

**UNACCOUNTED USED OIL STUDY :**  
**DRAFT REPORT**

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## **EXECUTIVE SUMMARY**

The purpose of this study was to identify and examine practices for handling or disposing of used oil that has not attracted a return incentive, (R.I.), and therefore is “unaccountable” to the BCUOMA. **The unaccounted volume totals 18.75 mil L.**

Once a practice was understood, a volume estimate was assigned and an assessment made as to whether or not the oil could eventually become collectible. The unaccountable categories and assessed volumes are as follows:

**1) Burner Fuel – 8.1 million liters**

- Used oil heaters
- Paving companies use of non R.I. oil
- Paving companies use of internally generated oil
- Collectors and processors use of contaminated non R.I. oil
- For producing burner fuel

**2) Landfill – 2.55 million liters**

- Floor dry and rags
- DIY automotive
- DIY other

**3) Industrial and commercial companies use of internally generated oil – 2.4 mil. L**

**4) Explosives Manufacturing – 1.7 million liters**

**5) Engine Oil Burn Systems – 0.6 million liters**

**6) Cement and Lime Kilns – 0.6 million liters**

**7) Queen Charlotte Island and the B.C. Coast – 0.4 million liters**

**8) Fish and Pleasure Boats – 0.1 million liters**

**9) Victoria Harbor – 0.1 million liters**

**10) Cruise Ships and Navy – 0.2 million liters**

**11) N.E. Oil – 1.5 million liters**

**12) Toilet, Sewer, Road Oiling, Weed Control, Fire Starter, Ground Pits – 0.5 mil. L**

## INTRODUCTION

The goal of this study was to identify and quantify EHC applicable used oil that does not attract a return incentive and therefore is not processed through BCUOMA.

BCUOMA knows the quantity of virgin EHC applicable oil sales, 101.8 million liters for 2005, and collections for 2005 were 47.7 million liters. After deducting the consumed in use, (CIU), portion the remaining volume has been dubbed the “unaccounted used oil” portion.

BCUOMA’s historical CIU rate has been 35.5%, but the “CIU Study” in 2005 pegged the CIU rate lower at 30.1%. Applying these percentages against sales and deducting collections produces a range of **18.0 to 23.5 million liters of “unaccounted used oil”**

The major sources of unaccounted used oil are known to BCUOMA and were identified in the proposal. The directive for the consultant was to explore the known sources and assess volumes estimates for each category. During the exploration phase it was presumed that other sources would surface and they to would be quantified and added to the total.

It was agreed at the onset of this study that if after a first pass the consultant identified sources that totaled unaccounted used oil volumes between 18 and 23.5 million liters, no further investigations would be pursued.

## **METHOD OF APPROACH**

An initial meeting with BCUOMA produced a starting list of contacts. As work progressed the list grew to include key players in the subsequent areas of investigation. The unaccounted used oil numbers for the various areas are the combination of telephone interviews and meetings with individuals in all of the areas or organizations. Each interview and meeting was documented in note form and can be made available.

### **Areas of investigation:**

- Burner Fuel
- Used oil heaters
- Paving Companies
- Cement and Lime Kilns
- Landfills
- DIY Automotive
- DIY Other
- Industrial and Commercial Companies' internal use
- Explosives Manufacturing
- Engine Oil Burn Systems
- Cement and lime kilns
- Queen Charlotte Island and Coast
- Fish boats and pleasure boats
- B. C. Ferries
- Vancouver and Victoria Harbors
- N.E. Oil & Gas
- "Catch all" – toilet, sewer, weed control, road oiling, ground pits etc.

