U.S. Department of Energy • Office of Fossil Energy

Used Oil Re-refining Study to Address Energy Policy Act of 2005 Section 1838

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Office of Oil and Natural Gas
Office of Fossil Energy
U.S. Department of Energy

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1 Executive Summary

This report is a response to the Energy Policy Act of 2005 Section 1838, which required:

> *The Secretary of Energy, in consultation with the Administrator of the Environmental Protection Agency, shall undertake a study of the energy and environmental benefits of the re-refining of used lubricating oil and report to Congress within 90 days after enactment of this Act including recommendations of specific steps that can be taken to improve collections of used lubricating oil and increase re-refining and other beneficial re-use of such oil.*

1.1 Methodology

To carry out this study, the U.S. Department of Energy (DOE), in consultation with the U.S. Environmental Protection Agency (EPA), analyzed prior studies and consulted with industry stakeholders. The specific sources of information used in this study to provide background information and to formulate conclusions and specific steps that could be taken are detailed in subsequent sections of the study, but are summarized below:

- Prior comprehensive studies on the energy and environmental impacts of re-refining used oils,
- Information gained from a meeting with industry stakeholders and subsequent followup discussions,
- Current federal legislation that deals with various aspects of used oil management,
- Used oil management programs utilized by various states, and
- Data on lube oil consumption in the U.S and in the world.

This report has been developed in consultation with the EPA and a draft report was reviewed with the original stakeholder meeting participants.

1.2 Executive Summary Roadmap

The Executive Summary is organized as follows:

- Background information on worldwide and U.S. lubricating oil demand and used oil management practices,
- Discussion of the used oil stakeholders,
- Summary of the energy and environmental benefits of used oil management practices,
- Existing legislation for used oil,
- Specific steps that could be taken, and
- Comments on emerging trends.

More detailed information and analysis is provided in the subsequent sections of this report.

1.3 Worldwide Lube Oil Demand Perspective and Used Oil Management Practices

An overview of the worldwide lubricants (lube oil) market indicates that the United States consumes about 25 percent of the total worldwide demand for lube oils, which reflects the United States' relatively large percentage (21.3 percent) of the world Gross National Product (GNP) and widespread use of the automobile compared to other regions of the world.

However, compared to the United States, it appears that most European countries are more advanced in the area of used oil recycling, re-use and source reduction. For example, Europe has three times as much re-refining processing capacity as the United States. Re-refining is a process that can regenerate used oils into base oils that are of equivalent quality to fresh virgin base oils, which are the most fundamental building blocks of all lubricating oil products. Virgin base oils are derived from oil refineries that have special high severity processing equipment that allows them to produce the highly refined and stable base oil products. These base oils are then blended with various additive components to produce a product that is specifically designed to lubricate or serve other very specific conditions.

This report refers to European lessons learned and hopes to avoid some of the pitfalls in dealing with used oil management issues. Also, it was found that many European countries are providing encouragement and subsidies to the re-refining industry to enhance the recovery and re-generation of used oils into recycled products. It was found that from a long term perspective, the size at which the re-refining industry is economic is limited and that it has received financial subsidies of one form or another in many other countries. While oil prices are currently high, this alone is not sufficient to significantly improve the economics of oil re-refining. Rather, the primary determinant of used oil re-refining economics is the price differential between lubricant base oils and fuel oil. This differential factor tends to dampen the impact of the significant oil price run-up recently experienced. Nonetheless, pricing time lags do occasionally impact re-refining economics because lube base oil market prices generally tend to lag the market much more so than fuel oil prices. These time lags would alternatively favor either the burner or the re-refiner. Specifically, in a rising crude oil price market it would favor the used oil burners and in a falling market it would favor the oil re-refiners.

The waste management hierarchy detailed below is expressed in the waste management policy sections of the Resource Conservation and Recovery Act and Pollution Prevention Act. The "Considered Action Step" is the logical application of this hierarchy to used oil from the most preferred environmental option to the least preferred environmental option.

Resource Conservation Hierarchy

Waste Management Ranking (from Environmental Perspective)	**Option**	**Considered Action Step**
Most Preferable	Prevent the waste in the first place	Source reduction (e.g. extended oil drain intervals)
	Re-use and reclaim the product	Re-refine used oil
	Recover energy by burning	Combust used oil for heating value recovery*
Least Preferable	Dispose of the waste by land filling or incineration	Recover and collect used oil for proper disposal

*The environmental ranking of combusting used oil depends on the fuel that is displaced. Displacement of high environmental impact fuels like coal or petroleum coke would make combustion of used oil rank higher from an environmental perspective.

1.4 Stakeholders in the U.S. Used Oil Business

In this Sec. 1838 report, the key characteristics of the used oil business are identified from the perspective of the key stakeholders in its ongoing operation. Toward this end, a meeting sponsored by the DOE was conducted on November 2, 2005 to solicit input from various industry representatives including used oil re-refiners, used oil processors, used oil collectors and transporters, representatives of the used oil consuming groups, and quick lube and automotive dealers associations.

All group representatives expressed strong support for the collaborative approach to this activity. They also welcomed the opportunity to communicate their opinions on how to improve the effectiveness of used oil collection and re-use. Many of their suggestions were included in the development of the study methodology and final proposals.

A key issue has been the “do it yourself” (DIY) oil changers and their reluctance to recycle oils in a proper manner. It has been estimated that more than 80 percent of the used oil generated by the DIY activities ends up being disposed in an improper manner. However, one of the positive observations is that since 1996, the volume percentage of automobile oil changes that take place in the increasingly popular “do it for me” (DIFM) quick lube shops, garages, and auto dealerships has increased and that the volume percentage of DIY changes has decreased. This increase in DIFM oil change volumes would lead one to conclude that the annual volume of improperly disposed oil has decreased from 426 million gallons in 1996 to an estimated 348 million gallons in 2004. From the information that is available on the used oil recycling progress in individual states, it is believed that there have been improvements in the DIY oil changers behavior, but little authoritative data is available nationwide. All in all, this is a positive message and reflects the effective programs that have been implemented at the state

and local government levels plus the efforts of the quick lube shops, garages, auto dealerships, and used oil collectors/recyclers.

This report also expands on the role of the various stakeholders in the used oil business and seeks to identify the key business considerations that hinder the progress in achieving higher levels of recycling and re-refining of used oils. It was found that the major impediment to expanding lube oil re-refining is that capital investment in expanding capacity is not economic. Factors affecting decisions to expand re-refining include: investment costs required to design and construct new facilities, raw material supply reliability, raw material costs, and although becoming less of an issue with time, outlet and market acceptance for re-refined oil products.

1.5 Energy and Environmental Impacts

Due to the short turnaround required for this study, a new, detailed study was not feasible. One specific step that could be taken is to update prior key studies. Prior studies that focused on the key used oil management processes were analyzed in detail and conclusions drawn. These studies dealt with the various disposal mechanisms and the obstacles to recycle and regenerate used oils into usable products, such as fuels for combustion or new lube oil products.

The two key options for used oil recycling are:

- recovering the inherent heating value of used oils in a combustion process, and
- re-refining used oil to recover not only its inherent heating value, but also its unique chemical composition so it can be re-used in producing fresh lube oil products.

Currently, of the estimated 945 million gallons of recycled used oil each year, 83 percent is burned and 17 percent is re-refined. It was found that re-refining used oils saved 8.1 percent of the energy content of the used oil compared to combusting the oil for heating purposes. Transforming all used oil that is currently combusted into lube oil products could save 63 million gallons of fuel oil equivalent per year; a savings of $63 million annually at current fuel prices.

As noted earlier, significant new investment in added capacity is not economic . The studies do note, however, that future re-refining energy savings will likely increase as the motor oil formulations transition to the higher quality required for extended oil drain intervals. Achieving this higher quality will rely on use of increased volumes of non-conventional lube base oils that feature superior performance and allow for extended drain intervals. These non-conventional lubes include synthetics and other highly refined lube base oils and today they make less than 4 percent of the total U.S. supply. As an indicator of future growth, while overall lube demands are forecast to grow modestly, global non-conventional lube base oil demands are projected to grow faster, as much as 20 percent compounded average growth rate, according to one study. Non-conventional lubes include poly alpha olefins, hydrocracked and gas to liquids (GTL) base oils. So while the growth rate appears very high, it is from a very low base level. The primary demand factors that drive this growth rate include the demand for low viscosity and high viscosity index motor oils, new generation automatic transmissions fluids balanced with the forecast growing availability of hydrocracked and GTL base oils." This will enhance the quality of the recycled used oil pool and, in turn, will yield a higher-quality, more valuable re-refined oil product. Because these non-conventional oils consume significantly more energy compared to traditional lube base oils, the energy comparison

made with used oil burning noted above is conservative and will become more so with time.

While it is true that extended drain intervals will reduce the amount of oil available for recycling, it may not have a significant detrimental impact on the U.S. re-refining industry. For example the volume of used oil that is burned is more than four times the volume that is re-refined. More importantly, as extended oil drain intervals become more prevalent, it will significantly increase the incentive to re-refine as the quality of the used oil will improve simultaneously with the expected higher quality trend.

Many major automobile manufacturers believe this extended oil drain interval / high quality trend is good for the consumer and GM, among others, are featuring this change in newer models with appropriate warranty safeguards.

While significant new investment in re-refining capacity is not economic, in some cases the environmental benefits favor re-refining because the toxic heavy metals (zinc, cadmium, chromium, and lead, among others) are extracted from the used oil. Compared to combustion, the re-refining process separates heavy metal compounds which are then solidified and stabilized into solids, therefore posing minimal environmental risk. In the combustion process, the metals in the combustion flue gases must be treated with air pollution abatement equipment prior to release to the atmosphere. Combustion in cement kilns, steel mills, and other large-scale industrial combustion processes featuring state-of-the-art flue gas treatment are effective in addressing the environmental issues. On the other hand, combustion of used motor oils in space heaters do not provide for similar levels of pollutant reduction.

To achieve maximum energy conservation and environmental benefit, it is generally preferable to re-refine used oils into regenerated base oils that can be blended with additives to make finished lube oil products compared to combustion for heating value recovery. However, the environmental benefit of combusting used oil depends on the fuel that is displaced. Displacement of high environmental impact fuels like coal or petroleum coke would make combustion of used oil rank higher from an environmental perspective.

Finally, to supplement the energy and environmental impact of used oil management as noted above, a market-based value analysis demonstrates that lube base oils command a significant premium over conventional petroleum products. This value differential reveals a $332 million annual incentive to re-refine used oils instead of burning the used oil as a fuel. Recycling used oil only for its heating value is a sub-optimum disposition compared to re-refining it into lube base oil, the highest ultimate value disposition. However, as noted earlier, investment in expanded capacity for used oil re-refining is not economic, because the cost differential between burning and re-refining outweighs the value differential.

