

# EVALUATION OF THE INTEGRAL MANAGEMENT OF THE MANAGEMENT OF USED OIL IN VEHICULAR BOGOTA

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## ABSTRACT

In Colombia are generated each year approximately 1.2 million barrels of oil used<sup>1</sup> motor oil (vehicular), of which it has been estimated a potential recovery close to the 420,000 barrels. Approximately 540 BPD (barrels per day) are incorporated in the fuel market, particularly in furnaces and boilers of small- and medium-sized industries, such as workshops of casting, metal fabrication workshops, small chircas, textile mills, steel small, garment factories and in the services sector especially in the laundries, however<sup>2,3</sup> due to lack of knowledge of technical procedures for its adaptation, due to the absence of technical norms and specific to your industrial reuse, by the lack of consumption standards in boilers, furnaces and dryers and by the black market existing with these products, it is presumed that the managements given to waste oils and in general to this type of alternative energy, is inadequate.

This led to raise the need to perform a qualitative and quantitative analysis of the various activities involved in the commercial chain of this residue (generation, storage, mixing, collection, transportation and final disposal), throwing as a result the manual for the management of waste oils dictated by the environmental authorities in this case the Administrative Department of the Environment LADY<sup>4</sup> for Bogota and the Autonomous Regional Corporation of Cundinamarca CAR, with the purpose of implementing plans and programs aimed at achieving an appropriate handling, collection, transportation and use of this residue and by the generation of a formal market you to delete your character of hazardous waste, encouraging the participation of different actors for their recovery, Collection and treatment.

This involves the manual steps to take in the commercial chain for both hoarders, transporters and processors and/or processors, however the illegal market continues the largest share of this volume of used oil, which does not receive prior treatment in

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<sup>1</sup> The regulatory definition of EPA for oil being used is the following: any oil that has been refined from crude oil or any synthetic oil that has been used and as a result of such use is contaminated by physical or chemical impurities.

<sup>2</sup> Report mining and energy planning unit /report waste oils Colombia

<sup>3</sup> Report Ocade Saniplan, waste oils Bogota, Cali and Barranquilla Environnement inc and Lupien Rosenberg et Associés Ltda. 1,999 -2.001.

<sup>4</sup> Currently District Secretariat of Environment.

appropriate facilities and is used directly for combustion furnaces and boilers, in addition to presenting a great disorder of fuels without any control, generating another alternative of illegality as is the mixture of new and used oils for reuse by the fleet..

*Keywords: Waste oils treatment, storage and handling of oil used in collection centers, processing enterprises of oil used in Bogotá, Tank reimbursement system, commercial chain of used oil.*

## 1. INTRODUCCIÓN

In the industrial sector of Hydrocarbons and more exactly the oils lubricants for the automotive sector, the generation of hazardous waste is an issue to take into account in relation to the protection of the environment; lubricating oils are used in the interior of the engines where operating conditions make that after a certain period of use do not degrade in compounds whose characteristics do not allow you to continue using them as lubricants and are converted in used oil. The majority of waste oils contain toxic compounds which when burned are released to the atmosphere, this makes it necessary the implementation of policies aimed at their disposal and the methods used for combustion of the same.

In the country are generated annually large volumes of oil used, from the consumption of lubricants for the automotive sector, process oils and transformer oils, among others and as determined in previous studies Bogota, the city generates approximately 30% of the total volume generated in the country, being a critical value for its improper management, social and environmental vulnerability of the impacts that can occur in these inadequate processes<sup>5</sup>.

## 2. CONTEXT

A lubricating oil is a liquid used to decrease the friction between two surfaces, these are used inside the engines where operating conditions make that after a certain period of use do not degrade in compounds whose characteristics do not allow their use as lubricants, in the same way an oil used is all oil from the crude oil or synthetic that has been used and where the conditions of operation make after a certain period of use do not degrade in compounds whose characteristics do not allow their use as lubricants (EPA 2,003 ).

## 3. CLASSES OF lubricating oils, characteristics, properties, PLUS SET OF TECHNIQUES USED IN THE DEVELOPMENT OF NATIONAL AND INTERNATIONAL LEVELS

The lubricating oil is a substance, able to interpose between the parties of the machine that remain in constant friction to reduce their wear and reduce friction, thanks to its membership base of hydrocarbons and additives which form a protective film. Depending on where you remove the hydrocarbon, oil takes its name. That is to say, if it is the process of refining oil, the lubricant or finished product is called ore, while if it comes from a chemical synthesis process is called synthetic.

The industrial segment includes all the products used for the lubrication of equipment in industrial processes. This constituted by the range of products used for the management, or as part of the raw materials for industrial or agricultural products. The distribution of the oil in the automotive segment is valued in the following table.

Table 01. Distribution of the lubricating oil in the auto segment.