### **The list of contacts pursued in this study were:**

- Used Oil Recycling Associations – BCUOMA, AUOMA
- Processor/collectors:
  - Newalta
  - M & R Environmental
  - Enviro West
  - Active Chemical
  - Peninsula Waste Water
  - All Things Energy
  - North Arm Transportation
  - Formula Transport
  - Brent Graham
- Oil Companies
  - Chevron
  - I.O.L.
  - Husky

- Petro Canada
- Governments:
  - GVRD
  - North Okanagan Regional District
  - South Okanagan Regional District
  - Capital Regional District
  - MOE – Prince George
  - MOE – Victoria
- End Users
  - Canfor
  - Eurocan
  - Canadian Tire
  - McTar
  - Imperial Paving
  - Tolko
  - Elk Valley Coal
  - B.C. Ferries
- Others:
  - Tymac Launch
  - CAT
  - Cummins
  - DSI –“Clean Burn” Used Oil Heaters –Tony Mulder, Ron Lugowski
  - Doug Bishop
  - Energylogic – Robin Lott

## RESULTS AND ANALYSIS

The total unaccounted used oil volume is **18.75 million liters** which fits into the expected range after deducting oil consumed in use and used oil collected from virgin oil sales.

Some practices such as using used oil in the manufacture of explosives or oil consumed in diesel engine burn systems can be quantified to a fairly accurate degree. Most other categories are not as quantifiable and are estimates based on conversations with the stakeholders listed in the method of approach section.

In order of descending volume the comments and results for each of the unaccounted used oil areas and practices are as follows:

### 1) Burner Fuel – 8.1 million liters

This category totals 8.1 million liters, and is comprised of used oil heaters that burn used oil neat or blended with a fuel component or other material such as bunker sludge, and sold primarily to the paving industry for heating asphalt. The paving industry burner fuel market is estimated by the major suppliers at 20 million liters, but the majority of the volume is not included in this study as it is presumed that the oil component has been collected by registered BCUOMA collectors and a R.I. paid out.

The exceptions are paving companies using non R.I. oil and a large percentage of this number, **750,000 L**, is represented by one collector, Formula Transport, who supplies the north east portion of the province. Newalta and other processor/collectors contribute a further **800,000 L** to the paving industry with burner fuel that includes contaminated non R.I. oil. Paving companies themselves internally generate and use **250,000 L** from their own equipment.

The used oil heater market is made up of relatively small units, (<150,000 BTU), to multiples of large, (500,000 BTU), heating units that are used for space heating and to a lesser degree boilers for heating water and making steam.

Users include: small repair shops, car and truck dealerships, auto departments of retailers like Canadian Tire, and a wide variety of commercial and industrial operations like mills, mines and construction companies, in their maintenance facilities and warehouses.

BCUOMA has estimated this category's volume at between 3 and 7 million liters. The large processor/collectors estimate the number to be much higher, but have no data to support the estimate. Several of the more prominent furnace distributors estimate the market to be higher, and one of the most outspoken representatives of this industry uses a range of 6 – 13 million liters. Unfortunately these representatives are unwilling to share any of their market data.

The components that make up the used oil heater market estimate are as follows (three solid data sources form the base of estimates):

- Prince George MOE survey – **150 heating units**
- Cranbrook Regional District – Kootenay area survey – **41 heating units**
- Distributor, CSI, customer list – **253 heating units**

This data was cross referenced with B.C. census data and resulted in units per 1,000 population of 1:1000, 1:3000, and 1:1000 respectively for the data.

The remaining small town and rural communities total a population of 1.3 million and applying a conservative estimate of 1 unit per 3,000 population, produced an estimate of **433 heating units**. (the N.E. section of B.C. was excluded from this calculation and reported separately).

The GVRD, Fraser Valley, and Victoria Saanich regions total 2.55 million in population, but mostly urban, and although there is proof of installed units, a conservative number of **100 heating units** was assessed for the entire area.

Data was obtained from customers and distributors for the sizing of units per square footage, litres of oil consumed per hour, and running hours per year estimates. The data was applied to the number of units as follows:

- 50 units @ 500,000 BTU burning 24,000 L@ year = 1.2 million liters.
- 250 units @ 250,000 BTU burning 9,600 L@ year = 2.4 million liters.
- 500 units @ 150,000 BTU burning 5,000 L@ year = 2.5 million liters.
- Remaining smaller units burning ~ 1,000 L @ year = 0.2 million liters.