1.6 Existing Federal and State Legislation Dealing With Used Oils

A brief overview is provided to identify the extent to which the federal government has passed legislation that impacts the management of used oils to date. The federal legislation currently in effect defines the monitoring and control of used oils.

Of particular note, at the federal level, used oils are not classified as hazardous wastes reflecting policy decisions made 20 years ago. Specifically, on November 19, 1986, EPA issued a decision not to list recycled used oil as a hazardous waste material (51 FR

41900). The agency determined that used oil being recycled should not be listed as a hazardous waste under Resource Conservation and Recovery Act (RCRA). The EPA stated in the November 1986 decision that the agency intended to issue recycled used oil management standards and was conducting studies necessary to determine appropriate standards under § 3014 of RCRA and to determine whether used oil being disposed of should be listed as a RCRA hazardous waste, or regulated under other statutes. At that time, it was the agency's belief that the stigmatic effects associated with a hazardous waste listing might discourage the recycling of used oil[1], thereby resulting in increased disposal of used oil in uncontrolled manners. EPA stated that several residues, wastewaters, and sludges associated with the recycling of used oil may be evaluated to determine if a hazardous waste listing was necessary, even if used oil was not listed as a hazardous waste. EPA also outlined a plan that included making the determination whether to list used oil being disposed as hazardous waste and promulgation of special management standards for recycled oil.

Aside from these federal level issues, a review of the various state programs reveals the existence of some very effective statewide programs that cover a broad range of mechanisms that have been used to promote recycling at the local government level. Many states have developed proactive local programs for dealing with used oil management, but there is little consistency from state to state. Some states promote curbside pickup of used oils from DIY oil changers while others classify used oils as hazardous wastes and tax lube oil sales to fund collection programs. Some fund recycling initiatives from state treasuries and others require retail gas stations to accept DIY used oils. These statewide programs appear to be effective, and states are well-positioned to design a program to promote used oil recycling in their states.

Although it is tempting to adopt one common, consistent recycling program throughout the United States, there are potential pitfalls to consider. For example, it might be counterproductive to adopt one national policy if that requires abandoning some local/statewide programs, procedures, and investments that have been in place and successfully utilized over the years. Any new policy or program should be evaluated to analyze whether it has a detrimental impact on consumer habits. For example, a locality that features curbside pickup may experience negative consumer reaction if a new program is implemented that features reliance on new municipal recycling centers or drop off at retail outlets. It has taken a long time to establish consumer habits and care should be taken in changing those practices.

Information is also provided on the long-standing and effective federal executive orders currently in effect; these executive orders deal with promoting the use of lube oil products made from recycled oils.

1.7 Reusing a Valuable Resource

The following is extracted from a December 1994 EPA report entitled “Managing Used Motor Oil.” Since its publication over 10 years ago, there have been no substantive studies or updates on this subject, and little has changed to alter the observations and conclusions of their in depth study.

> “Used oil is a valuable resource because it has lubrication value and heat value. Although motor oil becomes contaminated during use with materials that reduce

[1] Hazardous Waste Management System; Identification and Listing of Hazardous Waste; Recycled Used Oil Management Standards (57FR41566), September 10, 1992

its ability to adequately lubricate engine parts, it still maintains its basic lubricating properties. When specially treated to remove contaminants, the used oil can be used as a base stock (or a raw material called base oil) to produce new lubricating oil. This keeps the lubricating value of the used oil from being wasted. In addition, reusing the used oil as a base stock for lubricating oil saves the virgin oil that would otherwise be used as the lubricating oil base stock."

1.8 Specific Steps That Could be Taken to Improve Collections and Increase Re-refining and Other Beneficial Re-use of Used Oils

The key steps that could be taken relate to achieving two key objectives:

- increase the effectiveness of used oil recovery programs to minimize the potential for disposal of used oils into landfills or other improper outlets, and
- increase the volume of used oil available for re-refining since this process offers the maximum energy conservation and environmental benefits.

All of the suggestions were evaluated on how well they achieved the stated objectives, the impact on consumers, and cost effectiveness. Most of the proposals were discussed in the stakeholders meeting mentioned previously.

The following key steps that could be taken relate to the following broad areas:

1.8.1 Utilize Information Exchange Processes to Encourage Progress on Used Oil Management and Recycling

In order to stimulate further progress in the area of used oil recycling and key issues dealing with used oil management, consider conducting an information exchange activity among all state personnel and industry stakeholders involved in used oil management.

The broad objective is to allow states that do not have active recycling programs to benefit from the experiences of those that have well established and successful programs. Additionally, an industry technical group could focus on the energy and environmental aspects of used oil management. This activity could seek to identify the best practices and guidelines for states to follow, including funding mechanisms and how best to address updating the key energy and environmental studies.

Another key objective of the program is to consider more focus on rural and farming communities. It appears that the high density population areas already have effective recycling programs in place, reflecting ready availability of used oils for collection and close proximity to recycling centers. Industrial oil recycling is also adequately addressed with most existing programs due to industry obligations to comply with pollution regulations and severe penalties for non-compliance. However, history has indicated that enforcement continues to be a challenge considering the size and diversity of the used oil industry. On the other hand, cost conscious DIY consumers in the rural and farming communities offer the highest growth potential for recovering additional volumes of used oils. Thus, increasing the recovery of DIY oil is an important factor in making substantial progress in used oil recycling.

It is also important to ensure that effective public awareness and education programs are implemented to communicate the benefits of recycling used oils, particularly to the cost conscious DIY consumer. Depending on local factors, special consideration could

also be given to non-English speaking ethnic groups, if necessary. EPA's Hispanic Used Oil Recycling program can be used as an excellent model for that effort.

1.8.2 Encourage States to Adopt Used Oil Management System Standards

Pursuant to Section 3006 of RCRA, encourage those states that have not yet adopted the Used Oil Management Standards in 40 CFR Part 279 to do so.

1.8.3 Space Heaters

For those geographic areas not attaining the National Ambient Air Quality Standards (NAAQS) ($PM_{-2.5}$ and PM_{-10}), consider reassessment of used oil-fired space heaters. The reassessment could include estimating the number of units and quantifying hazardous air pollutant emissions from those units. The purpose of this assessment is to establish the impact of these combustion units on non-attainment of NAAQS.

For those states that offer state tax incentives to small businesses to buy space heaters, suggest that surveys be conducted to confirm whether the current results of those programs justify the costs involved. It is possible that the state would be better served by channeling those public funds into expansion of collection centers and financing recycling efforts as opposed to subsidizing space heaters.

1.9 Comments on Emerging Trends

1.9.1 Impact of Bio-based Lube Products

Although this subject was not included within the technical scope of the EPAct 2005 legislation, some comments on this subject are appropriate considering the numerous projects currently being pursued involving renewable energy sources. Biobased oils include lubricating oil products that are made from soy, corn, castor, rapeseed, canola, and cottonseed oil among others. While there are many promising initiatives underway to develop specific uses for biobased oils, little authoritative data is available that would help quantify the expected impact for the foreseeable future. Therefore, at this time it is premature to draw strong conclusions regarding the impact of biobased lubricants on the used oil market and the re-refining industry or recommendations on how best to address them.

However, the following are important points that need to be taken into consideration in moving forward on biobased lubricants.

1. There are generally two broad groups of lubricants that are candidates for substitution with biobased lubes: industrial oils (including greases) and motor oils.

   a) Industrial oils are products that generally contain small amounts of additives (normally less than 5 percent) and generally have less demanding operating environments compared to motor oils. These include products like hydraulic oils, metal working fluids, gear oils, and general utility greases. These products appear to be logical candidates for biobased oils substitution. Using biobased oils would help reduce dependence on foreign oil and potentially provide a biodegradable oil product that is more environmentally friendly compared to petroleum base

oils. In fact, much promising progress has been noted in this area already, both in the United States and in Europe.

b) Motor oils on the other hand, are much more technologically advanced oils that require significant amounts (i.e., 20–25 percent) of complex chemical additives to impart the desired performance characteristics demanded by today's automobiles. Compared to industrial oils, the operating environment is more severe in terms of temperature, exposure to combustion gases, water, soot, and the need to demonstrate performance characteristics over a wider range of temperatures including starting in extreme cold climatic conditions. The high temperature operating condition in most motor oil crankcases leads to oxidation stability quality being one of the key characteristics that can present challenges to biobased motor oil formulations. The magnitude and makeup of these additives which include heavy metal zinc compounds, suggest that the biodegradability of used motor oil cannot be assured. Also, the complex additive technology has taken years to evolve and it would be prudent to assume that its replacement will take sizeable technology advances over time to develop the new product formulations and to certify the products. Another key consideration with motor oils is that automobile manufacturers need to be convinced that any new biobased oils will perform in their vehicles as intended so that the warranties can be maintained. Therefore, while biobased lubes are promising possible candidates for petroleum base oils in motor oil formulations, it is premature to draw strong conclusions on a market penetration schedule.

2. In 2004, motor oil demand amounted to 1.04 billion gallons, or about 42 percent of the total annual lube product demand. While efforts to progress biobased lube oils into the marketplace are worthy of the accelerated programs currently underway, it is premature to suggest that petroleum based lube oils are going to disappear in the very near future. Thus, used oil management programs and re-refining will likely continue to be areas where environmental and energy benefits can be achieved.

1.9.2 Possible Limitations on the Re-use of Re-refined oils in Motor Oil Blends

The lubricants industry (both virgin lube refining and used oil re-refining) have faced a series of quality initiatives during the last five to ten years driven primarily by fuel economy and the desire to maintain efficient lubrication at the beginning and at the end of a motor oil application cycle. The trend toward smaller engines that operate at higher engine revolutions per minute also contribute to the need for better motor oil quality. These quality requirements have been met by a variety of investments to produce enhanced quality base oils but also by the judicious application of performance related additive packages. The recent quality transition from International Lubricant Standard Approval Committee (ILSAC) GF3 designation (in 2000) to ILSAC GF4 (in 2005) and ILSAC GF5 (expected in 2009-2010) is a good example of this quality trend. Among other factors, these trends have sought to increase the level of saturates and decrease the volatility both of which lead to superior quality oils that support extended oil drain intervals.

There are two key marketing and commercial factors that need to be taken into consideration in addressing this concern about the possible limited outlet for re-refined oils.

1. As higher quality motor oils become more popular in the market, so too will the quality of used oils improve. The quality of used oils is not stagnant and it improves along with the original product itself. This directionally enhances the re-refiners ability to manufacture the higher quality base oils. Also, from an economic point of view, as the quality of used oil and re-refined oil increases, the re-refining economic operating margins will also improve. The quality trends noted above do not have any significant impact on the economics of used oil combustion or the market price of untreated used oil, which are determined by the heating value of the used oil and not motor oil quality considerations. This improved margin will motivate the re-refiner to provide the highest quality product possible to the market and also serve to support the necessary investments.