Auto Segment	Volume (gal)	%Market	% Segment
Lubricating oils	26,358,693	53.80	74.01

<sup>5</sup> Report mining and energy planning unit /report waste oils Colombia. May 2,001

Transmission oils	3,362,607	6.86	9.44
Fats	1,289,943	2.63	3.62
Valvulinas	1,237,505	2.53	3.47
Oils 2 times	3,038,816	6.20	8.53
Additives	28,718	0.06	0.08
N. D	28,718	0.61	0.83
Total Segment	35,613,544	72.70	100

Source: Dane - Incomex.

Table 02. Distribution of the lubricant market by geographical areas.

Geographical Area	Volume (barrels)	% Participation
<b>Bogota.</b>	291,812	29
<b>Cundinamarca.</b>	52,252	5
<b>Cali.</b>	97,293	10
<b>Valley and Nariño.</b>	55,148	5
<b>Medellín.</b>	112,626	11
<b>Antioquia and Viejo Caldas.</b>	55,626	6
<b>Barranquilla.</b>	81,590	8
<b>Caribbean Coast.</b>	100,828	10
<b>Bucaramanga.</b>	39,024	4
<b>Santander.</b>	37489	4
<b>TOTAL</b>	1,004,690	100

Source: Dane , Incomex.

For the EPA<sup>6</sup> used oil is all oil from crude oil or synthetic that has been used. During the normal use of the oil can be mixed with this, impurities such as dirt, metal particles, water and chemicals that affect the long the performance of the oil.

Between the different types of used oil generated more known at present we have : synthetic oil, engine oil, transmission fluid, coolant oil, fluids and oils of the metallurgic, compressor oil, laminar oils, hydraulic fluids, industrial<sup>7</sup> solutions for wire drawing of copper and aluminum, electrical insulation Oil, Oils used as a means of rubbing, Oils of industrial processes.

Table 03. Pollutants in the waste oils

POLLUTANT	ORIGIN
Barium	Detergent Additives

<sup>6</sup> Environmental protection agency of the United States.

<sup>7</sup> Study on the management of waste oils in Colombia, GSI, Environnement inc. and Lupien Rosenberg et Associés Ltda. 1,999.

Lead	Petrol plumb - wear parts
Magnesium	Detergent Additives
Zinc	Antiwear additives and antioxidants
Phosphorus	Antiwear additives and antioxidants
Iron	Engine wear
Chrome	Engine wear
Nickel	Engine wear
Aluminum	Bearings wear
Copper	Bearings wear
Tin	Bearings wear
Chlorine	Additives - petrols
Sulfur	Base lubricant - combustion products
Water	Combustion
Hidroc. Light	Fuel Dilution
PAH	Incomplete combustion

Source: environmental protection agency of the United States EPA

- Most widely used technologies for the utilization of waste oils:

In the course of the time in the management of waste oils can be distinguish four types of alternatives for the reuse of these waste: re-refining, fuel type diesel power generation, valuation as industrial fuel and waste incineration as:

Table 04. Comparison, advantages and disadvantages of each process

PROCESS	ADVANTAGES	Disadvantages
RE - REFINING	<ul style="list-style-type: none"> <li>– The process is more favorable from an environmental point of view.</li> <li>– The raw material is in a cyclical process, in such a way that will always be recyclable.</li> <li>– Ease of collection.</li> <li>– Savings of exportable products (oil), that is to say, is no longer necessary to obtain oil refining oil lubricant.</li> </ul>	<ul style="list-style-type: none"> <li>– The technology used in the process is expensive.</li> <li>– The final product obtained in our country may not have a good market.</li> <li>– This would bring about a competition with the big producers (Texaco, Shell, among others).</li> </ul>
VALUATION AS INDUSTRIAL FUEL	<ul style="list-style-type: none"> <li>– It is the way to use more used although it is not the ideal.</li> <li>– Presents about labor costs for installation and operation low in relation to the treatment systems and/or use.</li> <li>– Possibility of a market interested in buying the product because of its low cost.</li> </ul>	<ul style="list-style-type: none"> <li>– This process from an environmental point of view is not the most favorable. With respect to the method of re-refining.</li> <li>– There are release of sludge that is necessary.</li> <li>– You may have difficulty collecting</li> </ul>

	<ul style="list-style-type: none"> <li>- Recent legislation.</li> <li>- Energy Recovery.</li> </ul>	the waste.
AS INCINERATION RESIDUE	<ul style="list-style-type: none"> <li>- It is a way to have hazardous waste, avoiding that are discharges into the environment.</li> <li>- Maximum reduction in the volume</li> <li>- Possible recovery in the form of energy</li> </ul>	<ul style="list-style-type: none"> <li>- Incineration is a expensive technology.</li> <li>- There is a need for a special device to control greenhouse gases, according to the regulations.</li> <li>- It is not a form of exploitation, therefore there is a loss of a material that can be used.</li> </ul>

The Colombian industry generally uses thirteen types of fuels, of the most commonly used is the fuel oil, natural gas and coal, by its calorific value and lower cost compared to other fuel as the CMPA, kerosene, crude oil, propane gas and other energy sources such as firewood and bagasse which are occupied only in timber industries and sugar.

