

**Consultancy to Assist SPREP and Pacific Island Countries in an  
Assessment of Options for Future Used Oil Management**

**REPORT ONE:  
DESKTOP REVIEW OF USED OIL  
MANAGEMENT DATA**

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March 2018

## 1. Executive Summary

*A significant number of reports have been generated between 2011 and 2014 on the status of used oil management in 14 GEFPAS Pacific Island countries. When analysed as a region, these reports suggest a number of clear priorities existed in 2014 for regional used oil management interventions. These included:*

- *Removal of the significant stockpiles (890,000L) of used oil in FSM (primarily from Pohnpei)*
- *Removal of the significant stockpiles (1,400,000L) of used oil in RMI (Majuro and Ebeye)*
- *Analysis of the logistics and costs of the successful export of used oil to New Zealand, India and Fiji by a number of Pacific Island nations*
- *Promotion of the potential for the use of used oil as a diesel extender in electrical power generation through the documentation of the operations of the Yap power station*
- *Replacement of aging and degraded temporary used oil IBC storage containers across the region*
- *Design and implementation of an advanced recycling fee (ARF) system for all imported lubricants to pay for their disposal after use*
- *Site clean-up and remediation of long-term used oil storage and collection locations*

*Based on the analysis of this collected information, a series of questions concerning contemporary national used oil management practices were devised and distributed to national focal points, and five countries were selected for in-country missions as a result of the desktop review. These missions were undertaken to obtain a comprehensive picture of local used oil management initiatives and priorities across the region in 2018, and to help prioritise expenditure of remaining funds for improved used oil management under the GEFPAS programme. These missions and their findings are documented in REPORT 2.*

## 2. Background to this Contract Report

This report is the first component of work contracted by UNEP/SPREP in 2018 to assist SPREP and PIC Governments in improving regional used oil management by:

- Undertaking a desktop review of all regional project reports related to used oil management (including past reviews and recommendations; audits and cost benefit analysis reports); and
- Completing a remote national consultation with PIC project focal points on local used oil management issues and priorities (**REPORT 1**).

Additional work to be completed under the contract following on from this activity will include:

- Identification and travel to 3 priority PICs including Bluescope Steel (Fiji) based on the findings arising from the oil management related consultation and desktop review; and documentation and summarization of findings from these three missions (**REPORT 2**);
- Provision of recommendations on priority activities and associated workplan to address regional used oil management within the remaining time and budget of the Project (**REPORT 3**); and
- Completion of a desktop review of regional e-waste activities, developing a current e-waste baseline for the region (including current levels of e-waste imported, old equipment entering for resale, from where, by whom, what happens to the waste at the end of the equipment life) (**REPORT 4**).

### 3. Used Oil

Petroleum oils and hydraulic fluids are used for the lubrication of internal combustion engines or associated mechanical parts. Improper disposal of used oil can have major negative impacts on natural resources such as water, groundwater, the marine environment and soil. Used oils typically contain a range of compounds that may have adverse impacts when released into the environment. These compounds include polycyclic aromatic hydrocarbons (PAHs), heavy metals, additives and antioxidants, trace levels of chlorinated solvents, and polychlorinated biphenyls (PCBs). Exposure to these compounds can result in damage to the liver, kidneys, heart, lungs and nervous system. Poly-aromatic hydrocarbons are also potent carcinogens. Oil concentrations as low as one part per million (ppm) can contaminate drinking water.

### 4. Objectives and benefits of sustainable used oil management in the Pacific region

Sustainable used oil management in Pacific Island countries requires the implementation of a management framework that improves national management of used oil and promotes shared used oil management responsibility by all stakeholders. Sustainable used oil management will:

- Minimise the unnecessary, untimely, and uncontrolled generation of used oil in the region;
- Minimise the adverse effects of used oil on the environment and people of the region;
- Ensure that national management of used oil conforms and complies with all relevant national and international conventions and legal requirements;
- Ensure that the costs associated with used oil treatment/final disposal in are met by those responsible for generating the used oil; and
- Increase the capacity of stakeholders to promote effective used oil management in the region.

### 5. Previous Pacific Based Used Oil Investigations

Improved management of used oil has been recognised as a regional pollution priority since the 1990s. A 1994 survey of 12 Pacific Island Countries by the Pacific Forum Secretariat found that the total volume of oil imported annually in the region was about 21 million litres, and it was expected that about half of this (10.5 million litres) would be discarded as waste oil<sup>1</sup>. Significant stockpiles of waste oil were stored in some of the countries and most did not have any viable disposal options. The problems with waste oil were also noted in the Phase I report for the AusAID/SPREP POPs in PIC Project<sup>2</sup>. The project identified a total stockpile in excess of 200,000 litres across 13 of the Pacific Island countries (PNG was not included) and also noted the use of unacceptable disposal procedures, such as open-burning. The waste oil situation was also assessed in the feasibility study<sup>3</sup> for the AFD Regional Initiative for Solid Waste Management in 2008.

More recently, a number of country assessments have been carried out between 2011-2016 to help identify national used oil generation rates and to propose contemporary cost effective management solutions (Table 1). These have been undertaken as part of the AFD/UNEP/GEFPAS project to minimise the release of uPOPs in the Pacific region. The recommendations presented in these reports now need to be updated to take into account changing circumstances including population

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<sup>1</sup> Pacific Waste Oil Study. Energy Planning and Management Branch, United Nations Department for Development Support and Management Services; report no. RAS/94/03C.

<sup>2</sup> Burns, T, Graham, B, Munro, A and Wallis I. (2000). Management of Persistent organic Pollutants in Pacific Island Countries.

<sup>3</sup> GHD (2008). AFD Regional Initiative for Solid Waste Management in the Pacific Region, Feasibility Study (Phase I, Component 2).

growth or contraction, increased vehicle imports and reductions in national used oil generation rates by power utilities caused by increasing uptake of solar electricity generation.

**Table 1. Previous national used oil management reports**

Location	AFD	EEC	Golder	O’Grady	Graham	SPREP
Cook Islands		2015	2014		2011	
Fiji	2014	2016		2013	2011	
FSM		2015		2014		
Kiribati		2015	2014			
Nauru		2015	2014			
Niue		2015				2014
Palau		2015		2014		
PNG					2011	2017
RMI		2015		2014		
Samoa		2012			2011	2013
Solomon Is		2015	2014			
Tonga		2015	2014			
Tuvalu		2015	2014			
Vanuatu	2013			2013		

## 6. Finding of Previous Pacific Island Used Oil Management Assessments (2011-2015)

Key findings of previous national used oil assessments completed as part of the GEFPAS project are presented below. These are summarised from the 44 reports listed in Appendix 1.