2. The use of re-refined used oils is not solely limited to motor oil applications. They can be used in any of several thousand different formulations of lubricating oil products ranging from motor oils and automotive transmission fluids (which is the next largest volume demand component) but also to industrial oils, which include hydraulic oils, metal working fluids, marine lubricants, compressor oils, heat transfer oils, process oils, and greases. Also, motor oils are comprised of many quality grades, just as there are many different types of engines and different levels of quality requirements. Over time, the quality trends will continue to improve but there will likely always be a wide range of quality requirements that will be candidates for blending with re-refined oils.

2 Worldwide Lube Oil Demand

Worldwide demand for lube oil products are shown in Table 1, which illustrates that the United States has nearly 25 percent of total worldwide demand and its per capita lube oil demands far exceed other regions. Two factors drive this latter observation: a) the United States was 21.3 percent of the total world GNP[2] in 2002, and b) the much higher per capita and widespread use of the automobile in the United States compared to other regions. Western Europe also has a high level of industrial activity but this region is much less dependent on personal automobiles due to the mass transit infrastructure.

Table 1: 2002 Total Lubricants Demand by Region[3]

Region	Demand, Billion (Gallons/Year)	Per Capita Demand (Gallons/Year) *
United States	2.5	8.4
Latin America	0.8	1.8
Western Europe	1.4	3.7
Central/Eastern Europe	1.4	3.2
Near/Middle East	.5	3.1
Africa	.5	0.7
Asia-Pacific/Oceania	3.2	0.9–5.3**
Total	10.3	1.7

* Per capita data based on 2001 statistics; marine lube oils excluded.
** Wide range of demand in Asia Pacific area with Japan/Australia demand on high end of range.

The relative importance of the automobile is demonstrated in Table 2, which breaks down the various key elements of demand in the United States[4]. This tabulation shows that the demand for automotive lube oil products is nearly 60 percent of the total lube oil demand.

[2] U. S. DOE International Energy Outlook 2005, Table A3., July 2005; GNP calculated on a purchasing power parity (PPP) basis.
[3] "Improving Markets for Waste Oils" David Fitzsimmons, Oakdene Hollins LTD, Organization for Economic Cooperation and Development, September 26, 2005 page 47, Working Group on Waste Prevention and Recycling; http://www.oecd.org/dataoecd/14/9/35438706.pdf.
[4] "2004 Report on U.S. Lubricating Oil & Wax Sales" by the National Petrochemical & Refiners Association, November 2005, page 3.

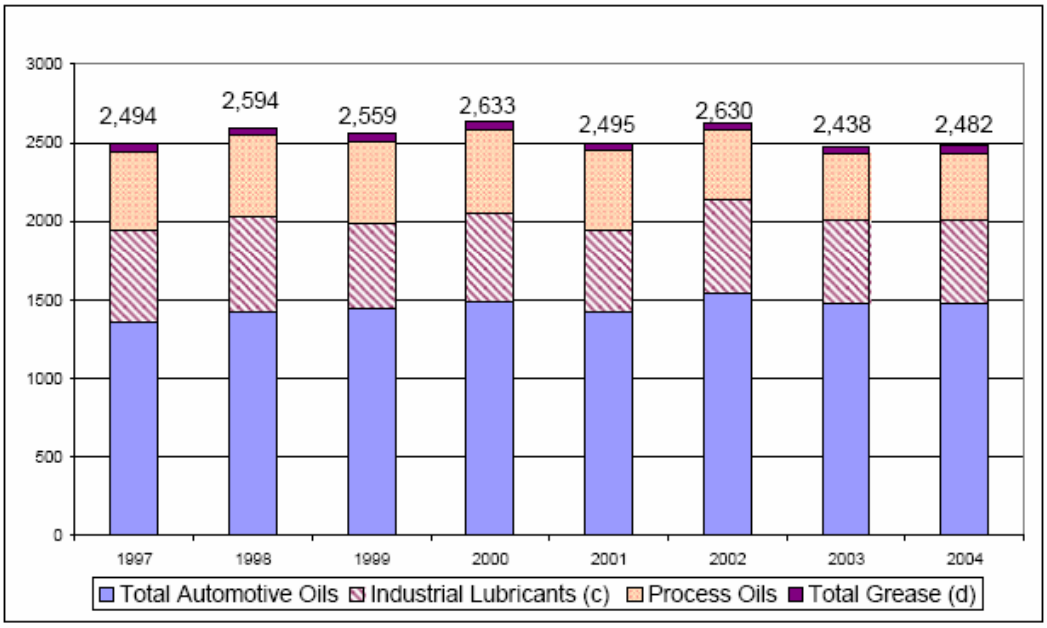
Table 2: U.S. Lube Oil Demand by Type

Lube Oil Type	Demand (Billion Gallons/Year)	Typical Applications
Automotive Fluids	1.48	Motor oils, automatic transmission fluids, and gear oils.
Industrial Oils	0.53	Hydraulic, turbine, and gear oils, heavy duty equipment and metal working fluids.
Process Oils	0.43	Rubber, transformer, white and agricultural spray oils.
Grease	0.05	Automotive and industrial.
Total	2.49	

Source: "2004 Report on U.S. Lubricating Oil & Wax Sales" by the National Petrochemical & Refiners Association, November 2005, page 8.

Figure 1 shows that total United States demand for lube oils has been relatively flat from 1997 through 2004. Although many factors are involved, in the case of automotive fluids increases in the number of registered automobiles is somewhat offset by the longer drain intervals, some of which is due to longer life synthetic motor oils.

Figure 1: Total Reported Sales of U.S. Lubricants 1997–2004



(a) "Total Reported" U.S. sales volume is dependent upon the population of reporters, which varies from year-to-year.
(b) Excludes Aromatic Oils & Wax.
(c) Includes General Industrial Oils, Industrial Engine Oils, and Metalworking Oils.
(d) Reported in gallons. Conversion factor from pounds to gallons: Grease (7.5 lbs. = 1 gal.)

Source: "2004 Report on U.S. Lubricating Oil & Wax Sales" by the National Petrochemical & Refiners Association, November 2005, page 8.

3 Worldwide Used Oil Management Practices

Although the United States represents the highest per-capita lube oil consumption in the world, the focus on re-refining used oil is less than in most other industrialized countries. The major countries in Europe, on the other hand, have active programs designed to increase the recovery of lube oils and some promote re-refining as the ultimate step in recycling. Based on percent of lube sales, Europe has approximately three times as much used oil re-refining capacity as the United States[5].

A summary of the used lube oil recycling efforts in the other countries is briefly summarized in Table 3. One conclusion is obvious from this summary — there is no commonly accepted best method for recycling of used oils and optimum disposition for recovered oils. Even in a region as closely linked as Europe, there are divergent policies whereby some countries subsidize the re-refining industry and others subsidize the sale of used oils for combustion purposes[6]. Although all agree on the broad merits and objectives of used oil recycling programs, it is clear that there are many paths for achieving those goals.

[5] European Industry Statistics. Groupement Européen de l'Industrie de la Régénération, (GEIR) Website: http://www.geir-regeneration.org/en/about_geir

[6] "Europe Weighs Its Waste Oil Options" by John Taylor, March 2005, pages 14 - 18, Lubes'N'Greases, LNG Publishing Co, www.lngpublishing.com

Table 3: Features of Used Oil Management Programs in Selected Countries

Country	Features of Used Oil Management Programs
France[7]	78% collection of used oils; government-funded programs and fees are imposed on virgin lubes producers; 42% of used oil is re-refined by government directed re-refining associations.
Germany[8]	94% recovered; high level of consumer interest in recycling, all used oils treated as hazardous waste; all oil marketers must provide collection facility near the retail establishment; retailers pay for used oil pick up; 41% of used motor oils are re-refined; 35% burned in cement kilns; and 24% processed and burned in other applications; recovering 48% of total lube oils sold.
Japan [9]	No national level recycling program; no subsidies/funding; essentially no DIY market in Japan; high percentage of used motor oil is recovered, treated, and burned for heating value; re-refining is very limited.
Italy[10]	Mandated use of re-refined oils in motor oils; six operating re-refining plants; funded by lube oil sales taxes; collectors and re-refiners both subsidized; only 10% of used oil can be directed to cement kilns, 18% of used oil is re-refined; government mandated used oil products with re-refined oil content for government uses; collecting 33% of total lubes sold.
Australia [11]	High subsidies for re-refining, low subsidies for low grade burning oils; none for reclaimed industrial oils; collecting 81% of available oil; $10M Australian funded by government to subsidize recycling; revising re-refining incentive downward; collecting 38% of total lube sold.
Alberta, Canada[12]	Focus on increasing collections; little emphasis on avoiding contamination; little emphasis on re-refining; funded by sales tax; recovering 51% of total lube oil sold.
United States	States have implemented a broad range of recycling programs; some states impose sales taxes to subsidize collections, some states classify used oil as hazardous waste to discourage illegal dumping, some local municipalities fund collection activities; signs of quick lube facilities growth which has produced positive results by reducing oil improperly disposed of by DIY oil changers; small re-refining industry; disposition of used oil as a fuel encouraged; the United States has no central coordinating body that focuses on used oil management similar to Europe, therefore industry statistics are not readily available. The U.S. does have a mandatory federal policy requiring the preferential purchase of re-refined oil and does promote the source reduction and recycling of materials over their treatment (including burning as a fuel) and disposal under the Resource Conservation and Recovery Act and the Pollution Prevention Act.

3.1 Observations on Worldwide Used Oil Programs

One of the major conclusions from this country-by-country analysis is that it is clear that the used oil management programs have evolved quite differently and that no standard or “best practice” exists. Some considerations include:

- It appears that used oil management programs in different countries have largely evolved based on different perceptions of the local governments and consumers as to what the problem is and how best to collect and manage used oil.
- Burning used oil has become the most prevalent practice due to the low price of those oils compared to fresh oils and most objectionable qualities can be corrected at relatively low cost (dewatering, filtration, etc.)