Table 05. Potential for contamination of fuels used in Colombia

COMB. /CONT.	PST	CO	OS2	NOX	HC	COU	METS
HYDRO POWER	NOT	NOT	NOT	NOT	NOT	NOT	NOT
Methane	NOT	M	B	M	B	B	NOT
Propane	NOT	M	B	M	M	M	NOT
NATURAL GAS	B	M	M	TO	M	M	NOT
PETROL	B	TO	M	M	TO	TO	M
ACPM	TO	M	TO	TO	TO	M	TO
DIESEL	TO	M	TO	TO	TO	M	TO
Combustibles	TO	TO	TO	TO	TO	M	TO
COAL	TO	TO	M	M	TO	B	TO
RAW	TO	TO	TO	TO	TO	M	TO
USED OIL	TO	TO	TO	TO	TO	TO	TO

Source: DPN - UNDP. "Air Pollutants of fuels"

Comb: Fuel

Cont: pollutant

PST: suspended particles

COU: volatile organic compounds

METS: heavy metals

A: High

M: Medium

B: Under

NO: Not presents.

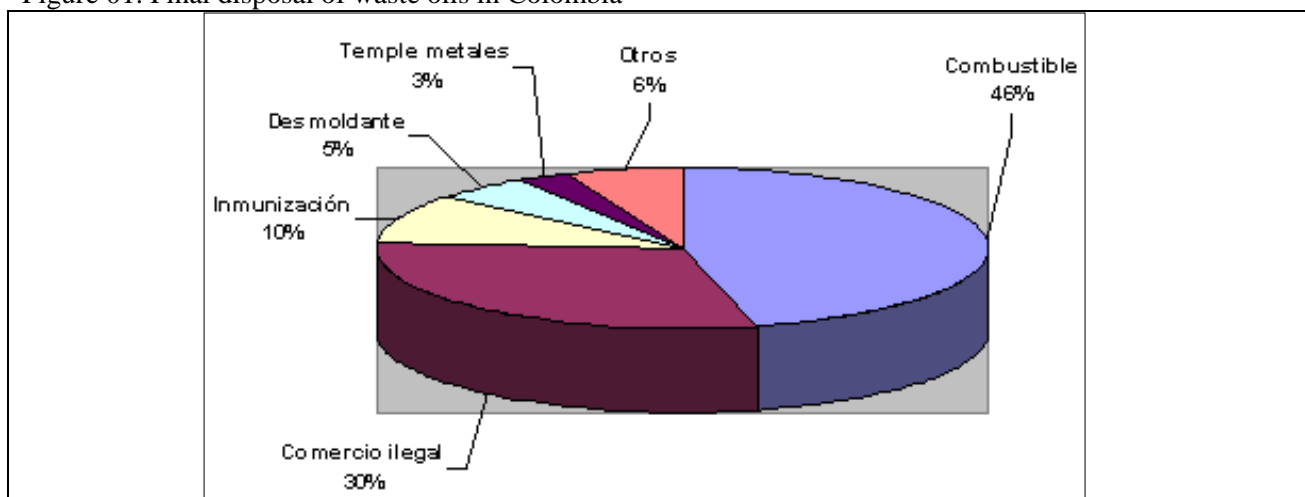
Table 06. Typical characteristics of waste oils

FEATURES	AUTOMOTIVE	INDUSTRIAL
Viscosity at 40 °C, SSU	97-120	143-330
Gravity to 15.6 °C, °API	19-22	25.7 -26.2
Specific weight to 15.6 °C	0.9396 - 0.8692	0.9002 - 0.8972

Water, % vol.	0.2 - 33.8	0.1 - 4.6
Sediments, % vol.	0.1 - 4.2	0.0
Insoluble in benzene, % weight	0.56 - 33.3	0.0
Soluble in petrol, % vol.	2.0 - 9.7	0.0
Trigger Point, °C	78 - 220	157 - 179
Calorific value, MJ/kg	31,560 - 44,880	40,120 - 41,840

Source: Esapetrol, processing company used oil in Bogota which owns a plant of cleaning the oil used to be used as a source of energy.

