Summary

Used oils are one of the greatest source of pollution worldwide mainly because of the quantities generated, their high toxicity level and mostly because of their mismanagement. A well organized waste oil management program will result in a most attractive economic venture for the promoter as well as for the Country that will benefit from its direct positive economical and environmental impacts.

Our presentation shall include, definitions, procedures, general requirements and various other considerations to overcome a problematic situation and convert it into a most attractive and feasible program. In conclusion, we shall briefly outline how, by whom and why we have been mandated to perform this study and the expected outcome of phase I. Unfortunately, results of field data survey was not available at time of printing, but preliminary results will hopefully have been compiled on time for the seminar presentation.
What are Waste Oils?

Lubricating oils become waste oil after most of their useful properties have been altered. The useful properties consist mainly of various additives that are chemically blended with base oils that originate from the fractionation of a certain portion of crude oil.

The base oils are composed of naphthalic or paraffinic hydrocarbon and they vary in terms of quality and viscosity. The fabrication of lubricants consists in a very complex science commonly called TRIBOLOGY. Scientists, mostly chemical engineers, constantly work in research trying to find the proper blends of various chemicals to be added to the mineral base oils in order to create better, more resistant and more environmentally friendly lubricants. But mineral oils will always remain hydrocarbons based containing various types of chemicals such as heavy metals for instance when blended.

World wide, waste oils represent the greatest sources of pollution because of their multi-purpose applications, quantities generated their low economic value and mismanagement.

The Problem

Lubricating oils are entering the waste streams and the environment in alarming quantities because there is no controlled, regulated and/or economic incentives to properly manage the various streams. Used oils contain toxic elements but they are still largely taken to landfills, dumped down sewers, used for dust control or wood protection or burned in an unregulated fashion in various small industrial boilers. The result is that the waste ends up in everyone soil, water and air.

The question is: what can be done about it? Some would say that more regulation is required, but the fact is that the regulation currently in place probably affects only a small part of this behavior. It would require an army of oil police to assure that every Colombian behaves in an environmentally acceptable manner.

Environmental Compliance of Waste Oil Recovery Technologies

Re-refining technologies development in the 1970’s emerged from a global need to reduce dependence on crude oil imports and to mitigate the catastrophic effects of oil embargoes. In the 1980’s, the emerging environmental awareness and the necessity to properly dispose hazardous wastes has shifted the focus of major refining engineering firms to find better environmental solutions. As a result, new technologies came out, allowing for high recovery of lube oil from a hazardous waste stream and reducing the discharge of chemicals, sludge or treating agents to a minimum or completely eliminated. In addition these new plants are engineered and designed to comply with all North American federal, state/or provincial laws, either existing or promulgated.
Colombian government demonstrated much interest and good will in relation to the development and the application of new environmental regulations. This is illustrated by the current Canadian-Colombian sponsored study that is now being carried out by Canadian experts together with Colombian knowledgeable parties. The Colombian Petroleum Association along with the cement plants association are also ready to support the implementation of a Waste Oil Management Program (WOMP).

The methodology of the study is described at the end of the presentation, but the following sections elaborate on the components to consider for the implementation of a used oil management system which objectives are:

- Increase controlled collection programs
- Ensure collected oils are managed to protect human health and the environment
- Encourage proper re-use, recycling

**The Options**

The following diagram illustrates the possible short, medium and long term goals of a WOMP. Several options will be looked at, but most likely, a dual or triple outlet system will be proposed articulated around a long term solution that will yield the best economical, environmental and technical benefits. Based on other countries experiences, re-refining was the best solution, providing some important conditions were put in place.
PRELIMINARY PROJECTED ORIENTATIONS

Actual situation:
In Colombia:
- Lack of control
- Society unawareness
- Inappropriate regulation
- Dumping
- General pollution

Short terms Goals:
- Proper regulation & Enforcement
- Waste oil collection program (accredited transport)
- Sensitization program
- End users accreditation program
- Adapted pricing structure
- Petroleum Ass. financial support
- Gov't financial support via temporary env. tax
- Proper waste oil management program i.e. Segregation

Medium terms Goals:
- Increase Collection
- Incentive program
- Do it yourself program
- Industrial support
- NGO's support
- Increase sensitization program

Long term Goals:
- Increase Collection
- Maintain adequate sensitization program
- Maintain secondary outlet i.e.: Controlled burning
- Promote re-refined lubricant consumption
Cost: paid from the petroleum special funds or absorbed by private organisms for marketing purposes.