[7] “Study of Used Motor Oil Recycling in Eleven Selected Countries” by the Used Oil Working Group November 1997, API.
[8] Ibid
[9] Ibid
[10] “Improving Market for Waste Oils” by David Fitzsimons, Oakdene Hollins LTD, page 57.
[11] Ibid
[12] Ibid

- It appears that consumers are becoming more environmentally conscious and are increasingly more reluctant to dispose of used motor oil in non-environmentally friendly ways, so the magnitude of the environmental issue is lessened. However, special attention may be necessary in dealing with the very cost conscious consumer segment that may not be aware of the serious environmental consequences of improper disposal of used oils.
- In some instances, re-refining business groups have prevailed on governments to support re-refining activities globally. In many cases, governments provide a combination of incentives and penalties that encourage re-refining, as noted in Table 3.
- The acceptance of re-refined oils in the marketplace is improving. When re-refined oils were first used in motor oils, industry used warning labeling to indicate that the product contained recycled oils. That practice no longer exists and re-refined oils can be used in motor oils as long as they meet the stringent industry certification requirements. In the United States, government procurement programs give preference to re-refined oils aimed at demonstrating that these products are technically and commercially viable. These programs are very effective in improving consumer acceptance.
- Government taxing levies also have a substantial impact on used oil management; for example in the United Kingdom (UK), the total exemption of waste oil burning as a fuel makes waste oil very attractive for combustion processes and this is the reason that the UK imports large quantities of waste oil from other EU countries and creates a shortage of raw material for re-refiners[13]. This is one distinguishing feature of the UK market compared to most other countries in Europe. Another study[14] concluded that this tax exemption was worth about 15 percent of the delivered product prices (in 2002/2003) and that it favored recovered fuel oil to the extent that the UK is importing 100,000 tons (approximately 25 million gallons in 2001) of waste oils from Europe and elsewhere.
- Recent European Commission activities relating to used oil management shows that the subject of used oil management continues to be a controversial issue with many varied opinions. Of particular note, environmental restrictions on used oil combustion are becoming more restrictive.
    - In 2005 more stringent controls were placed on the combustion of used oils due to continuing concerns over air pollution impacts. There is concern that this could reduce collection rates and increased discarding of used oils[15].
    - Similarly, it has also been observed[16] that “rules on burning waste oil as a fuel change on December 28 (2005) in order to tighten controls on emissions from the process under Europe’s Waste Incineration Directive”. Waste producers are being warned it is “unlikely” that current users of waste oil will

[13] “Critical Review of Existing Studies and Life Cycle Analysis on the Regeneration and Incineration of Waste Oils” by Taylor Nelson Sofres, S.A. December 2001, page 10.
[14] “Working Group on Waste Prevention and Recycling” published by the Organization for Economic Cooperation and Development, Environment Policy Committee, Sept 26, 2005, page 58.
[15] Europia (European Petroleum Industry Association) position paper on European Waste Oil Directives, 2005, page 7.
[16] “Waste Oil Market in England Poised for ‘Dramatic Change’ in 2006”; Liquid Recycling Newsletter Jan/Feb 2006, January 2006; NORANEWS.org, page 4.

meet these new standards, and that the market for waste oil will therefore shift radically. New outlets for the material are likely to include the steel industry and cement kiln burning. . Among other issues, this recent action appears to have the potential to limit combustion of used oils in roadstone asphalt coating plants in the UK [17].

- Also in December of 2005, the European Commission published a *proposal* for a Thematic Strategy on the prevention and recycling of waste and associated legislative proposals. The latter includes a revision of the Waste Framework Directive (WFD) (Council Directive 75/442/EEC as amended). In this European Commission document the priority to re-refining has been removed. It notes that "Recent analysis, using the life-cycle approach, has shown that the priority given to regeneration of waste oils over use as a fuel is not justified by any clear environmental advantage"[18].

- On the other hand, one experienced industry observer has commented that this directive could well serve to motivate the re-refining industry due to the expected reduced market price for used oils and resulting improved margins for used oil re-refining[19]

[17] www.environment-agency.gov.uk/ commondata/acrobat/waste_**oil**_1294309.pdf -
[18] Jeffrey Conklin, Shell Oil, personal correspondence, February 2006.
[19] David Fitzsimons, Oakdene Hollins LTD, personal correspondence, February 2006.

4 Used Oil Business Stakeholders

This section summarizes the characteristics of the various segments of the used oil business which include:

- Generators
- Collectors/Transporters
- Processors
- Re-refiners
- Used Oil Burners

The used oil industry (including the refiners, burners, collectors, re-refiners, and regulators) has played a very important part in developing a productive recycling program for used oil and, in so doing, created an active, open and free market for what used to be referred to as a true waste product. In addition, generators of used oil including garages, vehicle dealerships, quick lube change installations and municipal collection activities have also played an important part in encouraging DIY oil changers to recycle their used oils.

Key elements of that market development include investments in terminalling, re-refining and processing used oils, operation of trucking and collection and distribution centers for used oils, and all of the administrative and operating personnel required to support the industry.

The used oil industry provides a very useful and productive function in the management of used oils and other automotive products including used oil filters, antifreeze, brake fluids, and other fluids. Also, the end users of used oils have innovatively adapted their equipment and processes to accept used oil as a fuel and to produce lube oil through the re-refining process.

Without development of the used oil market, improper used oil disposal would be a more serious problem. It is also interesting to note that several of the industry representatives have commented that used oil value has evolved to such an extent that theft of used oil is not uncommon.

These are discussed in further detail in the Appendix.

4.1 DIY and DIFM Consumers

Motor oil is the most significant concern from a recycling point of view. Generators are those entities that create used oil. Although the DIY consumer has been the most significant element of this market, recent studies have shown that the DIFM consumers are steadily increasing in popularity. From an environmental point of view, the DIY activity presents the most risk because historically they recycle less of their used oil and, in many cases, dispose of it in landfills or other improper ways. Studies have shown that convenience of recycling facilities and consumer awareness are the most important factors impacting recycling of used oils. DIFM operations have expanded because of the cost effective service and convenience that they offer consumers in terms of automobile maintenance and avoiding difficulties in disposing of their own used oil. This segment has been growing rapidly and has surpassed the DIY in terms of volume handled over the last 10 years. DIFM operators are very responsible in their handling and recycling of

used oils. Their percentage of the DIFM oil change volume has grown from 40 percent in 1995 to 55 percent in 2004.

4.2 Collectors / Transporters

Collectors act as transporters and middlemen between the generators and the end consumers of used oils. They perform a service for the industry and their business is very competitive. The major factors impacting the collectors' profit margins are the pickup volumes collected and the distances to the end user. As the parcel volumes diminish and as the distances increase, their ability to maintain a profit margin erodes. Both re-refiners and processors also act as collectors, and thus there is competition between the end users of the recycled oil, those that seek to combust the oil for its heating value (the burners) and the "re-refiners" or "processors," who seek to regenerate the used oil into clean fresh base oils similar in quality to virgin base oils.

4.3 Used Oil Processors

There are several types of used oil processors that are largely defined by the end market that they serve[20]. The processing technology employed is less intensive compared to re-refiners, which is discussed later. The used oil processors can produce a broad range of products from industrial fuels to regenerated base oils that can be used as industrial lubricating oils. This latter option depends upon having used oil feedstock that is predominantly used industrial oils. If the used oil feedstock contains high levels of motor oils then re-refining is required to regenerate base oils. The processing required for these end users focuses on removing the bulk contaminants from the used oil and typically involves, dewatering; filtering; chemical treatment; and in some instances heavy end (asphalt) removal. The desired end market and the fuel specifications thereof determine the type and degree of processing undertaken.

These used oil processors serve a wide range of end user markets and utilize both used motor oils and industrial oils as feedstock into the process. Some used oil processors mildly treat the used oil to create industrial burner fuel. Hot mix asphalt plants, for example, are the largest consumers of used oil burner fuel in the United States. Similar processes are used to manufacture a wide range of industrial fuels for large scale operations like steel mills, cement kilns, and utility boilers.

Other used oil processors focus on treating used industrial lubricating oils to produce industrial fuels and/or regenerated industrial lube oils that can be re-used as lubricants. Some of these processors link their facilities to their industrial customers and have evolved innovative techniques to allow them to recycle used oils almost indefinitely.

Finally, some used oil processors more intensively treat used lubricating oils to produce a fuel that can be blended and burned as a off road transportation diesel fuel or sold to a refinery as a catalytic cracking unit feedstock. In many cases this can involve distillation of the used oil to separate out the heavy boiling components.

4.4 Used Oil Re-refiners

Although used oil processors can produce regenerated base oils in their facilities from feedstocks that contain low levels of motor oils, re-refiners can accommodate much higher levels of motor oil in their feedstock because they utilize a more severe manufacturing process. The impact of motor oil additives is the key consideration that drives processing severity. Motor oil additives can make up 20 to 25 percent of the total

[20] Martin MacDonald, PetroTex Hydrocarbons, personal correspondence, February 2006.

motor oil composition, whereas industrial oils contain much lower concentrations of additives (in range of 2 to 5 percent). The more intense processes include vacuum distillation and hydrogenation or clay treatment to remove contaminants. The re-refining facility is expensive to design and construct and more expensive to operate. Also, compared to European countries, the United States has a small re-refining industry on a percent of lube oil sales basis.

The recent trend of motor oil quality improvements is expected to continue and poses unique challenges for used oil re-refiners, as discussed below.

The lubricants industry (both virgin lube refining and used oil re-refining) have faced a series of quality initiatives during the last five to ten years driven primarily by fuel economy and the desire to maintain efficient lubrication at the beginning and at the end of a motor oil application cycle. The trend toward smaller engines that operate at higher engine revolutions per minute also contribute to the need for better motor oil quality. These quality requirements have been met by a variety of investments to produce enhanced quality base oils but also by the judicious application of performance related additive packages. The recent quality transition from International Lubricant Standard Approval Committee (ILSAC) GF3 designation (in 2000) to ILSAC GF4 (in 2005) and ILSAC GF5 (expected in 2009-2010) is a good example of this quality trend. Among other factors, these trends have sought to increase the level of saturates and decrease the volatility both of which lead to superior quality oils that support extended oil drain intervals.

There are two key marketing and commercial factors that need to be taken into consideration in addressing this concern about the possible limited outlet for re-refined oils.

1. As higher quality motor oils become more popular in the market, so too will the quality of used oils improve. The quality of used oils is not stagnant and it improves along with the original product itself. This directionally enhances the re-refiners ability to manufacture the higher quality base oils. Also, from an economic point of view, as the quality of used oil and re-refined oil increases, the re-refining economic operating margins will also improve. The quality trends noted above do not have any significant impact on the economics of used oil combustion or the market price of untreated used oil, which are determined by the heating value of the used oil and not motor oil quality considerations. This improved margin will motivate the re-refiner to provide the highest quality product possible to the market and also serve to support the necessary investments.

2. The use of re-refined used oils is not solely limited to motor oil applications. They can be used in any of several thousand different formulations of lubricating oil products ranging from motor oils and automotive transmission fluids (which is the next largest volume demand component) but also to industrial oils, which include hydraulic oils, metal working fluids, marine lubricants, compressor oils, heat transfer oils, process oils, and greases. Also, motor oils are comprised of many quality grades, just as there are many different types of engines and different levels of quality requirements. Over time, the quality trends will continue to improve but there will likely always be a wide range of quality requirements that will be candidates for blending with re-refined oils.

4.5 Used Oil Burners

Used oil burners are one of the key end users of recycled oils and they supplement their base load gas or liquid fuel supplies with recycled oils to lower their operating costs. Used oils are discounted compared to virgin liquid fuels or natural gas on a heating value parity basis reflecting the quality considerations of the fuels in question. These factors lead to a range of discount of 25–35 percent from No. 6 fuel oil[21]. The range reflects normal market factors, distances from source, and quality considerations. Many burners maximize used oil combustion up to physical or environmental limits. The burners compete with re-refiners for access to low cost used oils.