Figure 01. Final disposal of waste oils in Colombia



Source: current uses of the used oil in Colombia, graphic of the scenarios and strategies magazine, December 2003, p.21

**4.SHOWDOWN OF THE MANUAL OF STANDARDS AND PROCEDURES FOR THE MANAGEMENT OF WASTE OILS, ISSUED BY THE LADY AND THE CAR, compared to the practices currently deployed by the different actors in the chain SELECTED COMMERCIAL HANDLING OF USED OIL VEHICULAR:**

Selected Hoarders

Commercial Rating	Name	Address
Service Station	ESSO Saltpeter	CL 22 C # 68 D 20
Serviteca	The Multiservice Empire	CL 63 # 70 - 63
Lubricentro	The Rojas Lubricentro	AV Red # 64 - 75
Parking Lot	Metrobus S. A / Portal Transmilenio Tunal	Boyaca Av # 68 - 65 South

Workshop	General mechanical city of Cali	Cra 87 # 78 - 65
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Conveyors elected

Name	Address
EDUARDO EMPHASIZES GIRALDO	Cra. 19C No. 68 - 63 south
ESAPETROL S.A.	Calle 59 TO Bis TO south No. 81D - 45 Bosa
YESID GOMEZ FRANCO	Av. 42 No. 16B - 23

Processors chosen

Name	Address
PROTELMA Ltda.	CL. 14 No. 33 - 45
ESAPETROL S.A.	Calle 59 TO Bis TO south No. 81D - 45 Bosa

– Aspects observed in each of the selected actors

- Gatherers: Lubrication Area, drainage systems, receipt of primary containers, container for drainage of filters, tanks or drum storage, Dike or containment wall, physical plant.
- Conveyors: collection of used oil in the gatherer, characteristics of the vehicle used (cart tank/van/other).
- Processor and/or transformer: Uses authorized by the Environmental Authority, tanks, Dike or containment wall, physical plant, pumping process of used oil to the transformer tank.

Each of the stages of the process outlined above is essential within the proper storage, transportation and processing of the used oil, are also referred to within the Manual of rules and procedures for the management of used oil in Bogota.

- Identification of hoarders: in the following tables shows the compliance of each gatherer visited, with the parameters required by the Environmental Authority in the Manual of rules and procedures for the management of used oil in Bogota<sup>8</sup>.

<sup>8</sup> Naming Convention: Compliance  Not compliance



Gatherer	IDENTIFICATION
ESSO Saltpeter	1
The Multiservice Empire	2
The Rojas Lubricentro	3
Metrobus S. A / Portal Transmilenio Tunal	4
General mechanical city of Cali	5

Lubrication Area.

Observed Condition	1	2	3	4	5
1- Is clearly identified.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2- Floors built in solid material and waterproof, without cracks or other defects that would prevent the easy cleaning of fats, oils, or any other slippery substance.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3- Connection with the sewage.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4- Excellent ventilation (natural or forced)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5- Free materials, clinging, boxes and any other type of objects that prevent the free movement of equipment and people.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Drainage System.

Observed Condition	1	2	3	4	5
1- Ensures the secure transfer of used oil from the engine or equipment until the receipt of primary container.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2- Designed in such a way as to avoid spills.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Container(s) of primary receipt.

Observed Condition	1	2	3	4	5
1- The container allows you to move the used oil removed from the place of service of the engine or equipment, up to the area for temporary storage of waste oils.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2- This developed in materials resistant to the action of hydrocarbons.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3- Account with handles or straps to ensure the safe handling of the container.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4- Account with a mechanism to ensure that the transferred operation of waste oils of the primary container of receipt to the aboveground tank or drum, will perform without spills, drips or leaks.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Drain container filters

Observed Condition	1	2	3	4	5
1- Maximum of five (5) gallons and endowed with a funnel or mesh that support the filters or other elements to be drained.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2- Account with handles or straps that allow you to move the used oil drained to the area for temporary storage of waste oils, ensuring you do not submit drips, spills or leaks.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3- Account with a mechanism to ensure that the operation of waste oils transferred to tank or drum surface, perform without spills, drips or leaks.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Tanks or drums of storage

Observed Condition	1	2	3	4	5
1- Ensure at all times the total containment of the used oil stored.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2- Developed in materials resistant to the action of hydrocarbons.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3- Allow for the movement of the used oil from the primary container of receipt and toward the transport system to be used, ensure that there is no submit spills, drips or leaks of oil used.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4- Account with a filtration system installed in the mouth of receipt of waste oils of the tank or drum in operation, to avoid the entry of particles with dimensions greater than five (5) millimetres.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5- Is labeled with the words "USED OIL" in legible size, which should be in view at all times, on a label in at least 20 cm x 30 cm.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6- In the storage site signals there are "no smoking in this area and storage of waste oils".	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