(1) Collection performed by re-refiners or private transports for the fuel blenders – 0.05 USD/liter for Ind/Inst/Comm. ∅ cost for DIY.

(2) Fuel blending may consist of burning waste oil with coal or recycling, demetalizing and reselling as commercial or industrial fuels (must meet regulated specifications).

(3) Re-refining technologies are subject to public appeals and must meet all regulation requirements.

(4) If permitted (must meet regulatory standards in terms of combustion efficiency).
The Collection System

1- General Considerations

Setting up a collection system can be quite time consuming. Around large metropolitan or industrial areas, the collection of waste oils is fully established. In such cases it is the Consultant’s experience that cooperation with the established collectors is time and cost efficient.

The collection system objective is to gather sufficient quantities of waste oil with specific characteristics and quality for ultimate disposal. Consequently, large metropolitan or industrial areas may be considered prime locations for a lube oil re-refining plant or large scale recycling. Quantities of waste lube oil must be sufficient to meet the minimum operating capacity of a plant, even during seasonal slump. The situation in each location must be studied and a strategy should be developed to determine the best method of collecting the waste lube oil. The quality of the waste oil collected is also an important consideration. A quality assurance procedure is a necessary aspect of the overall plant operating procedure and should include quality control guidelines for testing all incoming oils and segregating them if they are not acceptable.

2- Waste Oil Sources

Automotive service centres and commercial engine fleets: This includes service stations, garages, new car dealers, other retail establishments and automotive fleet service areas where waste oils are drained from crankcases of automobiles and some trucks. The drain oils consist primarily of crankcase drippings (greater than 90%), but also include waste transmission fluids, gear lubricants, hydraulic oils, and minor amounts solvents used in the service areas. In highly industrialized regions, considerable amounts of waste oil is available from trucking, transportation and construction company fleets. A high percentage of commercial fleets operate diesel engines. Waste oils from automotive service centres and commercial engine fleets represent the largest relatively uniform source of feedstock with good recycling capabilities.

Aviation service centre: The aviation industry is an important user of petroleum based fuels and lubricants. Waste oil generated at major airports is likely to include: Jet fuel drained from aircraft, draining of petroleum based engine and transmission lubricants (primarily from ground support equipment) and synthetic lubricants, which may be re-used as long as they meet specific gravity, viscosity, acid number and water specifications.

Industrial oils: Included in this category are all industrial oils (lubricating and non-lubricating) which have as their source lubricating oil stocks sold to industry. These include: turbine oils, gas engine oils, transformer oils, refrigeration oils, heat transfer oils and hydraulic oils. Most of the waste oils available have compositions similar to the original product but with impurities such as fine suspended dust and metal particles, as well as oxidation and decomposition products. However, waste oil picked up from industrial plants
may be mixtures of various oil types, and may be mixed with synthetic oils, solvents, and transformer oils, etc.

**Marine transportation oils**: Collection tanks are installed on all ocean going ships and vessels to retain waste oil, spent lubrication greases, contaminated fuel oils and diesel engine crankcase draining accumulated during operations. Retention tanks are discharged during port calls and the waste oil generated is generally suitable for processing, however, it may contain up to 10% water.

Therefore, the sources of waste oil in any given area depend on the type of industrial activities prevailing in that area. The waste oil collector must identify the various sources in his area and systematically contact each source to develop a collection network. Automotive sources should be exploited first since this market represents the largest proportion of waste oil available.

### 3- Equipment Required for Waste Oil Collection

The waste oil hauler must have a tank truck which is large enough to carry an economic load of oil, yet small enough to be able to get into areas where there are waste oil tanks. Often, the storage tanks are squeezed between building or in the back of service stations, etc. These tank trucks generally have a capacity of 7 to 16m³. For very large waste oil generators and for longer transport distances to the end user, a more expensive transport tanker would be required. The collector, in order to take advantage of market opportunities, should have several storage tanks distributed strategically in an industrial zoned area. Each tank should be dedicated for specific types of oil, ex: - regular waste automotive oil draining, - light fuels such as diesel, jet fuel, kerosene and waste gasoline, - oil water emulsions, crude oil or waste which will need to be processed separately, depending upon the nature of the final usage business.

### 4- Route Development

The success of a collection system will depend on cost and time efficiency. At today’s petroleum products prices and labor rates, the collector must be careful to plan efficient routes and endeavor to get full truck loads of oil and minimize mileage between loads.

**Regular collections**: A pick-up schedule should be developed convenient to both the collector and the client and such a schedule should be strictly adhered to in order to save time and money.