Total 977 heating units burning **6.3 million liters of used oil**.

## 2) Landfill – 2.55 million liters

This category is subdivided into 3 sub categories; floor dry and rags, DIY Automotive and DIY Other.

Compositional landfill surveys have been undertaken by several regional districts. Data was compiled from surveys conducted by Capital, Greater Vancouver, and North and South Okanagan Regional Districts. The surveys do confirm that used oil in containers and filters is being deposited in landfills, but the data is sporadic and not conclusive enough to extrapolate for every landfill around the province, so a decision was made not to use the data for the following volume estimates.

- **Floor Dry and rags** – all automotive and industrial repair shops use what is referred in the industry as floor dry or adsorbent material and rags to mop up drips and spills of virgin and used oil. Some of the material with 10% oil retention is burned, but the majority goes to landfill.

Calculation for landfill volume:

- ~ 5,000 shops
- 0.5 to 1.0 L dripped and spilled a day – use average 0.75 L.
- 250 days a year
- oil to landfill =  $5000 \times 0.75 \times 250 = \mathbf{0.95 \text{ million liters}}$ .

- **DIY Automotive** - The following estimate uses data from the February 2005 Criterion Research's "Awareness and Perception Analysis Report". The resulting number is in the range for similar estimates by the Public Research Institute – California 2002 Survey and an undated report by the U.S. Dept. Of Transport
  - 25% of B.C. residents change their oil personally or have an acquaintance change it.
  - 11% sometimes change oil themselves and sometimes pay a business to change it.
  - Combining these two findings - 30% change their own oil.
  - 84% of the 30% DIY say they recycle the oil, (1% say they recycle sometimes) by default 16% do not recycle.
  - 2004 sales of passenger car motor oil – 22.8 million liters.

This data translates to  $.16 \times .30 \times 22.8 = \mathbf{1.1 \text{ million liters}}$  of questionably disposed of oil. Other disposal methods are covered elsewhere in this study but this calculation assumes all the oil goes to landfill. For comparison purposes, M & R Environmental collect and process oil filters from primarily the lower mainland automotive market, and they reclaim 380,000 L of used oil from filters alone.

- **DIY – Other** - The majority of this category is made up of truck owner operators and farmers, and there is no survey data available. The major collectors; Newalta, M&R Environmental and Enviro West were asked about the practices of the agriculture communities in the Okanagan and Fraser Valleys, and collectively their opinion was that most used oil is being collected and what is not, is being used for heat. Although the collectors did not have an opinion about the truck owner operators, it is likely that they or their friends use a portion of the oil for heat.

The volume of DIY heavy duty engine oil and other oil purchases is similar to the automotive volume, i.e. very large, but the volume to landfill would be smaller and estimated at **500,000L**.

### **3) Chain, slide way, and other used oil lubricating practices - 2.4 million liters**

Each liter of oil reused displaces the purchase of an equal volume of virgin oil in this category. Economics dictate using the oil versus having it collected. B.C.'s sawmills, OSB and plywood mills, pulp and paper mills, plus logging and construction make up most but not all of this category.

The CIU study estimated that 50% of the hydraulic oil, and 20% of heavy duty engine oil sales were to the mills alone. In B.C. there are ~115 saw, OSB, and plywood mills which are the main users of used oil for lubrication.

After deducting CIU volumes, for the 2 main lubricants, 3.1 million liters should be available for collection. It was estimated that 50% of the engine oil and 75% of the hydraulic oil was used in lubricating chains, slide ways and other equipment for a total of **2.2 million liters**. An additional **200,000 L** was estimated to be used by logging, construction and other industries.