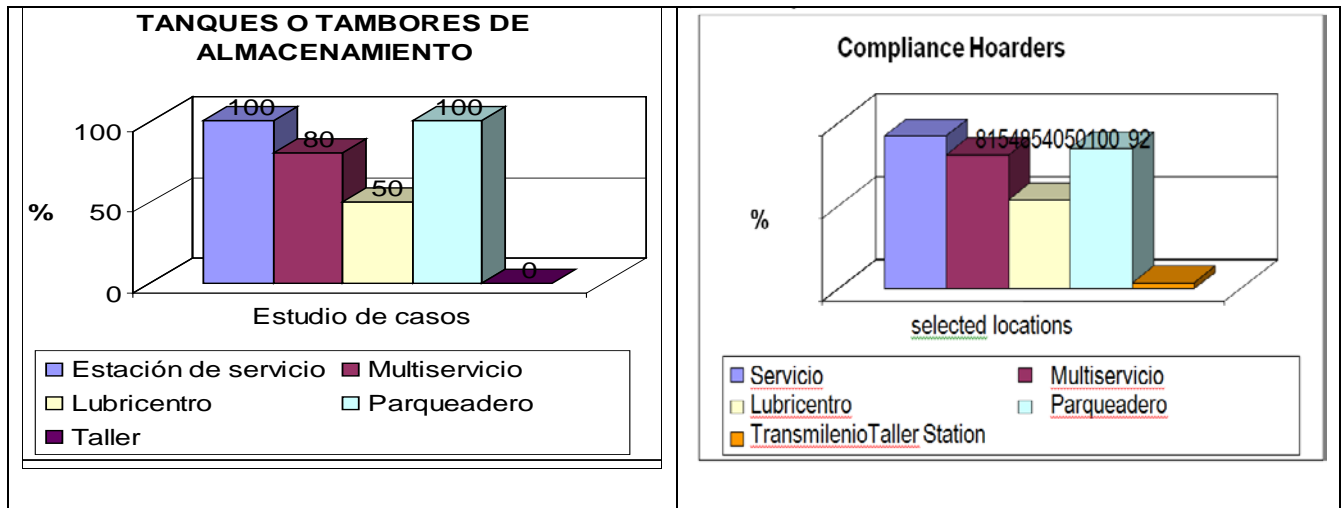
Levee or containment wall.

Observed Condition	1	2	3	4	5
1- Cyberneticians possible spills, drips or leaks produced to receive or deliver waste oils, to or from tank(s) and/or drum(s), or by occasional	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

incidents.					
2- Possesses a minimum capacity to store 100 % of the volume of the largest tank, more the 10% of the volume of the additional tanks.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3- The floor and the walls are constructed in impermeable material.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

In the graphs below the classification as a percentage of compliance with the conditions outlined in the Manual of rules and procedures for the management of waste oils in Bogota.

<p>Figure 02. Lubrication Area</p> <table border="1"> <caption>Area de Lubricación</caption> <thead> <tr> <th>Facility Type</th> <th>Compliance (%)</th> </tr> </thead> <tbody> <tr> <td>Estación de servicio</td> <td>100</td> </tr> <tr> <td>Multiservicio</td> <td>80</td> </tr> <tr> <td>Lubricentro</td> <td>40</td> </tr> <tr> <td>Parqueadero</td> <td>80</td> </tr> <tr> <td>Taller</td> <td>20</td> </tr> </tbody> </table>	Facility Type	Compliance (%)	Estación de servicio	100	Multiservicio	80	Lubricentro	40	Parqueadero	80	Taller	20	<p>Figure 03 drainage system</p> <table border="1"> <caption>SISTEMA DE DRENAJE</caption> <thead> <tr> <th>Facility Type</th> <th>Compliance (%)</th> </tr> </thead> <tbody> <tr> <td>Estación de servicio</td> <td>100</td> </tr> <tr> <td>Multiservicio</td> <td>100</td> </tr> <tr> <td>Lubricentro</td> <td>50</td> </tr> <tr> <td>Parqueadero</td> <td>100</td> </tr> <tr> <td>Taller</td> <td>0</td> </tr> </tbody> </table>	Facility Type	Compliance (%)	Estación de servicio	100	Multiservicio	100	Lubricentro	50	Parqueadero	100	Taller	0
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<p>Figure 06. Dykes or retaining walls</p>	<p>Figure 07 Compliance Hoarders</p>																								



The hoarders selected do not meet in its entirety with the conditions of the policies and procedures manual for the handling of waste oils, on a scale from 1 to 100 the Service Station generates 92% of compliance, this is thanks to the fact that this is a place open and easily controllable, both by the multinational which the opera (for the selected station ESSO), such as the environmental authority or by the same customers; the station tries to keep their areas signposted lubrication, tidy and comply with the management parameters dictated by the environmental authority.