### 6.1 Cook Islands

- Triad Pacific Petroleum Ltd is a local and privately-owned company that imports over 80% of all lubricating oil into the Cook Islands. They import oil using shipping containers, with the oil imported in drums and retail containers.
- Triad Pacific Petroleum Ltd has no obligation to collect or export any used oil.
- Lubricating oil is also imported by Pacific Energy SWP Ltd and TOA Petroleum.
- The single largest generator of used oil is the Rarotonga power station Te Aponga Uira (TAU). The Cook Islands Investment Corporation (CIIC) oversees operations of TAU on behalf of the Prime Minister.
- Used oil generated by TAU is collected in drums in a well-managed system and shipped to Fiji by Pacific Energy SWP Ltd on their Local Coastal Trader (LCT).
- The second Cook Island power station is located at Aitutaki, and generates and well-stores 3 to 5 drums of 200 L of used oil per year. This used oil has been collected by TOA Petroleum in the past.
- TOA Petroleum had a used oil take back scheme in place and last shipped used oil in IBCs to Salters Recycling in New Zealand in May 2014, where it was used in a cement kiln.
- Two international shipping services connect Rarotonga with Auckland, Samoa, Tonga and Niue.
- The shipping cost to Auckland is approximately US \$4,000 for a 20 ft Container.

- Recent PV Solar installations and the on-going energy efficiency program have decreased the national demand for lubricating oil.

## 6.2 Fiji

- The main companies importing lubricating oil into Fiji are BP SWP Ltd (trading as Pacific Energy), Total Fiji Ltd, Carpenters Lubricants (who act as distributors for Mobil), and Supreme Fuel Ltd.
- Oil is also imported for retail sale by a range of other smaller importers and retail outlets.
- It is estimated that only half of the used oil generated in Fiji is currently collected.
- One percent of recovered used oil in Fiji is sourced from power stations.
- Ten percent of recovered used oil in Fiji is sourced from (foreign?) ships.
- Blue Scope Steel is the main company recovering and re-using used oil. They currently recover about 875,000 litres/year (2013) which is used primarily in their blast furnaces.
- Temperature monitoring of stack emissions from Blue Scope Steel is not carried out.
- Eco Oil is the other main oil recovery company, recovering about 680,000 litres/year and on-sell it to the local mining, sugar and battery recycling industries.
- Blue Scope Steel is well run and has expressed interest in importing and using more used oil in its operations. They are prepared to cover all domestic costs (excluding shipping costs to Fiji).
- Blue Scope Steel have emphasized the importance of dewatering of used oil prior to export to reduce shipping costs.
- Agents from India/Singapore have offered to buy used oil from Fiji at \$US280 per tonne (excluding shipping costs).

## 6.3 FSM: Chuuk

- The three companies import lubricating oil into Chuuk are CTSI, FSM Petroleum Corp and Ace Hardware.
- There is essentially no organised management of used oil in Chuuk.
- Used oil is often stored poorly at the site of collection, and there is no national central storage site.
- It is estimated that around 60% of potentially recoverable used oil is currently collected.
- Ten per cent of used oil is produced by Chuuk power station (CPUC) (10,000L per year). This relatively clean used oil is stored at the power station until it is used as fuel by the local Dive vessel *SS Thor Finn*.
- A burner is to be installed at the power plant to incinerate used oil.
- Six per cent of used oil is produced by motor vehicle servicing (6,600 L used oil per year).
- Local boats produce around 2,500 L of used oil per year.
- 70% of Chuuk's population live on the outer islands and do not have a power utility nor do they have any motor vehicles. Used oil generation at these locations will be primarily from small electrical generators and from the maintenance of outboard motors.
- The cost to ship a 20 ft container from Chuuk to the Philippines is \$US3,000 - \$4,000. This does not include the collection, loading and unloading of the drums, port handling fees or insurances.

## 6.4 FSM: Kosrae

- There are two companies importing lubricating oil into Kosrae: FSM Petroleum Corporation and Ace Hardware.
- There is essentially no organised management of used oil in Kosrae.

- Based on the volumes of used oil that are being generated, it is likely that used oil is not being disposed of unlawfully in significant quantities in Kosrae.
- The Kosraean power utility, Kosrae Utilities Corporation (KUC) produces 2,500 L/yr of used oil.
- The power company indicated that they did not accept used oil from outside organisations, however a number of local companies confirmed that they do take their used oil to the power company where it is being stored in holding tanks.
- The cost to ship a 20 ft container to the Philippine's is estimated at around \$US2,500 - \$3,000. This does not include the collection, loading and unloading of the drums, port handling fees or insurances.

## 6.5 FSM: Pohnpei

- CTSI Logistics Ltd (194,000 L/yr) and PT&S (183,000 L/yr) import around 50% of all imported lubricants into Pohnpei.
- 255,000 L/yr of oil is supplied to visiting marine vessels and any resulting used oil is not collected locally. (Pohnpei does not accept used oil from foreign ships).
- Vehicle servicing produces 28,990 L/yr of used oil.
- Approximately 16,250 L/yr of used oil is generated by local marine vessels.
- The Pohnpei Utility Company (PUC) which generates electrical power produces 13,000 L/yr of used oil.
- There are no private used oil recovery companies in Pohnpei and there is no formal used oil collection point in Pohnpei.
- There are over 800,000 litres of used oil currently stored on Pohnpei. Some of the used oil has been stored for up to 10 years.
- The local landfill is currently being used as a poorly managed informal used oil storage facility. 245,000 L of used oil is currently stockpiled at this location in 200L drums that are beginning to fail.
- The PUC power station holds 474,000L of used oil. 83,000 L of this is stored in three large tanks, 268,300 L is currently stored in drums and 122,500 L is stored as free product in continuous concrete pits or sumps constructed into the floor of the buildings where the generators are housed.
- FSM Petroleum Corporation is considering establishing a used oil recovery system at the local power plant that would alleviate the used oil stockpiling issues that currently exist on Pohnpei.
- FSM PC could consider providing a large capacity storage tank at their distribution facility tank farm in Dekehtik, Nett, to hold all of Pohnpei's used oil.
- The Pohnpei hospital has a medical waste incinerator that is fuelled by used oil.
- The cost of shipping a 20 ft container from Pohnpei to the Philippine's is US\$3000. This does not include the collection, loading and unloading of the drums, port handling fees or insurances.

## 6.6 FSM: Yap

- FSM Petroleum Corp (26,000L/yr) and CTSI Logistics Ltd (33,000 L/yr) import the bulk of lubricants into Yap.
- Vehicle servicing produces 9,500 L/yr of used oil.
- The Yap State Power Company (YSPC) incinerates 17,600 litres of internally produced used oil per year as a diesel extender. This process generates 2,500 L per year of oil-based sludge from used oil treatment prior to incineration.