#### **4). Explosives Manufacturing – 1.7 million liters**

The coal mines, (5) in south eastern B.C.'s Elk Valley, purchase 5.0 million liters of lubricants a year. After deducting the CIU factor, the remaining used oil is mostly consumed on site by a combination of heating, diesel engine burn systems, and explosive manufacturing. This latter practice consumes **1.5 million liters** of used oil. The customer, Elk Valley Coal, Newalta, the explosives manufacturer, and the oil supplier all confirm the disposal practices and the numbers.

The remainder of the province contributes an estimated **200,000 L**.

#### **5). Engine Oil Burn Systems - 0.6 million liters**

CAT and Cummins both offer engine oil burn systems in large power engines, e.g. 2500 h.p. range, that are typically used in 200 – 350 ton ore haul trucks in open pit mining operations. The primary reason for enabling these systems is to extend oil drain intervals which in turn reduces downtime. This type of equipment operates 24/7.

In conversation with CAT, Cummins and the purchasing manager with Elk Valley's five mines it was determined that 500,000L was consumed by their operations. A further 100,000 L is estimated for other equipment operating on these systems around the province for a total of **600,000 L**

#### **6). Cement & Lime Kilns – 0.6 million liters**

There are no known lime kilns being fired solely on used oil. There is at least one pilot project at Canfor's pulp mill in Prince George and they do consume internally

generated oil. It is likely that most pulp mills with lime kilns burn their used oil and this practice is confirmed at several sites. In addition to burning there are some sites that are more liberal than others in allowing oil to flow to effluent that has bugs, (microorganisms), eat the oil, but this could be construed as a consumed in use practice. Collectively these practices total **500,000 L**.

The three operating cement kilns consume considerable “burner fuel”, which would contain used oil, but that oil would have had a R.I. paid out. The exception for these kilns is oil burned that is internally generated in their operations. Estimate that volume at **100,000 L**.

#### **7). Queen Charlotte Islands and the Coast – 0.4 million liters**

This region has experienced a severe reduction in logging in the last decade. It has also seen the replacement of large forestry companies like Weyerhaeuser with logging contractors doing the tree harvesting. The large companies had a vested interest in handling used oil in the most diligent manner, whereas individual contractors are driven by reduced operating expenses, or conversely, finding the best value for handling used oil, which usually translates to burning for heat.

Used oil has always been collected from some sites in the Charlottes and Coast and returned to the lower mainland, but the paper trail likely did not indicate the source.

Estimated virgin oil sales for this region is 750,000 L. Deducting an estimated CIU of 30% leaves 525,000 L available for collection. Applying a collection rate of 25% leaves **400,000 L** “unaccountable”. These estimates are confirmed with oil suppliers and collectors, North Arm Transportation, All Things Energy, and IOL. All the volume is likely going to space heating and greenhouses, but because of the region’s unique geography, it was presented as its own category.

#### **8). Fish and Pleasure Boats – 0.1 million liters**

The practice of improper disposal of use oil is vague and by its nature, impossible to substantiate – but it happens. The large players in the fishing industry undoubtedly are diligent, but some smaller players are driven by tight economics and there is a long standing practice bred from environmental ignorance that “overboard at midnight” is okay. An estimate of **100,000 L** is applied to this category based on several conversations with people in the fishing industry and others associated with the waterfront.

#### **9). Victoria Harbor 0.1 million liters**

On the surface it would appear there should be a significant volume of used oil available from the Navy, Coast Guard, Cruise Ships and dry docked deep sea freighters, but there is not.

Peninsula Waste Water is the major collector/processor and sells about 1.0 million liters of burner fuel after dewatering a much larger volume of oily water and bunker sludge. The bottom line for this business is that oil and water are rarely segregated, and Peninsula estimates they collect about **100,000 L** of oil with R.I. potential. Oil that is burned onboard with the Navy is reported elsewhere.