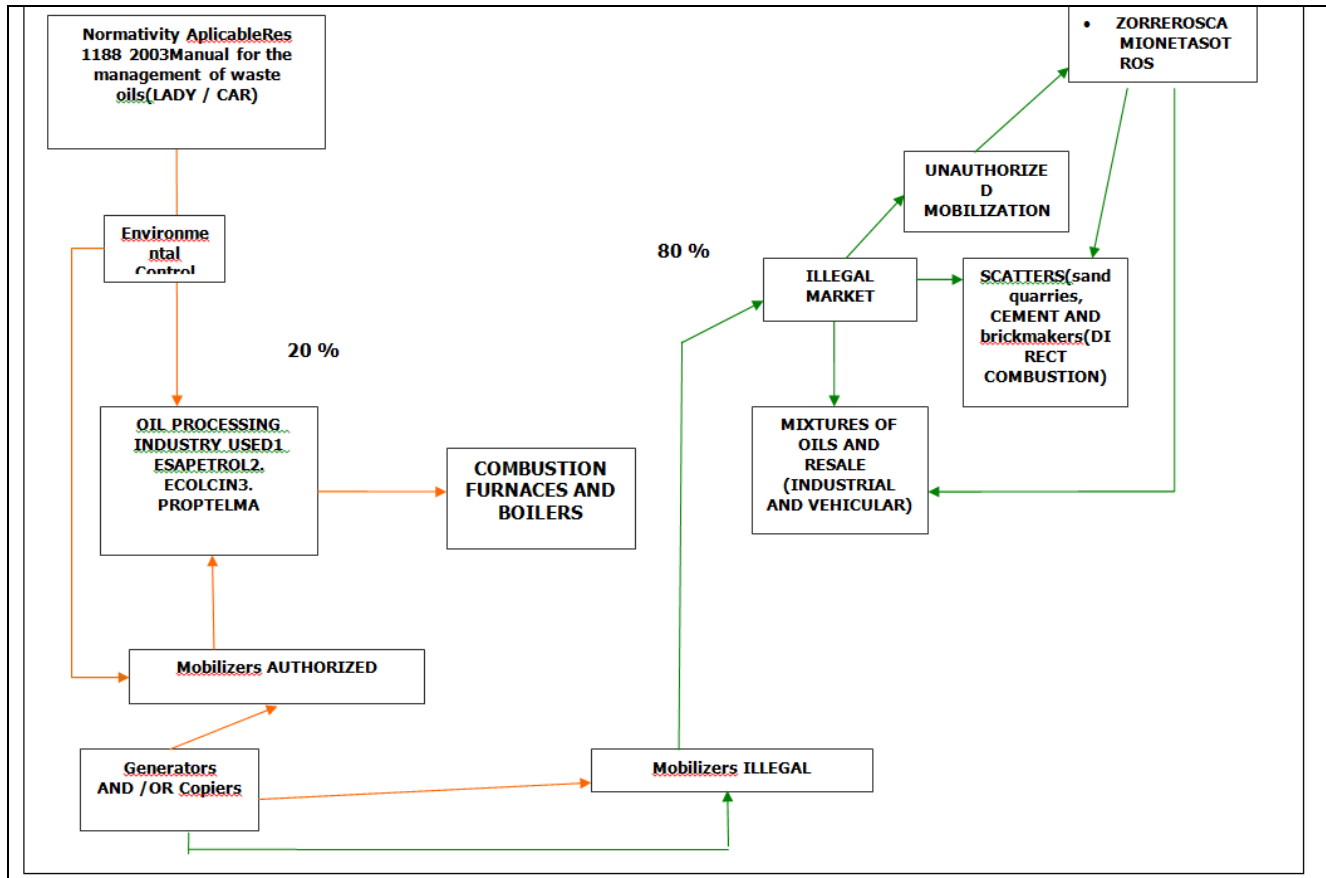
On the contrary, the selected workshop presents a mismanagement of its waste and in the case of the used oil, but generates a lower volume to be compared with the other copiers involved in this research. Compliance with the manual is minimal (4 %) and is to know that there are numerous workshops in Bogota without registration in Chamber of Commerce and by the same token, outside the control of the environmental authority. In conclusion the major establishments such as the courtyard of Transmilenio, service stations and the Multiservice Servitecas or meet in greater proportion with the technical aspects of the manual without reaching a full compliance, in comparison to the small local intended for the management of used oil as the Lubricentros and workshops that meet in a low percentage the manual designed by the environmental authority LADY.

- Result of the observation process:

- o Compliance with the manual in the authorized transporters of the used oil and processing plants and/or legally constituted processing, it is good and the control of the environmental authority is efficient in this aspect.
- o The compliance of the generators or copiers is the main conflict within an appropriate comprehensive management for used oil, by the commercial diversity that exists in the city.
- o The large copiers (Service Stations, Servitecas, among others) comply with the minimum conditions of the Policies and Procedures Manual for the management of used oil in comparison with the small business (workshops and Lubricentros), where the street work and inadequate conditions in conflicting with the minimum standards for safety and environmental control willing in the Manual.
- o The illegality part basically small copiers, which delivered its waste transporters to unauthorized and they eventually sell them at a cheaper price for cement plants, brickmakers and sand quarries, in comparison to the treaty that sell oil processing plants in Bogota.