4.6 Appendices

The appendices include detailed information on pertinent aspects of the used oil business. Aside from elaborating on the roles of the various segments in the used oil business, the appendices also document industry statistics from both the United States and Europe, helpful guides in managing transportation aspects of used oils, and the full executive orders that deal with used oil management.

- Appendix 9.1 provides further details on the stakeholders and provides a simplified flowchart showing the key used oil flows and the interrelationships in the used oil industry and how used oil moves from source to final disposition.
- Appendix 9.2 expands on the type of process typically used in oil re-refining.
- Appendix 9.3 tabulates operating re-refiners and processors and some key specifics on their operation.
- Appendix 9.4 presents some specific data on the European used oil market statistics, re-refining plant locations, and capacities and typical base oil qualities produced.
- Appendix 9.5 provides information on the Automotive Oil Change Association Green Recycler Program.
- Appendix 9.6 presents the Executive Orders Dealing with Used Oils.
- Appendix 9.7 presents an example of State Legislation dealing with Used Oil Management (from the State of California).
- Appendix 9.8 - Highlights of Key Federal Statutes and Regulations That Relate to Management of Used Oil

[21] "An Examination of Used Oil Gathering and Re-refining" by PetroTex Hydrocarbons, November 2005.

5 Analysis of Used Oil Disposition

Table 4 presents a combined tabulation of the major used oil dispositions based on two prior studies during 1995-1996. Although the information presented is dated, as noted in Figure 1 on page 2-2, total lube oil demands have been relatively flat, so many of the observations are still valid. One of the specific steps that could be taken as an outcome of this report is to conduct a thorough and comprehensive update of the used oil industry major flows to validate the key assumptions. The tabulation serves to highlight the impact of the DIY consumer and his or her role in generating improperly disposed used oil, as well as the other major outlets for used oil in the burner industries.

Table 4: Used Oil Disposition, Billion Gallons/Year (1995 data)

Item	Billion Gallons per Year	Comment
Total Annual Demand (1)	2.363	60% automotive oils
Consumed in operation	0.992	Unavailable for recovery (Note 2)
Balance Available for Recovery	1.371	58% of total demand
1. Estimate of Oil Volume Actually Recovered	0.945	69% of available *
Combusted	*0.780*	See below (Table 5)
Re-refined	*0.165*	12% of available
2. Improperly disposed of (balance)	0.426	31% of available
From DIY	*0.297*	Only 16% of total volume is recycled
Non motor oil	*0.129*	

(1) Includes all motor oils, industrial oils, process oils, and greases.
(2) Includes "top up" oil consumption which replaces burned oil or oil that has been consumed internally within the automobile engine.

Sources: a) "Assessment of Opportunities to Increase the Recovery and Recycling of Waste Oil" by D.J. Graziano and E. J. Daniels; Department of Energy Argonne National Laboratory August 1995, page 9 and b) API Used Motor Oil Collection and Recycling 1997 draft report; http: www.recycleoil.org/usedoilflow.htm

Almost 42 percent of the total lube oil consumption, or 0.992 billion gallons of lube oils annually, are consumed in operation representing numerous types of applications where recovery is not possible or practical. These are detailed in the Appendix, Section 9.1.9 Used Oil Consumed in Operation.

As noted, of the used oil that is currently recovered (0.945 billion gallons), the vast majority is burned as a fuel (0.780 billion gallons) in various processes and only a relatively small percentage (17 percent) is re-refined, amounting to approximately 0.165 billion gallons per year. Of the 0.780 billion gallons of used oil that is consumed annually in combustion processes, the disposition is further broken down in Table 5 along with the typical type of air pollution controls (APC) that are used in the subject combustion processes.

Table 5: Used Oil Combustion Mechanisms[22]

Combustion Type	Annual Volume, billion gallons	APC Comments
Asphalt Plants	0.286	Hot Mix Plants fitted with Baghouses
Space Heaters	0.113	No APC equipment
Industrial Boilers	0.093	Equipped with APC Equipment
Utility Boilers	0.080	Equipped with APC Equipment
Steel Mills	0.080	Equipped with APC Equipment
Cement Kilns	0.033	Equipped with APC Equipment
Others	0.095	Equipped with APC equipment; Includes: marine boilers, pulp & paper mills, commercial boilers
Total	0.780	

This tabulation highlights the fact that most of the used oil combustion processes are fitted with APC equipment. The largest single application of used oil combustion is in asphalt hot mix plants where the combustion gases have intimate contact with the product where pollutants are partially absorbed.

Space heaters are not equipped with APCs but have special allowances for burning used oils that will be discussed in further detail later.

5.1 DIY / DIFM Volume Trends Update

Regarding the data presented in Table 4, the only major new information that is available today relates to two factors:

1. There has been a sizeable shift in sales volume from the DIY oil change activity to the DIFM activity since 1997 (specifically, in 1997 the volume of oil changed through the DIY channel was 60 percent of the total, where as by 2005 this had reduced to 45 percent), and
2. Industry analysts indicate that virtually all of the used oil generated in DIFM operations is now recycled, whereas in the 1997 study, 66 percent was assumed to be recovered and collected. It is possible that some may have been accounted for as internally consumed in space heaters.

Incorporating these two factors, and assuming that the DIY consumer continues to dispose of his oil improperly in a similar manner to 1997, the estimate of improperly disposed of volumes of used oil has been updated as shown in Table 6. It is possible that the DIY consumer has changed his practices and recycles more of his oil than in 1997 but there are no hard statistics to support that at a national level.

[22] American Petroleum Institute “Used Motor Oil Collection and Recycling”, 1996 Study volumes extrapolated to coincide with DOE annual volume estimates.

Table 6: Improperly Disposed of Used Oil Volumes
Billion Gallons/Year

	1995[23]		2004[24]	
Sales Channel	**Billion gallons/Year**	**DIY/DIFM % of Total Sales**	**Billion Gallons/Year**	**DIY/DIFM % of Total Sales**
DIY	0.297	60	0.219	45
DIFM	0.0	40	0[25]	55
Other Used Oils	0.129	n/a	0.129	n/a
Total	0.426	n/a	0.348	n/a

This summary indicates a significant reduction in the estimated volume that is disposed of improperly down from 426 million gallons in 1995 to 348 million gallons in 2004 (an 18 percent reduction). This reduction is driven solely by the increase in DIFM oil change volumes. Therefore it takes a worst case assumption that DIY oil changers continue to dispose of oil improperly at rates similar to 1997. Although some states believe their DIY collection programs are working effectively, quantification of those improvements is complicated by the fact that there are no central coordinating bodies that monitor progress on a nationwide level.

[23] American Petroleum Institute Web site: http://www.recycleoil.org/backup/About_us.htm.
[24] Kline and Company "Opportunities In Lubricants, North America" – Volume II-Consumer Automotive, 2004.
[25] Automotive Oil Change Association discussions, November 2005.

6 Government Role in Used Oil Management

This section summarizes the scope of the federal and state programs that deal with used oils. Some specific features of the state programs are noted to provide an example of the wide ranging regulations that have been implemented.

6.1 Federal Programs

6.1.1 Federal Environmental Regulations Dealing With Used Oil

The primary federal level regulation that applies to used oil has been enacted by the U.S. Environmental Protection Agency (EPA) as established in 40 CFR part 279, to control the management of used oil destined for recycling. The regulations in 40 CFR part 279 establish, among other things, streamlined procedures for notification, testing, labeling, and record keeping. They also establish a flexible self-implementing approach for tracking offsite shipments that allow used oil handlers to use standard business practices (e.g., invoices, bill of lading). In addition, part 279 sets standards for the prevention and cleanup of releases to the environment during storage and transit.

EPA believes these requirements establish a structure designed to minimize potential mismanagement of used oils, while not discouraging recycling. Used oils that are recycled are not classified as hazardous wastes primarily because of the possibility that such characterization might discourage or hinder recycling practices. However, used oils containing polychlorinated byphenyls (PCBs) are subject to the Toxic Substances Control Act.

The regulations allow for recycling and burning used oils for heating purposes as long as the volume is limited to self generation activities, but prohibits combustion in heating systems in excess of 500,000 Btu/hr or collections of used oil from others for the purpose of space heating on the basis that the volumes can increase to the point where they become environmentally significant. Mines, military installations, and service station garages where space heaters can be used are examples of where these regulations would be most applicable. The objective was not to impose a significant burden on small garage/mine operators who have long standing practices of utilizing used oil as an economical heating fuel.

Appendix 9.8 further details the highlights of key federal statutes and regulations dealing with used oil management including:

- Resource Conservation and Recovery Act (RCRA) Used Oil Management Standards
- Toxic Substances Control Act (TSCA)
- Clean Air Act (CAA) National Emission Standards for Hazardous Air Pollutants (NESHAP)
- Clean Air Act Offsite Waste Rule
- Clean Water Act Centralized Waste Treatment (CWT) Point Source Category
- The Spill Prevention Control and Countermeasures (SPCC) plan requirements
- The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

- The Emergency Planning and Community Right to Know Act
- The Nuclear Regulatory Commission used oil regulations
- Coast Guard used oil regulations dealing with releases of used oil to navigable waters and shipboard management of used oil
- Hazardous Materials in Transportation Act (HMTA)

6.1.2 Executive Orders Applicable to Executive Branch Agencies

The Resource and Conservation Recovery Act Section 6002 included statutory purchasing and waste prevention mandates, as detailed in Section 9.6. The following Executive Orders established policy and were written to emphasize the implementation of these mandates. Specifically, two Executive Orders have been enacted as detailed in Appendix 9.6.2 and 9.6.3. They provide for preferred procurement practices that direct Federal Government agencies to buy finished lube oils that have been made with re-refined oils to the extent practical and economic.

Executive Order 13101 was enacted on September 14, 1998 and was entitled “Greening the Government through Waste Prevention, Recycling, and Federal Acquisition.” In the interest of pollution prevention, this promoted waste management, recycling, and the preferred use of end products made of recycled materials including lube oils. It specifically required that “agencies shall implement the EPA procurement guidelines for re-refined lube oils and retread tires.” Additional information on the EPA procurement guidelines can be found at http://www.epa.gov/epaoswer/non-hw/procure/index.htm which highlights the broad scope of the EPA recycling programs, which have now been in effect for over 10 years. It also identifies the obligations of federal agencies in selecting recycled products.

Executive Order 13149 was enacted on April 21, 2000 and was entitled “Greening the Government through Federal Fleet and Transportation Efficiency.” It specifically required that “no federal agency shall purchase, sell, or arrange for the purchase of virgin petroleum motor vehicle lube oils when re-refined motor vehicle lube oils are reasonably available and meet the vehicle manufacturer's recommended performance standards.”