- There are approximately 5 years of accumulated used oil stockpiled on Yap. Stockpiled used oil is stored poorly.
- The FSM Petroleum Corporation (FSM PC) tank farm could be potentially used to store used oil.
- The Yap hospital uses a diesel fuelled burner but have never considered introducing used oil as fuel option.
- The cost of shipping a 20ft container from Yap to the Philippines is \$US2,500. This does not include the collection, loading and unloading of the drums, port handling fees or insurances.

## 6.7 Kiribati

- The Kiribati Oil Company Limited (KOIL) is a government-owned corporation and is the sole importer and distributor of petroleum products throughout Kiribati.
- KOIL imports petroleum fuels to its two main terminals, one is situated in Betio and the other is in Kiritimati Island.
- KOIL imports 21,000 litres of lubricants into Kiribati per annum.
- The major lubricant consumers are the Power Stations run by the Public Utilities Corporation (PUB).
- PUB generates around 4,000 L waste oil per year. This used oil is returned to KOIL.
- Motor vehicle service shops are run well and send their used oil to the KOIL storage at Betio.
- Until 2011, KOIL exported the Waste Oil to East Wind Ltd, Suva, Fiji. The total cost involved for a shipping container with 80 drums (16,000L) was AUD\$14,000 including the freight (\$2,500), handling, Kiribati and Fijian taxes, etc. All export costs were paid for by KOIL Ltd.
- In 2012 and 2013, KOIL exported used oil to Kolkata, INDIA. KOIL Ltd. was responsible for shipping costs and the buyer pays AUD \$ 3,000 per container which contains 80 drums x 200L so the final expense paid by KOIL Ltd is \$3,500 per container.
- KOIL Ltd. has exported 16,000 L used oil to India in 21/10/2012 and 32,000L of used oil in 20/07/2013.

## 6.8 Nauru

- Nauru Utilities Corporation (NUC) is the sole provider of utility services to Nauru, including electricity and water and services for bulk fuel supply.
- NUC provides all energy services to Nauru (except for the Australian refugee camp and the main processing plant of RonPhos which both generates their own power).
- There are two major consumers of lubricating oils: Nauru Utilities Corporation (70,000 L pa) and RonPhos (60,000 L pa).
- NUC power station generates 80 drums or 16,000 L of used oil per year. They have also 150 drums (31,000L) of used oil to remove that has been stockpiled over previous years
- RonPHOS is a consumer of used oil in their furnace and in 2013, they used 20,000 L of their own used oil as a diesel extender.
- Use oil storage is not well managed on island.
- The cost for shipping a container is regulated by the world market but the current price for 1 container (80 drums) shipped to Fiji is AUD \$55,000.

## 6.9 Niue

- Niue Bulk Fuel Department is the only importer of lubricating oil into Niue.
- There is no specialised oil recovery company based in Niue.
- The annual volume of used oil generated by Niue Power Corporation is estimated to be 2,460 L/yr.

- Used oil is stored in twenty eight (28) 1000 litre plastic Intermediate Bulk Containers (IBCs) located across the island. The used oil is then decanted from IBCs into a 10,000lt storage tank-tainer.
- Used oil from Niue Power is also stored temporarily on site in 1,000lt IBCs and then decanted into tank-tainers for long-term storage. No bunding or spill equipment is present at the power station site.
- The last used oil shipment to leave Niue for New Zealand cost over \$18,810 NZD to export.

#### 6.10 Palau

- IP&E and Blue Bay are the two biggest oil importers in Palau.
- 394,500 L of lubricating oils are imported into Palau each year.
- 61,000 L of used oil is generated annually from vehicle servicing.
- 34,000 L of used oil is generated from marine engine servicing.
- Malakal Power station generates 77,500L of used oil per year. The second power station (at Ameliik) incinerates all internally produced used oil to produce heat which is discharged to the atmosphere.
- Sites stockpiling of used oil often has poor containment practices.
- Collection of used oil is undertaken by the Palau Public Utilities Corporation (PPUC) at their tank farm in Ameliik. They have suitable facilities to manage used oil shipments.
- PPUC have recently begun charging \$US80 per 200 L drum (ie 40c per L) to dispose of the used oil (by exporting it periodically).
- The cost of shipping a 20ft container from Yap to the Philippine's is \$US2,500. This does not include the collection, loading and unloading of the drums, port handling fees or insurances.

#### 6.11 Papua New Guinea

- The average annual quantities of lubricating oil imported into PNG is 7,867,000 L pa.
- The average used oil collection rate (2012-2015) is estimated to be around 4,800,000 L (60% of imported oil volumes). Used oil recovery data collected in 2014 confirmed this estimate.
- About 20% of collected used oil was produced by the automotive and the transport sectors.
- About 80% of collected used oil is generated by the commercial and industrial sectors.
- It was estimated that annually, 10% of collected used oil (~450,000L) was exported (to Australia?) for refining and re-use.

#### 6.12 Republic of the Marshall Islands

- Marshalls Energy Company (Majuro), Marshall Islands Fishing Venture and Marshalls Energy Company (Ebeye) are the largest importers of lubricating oils into RMI.
- An informal used oil collection service is co-ordinated by Marshalls Energy Company who stores used oil on its tank farm and charges \$US25 to dispose (accept) a 208L drum of used oil.
- 67,000L of used oil is generated annually by vehicle and machinery servicing.
- 78,000L of used oil is generated by marine vessel servicing.
- 13,000 L of used oil is generated by power stations at Majuro, Watge and Jalnit. Ebeye Power Station generates 21,000L used oil per year.
- Up to 76,000L per year of used oil is also received from foreign fishing vessels and stored at Marshalls Energy Company (Majuro).
- There is significant storage capacity for used oil in RMI in the MEC storage tank.
- A majority of used oil collection points are poorly run.

- The cost of shipping a 20ft container from Majuro to the Philippines is \$US3,500. This does not include the collection, loading and unloading of the drums, port handling fees or insurances.