The processing companies delivered a worrying position by the under environmental control of the process and with the small treatment that is generated from the total of the oil generated by the fleet of Bogotá, reason that complements the foregoing in direct observation, where the illegality plays an important role when selling the used oil without trying to lower cost or in the worst cases mix it with other hydrocarbons. Similarly, the processing plants synthesize the problem in the lack of a system of self-regulation that become efficient the system within a proper management of the resource. In figure 09, condenses the current situation of the management of used oil in vehicular Bogota.

Figure 08 - current situation of the oils used in Bogota.



## 5. ALTERNATIVE FROM THE ENVIRONMENTAL MANAGEMENT, THAT PERMITIRÍA A COMPREHENSIVE MANAGEMENT OF USED OIL IN VEHICULAR BOGOTA:

One of the approaches that has been successful in recovering the lubricating oils used in Mexico, Federal District, using the approach Ganar-Ganar , incentive is the recovery of the oil used for the benefit of the customer, the gatherer and the environment.

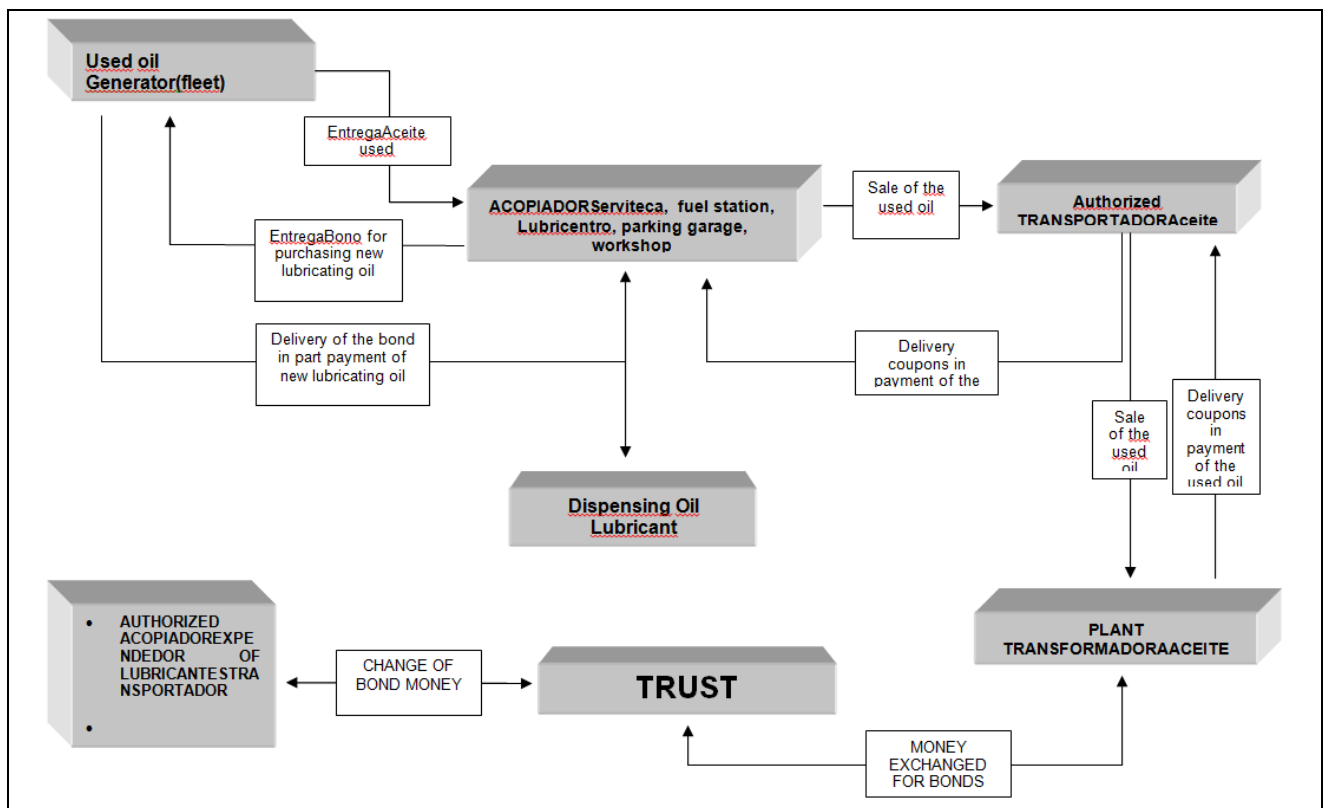
In the first stage of this process involved the service stations, which develop a social activity and for the protection of the environment, which creates a positive image to your customers. It was also set up collection centers for waste oils that return customers together with the empty packaging (of which it retrieves the virgin oil remnant) and finally the marketers or authorised recyclers can gather the oils collected.

"The creation of markets that incorporate environmental, such as cost, the sustainability of the use of natural resources, gives rise to the market-based instrument used in the Federal District, called Tank reimbursement system"<sup>9</sup>.

