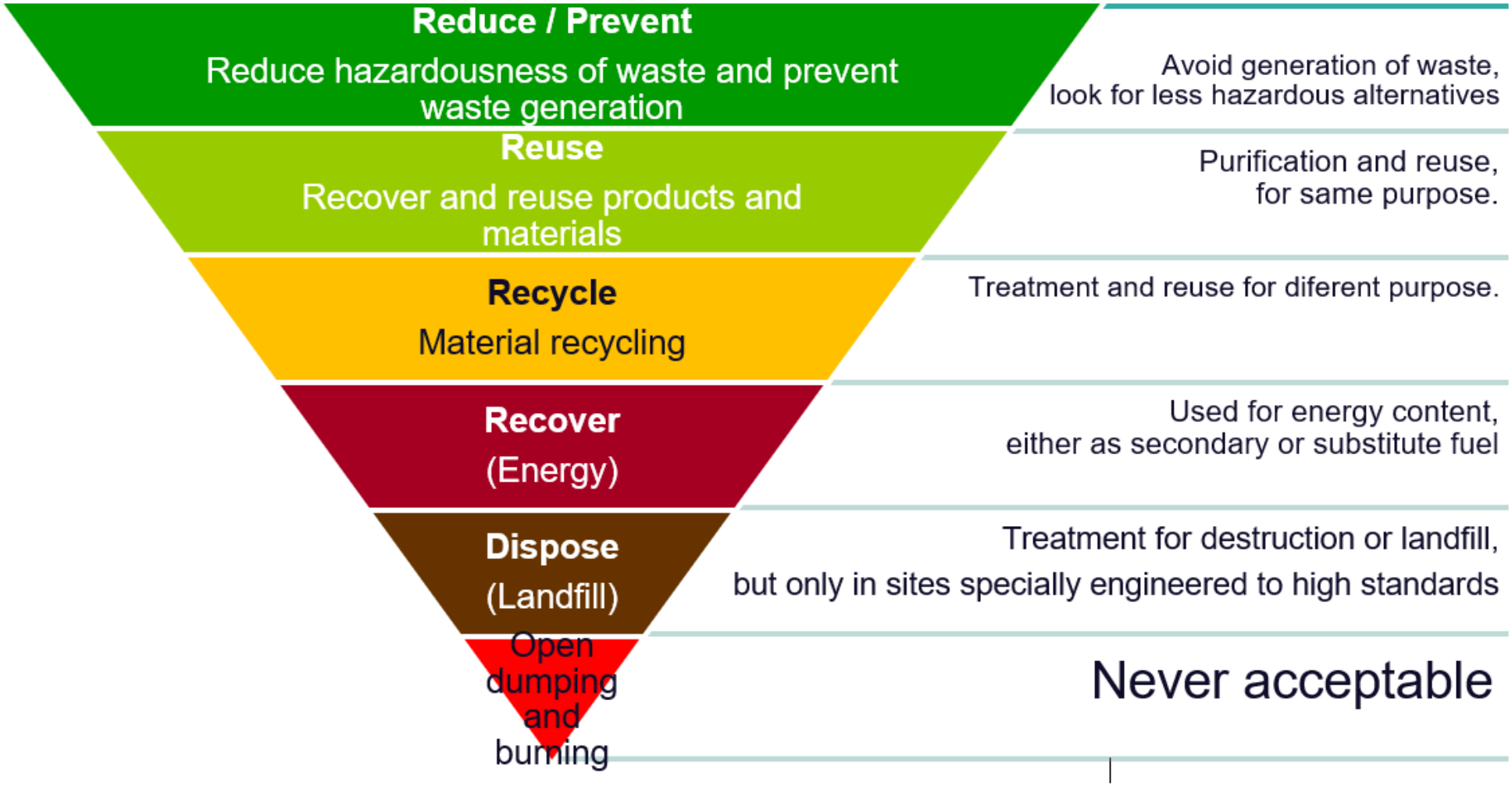
Options for sound waste oil management

Following waste hierarchy is paramount



Options for sound treatment of waste oils

Best Available Techniques Reference Document for Waste Treatment (2018) (adapted)