### 6.13 Samoa

- Electrical Power Corporation (EPC) uses 6% of lubricating oil imported into Samoa.
- The vast majority of lubricating oils are used in the local transport and construction industries.
- Petroleum Products Supplies Ltd (PPS), as the Samoan Fuels Distributor and Terminal Operator, has storage tank capacity of 185,000 litres for its own used oil and fuel slops generated from terminal activities.
- EPC has tankage of 185,000 litres at its Tanugamanono plant site that could be made available for national storage of used oil.
- Nearly all used oil collection sites are poorly managed.
- Used oil is used for a wide range of alternative purposes in Samoa that are not sustainable or environmentally acceptable.
- The cost of shipping a 20ft container from Apia to Fiji is \$US3,500. This does not include the collection, loading and unloading of the drums, port handling fees or insurances.
- The cost of shipping a 20ft container from Apia to India is \$US1,870. This does not include the collection, loading and unloading of the drums, port handling fees or insurances.

### 6.14 Solomon Islands

- There are two national oil suppliers operating in Solomon Islands, MARKWARTH OIL Ltd and SOUTH PACIFIC OIL LIMITED (SPOL) which has a much larger market share. SPOL supplies Aviation and Marine Fuel, Petroleum, Oils and Lubricants.
- Both companies use shipping containers to import product, with the oil imported in drums and retail containers. Both companies have storage depots and tanks in central Honiara.
- The main consumers of lubricating oil are the Solomon Islands Electricity Authority (SIEA), the mining industry (Gold Ridge Mine), the Timber Industry and motor servicing centres.
- SIEA is a state-owned enterprise which operates and maintains the power supplies to all the urban and provincial centers.
- SIEA uses 73,000 L/y of lubricating oil and should generate 40 000 L of used oil per year. All used oil generated at the power station is given away to locals.
- Local customers and some logging companies are using the used oil as poor quality lube oil for chainsaw and for timber painting.
- SPOL is responsible for maintaining storage facilities in all SIEA stations. They also manage stock, assets and fuel control systems on all SIEA stations.
- As such, it is suggested that SPOL should be responsible for the collection and treatment of used oil. However, SPOL has no obligation to collect or export any used oil, and does not offer any "take-back" service to their retailer consumers.
- The shipping costs from Honiara to PNG is approximately US \$800 for a 20 Foot Container, US \$1,500 to Australia, and US \$2,000 to New Zealand.

### 6.15 Tonga

- Two major companies (TOTAL and Pacific Energy) supply lubricating and hydraulic oil to Tonga.
- Pacific Energy imports 50,000L of lubricating oil per year to Tonga and offers a used oil take-back service for its retail customers.

- The main consumer is the public power authority Tonga Power Limited (TPL) and their Power Station located in Popua, Tongatapu. TPL is a state-owned entity which also operates power supplies in the Islands of 'Eua, Ha'apai and Vava'u.
- The outer islands have either solar power or community-managed diesel mini-grids.
- The Popua Power Station produces 50 to 60,000 L of used oil per year which is currently sold to local customers for \$US50-100 (per barrel) as poor quality lubricant used for tractors, chainsaws and for timber painting.
- Tonga has an objective of 50% renewable power generation by 2020.
- Pacific Energy ships used oil in drums on board their coastal LCT tanker to Fiji.
- The shipping cost to Fiji is approximately US \$2,500 for a 20ft Container.
- GIO Recycling has already sent containers of waste oil to India and to Japan (US \$2,200 for a 20ft container). The export cost is covered by the used oil importer.

### 6.16 Tuvalu

- Pacific Energy South West Pacific Ltd (PESW Ltd) is the sole lubricant importer to Tuvalu.
- Tuvalu Electricity Corporation (TEC) is a state-owned commercial utility and is the main national consumer of lubricants (2,400L per year).
- Pacific Energy collects used oil from its customers and exports it in drums to Fiji on its LCT coastal tanker since 2014.
- Uncollected used oil is used on motor bike chains.
- Two ships are regularly transiting from Suva: the MV Nei Matangare and the MV Southern Moana, supplying several countries: Tuvalu, Kiribati, PNG, Wallis and Futuna, New Caledonia from Fiji.
- The shipping cost to Fiji is approximately US \$5,500 for a 20 Foot Container.

### 6.17 Vanuatu

- Pacific Petroleum and Trade Tools Direct are the major lubricating oil importers into Vanuatu (with ~70% of market share). Trade Tools is the main supplier to small volume users.
- Pacific Petroleum's largest customer is UNELCO, which operates power stations on the main islands of Efate and Santo.
- Other large users include the two main vehicle distributors (ASCO Motors and Carpenter Motors), and other vehicle and boat servicing companies.
- Pacific Petroleum operates a used oil take-back scheme and they are currently recovering around 125,000 litres of used oil per year.
- The collected oil is shipped to India for processing and where it is use as an industrial fuel, and the costs of collection and shipping are recovered through an elevated price that Pacific Petroleum charge for oil. The take-back system is currently only available to Pacific Petroleum customers.
- The primary barrier to including all other waste oil into the Pacific Petroleum system is cost as other importers would also need to increase their prices and pass the additional revenue on to Pacific Petroleum, assuming that Pacific Petroleum continued to take the lead in this area.
- UNELCO, the dominant electricity generator, indicated that they were unable to use used oil as a supplementary fuel in their power stations.
- The 20,000 L storage tank currently being used by Pacific Petroleum to store used oil would probably be inadequate if the total quantities of oil being collected were doubled.
- The shipping cost to Fiji is approximately US \$2,000 for a 20 Foot Container.

## 7. Summary of Findings of Previous Pacific Island Used Oil Management Assessments (2011-2015)

Finding from previous used oil management reports are summarised in Table 2. The clear outcome from this review was the immediate priority for the removal of the large stockpiles of used oil that were present in the northern Pacific: Federated States of Micronesia and Republic of the Marshall Islands) in 2014 (Table 3). This conclusion was unaltered by contemporary data collected during subsequent liaison and in-country visits (RMI, Pohnpei, Kiribati, Fiji and Niue). **This consultation and country visits are documented in detail in REPORT 2.**

## 8. Potential options to manage or transport used oil

Potential options to manage or transport used oil are presented in past reports are summarised in Appendix 2. The ISO Tank Tainer (TT) is the preferred used oil transport container in the Pacific. A Tank Tainer is typically a 25,000 litre steel vessel surrounded by an insulative and protective layer of polyurethane and aluminium. The vessel is contained in the middle of a steel frame. TTs are typically used to transport fuel and can also be refilled with used oil, the used oil decanted and the TT cleaned and reused. Their use is becoming increasingly common in the Pacific as their contents are discrete packages that will have limited impact if ruptured and spilt compared with a larger fuel tanker.