The tank reimbursement systems (RDS), is to charge a deposit to the economic agents for the purchase of a contaminant, in order to avoid that have incorrectly generated waste after its consumption. This deposit is refunded when the actor involved delivery your residue to pickup a center within the commercial chain and distribution, in which begins the process of handling and final disposal. This tank reimbursement systems (RDS), is considered as an economic incentive for generators of waste such as used oil, are interested in return; for this reason, the amount should be enough to motivate the generators to retrieve your refund.

Knowing the international experiences and the current management of the oil used in vehicular Bogota, the incorporation of the model SDR is a possible alternative in the city, with great strides as the processing plants, the authorized group of conveyors and much of the warehousemen involved with the conditions set forth in the Manual of rules and procedures for the management of waste oils.

In figure 09, is structured the management model proposed for the management of used oil traffic in the city of Bogota.



Before starting the formulation of the reimbursement system Tank in Bogotá for the management of waste oils, it is recommended that:

<sup>9</sup> The case of Mexico, Roberto Escalante, Fidel de Aroche

- Learn which is the situation of their consumption and management in each locality.
- Identify and involve the actors or participants more effective (warehousemen basically) by locality.
- Updating the inventory of generators and/or copiers depending on their size (Service Stations, Servitecas, Lubricentros, parking facilities and workshops).
- Set the value of the coupon discount for new products to return the used oils for the customer (owner of the motor vehicle that generates the used oil).
- Set the value of the bond of purchase of the conveyor to the gatherer of the sale of the used oil stored in their vehicular installations.
- Set the value of the bond by the mobilization and delivery of the oil used by the conveyor to the oil processing plant used.

Also for a proper functioning of the SDR Vehicular used oil is necessary to consider:

- A mechanism for collecting sites in certain oils used vehicle: it is necessary to determine sites of primary storage (collection), for the small players in the chain, as are the mechanical workshops, those who do not have the adequate infrastructure to store waste oils and also do not meet the conditions set forth in Security Policies and Procedures Manual for the handling of waste oils.
- The identification of the economic agents involved with the implementation of the RDS: As it is a new economical alternative that will assess the used oil vehicular, some economic agents will be interested in be linked to the process, for example, the management of the resources of the trust, but basic new entity in the marketing chain; other economic actors will be involved depending on the degree of integration between copiers and conveyors, to minimize costs and increase profits.
- The amount of the deposit that is refunded to each actor of the chain of trade: the value of the bond for each actor of the commercial chain must be different, the generator receives a credit for the delivery of used oil in your vehicle, the gatherer sells this oil to the processor at a different value, and the conveyor delivers it to the processing plant by another value due to transportation costs incurred by this actor; by which is the decisive set different rates for not generate a speculation on prices and create a competition that mismanaged again create illegality.
- In the implementation of the SDR for the management of used lubricating oil, a leader must be defined or responsible (either the producer, distributor, an association of hoarders, transporters and treatment plants, other), which must intervene directly in the design of the mechanism, formulating the strategy of communication between the actors, the contents of the advertising and coordinate the efforts.
- It is essential to understand the commitment of the environmental authority, therefore, the District Secretariat of Environment, you must define the degree and form of participation in the management process, either with human resources, technical and/or financial; they may also contribute to their ability to call, facilitating administrative procedures, using the times and spaces that are available to the media, by promoting new markets of recycling of used oil in which the generator is benefits selling the oil in your vehicle and receive a bonus for the new purchase of lubricating oil.
- Prior to the application of the instrument of the reimbursement system tank, in Bogota there was a market for used lubricants. An action that would have to be taken immediately to facilitate the adaptation of the market that existed before the SDR, is to provide economic incentives to the actors in the marketing chain, as for example, a fiscal stimulus that would be to waive the payment of income tax for a period of two

years, and establish commitments to continue during that time. In this case, the conclusion will be paramount to obtain results.

– The Colombian State and regulatory body in the provision of waste oils, you can take an active part in the implementation of the SDR, promoting the surveillance and control on the part of the environmental authorities to the entire chain of the commercial waste oils, putting in place the mechanisms that allow them to promote the use of technologies for reuse and utilization of waste oils, punishing criminally who transport or eliminate hazardous waste in any way that is unlawful or pollution of the atmosphere, water or soil with these substances and develop policies that will increase the study or investigation of correct ways of use or disposal of this waste.

– Finally for the implementation of a deposit refund system in Bogota, you can count on the support of the Pan American Network for Environmental Management of Waste (Repamar), promoted by the Technical Cooperation Agency of the German Government (GTZ) and the Pan American Health Organization (PAHO), through its Pan American Center for Sanitary Engineering and Environmental Sciences (CEPIS), as well as Argentina, Brazil, Colombia, Costa Rica, Ecuador, Panama, and Peru, countries that comprise it.

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