Both of these executive orders have been very effective in demonstrating that the quality of lube oils manufactured with used oils can be used with confidence. Companies that market to the Federal Government can advertise those relationships to promote additional sales and demonstrate the technical viability of the products.

6.2 State Programs

All states are encouraged to adopt the fundamentals provided in regulations outlined in 40 CFR part 279, in developing statewide programs. Many implement proactive local programs and provide funding to motivate progress down to the municipal level.

In 1997, API conducted an extensive study on used oil management. In addition to providing a comprehensive analysis of the major used oil volume flows, the API also surveyed recycling programs state by state. In analyzing the last 10 years or so of experience, it concluded that the most common success factors involved:

- High level of education programs aimed at consumers;
- Sufficient funding for collection locations; and
- Convenience of collection points.

6.2.1 Elements of State Programs

Some features of the statewide programs that have evolved include:

- Nine states collect taxes on lube oil sales and channel those funds back to collection facilities;
- In 1995 it was reported that the state of California dedicated $22 million dollars of state funds to manage used oil collections and disposal;
- Twelve states have unique laws that pertain to the handling of used oils (collection, contamination, containers specifics, etc.);
- Twenty-four states have enacted purchasing program preferences for lube oil products derived from used oils to stimulate demand;
- Three states ban oil filters from landfills;
- Eight states have formal programs for recycling oil filters;
- Thirty-two states have voluntary collection centers operated by government personnel;
- Thirty states have collection centers operated by private companies;
- California has 2,500 collection centers operated by private businesses and 200 by local government programs;
- Eleven states have curbside collection programs;
- Forty-two states indicate that retailers collect used oils;
- Nineteen states require periodic reports on amount of oil collected and its destination;
- Some states classified used oils as hazardous wastes to foster a higher level of consumer awareness;
- Some states mandate that all gasoline retailers must accept used oils from DIYers; and
- Many states have collection center requirements controlling the type of hauler used to pick up used oils, spill containment designs, advertisement requirements, hours of operation, and types of containers accepted.

Considering the broad range of collection programs and financing schemes that exist across the United States, it is difficult to identify one solution as a model that could be used across the country. This is a complicating factor when considering specific steps that can be taken to improve collections on a national level.

6.2.2 State Legislation

16 states have used legislation based on API guidance. Some of the most common elements include the following:

- Hazardous/Non-hazardous classification
- Funding of used oil recycling activities
- Identification of spending authorities within state government
- Liability limitations
- Requirements for retail gasoline stations and other retail motor oil businesses
- Standards applicable to recyclers and collectors including requirements for: reporting, licensing, liability coverage, transaction documentation.
- Prohibited Acts – listing of acts and applicable penalties and applicable governing body

As an example, Section 9.7 contains the applicable California legislation dealing with the management of used oils.

6.2.3 Superfund Liability

As mentioned earlier, an important aspect of used oil management relates to the legal liabilities for handling used oils.

In 1993, recycling of used oil from DIY consumers took a major step forward when CERCLA was amended — see Section 114(e). It provides an exemption from Superfund liability for certain categories of used oil generators (companies that sell, service, or repair automobiles and/or light trucks) provided these generators have a DIY used oil collection tank available to the public, do not mix their used oil with hazardous substances, and comply with applicable environmental laws, including those used oil management standards applicable to generators[26]. Without this change, there would be less incentive for a service station dealer (SSD) to accept DIY oil considering the exposure to Superfund liabilities. The regulatory term "service station dealer" is used when referring to garages, quick lube change stores, etc. Operators have to meet the definition of an SSD (see CERLCA §101(37)) before qualifying for this CERCLA liability exemption.

[26] Scott Parker, National Oil Recyclers Association (NORA), personal correspondence, January 20, 2006.

7 Energy and Environmental Impacts of Re-Refining Used Oils

Section 1838 of EPAct 2005 specifically asked that the energy and environmental implications of used oil re-refining be addressed in this study. The following studies have been conducted on these topics, analysis of which supports re-refining as the best solution from both energy resource preservation and environmental conservation perspectives. The primary sources cited in this section include:

- DOE study entitled “Assessment of Opportunities to Increase the Recovery and Recycling of Waste Oil” by D.J. Graziano and E. J. Daniels; Department of Energy Argonne National Laboratory, August 1995.
- Study by the California Environmental Protection Agency and the University of California (Berkeley) by Bob Boughton and Arpad Horvath as published in the Environmental Science and Technology, 2004.

Although the 1995 DOE study is over ten years old, there have been no major updated studies of similar scope conducted in the United States. Time did not allow for a detailed study to be conducted in preparing the response to EPAct 2005.

Compared to the alternative of disposing used oil in landfills or improper dumping, collection and re-use of used oil in combustion processes is preferred for obvious reasons — it recovers the energy heating value of the hydrocarbons and it avoids drinking water contamination. But that is not the only concern.

After recovering and collecting used oils for recycling, the more significant question is: what are the energy and environmental impacts of the two end-user alternatives: burning or re-refining to recover re-refined base oils. Re-refining goes beyond recovering the inherent heating value of used oil by also recapturing its unique chemical makeup that is suitable for use as a premium hydrocarbon product for manufacturing lube oils. Specifically, the issue is: how the energy impact of combusting used oil for its heating value compares to the energy impact of re-refining used oil to produce hydrocarbons that can be re-used in manufacturing fresh lube oil products. Section 7.2 expands on these considerations.

The environmental impacts are evaluated in a system analysis basis and follow the model used of evaluating the energy impact. This is discussed in Section 7.3.

This report presents a wide range of views and studies that focus on the environmental and energy aspects of used oil management. The next section details some of the other important studies that have been evaluated. However, final conclusions are drawn from the studies conducted by the DOE and the California EPA / University of California (Berkeley). As detailed later, these studies are judged to be more applicable to the United States and more representative of the U.S. industry.

7.1 Supplemental References

The subject of used oil management has drawn a significant amount of attention in Europe and numerous studies have addressed the environmental and energy implications of alternative used oil dispositions. The European Sofres report is referenced and its conclusions are presented because it evaluates and summarizes a number of major European studies:

- "Critical Review of Existing Studies and Life Cycle Analysis on the Regeneration and Incineration of Waste Oils" by Mrs. Veronique Monier of Taylor Nelson Sofres Consulting, December 2001.

A study conducted by the IFEU and commissioned by GEIR (the European association for the re-refining industry) in February, 2005 features the most recent update of technology advances, recent quality trends and the impact of synthetic lubes:

- "Ecological and Energetic Assessment of Re-refining Used Oils to Base Oils"; IFEU, February 2005

Aside from these two important European studies, two U.S. studies are referenced that investigated environmental studies on specific combustion processes, the asphalt hot mix plant and the space heater. These are of interest because they represent the largest end users of used oil in the United States.

A 1995 study funded by the Used Oil Recycling Coalition conducted by Entropy Inc. is also referenced as it analyzes the environmental implications of hot mix asphalt plants that combust used oils.

- "Stationary Source Sampling Report" Published by Entropy Inc. Reference No. 14505C, July 1995.

Finally, a 1994 study by the Vermont Agency of Natural Resources on space heaters is referred to:

- "Vermont Used Oil analysis and Waste Oil Furnace Emissions Study", September 1994.

7.2 Energy Impacts

The evaluation technique that has been used by the DOE in their 1995 in-depth study compares the net energy resources impact of combusting used oil to the alternative step of processing used oil to generate re-refined base oils, thus reducing the need to manufacture fresh virgin base oils. The next section provides an introduction to the subject highlighting some of the unique features of lube base oils.

7.2.1 Key Characteristics of Petroleum Base Oils

Base oil is the name given to the key building block for all lube oil products and it is typically a highly refined, low sulfur, long chain, paraffinic hydrocarbon which has excellent lubricity properties. It is also referred to as "basestocks". Because it is a paraffin, it is relatively inert and not readily vulnerable to oxidation, as contrasted to aromatic stocks.

It is traditionally manufactured in special crude oil refinery processing equipment designed to extract lube molecules from heavy crude fractions and to process and concentrate those molecules to the point where they can be used in manufacturing finished lube products. The processing facilities implications of a lube base oil refinery are significant compared to a normal fuels refinery. Whereas a normal crude oil refinery costs approximately $12,000 per barrel per day of crude oil processing capacity[27], base

[27] "U.S. Refining Industry Capacity Trends 1993-2004", by Anderson and Lappinen, TMS Inc., August 2005, page 8.

oil production plant investment costs are more than eight times higher[28] at over $90,000 per barrel per day. Typically, they also process higher quality, more expensive crude oil that contains a higher concentration of the desired long chain paraffin molecules.

Many of these lube base oils are so highly refined that they can be used in some applications normally not associated with crude oil or hydrocarbons. For example, oils are used as key raw materials for facial cosmetics, baby oils, sun tan oils, and as lube oils for food handling equipment where low toxicity, stability, emolliency, cleanliness, and odor and taste characteristics are of paramount importance.

Table 8 in Section 7.2.4 compares the market value of common petroleum products to demonstrate that lube base oils are the among the most highly valued petroleum products on the market today.

7.2.1.1 Impact of Bio-based Lube Products

Although this subject was not included within the technical scope of the EPAct 2005 legislation, some comments on this subject are appropriate considering the numerous projects currently being pursued involving renewable energy sources. Biobased oils include lubricating oil products that are made from soy, corn, castor, rapeseed, canola, and cottonseed oil among others. While there are many promising initiatives underway to develop specific uses for biobased oils, little authoritative data is available that would help quantify the expected impact for the foreseeable future. Therefore, at this time it is premature to draw strong conclusions regarding the impact of biobased lubricants on the used oil market and the re-refining industry or recommendations on how best to address them.

However, the following are important points that need to be taken into consideration in moving forward on biobased lubricants.

1. There are generally two broad groups of lubricants that are candidates for substitution with biobased lubes: industrial oils (including greases) and motor oils.

   a) Industrial oils are products that generally contain small amounts of additives (normally less than 5 percent) and generally have less demanding operating environments compared to motor oils. These include products like hydraulic oils, metal working fluids, gear oils, and general utility greases. These products appear to be logical candidates for biobased oils substitution. Using biobased oils would help reduce dependence on foreign oil and potentially provide a biodegradable oil product that is more environmentally friendly compared to petroleum base oils. In fact, much promising progress has been noted in this area already, both in the United States and in Europe.

   b) Motor oils on the other hand, are much more technologically advanced oils that require significant amounts (i.e., 20–25 percent) of complex chemical additives to impart the desired performance characteristics demanded by today's automobiles. Compared to industrial oils, the operating environment is more severe in terms of temperature, exposure to combustion gases, water, soot, and the need to demonstrate

[28] Worldwide Construction Report, Oil and Gas Journal, April 16, 2001, vol 99.16, page 68.; Worldwide Construction Report, Oil and Gas Journal, April 8, 2002, vol 100.14, page 81; Alexanders Gas and Oil Connections, 1997. http://www.gasandoil.com/goc/company/cnm70201.htm

performance characteristics over a wider range of temperatures including starting in extreme cold climatic conditions. The high temperature operating condition in most motor oil crankcases leads to oxidation stability quality being one of the key characteristics that can present challenges to biobased motor oil formulations. The magnitude and makeup of these additives which include heavy metal zinc compounds, suggest that the biodegradability of used motor oil cannot be assured. Also, the complex additive technology has taken years to evolve and it would be prudent to assume that its replacement will take sizeable technology advances over time to develop the new product formulations and to certify the products. Another key consideration with motor oils is that automobile manufacturers need to be convinced that any new biobased oils will perform in their vehicles as intended so that the warranties can be maintained. Therefore, while biobased lubes are promising possible candidates for petroleum base oils in motor oil formulations, it is premature to draw strong conclusions on a market penetration schedule.