## 9. Conclusions

A significant number of reports have been generated between 2011 and 2014 on the status of used oil management in 14 GEFPAS Pacific Island countries. When analysed as a region, these reports suggest a number of clear priorities existed in 2014 for regional used oil management interventions. These included:

- Removal of the significant stockpiles (890,000L) of used oil in FSM (primarily from Pohnpei)
- Removal of the significant stockpiles (1,400,000L) of used oil in RMI (Majuro and Ebeye)
- Analysis of the logistics and costs of the successful export of used oil to New Zealand, India and Fiji by a number of Pacific Island nations
- Promotion of the potential for the use of used oil as a diesel extender in electrical power generation through the documentation of the operations of the Yap power station
- Replacement of aging and degraded temporary used oil IBC storage containers across the region
- Design and implementation of an advanced recycling fee (ARF) system for all imported lubricants to pay for their disposal after use
- Site clean-up and remediation of long-term used oil storage and collection locations

Based on the analysis of this collected information, a series of questions concerning contemporary national used oil management practices were devised and distributed to national focal points, and five countries were selected for in-country missions as a result of the desktop review. These missions were undertaken to obtain a comprehensive picture of local used oil management initiatives and priorities across the region in 2018, and to help prioritise expenditure of remaining funds for improved used oil management under the GEFPAS programme. These missions and their findings are documented in REPORT 2.

**Table 2: Summary of Pacific Island Used Oil Management Information Collected prior to 2015**

Nation	Annual Lubricant Importation (L)	Estimated Annual Used Oil Production (L)	National Used Oil Stockpile in (L)	National Used Oil Storage Capacity (L)	Past Used Oil Management Practice(s)	Previous Used Oil Management Recommendations
<b>Cook Islands</b>	90,000 <sup>4</sup> . About half of this (45,000 L) is used by the Power Station (TAU)	55,000 (2014) <sup>4</sup> 30,000 (2011) <sup>5</sup>		13,000 L <sup>4</sup> tank at TAU	Pacific Energy (PE) exports used oil from TAU back to Fiji on a PE coastal tanker <sup>4</sup>	Combust in commercial laundry boiler <sup>4</sup> Diesel blending for national power generation <sup>6</sup>
<b>Fiji</b>	5,200,000 <sup>7</sup>	3,000,000 <sup>7</sup>			Used as a fuel by industry and mining Export to India	Combustion at Blue Scope Steel <sup>7</sup> Diesel blending for national power generation <sup>8</sup>
<b>FSM Chuck</b>	95,000 (2014) <sup>9</sup>	48,000 (2014) <sup>9</sup>	22,000 L (2014) <sup>9</sup>	24,000 L tank CPUC (power station, Weno) <sup>9</sup>	Used as a marine fuel	Utilise to generate electrical power <sup>9</sup> Use in hospital incinerator <sup>9</sup> Continue to use as fuel by the local dive boat (MV Thor Finn) <sup>9</sup>
<b>FSM Kosrae</b>	22,000 (2014) <sup>10</sup>	12,000 (2014) <sup>10</sup>	50,000 L (2014) <sup>10</sup>	60,000 L (in 3 tanks located at KUC) <sup>10</sup>		Utilise to generate electrical power <sup>10</sup>
<b>FSM Pohnpei</b>	483,000 (2014) <sup>11</sup>	240,000 (2014) <sup>11</sup>	891,600 (2014) <sup>11</sup>	90,000 L in 3 tanks located at PUC (Large storage potentially)		

<sup>4</sup> Golder and Associates (2014). *Contemporary Used Oil Audit in the Cook Islands*.

<sup>5</sup> Graham, B. (2011). *Organic Waste and Waste Oil Strategy Enhancement*.

<sup>6</sup> Envirocare Engineering Consult Ltd (2015). *Cost Benefit Analysis of Used Oil Management Options for Cook Islands*.

<sup>7</sup> Contract Environmental (2013). *Consultancy for In-Country Waste Oil Audit for Fiji*.

<sup>8</sup> Envirocare Engineering Consult Ltd (2015). *Cost Benefit Analysis of Used Oil Management Options for Fiji*.

<sup>9</sup> Contract Environmental (2013). *Consultancy for In-Country Waste Oil Audit for FSM:Chuck*.

<sup>10</sup> Contract Environmental (2013). *Consultancy for In-Country Waste Oil Audit for FSM:Kosrae*.

<sup>11</sup> Contract Environmental (2013). *Consultancy for In-Country Waste Oil Audit for FSM:Pohnpei*.

				available at FSM PC Pohnpei		
<b>FSM: Yap</b>	65,000 (2014) <sup>12</sup>	14,000 (2014) <sup>12</sup>	65,750 (2014) <sup>12</sup>	8 x 945 L steel-encased containers <sup>12</sup>	YSPC uses 15,000 L per year used oil as a diesel extender. Thor Finn used to collect used oil from Yap <sup>12</sup>	
<b>Kiribati</b>	21,000 <sup>13</sup> (2014) 14,000 <sup>14</sup> (2015)	11,500 <sup>13</sup> (2014) 6,000 <sup>14</sup> (2015)	8,000 <sup>13</sup> (2014)		Export to Fiji or India	Export to India (at no cost) <sup>13</sup> Small batch incineration <sup>14</sup>
<b>Nauru</b>	140,000 <sup>15</sup> (2014)	50,000 <sup>15</sup> (2014)	46,000 L (2014) <sup>15</sup>	Fuel Tank at NUC Tank Farm (2,800,000L)	Used as diesel extender by RonPhos	Diesel blending for use in national power generation <sup>16</sup>
<b>Niue</b>	6,500 <sup>17</sup> (2014)	18,000 <sup>3</sup> (2011) 3,250 <sup>17</sup> (2014)	4,000 (2014) <sup>17</sup>	20,000 L in two Tank Tainers; 28,000 L in IBCs <sup>17</sup>	Export to New Zealand	Small batch incineration <sup>18</sup>
<b>Palau</b>	394,500 <sup>19</sup> (2014)	220,000 <sup>19</sup> (2014)	550,000 (2014)	2,800,000 L PPUC Tank	Government tender let on an as-needs basis to export used oil offshore	Export offshore Use to generate electrical power <sup>20</sup>
<b>PNG</b>	7,867,000 <sup>21</sup>	4,800,000 <sup>21</sup>			Export to Australia	On site refining for re-use Use as a supplementary fuel in kilns and boilers
<b>RMI</b>	372,000 <sup>22</sup> (2014)	197,000 <sup>22</sup> (2014)	988,000L MEC (Majuro) plus 120,000L at	2,800,000 L MEC Tank	Limited use in power station and industry as diesel extender	Export offshore <sup>22</sup> Diesel blending for use in national power generation <sup>23</sup>

<sup>12</sup> Contract Environmental (2013). Consultancy for In-Country Waste Oil Audit for FSM:Yap.

<sup>13</sup> Golder and Associates (2014). *Contemporary Used Oil Audit in Kiribati*.