Waste oil input	Type of treatment	Treatment process	Products obtained
Waste oil for re-refining			
Clean waste oil, especially hydraulic or cutting oil	Re-use	Laundering	Hydraulic or cutting oil - Electricity companies - Shipping industry - Major engineering companies
		Reclamation	Mould release oil or base oil for the production of chainsaw oil
Engine waste oil + clean waste oil - Engine oils without chlorine - Hydraulic oils without chlorine - Hydraulic mineral oils - Mineral diathermic oils	Re-refining	Pre-treatment Cleaning Fractioning Finishing	Lubricant base oil (quality depends on treatment)

Options for sound treatment of waste oils

Waste oil input	Type of treatment	Treatment process	Products obtained
Waste oil as fuel			
All types of waste oil, including synthetic oils	Thermal cracking	Spring oil conversion process Great Northern Inc. processing process other	Distillate gasoil products - Gasoil (also called heating oil, diesel oil, furnace oil, etc.) - De-metallised heavy fuel oil - Marine gasoil (MGO) - Re-refined light base oil
Mixed wastes	Gasification		Synthetic gas - Hydrogen - Methanol

Options for sound treatment of waste oils

Waste oil input	Type of treatment	Treatment process	Products obtained
Waste oil as fuel			
All types of waste oils, especially heavy polluted ones	Severe processing	Chemical processes (with no finishing steps) - Acid/clay - Solvent extraction - Propane extraction - other	De-metallised heavy fuel oil or heavy distillate - marine diesel oil - fuel for heating plants
		Thermal processes, including distillation - various techniques	
	Mild processing, then burning		Replacement fuel oil (treated oil still containing heavy metals, halogen and sulphur contained in the original waste oil) - road stone plants - cement kilns (substitutes other secondary liquid fuel or heavy fuel, coal, or petroleum coke) - large marine engines - pulverised coal power stations (as furnace start-up fuel)

Disposal options for waste oils and oil contaminated wastes

Incineration

- Ideally – with energy recovery
- For oil wastes which cannot be recovered due to technical or commercial reasons
- Preferred option for waste oils containing high levels of PCBs
- Likely to require emission control/gas cleaning equipment to achieve environmentally sound emission standards

Disposal options for waste oils and oil contaminated wastes

Landfilling

- Even when landfill is specially engineered to high standards, with advanced control on leachate and gas management – careful evaluation by authorities is needed
- In case of minimal quantities of oily waste in small containers, such as the ones present in household-generated wastes, these could be disposed of in the landfill
- Depending on site characteristics and absorptive and biodegradable potential, landfilling may be acceptable for highly aqueous oil containing wastes

Options for sound treatment of oily sludges

Oil recovery from petroleum sludge

- Solvent extraction
- Centrifugation
- Surfactant enhanced oil recovery
- Freeze/thaw
- Pyrolysis
- Microwave irradiation
- Electrokinetic
- Ultrasonic irradiation
- Froth flotation

Petroleum sludge disposal methods

- Incineration
- Stabilization/ solidification
- Oxidation

Bioremediation

- Land farming
- Biopile/biocomposting
- Bioslurry

https://www.sciencedirect.com/science/article/abs/pii/S0048969719314585

Conclusions and recommendations

- Technical performance of recovery technologies depend on characteristics of input oils and level of contamination.
- Complex installations, requiring very high investment and operational expenditures
- In lack of a suitable enabling environment, treatment/recovery facilities will not be economically viable

- Using as secondary fuel in distillery boilers -> flue gas quality standards needs to be addressed

- In lack of on-island sound treatment options:
  - Temporary storage at generator in safe conditions (if large quantities) or **in a Hazardous Waste Interim Storage Facility**
  - Send for treatment at approved facilities abroad (Basel Convention Provisions need to be followed)
- **Extended Producer Responsibility** implemented on motor oil, oil products…