2. In 2004, motor oil demand amounted to 1.04 billion gallons, or about 42 percent of the total annual lube product demand. While efforts to progress biobased lube oils into the marketplace are worthy of the accelerated programs currently underway, it is premature to suggest that petroleum based lube oils are going to disappear in the very near future. Thus, used oil management programs and re-refining will likely continue to be areas where environmental and energy benefits can be achieved.

7.2.2 System Analysis

The 1995 DOE Study system evaluation is conducted on a two-step process whereby both steps consume equal volumes of used oils. Once the analysis is performed on a consistent and comprehensive basis, then the energy resource requirements for the two alternatives can be directly compared and conclusions drawn.

Step 1: Calculate the energy required to prepare the used oil for combustion in a utility boiler or a cement kiln; also, take into account the amount of energy resources displaced in doing so (i.e., the fuel that was displaced by the combustion of the used oil).

Step 2: Alternatively, calculate the level of energy consumption required to process the used oil into re-refined base oil and the energy saved in not producing that equivalent volume of fresh virgin base oil in a crude oil refinery. The energy required to re-refine the used oil includes the energy involved in dewatering the base oil and filtering it similar to the preparation required for combustion, but also includes vacuum distillation and hydrotreating to achieve the final base oil qualities similar to virgin base oil.

By comparing the energy required in step 1 versus step 2, re-refining presents greater benefits from a total energy resource conservation point of view. Table 7 depicts the results of DOE's 1995 study.

Table 7: Energy Savings for Re-refining vs. Burning of Used Oils

Energy Balance (Thousand Btu/Bbl of Waste Oil)	Process to Fuel & Burning	Re-refine	Variance	% [4]
Transportation [1]	-144	-198	-54	-0.9
Processing consumed [2]	-294	-742	-448	-7.6
Processing saved [3]	745	1,722	977	16.6
Energy Recovered	5,564	5,564	0	0
Net Energy Recovered	5,871	6,346	474	8.1

Source: Assessment of Opportunities to Increase the *Recovery and Recycling of Waste Oil* by D.J. Graziano and E. J. Daniels; Department of Energy, Argonne National Laboratory, August 1995, page 50.

Notes:
[1]Fuel Burning: Transportation to burning facility from collection facility; Re-refining transportation to re-refining facility also takes into account indirect crude oil transportation.
[2] Fuel Burning: reduce water and sediment content; Re-refining: energy consumption in re-refining process including distillation and hydrotreating.
[3] Fuel Burning: saved energy to produce alternative fuel for combustion; Re-refining: energy saved in virgin base oil refining.
[4] percent of 5,871 Btu/Bbl (Net Energy Recovered for Process to Fuel and Burning)

Considering the volume of used oil that is recovered and burned, estimated at 780 million gallons per year (see Section 5, Table 4), the analysis above would conclude that in total the net theoretical energy savings for re-refining compared to burning is 8.1 percent of 780 million gallons. This equates to an annual energy savings of up to 63 million gallons ($63 million at current fuel oil prices in the range of $1.00/gallon).

The above analysis is conservative based on an independent study conducted by the EPA[29]. Specifically, the EPA concluded that the energy consumed in re-refining is 50 to 85 percent less when compared to virgin base oil refining. The 1995 DOE Study referred to above assumes a 57 percent factor which is on the low end of the EPA estimated range. For reference, if the high end of the EPA range is used in the DOE energy calculation, then the overall energy savings for re-refining versus burning would be 16 percent compared to the base 8.1 percent assumed. On the other hand, if the low end of the range were assumed then the result would be 6.0 percent compared to the base 8.1 percent assumed.

7.2.3 Impact of Synthetics

As motor oil qualities have improved with coincident extended drain intervals and the use of synthetic lube oils, the energy implications favor re-refining even more so. As stated in the most recent in-depth study on this matter[30] "in today's markets, the amounts of synthetic and semi-synthetic compounds have increased significantly and keep on increasing. These more sophisticated and stable oils require far more energy to manufacture and allow re-refiners to manufacture high quality base oils more easily because the inherent quality of collected used oil is substantially improving."

[29] "Managing Used Motor Oil", U.S Environmental Protection Agency report number EPA/625/R-94/010, December, 1994; page 23.
[30] "Ecological and Energetic Assessment of Re-refining Used Oils to Base Oils"; IFEU, February 2005, page 1.

The IFEU Study[31] assessed the impact of synthetics and concluded that compared to the production of normal base oils, the energy impact of synthetics (PAO's) was more than double that of group I base oils.

The growth of synthetic lubricants will continue to be strong. According to one study[32], total global lube demand is relatively flat and forecast to grow modestly, by only 2.2 percent annually from 2003 through 2008. On the other hand, the growth in demand for non-conventional (synthetic or highly refined basestocks) lubes is forecast to grow by as much as 20 percent annually (compounded average growth rate)[33] in the time period of 2004 through 2015. The predominant factors driving this trend reflect forecast motor oil and automatic transmission fluid quality improvements.

These quality related factors suggest that the energy consumption for virgin base oil production presented in Table 7 are likely higher if the impact of synthetics are taken into account. As the quality of the pool of used oil increases with growing synthetic content, then the quality of the re-refined oil also increases thus displacing higher quality virgin base oil. This is an important area that could be addressed in future studies.

7.2.4 Scoping Analysis of Current Market Value of Base Oils

Looking beyond the hydrocarbon content of used oils, an indication of the relative market value of different hydrocarbon stocks is warranted. Table 8 shows the current range of U.S. spot prices for key petroleum products[34] and highlights the fact that lube base oils are a premium petroleum product and that they command a market premium of 52 percent to 68 percent over more conventional products like motor gasoline and heating oil.

Table 8: Market Value of Base Oils and Petroleum Products

Petroleum Product	$/Gallon	Lube price premium (%)
Lube base oil[35] Group I Classification	2.50–2.80	–
Motor Gasoline	1.53–1.64	+68
Heating Oil	1.73 –1.74	+52
Fuel Oil	1.06 –1.19	+134
Memo: Synthetics	5.30 – 11.00	N / A

The point of this comparison is that lube base oils are more highly refined, premium products and that there is more to recover than just the hydrocarbon heating value. This price differential primarily reflects the higher severity processing and higher manufacturing cost of the base oils compared to standard petroleum products. This makes the case for re-refining stronger than just a heating value consideration.

[31] David Fitzsimons, Oakdene Hollins LTD, Horst Fehrenbach, IFEU, personal correspondence February 2006.
[32] "Study Forecasts Growth for Lubes" by Tim Sullivan, Lube Report, Volume 5, Issue 8 February 23, 2005
[33] "Global Lubricant Baseoils Supply Overview", by Geeta S. Agashe and Milind Phadke, Kline and Company, February 15, 2005; personal correspondence 5-24-06.
[34] "Refined Product Prices", Oil & Gas Journal, November 21, 2005, Volume 103.43, page 73.
[35] "Base Oil Price Report" Lubes-n-Greases publication, November 30, 2005.

Compared to the value of disposing used oils as a combustion fuel, recovering the lubricant qualities can save an estimated $332[36] million annually assuming the following:

- 780 million gallons of used oil annually available for re-refining (see Table 4) that is currently being combusted to recover its heating value;
- 75 percent yield of lube base oils from used oil in the re-refining process at $2.65/gallon; 12 percent yield of fuel oil at $1.44/gallon which is the average of heating oil and fuel oil, and 13 percent yield of asphalt flux at $0.70/gallon[37]; weight average products is $2.25/gallon.
- Average untreated used oil market value of $1.20 based on average of 85 percent fuel oil value ($1.10/gallon) and 15 percent contribution from heating oil ($1.74/gallon); this reflects the ratios of used oil combustion in industrial applications and space heaters respectively.
- Re-refining operating costs of $0.625 per gallon operating cost for re-refining used oil to lube base oil (see Table 16).
- Transportation costs offset the market fuel discounts for used oils in combustion applications.

In Section 7.1.2 the energy credit for re-refining used oils was calculated at $63 million annually. However, by taking market factors into consideration the incentive to re-refine used oils increases to $332 million annually.

This analysis is somewhat conservative as it does not account for the impact of synthetics mentioned in the prior section. Just as synthetic oils are becoming more popular in the motor oil market, the makeup of used oils reflects growing percentages of synthetics. These synthetic components enhance the value of used oil due to their physical and chemical characteristics which can be partially recovered in the re-refining process. For reference, the value of synthetics in today's market is in the range of 2 to 4 times as valuable[38] as Group I base oils noted in Table 8. In addition to resource conservation considerations, these economic factors involving the contribution of synthetic oils further support re-refining over just burning used oil for its heating value.

7.3 Environmental Impacts

The additive content of lubricants and motor oils in particular, gives rise to the environmental concerns involved with combustion of used oils. It is common that up to 20 to 25 percent of typical motor oil blends are made up of additives that are used to improve the quality, stability, and longevity of motor oils in combustion engine applications. Although industrial oils are also components of used oils, they do not contain the same level of additization and thus they tend to dilute the impact of motor additives. Table 9 details some of the common additives and their chemical makeup that are present in typical used oils.