<sup>14</sup> Envirocare Engineering Consult Ltd (2015). *Cost Benefit Analysis of Used Oil Management Options for Kiribati*.

<sup>15</sup> Golder and Associates (2014). *Contemporary Used Oil Audit in Nauru*.

<sup>16</sup> Envirocare Engineering Consult Ltd (2015). *Cost Benefit Analysis of Used Oil Management Options for Nauru*.

<sup>17</sup> SPREP. (2014). *Report for Niue: Used Lubricants and Oil*.

<sup>18</sup> Envirocare Engineering Consult Ltd (2015). *Cost Benefit Analysis of Used Oil Management Options for Niue*.

<sup>19</sup> Contract Environmental (2013). *Consultancy for In-Country Waste Oil Audit for Palau*

<sup>20</sup> Envirocare Engineering Consult Ltd (2015). *Cost Benefit Analysis of Used Oil Management Options for Palau*

<sup>21</sup> Failou, B. (2017). *Used Lubricants and Oil Audit Report: Papua New Guinea GEF Pacific POPs Release Reduction Project on Used Lubricants and Oil Management System*.

<sup>22</sup> Contract Environmental (2013). *Consultancy for In-Country Waste Oil Audit for RMI*

<sup>23</sup> Envirocare Engineering Consult Ltd (2015). *Cost Benefit Analysis of Used Oil Management Options for RMI*

			Majuro 302,000L at Ebye			
<b>Samoa</b>	660,000 <sup>24</sup>	330,000 <sup>24</sup>	8,400	2,700,000 L (PPS and EPC tanks)	Refining and re-use Used as a free lubricant by locals	Diesel blending for use in national power generation Export to India
<b>Solomon Islands</b>	1,600,000 <sup>25</sup>	800,000 <sup>24</sup>			Used as a free lubricant by locals	Diesel extender <sup>26</sup>
<b>Tonga</b>	455,000 <sup>27</sup>	225,000 <sup>27</sup>			Export to India and Japan Used as a free lubricant by locals	Export to Fiji or India Diesel extender <sup>28</sup>
<b>Tuvalu</b>	6,500 <sup>29</sup> (2014)	3,500 <sup>29</sup> (2014)	2,500 <sup>29</sup> (2014)	5,000 L stored at Tuvalu Electricity Corp (TEC)	Pacific Energy collects 70% of generated used oil and ships Fiji on the LCT coastal tanker	Export to Fiji
<b>Vanuatu</b>	750,000 <sup>30</sup>	250,000 (approximately half of this is being recovered by Pacific Petroleum and exported)	0 <sup>30</sup> (2014)	20,000 L Pacific Petroleum Port Vila	Pacific Petroleum past export to New Caledonia and Singapore. Currently export 50% of available used oil to India <sup>30</sup>	Export to India <sup>30</sup>

<sup>24</sup> Envirocare Engineering Consult Ltd (2015). *Cost Benefit Analysis of Used Oil Management Options for Samoa*

<sup>25</sup> Golder and Associates (2014). *Contemporary Used Oil Audit in Solomon Islands*

<sup>26</sup> Envirocare Engineering Consult Ltd (2015). *Cost Benefit Analysis of Used Oil Management Options for Solomon Islands*

<sup>27</sup> Golder and Associates (2014). *Contemporary Used Oil Audit in Tonga*

<sup>28</sup> Envirocare Engineering Consult Ltd (2015). *Cost Benefit Analysis of Used Oil Management Options for Tonga*.

<sup>29</sup> Golder and Associates (2014). *Contemporary Used Oil Audit in Tuvalu*

<sup>30</sup> Contract Environmental (2013). *Consultancy for In-Country Waste Oil Audit for Vanuatu*

**Table 3. Removal of used oil stockpile priorities (based on information from 2014 data)**

Nation	2014 Annual Used Oil Production (L)	2014 National Used Oil Stockpile (L)	Used Oil Storage Capacity (L)	2014 Cost of Diesel (per L)*	Current used oil management practice
Cook Islands	55,000		13,000L tank at TAU		Export to Fiji
Fiji	3,000,000		170,000L (BS Steel)		Internal re-use
FSM Chuck	48,000	22,000	24,000 L tank CPUC	\$US 1.33	Steam vessel fuel
FSM Kosrae	12,000	50,000	60,000 L (in 3 tanks located at KUC)	\$US 1.33	
FSM Pohnpei	61,140	891,600	90,000 (in 3 tanks located at PUC)	\$US 1.33	Steam vessel fuel
FSM Yap	14,000	65,750	8 x 945 L steel-encased containers	\$US 1.33	Power station diesel extender
Kiribati	11,500	8,000		\$AUD 1.27	Export to India
Nauru	50,000	46,000	Fuel Tank at NUC Tank Farm (2,800,000L)		Diesel extender (RonPhos)
Niue	3,250	4,000	20,000 L in 2 Tank Tainers; 28,000 L in IBCs	\$NZ 2.55	Export to New Zealand
Palau	220,000	550,000	2,800,000 L PPUC Tank	\$US 1.33	Export
PNG	4,800,000				Export Local refining
RMI	197,000	1,108,000 (Majuro) 302,000 (Ebeye)	2,800,000 L MEC Tank	\$US 1.00	Stockpile
Samoa	330,000	8,400	2,700,000 L (PPS and EPC tanks)		
Solomon Islands	800,000			\$US 1.00	
Tonga	225,000	0		\$US 0.98	Export to India
Tuvalu	3,500	2,500	5,000 L stored at TEC		Export to Fiji
Vanuatu	250,000 (50% recovered by Pacific Petroleum and exported)	0	20,000 L Pacific Petroleum Port Vila		Export to India

\*May be much cheaper for Power Utility

## **Appendix One: Reviewed Reports**

### **Cook Islands**

Golder and Associates (2014). *Contemporary Used Oil Audit in the Cook Islands*. Unpublished Report to the Secretariat of the Pacific Environment Programme. Golder Associates NC, Nouvelle-Calédonie. 18pp.

Envirocare Engineering Consult Ltd (2015). *Cost Benefit Analysis of Used Oil Management Options for Cook Islands*. Unpublished Report to the Secretariat of the Pacific Environment Programme. Fereti Filipe, Christchurch, New Zealand. 15pp.

### **Fiji**

Contract Environmental (2013). *Consultancy for Fletcher Pacific Steel Waste Audit*. Unpublished Report to the Secretariat of the Pacific Regional Environment Programme (SPREP). 17pp.