**Response to emergency calls**: Though this should be avoided through proper scheduling, the waste oil hauler will be subjected to having to make occasional irregular pick-ups.

**Collection contracts**: Collection contracts are often required to secure waste oil business sources, stabilize prices, curb competitions and improve relationships between the oil
generator and collector. A contract is advantageous for both the waste oil collector and the client. The waste oil collector has a secured feedstock source at a fixed price while the client has no “worries”, to find an outlet for this waste streams.

**Storage tanks at source of waste oil:** Most waste oil generators have small storage tanks on their premises which are used to store the waste oil. The size is generally appropriate to the quantity of oil collected in any particular period of time. In some instance the tanks may be too small for carrying out efficient collection. In either case, it may be more practical for the collector to install his own larger tank. The collector may keep title to the tank and take it away when his service ends. Good arrangements should be made prior to the installation of the collector’s tank, in order to describe responsibilities, liabilities and costs, of each party.

5- Networking and Computerisation

Experience in the waste oil collection business has shown that the use of computers to network and monitor waste oil collections has actually led to a significant increase in the efficiency of the collection operation. The diversified character and the mere numbers involved are justifying the use of a computerized collection system. Currently, a network may include up to 2,500 sources of waste oil for 5,000 m3 collected monthly. Also these sources differ widely in the quality of waste oil which are use generated and the method of required payment. A tailor made computer system can help to manage a large supply network, increase daily volume collection, reduce time and distance. This is leading to cost reduction and higher profits from operation.

THE MANDATE OF THE CANADIAN-COLOMBIAN CERI STUDY
HANDLING OF USED OIL

Component 1: Availability, Characteristics and Handling of Used Oils in Colombia

Objectives

1- To identify and collect available secondary information and complete the overall picture with primary information) for Bogota, Cali, Medellin and Barranquilla for the following:

- engine lubricant used oil volumes and characteristics;
- geographical distribution of used oils;
- the main actors involved in the lubricating oil/used oil market in Colombia;
- estimates of the volumes of used oil generated in Colombia;
- markets for the lubricating oil sold in Colombia by major oil companies;

2- To describe the current used oil management conditions and practices in Colombia, including:
   - transport and handling conditions and practices;
Component 2: International Experience Relating to the Handling of Used Oils

Objective: To compile information relating to existing used oil management practices at the international level, mainly Canada and U.S. used oil management practices;

Component 3: Evaluation Of Alternatives for Implementation in Colombia

Objective: To assess and propose viable alternatives for the short-, medium- and long-term management of used oil and analyze the challenges and limitations facing the implementation of used oil management solutions in Colombia, such as:

- Pricing: structure and levels of imposition of any proposed surtax; time frame for the implementation of such a tax;
- Socio-economic impacts of the levying of a used oil management surtax: effects on the current markets for used oil (legal and illegal);
- Logistics of the handling of used oils:
  - Transportation: collection points, transfer points, costs.
  - storage (short- and long-term);
  - final disposal (technology and sites);
- Education and awareness / enforcement challenges: current level of environmental awareness; willingness of local, regional and national authorities to encourage participation in a nation-wide used oil program, and to enforce used oil regulations;

Component 4: Analysis and Recommendations Relating to Regulations on the Management of Used Oils

Objectives

1. To evaluate the current legislative environment in Colombia with respect to the management of used oils.
2. To assess the need for additional legislation, based on the information obtained on the current situation in Colombia, as well as on the acquired knowledge about international used oil regulatory experiences;
3. Validation of the recommendations and conclusions of the Consultant by the Colombian key players, clear presentation of the results of the study, phases 1 and 2 and ensure deliverables is to their satisfaction;
4. Ensure disclosure of the study results to all players directly or indirectly involved in handling of used oil.

**Conclusion**

The present preliminary information document as been composed in order to outline and briefly explain the nature of the study being performed bearing in mind that the final report will become more perceivable and understandable by all implicated and interested parties.

Some essential elements were covered including an exhaustive layout of the mandate. We have briefly described our actual perception related to the petroleum management policy existing in Colombia in order to properly identify the possible impacts that a proper waste oil management program will create on an overall basis. Also as a guideline, in order to demystify the logistics related to such a program, we have included certain practical elements related to a collection system and waste oil sourcing.

A most exhaustive survey is currently being performed to identify the proper sources of supply, available equipment, overall transportation logistic, generators general position, etc... The results of that survey will essentially nourish the recommendations to be included in the final report.