#### **10). B.C. Ferries, Cruise Ships, Coast Guard and Navy – 0.2 million liters**

The Navy and cruise ships burn oil on board. The Navy burns used oil in their boilers and the cruise ships burn oil just because it is an expedient disposal method. Cruise ship oil will not have attracted a R.I. so it is a moot point. The Coast Guard does not segregate oil, water and fuel sludge very well, and little is collected from them. Presumably they burn used oil for heat on land. The combined Navy and Coast Guard estimate is **200,000 L**.

B.C. Ferries is a large consumer of lubricants, (~ 2.0 million liters annually), and subsequently generates large quantities of used oil. A significant portion of used oil collected from ferries by their principal collector, Newalta, contains too much water >35%, to attract the R.I. Estimates vary for the volume of non R.I oil collected. A conservative number of 800,000 liters was used for contaminated non R.I oil sold into the burner market by Newalta and other collector/processors and that volume is included in the burner fuel category.

#### **11). N.E. Oil & Gas Patch – 1.5 million liters**

The N.E. oil and gas patch consume ~ 18.0 million liters of EHC applicable lubricants annually. Applying CIU factors to the major products produces a CIU volume of 12.4 million liters, leaving 5.6 million liters available for collection.

Registered BCUOMA collectors do ~ 1.2 million liters and estimate an additional 0.3 million liters by other collectors other than Formula Transport who have a reported 0.75 million liters, but whose volume is accounted for in the burner fuel category.

Totaling these known volumes leaves, (5.6 less 2.25), ~ 3.0 million liters unaccounted for.

The consultant was unable to confirm the rumored practice of drilling company maintenance contractors adding used oil with drilling mud for down hole drilling, but it is reasonable to assume that some volume is lost in that way.

It is not known where the majority of unaccounted used oil goes, but if this region mirrors other areas in the province it is likely for heating purposes. There may be some unique used oil disposal practice for this area, but short of spending time in the region it will remain unknown for this study.

A conservative estimate of half the 3.0 million liters, i.e. **1.5 million liters** was applied to this category, because it could be supported by heating use alone.

**12). Toilet, Sewer, Weed Control, Road Oiling, Fuel Starter, Ground Pits, etc – 0.5 million liters**

This is the catch all category that no one will admit to doing, but many will point a finger at someone else who does dispose of used oil in an undesirable manner. Volume estimates for any of these practices cannot be substantiated, but a number has to be assigned to the sum to acknowledge that they do occur.

**500,000L** is a conservative estimate, and the number could easily be several times higher.

## CONCLUSIONS

Used oil that was unaccountable is now identified and quantified, if not “accounted for”. It is encouraging that the unaccounted used oil volume reported in this study, when combined with the CIU and oil collected, accounts for between 95% and 100% of virgin oil sales, depending on the CIU number used.

Factors that influence the amount of used oil collected range from return incentive amounts, environmental awareness, diligence and penalties, remoteness of locations, to fuel costs. Rising fuel costs are one recent change that influences current collection rates more than any other in the last two years, particularly the distillate, (diesel and heating fuels), portion of the barrel.

Individuals to large companies are looking for cost saving initiatives and displacing high priced diesel/heating fuel with used oil for producing BTU's for space heating, boilers, heating asphalt, and firing cement and lime kilns makes good sense.

The practice of converting used oil to energy appears to be on the rise.

Two other significant practices: internally generated used oil lubrication like chain oiling and engine oil burn systems are also economically driven choices. Internally generated used oil for chain and other lubrication practices displaces the purchase of virgin oils, and adding oil to an operating engine in a mine haul truck or other equipment, extends oil drains, thus reducing down time.

The remaining volume of oil that could be collected is relatively small, and is not currently being collected because of either environmental ignorance, e.g. weed control and road oiling, or the remoteness of some locations making it too onerous to collect and transport.

The BCUOMA recycling program appears to be working well, as it is estimated that with considerable effort only 2 – 5 million liters of additional oil could be available for collection, unless the R.I. paid was raised by an unjustifiable amount.