Envirocare Engineering Consult Ltd (2015). *Cost Benefit Analysis of Used Oil Management Options for Fiji*. Unpublished Report to the Secretariat of the Pacific Environment Programme. Fereti Filipe, Christchurch, New Zealand. 20pp.

Contract Environmental (2013). *Consultancy for In-Country Waste Oil Audit for Fiji*. Unpublished Report to the Secretariat of the Pacific Regional Environment Programme (SPREP). 40pp.

### **FSM: Chuuk**

Contract Environmental (2014). *Consultancy for Contemporary Used Oil Audits in Selected Pacific Island Countries. Report for the State of Chuuk, Federated States of Micronesia*. Unpublished Report to the Secretariat of the Pacific Regional Environment Programme (SPREP). 30pp.

Envirocare Engineering Consult Ltd (2015). *Cost Benefit Analysis of Used Oil Management Options for Chuuk*. Unpublished Report to the Secretariat of the Pacific Environment Programme. Fereti Filipe, Christchurch, New Zealand. 14pp.

### **FSM: Kosrae**

Contract Environmental (2014). *Consultancy for Contemporary Used Oil Audits in Selected Pacific Island Countries. Report for the State of Kosrae, Federated States of Micronesia*. Unpublished Report to the Secretariat of the Pacific Regional Environment Programme (SPREP). 29pp.

Envirocare Engineering Consult Ltd (2015). *Cost Benefit Analysis of Used Oil Management Options for Kosrae*. Unpublished Report to the Secretariat of the Pacific Environment Programme. Fereti Filipe, Christchurch, New Zealand. 14pp.

### **FSM: Pohnpei**

Contract Environmental (2014). *Consultancy for Contemporary Used Oil Audits in Selected Pacific Island Countries. Report for the State of Pohnpei, Federated States of Micronesia*. Unpublished Report to the Secretariat of the Pacific Regional Environment Programme (SPREP). 33pp.

Envirocare Engineering Consult Ltd (2015). *Cost Benefit Analysis of Used Oil Management Options for Pohnpei*. Unpublished Report to the Secretariat of the Pacific Environment Programme. Fereti Filipe, Christchurch, New Zealand. 19pp.

**FSM: Yap**

Contract Environmental (2014). *Consultancy for Contemporary Used Oil Audits in Selected Pacific Island Countries. Report for the State of Yap, Federated States of Micronesia*. Unpublished Report to the Secretariat of the Pacific Regional Environment Programme (SPREP). 28pp.

Envirocare Engineering Consult Ltd (2015). *Cost Benefit Analysis of Used Oil Management Options for Yap*. Unpublished Report to the Secretariat of the Pacific Environment Programme. Fereti Filipe, Christchurch, New Zealand. 15pp.

**Kiribati**

Envirocare Engineering Consult Ltd (2015). *Cost Benefit Analysis of Used Oil Management Options for Kiribati*. Unpublished Report to the Secretariat of the Pacific Environment Programme. Fereti Filipe, Christchurch, New Zealand. 14pp.

Golder and Associates (2014). *Contemporary Used Oil Audit in Kiribati*. Unpublished Report to the Secretariat of the Pacific Environment Programme. Golder Associates NC, Nouvelle-Calédonie. 21pp.

**RMI**

Envirocare Engineering Consult Ltd (2015). *Cost Benefit Analysis of Used Oil Management Options for RMI*. Unpublished Report to the Secretariat of the Pacific Environment Programme. Fereti Filipe, Christchurch, New Zealand. 19pp.

Contract Environmental (2014). *Consultancy for Contemporary Used Oil Audits in Selected Pacific Island Countries. Report for the Republic of the Marshall Islands*. Unpublished Report to the Secretariat of the Pacific Regional Environment Programme (SPREP). 146pp.

**Nauru**

Envirocare Engineering Consult Ltd (2015). *Cost Benefit Analysis of Used Oil Management Options for Nauru*. Unpublished Report to the Secretariat of the Pacific Environment Programme. Fereti Filipe, Christchurch, New Zealand. 14pp.

Golder and Associates (2014). *Contemporary Used Oil Audit in Nauru*. Unpublished Report to the Secretariat of the Pacific Environment Programme. Golder Associates NC, Nouvelle-Calédonie. 18pp.

**Niue**

Envirocare Engineering Consult Ltd (2015). *Cost Benefit Analysis of Used Oil Management Options for Niue*. Unpublished Report to the Secretariat of the Pacific Environment Programme. Fereti Filipe, Christchurch, New Zealand. 11pp.

SPREP. (2014). *Report for Niue: Used Lubricants and Oil*. Secretariat of the Pacific Environment Programme, Apia, Samoa. 8pp.

**Palau**

Envirocare Engineering Consult Ltd (2015). *Cost Benefit Analysis of Used Oil Management Options for Palau*. Unpublished Report to the Secretariat of the Pacific Environment Programme. Fereti Filipe, Christchurch, New Zealand. 19pp.

Contract Environmental (2014). *Consultancy for Contemporary Used Oil Audits in Selected Pacific Island Countries. Report for the Republic of the Marshall Islands*. Unpublished Report to the Secretariat of the Pacific Regional Environment Programme (SPREP). 170pp.

## **PNG**

FAILOU, B. (2017). *Used Lubricants and Oil Audit Report: Papua New Guinea GEF Pacific POPs Release Reduction Project on Used Lubricants and Oil Management System*. Unpublished Report to the Secretariat of the Pacific Environment Programme. Conservation and Environment Protection Authority. 81 pp.

## **Regional**

Anon (2007). *Technology and Market Development for Used Oil Products in Western Australia*. Unpublished Report to the Department of Environment and Conservation. Cardno BSD Pty Ltd, W.A. 89pp.

Anon (2015). *Waste assessment guide for the export and import of used lubricants and used oil*. Unpublished Report to the Secretariat of the Pacific Environment Programme. 24pp

Banks, A. and Mueller, J. (2015). *Minimisation of uPOPs emissions from combustion of used oil for electrical power generation: Literature review and Controlled Laboratory Experiments*. Unpublished Report to the Secretariat of the Pacific Environment Programme. 46pp.

Banks, A., Thai, P. and Mueller, J. (2015). *Emissions of Dioxins and dioxin-like chemicals from diesel engines – A review*. Unpublished Report to the Secretariat of the Pacific Environment Programme. 46pp. 23pp.

Graham, B. (2011). *Organic Waste and Waste Oil Strategy Enhancement*. Unpublished Report to the Secretariat of the Pacific Environment Programme. Graham Environmental Consulting Ltd. 59pp.

GHD (2008). *AFD Regional Initiative for Solid Waste Management in the Pacific Region, Feasibility Study (Phase I, Component 2)*. Unpublished Report to Agence Française de Développement. GHD. 248pp.

GHD (2009). *AFD Regional Initiative for Solid Waste Management in the Pacific Region, Final Completion Report Feasibility Study (Phase II, Component 2: Scoping Studies)*. GHD. 93pp.

Forum Secretariat (1994). *Pacific Waste Oil Study*. Energy Planning and Management Branch, United Nations Department for Development Support and Management Services; report no. RAS/94/03C.

*Management of Persistent organic Pollutants in Pacific Island Countries*. Burns, T, Graham, B, Munro, A and Wallis I. SPREP, Apia, 2000.

UNEP (2002). *Basel Convention Technical Guidelines on Used Oil Re-Refining of Other Re-Uses of Previously Used Oil*. Basel Convention series/SBC No. 02/05. 20pp.

## **Samoa**

SPREP (2013). *Cost-benefit analysis of used oil management options for Samoa*. Unpublished Report to the Secretariat of the Pacific Environment Programme. 31 pp.

Envirocare Engineering Consult Ltd (2012). *An audit survey of used oils in Samoa*. Unpublished Report to the Secretariat of the Pacific Environment Programme. Fereti Filipe, Christchurch, New Zealand. 18pp.

### **Solomon Islands**

Golder and Associates (2014). *Contemporary Used Oil Audit in Solomon Islands*. Unpublished Report to the Secretariat of the Pacific Environment Programme. Golder Associates NC, Nouvelle-Calédonie. 20pp.

Envirocare Engineering Consult Ltd (2015). *Cost Benefit Analysis of Used Oil Management Options for Solomon Islands*. Unpublished Report to the Secretariat of the Pacific Environment Programme. Fereti Filipe, Christchurch, New Zealand. 19pp.

### **Tonga**

Golder and Associates (2014). *Contemporary Used Oil Audit in Tonga*. Unpublished Report to the Secretariat of the Pacific Environment Programme. Golder Associates NC, Nouvelle-Calédonie. 18pp.

Envirocare Engineering Consult Ltd (2015). *Cost Benefit Analysis of Used Oil Management Options for Tonga*. Unpublished Report to the Secretariat of the Pacific Environment Programme. Fereti Filipe, Christchurch, New Zealand. 16pp.

### **Tuvalu**

Envirocare Engineering Consult Ltd (2015). *Cost Benefit Analysis of Used Oil Management Options for Tuvalu*. Unpublished Report to the Secretariat of the Pacific Environment Programme. Fereti Filipe, Christchurch, New Zealand. 11pp.

Golder and Associates (2014). *Contemporary Used Oil Audit in Tuvalu*. Unpublished Report to the Secretariat of the Pacific Environment Programme. Golder Associates NC, Nouvelle-Calédonie. 20pp.

### **Vanuatu**

AFD (2014). *Cost Benefit Analysis of Used Oil Options for Vanuatu (2013-2014)*. Unpublished Report to the Secretariat of the Pacific Environment Programme. 28pp.

Contract Environmental (2013). *Consultancy for Contemporary Used Oil Audits in Selected Pacific Island Countries. Report for the Republic of the Marshall Islands*. Unpublished Report to the Secretariat of the Pacific Regional Environment Programme (SPREP). 13 pp.

## **Appendix Two: Generic Used Oil Management and Transportation Options**

### ***Batch incineration***

Small scale specialist incineration technologies suitable for combustion of small quantities of used oil are available. The units can incinerate 20 Litres of used oil per hour and are portable, easy to use and have a 2-stage combustion process which reaches 1000°C and minimises the release of uPOPs.

### ***Use as a diesel fuel extender***

The practical option for re-use of used oil is to re-use it as a fuel, but combustion must be undertaken in an environmentally sound manner. Normally, used oils need to be subjected to basic treatments involving some form of settlement to remove sludges and suspended matter, and filtration and centrifugation to remove other contaminants before re-use<sup>31</sup>. Cleaned used oils can be then used as diesel extenders, which are of a similar chemical composition to virgin diesel fuel. Diesel extenders can be blended with diesel up to about 10% depending on its quality. Adoption of this process requires a collection, storage and treatment system to be in place, and it is only likely to be suitable for use in the Pacific in large-scale stationary diesel engines such as those used in electrical power generation facilities. Work completed by University of Queensland found that combustion of low concentrations of used oil that had been added to diesel fuel in internal combustion engines did not increase the concentrations of uPOPs emissions.<sup>32</sup>

### ***Offshore Disposal***

#### **Steel Drums**

A 200-litre drum is commonly used for transporting oil and has a nominal capacity of 200 litres (55 US or 44 imp gal). The drums are typically made of steel with a ribbed outer wall to improve rigidity and for rolling. Shipping used oil out in drums is labour extensive and time consuming. Drum condition is also a concerning factor as these drums could leak during transit. A shipping container can carry 80 drums (16,000 L).

#### **IBCs**

An intermediate bulk container (IBC) is a reusable industrial container designed for the transport and storage of bulk liquid. The most common size is 1,040 litres which is equivalent to five 208 L drums in storage capacity. The most common IBC is the polyethylene composite IBC housed within a tubular galvanized iron cage that is attached to a pallet. Approximately 18,000 litres of used oil contained in 18 IBCs can be shipped in a shipping container at one time. Concerns have been raised about UV degradation of IBCs: they are often stored in the open, probably becoming brittle and are often not banded against leakage<sup>33</sup>.

#### **ISO Tank Container**

A tank container is typically a 25,000 litre steel vessel surrounded by an insulation and protective layer of polyurethane and aluminium. The vessel is contained in the middle of a steel frame. TTs are typically used to transport fuel and can also be refilled with used oil, the oil decanted and the TT cleaned and reused. Their use is becoming increasingly common in the Pacific as their contents are discrete packages that will have limited impact if ruptured compared with a larger fuel tanker.

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<sup>31</sup> UNEP (2002). *Basel Convention Technical Guidelines on Used Oil Re-Refining of Other Re-Uses of Previously Used Oil*.

<sup>32</sup> Banks, A. and Mueller, J. (2015). *Minimisation of uPOPs emissions from combustion of used oil for electrical power generation: Literature review and Controlled Laboratory Experiments*.

<sup>33</sup> SPREP. (2014). Report for Niue: Used Lubricants and Oil.

**Flexi-Tanks**

Used oils can also be exported in flexi-tanks (23,000 litres) which are made of rubber and are placed inside a normal dry 20 foot shipping container. On arrival at destination, the oil can be pumped out and the flexi-bag disposed of (as bags are not designed to be used more than once). The shipping container has to be properly prepared before the used oil is transferred to the tank for shipment.