[36] $332,000,000 = 780,000,000 gallons x ($2.25 - $1.20 - $0.625) : gallons x value differential less operating costs

[37] Monthly Asphalt Cement Assessments, Platts Oilgram Price Report, December 2005

[38] "UK Waste Oils Market 2001", by David Fitzsimons, Nicholas Morley, Peter Lee, Oakdene Hollins LTD, page 7, http://www.defra.gov.uk/environment/waste/topics/oils/pdf/wasteoils.pdf

Table 9: Listing of Common Additives in Used Oils[39]

Antiwear	Zinc dithiophosphates, acid phosphates, organic sulfur and chlorine compounds. Sulphurized fats, sulfides and disulfides
Detergent	Metallo-organic compounds of sodium, Calcium and magnesium phenolates. Phosphonates and sulphonates
Anticorrosion	Zinc dithiophosphates, metal phenolates, fatty acids and amines
Dispersant	Alkylsuccinimides, alkylsuccinic esters
Friction Modifier	Organic fatty acids. Lard oil. Phosphorous based compounds
Pour point depressant	Alkylated naphthalene and phenolic polymers, polymethacrylates
Seal Swell Agent	Organic phosphates aromatic hydrocarbons
Viscosity Modifier	Polymers of olefins, methacrylates, di-enes or alkylated styrenes
Antifoamant	Silicone polymers, organic copolymers
Antioxidant	Zinc dithiophosphates, hindered phenols. Aromatic amines, sulphurized phenols
Metal Deactivator	Organic complexes containing nitrogen and sulfur amines, sulphides and phosphates

Table 10 presents the 1995 analysis conducted by DOE. It highlights the end disposition of the key contaminants depending on whether the used oil was combusted or re-refined. The key conclusion in the case of re-refining is that the noxious compounds are solidified and stabilized due to their disposition as a solid and pose minimal environmental risks. On the other hand, combustion of used oil results in air emissions, the magnitude dependent on the quality of the air pollution control equipment utilized. Space heaters are small scale burners used for heating work areas. Space heaters have higher emissions than any other type of used oil combustion process (i.e. more than cement kilns, industrial burners, hot mix asphalt plants, etc) because they do not feature any emissions control equipment. On the other hand many large scale industrial applications, which feature air pollution control equipment, are capable of emitting metals within allowable limits.

[39] "UK Waste Oils Market 2001", by David Fitzsimons, Nicholas Morley, Peter Lee, Oakdene Hollins LTD, page 8; http://www.defra.gov.uk/environment/waste/topics/oils/pdf/wasteoils.pdf

Table 10: Environmental Impact Characteristics for Used Oil Re-use Options

Item	Burn in Space Heaters	Industrial Burning	Re-refine
Lead	50+% to air, balance to ash deposits	50%+ to air (90+% less with pollution control equipment) balance to ash	100% to asphalt
Cadmium	50+% to air; balance to ash	50%+ to air (90+% less with pollution control equipment) balance to ash	100% to asphalt
Chromium	<50% to air balance to ash	50%+ to air (90+% less with pollution control equipment) balance to ash	100% to asphalt
Zinc	50% to air, balance to ash	50%+ to air (30+% less with pollution control equipment) balance to ash	100% to asphalt
Sulfur	So_X to air	So_X to air, possibly scrubbed to form neutral salt	Burned to SO_X scrubbed with caustic to form neutral salt
Nitrogen	NO_X to air	NO_X to air	NO_X to air or pollution control equipment
Polynuclear hydrocarbon	CO_X to air, ash/soot	Co_X to air, ash/soot	Removed by hydrotreatment
Chlorinated hydrocarbons	HCl to air minimized in feeds	HCl to air, possibly scrubbed to form neutral salt	HCl scrubbed with caustic for form neutral salt
Phenols	CO_X to air	Co_X to air, fraction to wastewater	To fuel by-product or to wastewater treatment
Waste streams	Ash deposits	Wastewater, filtration solids, oily sludges, tank bottoms, ash	Wastewater, tank bottoms, ash

Source: "Assessment of Opportunities to Increase the Recovery and Recycling of Waste Oil" By D.J. Graziano and E. J. Daniels; Department of Energy Argonne National Laboratory, August 1995, pages 56-57.

7.3.1 2004 California EPA / University of California (Berkeley) Study

A peer reviewed study[40] conducted by the California EPA and University of California (Berkeley) compared the life cycle environmental impacts of combusting used oil and re-refining used oils to produce base oils. This study was initiated because no other studies could be found for the United States and because other studies had not fully assessed the impacts on human health or the environment. The two management options of re-refining and burning were balanced by including offset credits for avoided crude based fuel oil or lubricant base oil production. The data used was for used oil destined for fuel use and United States based crude refining and used oil re-refining facilities.

[40] "Environmental Assessment of Used Oil Management Methods", Bob Boughton, Arpad Horvath Environmental Science and Technology, Vol. 38 No. 2, page 353, 2004, http://pubs.acs.org/cgi-bin/download.pl?es034236p/D2gn

The results showed that heavy metal emissions from uncontrolled combustion of used oil fuels could be hundreds of times higher than the comparable re-refining process or from the combustion of virgin fuel oil. The data from uncontrolled combustion of used oil and from re-refining (each credited with offsetting credits) were compiled and categorized into life-cycle impact characteristics.

A comparison was made using a ratio of the results for combustion divided by the re-refining results (hence, values of more than one by definition show that uncontrolled burning raises more concerns than re-refining). The results shown in Table 11 indicate that for most of the environmental parameters studied, the impact of burning used oil, assuming no pollution controls, is worse than the alternative of re-refining used oil. The heavy metals emissions may lead to 150 times the ecotoxicity impacts compared to re-refining if air pollution control technology is not used. As noted earlier, the metals emissions from space heaters are approximately 50 percent of the input feed, thus the toxicity impact is prorated accordingly to a factor of 75. To put this into perspective, the California EPA study estimated that the zinc emissions from space heaters alone amount to approximately 7 percent of the total U.S. zinc air emissions.

This assessment showed that combustors will need over 99 percent air pollution control efficiency before the toxicity impacts become comparable to re-refining. However, the impacts from operating air pollution control equipment or of ash management were not included in this analysis and could be significant.

Table 11: Ratios of Impact Characteristics for Used Oil Combustion Compared to Re-refining (Assuming No Pollution Control on Combustion of Used Oil)

Environmental Impact Category	Ratio of used oil combustion to re-refining
Terrestrial ecotoxicity potential [kg DCB equiv.] Note (1)	150
Human toxicity potential [kg DCB equiv.]	5.7
Heavy metals [kg Pb equiv.]	5.1
Eutrophication potential [kg phosphate equiv.]	3.2
Aquatic ecotoxicity potential [kg DCB equiv.]	2
Carcinogenic substances (EI 95) [kg PAH equiv.]	1.1
Ozone depletion potential [kg R11 equiv.]	1.1
Photochemical oxidant potential [kg ethene equiv.]	1.1
Global warming potential (100 yr) [kg CO_2 equiv.]	0.9
Acidification potential [kg SO_2 equiv.]	0.5

Note (1): This relates directly to the heavy metals impacts; this category accounts for the toxic effect of all compounds and elements combined for all land based plants and animals

Code:

1 : re-refining is equal to burning (without air pollution controls)
>1 : re-refining is better than burning (without air pollution controls)
<1 : burning (without air pollution controls) is better than re-refining

7.3.2 2001 Sofres Report

As noted earlier in Section 3, there are a wide range of used oil management programs in place in Europe and accordingly it is not surprising that there are numerous studies that support a variety of positions. The Sofres report was conducted to address and summarize many of the key studies conducted in Europe. In all, more than 75 studies were analyzed. The focus of the report was on four studies[41] judged to be the most comprehensive and applicable across Europe. As noted in their Executive Summary however, only two of these studies were performed consistently with the requirements of ISO 14040. Also, the study may not accurately reflect the typical re-refining technology utilized in the United States — that of thin-film evaporation and hydrotreatment technology. Nonetheless the study is one of the most often quoted studies relating used oil management. The four studies include:

- Burning or Re-refined used lube oil? The Norwegian Environmental Protection Agency, 1995;
- Waste Oil – Fuel or Lubricant? Examination for precedence on accordance with the waste recycling act – Lower Saxony Minister of the Environment (German), post 1997;
- Recyclage et Valorsation energetique des huiles usages – Atouts et faiblesses – ADEME (France) 2000; and
- Okologishe Bilanzierung von AltoVerwertungswegen – Okologisher Vergleich von vier wichtigen Altolwertungsverfahren – UBA (Germany), 2000.

The conclusions, which are taken directly from the report are as follows[42]:

> "The following conclusions drawn from the Life Cycle Assessments (LCA's) can be considered sound:
>
> From a local impacts perspective, when considering only the recovery treatments, the impacts generated by the regeneration plant are generally lower than those generated by the incineration plant.
>
> The environmental performance of an old regeneration process can be improved with modern technology.
>
> The environmental impacts due to collection and transport of waste oil are not significant within a life cycle perspective compared to the impacts of the industrial processes.
>
> The environmental burden of the recovery treatment (regeneration or incineration) by itself is generally less important than the one of the avoided process (virgin base oil production for tradition fuel or energy production).
>
> > Within a life cycle perspective, the total contribution of the management system under consideration is indeed the result of the differences between the two different quantities; the impact of the recovery treatment minus the impact of the main avoided system (this latter representing a bonus). The environmental impact of waste oil recovery systems are mainly determined by

[41] "Critical Review of Existing Studies and Life Cycle Analysis on the Regeneration and Incineration of Waste Oils" by Mrs. Veronique Monier of Taylor Nelson Sofres Consulting, December 2001, page 5.
[42] "Ibid, page 13.

this bonus and less by the direct impacts of the recovery processes themselves.

All the waste oil recovery options under consideration are favorable in terms of environmental impacts (i.e., they contribute to avoid impacts) by comparison with a "do nothing" system.

The amount of bonus brought by the avoided process is determined by the choice of the substituted process.

Especially in the case of incineration of waste oil with energy recovery, the type of fuels that the waste oil replace is crucial: fossil fuel, hydroelectric, thermal electricity, other wastes…

This explains that in the LCA's analyzed:

For almost all of the environmental impacts considered, incineration in cement kilns (where waste oil replaces fossil fuels) is more favorable than incineration in an asphalt kiln (where waste oil replaces gas oil).

A modern regeneration may be, according to the impact considered, more favorable than or equivalent to burning in an asphalt kiln.

Compared to incineration in a cement kilns (where waste oil replaces fossil fuels) waste oil regeneration has environmental advantages and drawbacks depending on the impact considered.

It appears that regeneration would present advantages for all environmental impacts in all scenarios if the waste oil would replace non fossil fuels (e.g. hydroelectric, nuclear)."

7.3.3 February 2005 IFEU Study

The IFEU study was commissioned by GEIR (European association for the re-refining industry) in February, 2005. Aside from being the most recent update of the industry used oil management processes, it featured several other key elements: it incorporated the latest refining and re-refining technologies including those representative of the United States, it accounted for the impact of synthetic lubes, and it was peer reviewed consistent with the standards of ISO 14040.

It states:

"The European Association for the re-refining industry (GEIR) has reasons to assert that the results of LCA (life cycle analysis) studies published in the past and focusing on re-refining industry practices and lubricant qualities of the 1990's are no longer valid. Key developments supporting this view include:

- New regeneration (re-refining) technologies with improved performance have been developed and implemented;
- Regulatory requirements concerning motor vehicle emissions have enhanced the quality of lubricants, and
- In today's markets, the amounts of synthetic and semi-synthetic compounds have increased significantly and keep on increasing, These more sophisticated and stable oils require far more energy to manufacture and allow re-refiners to manufacture high quality base oils more easily because the inherent quality of collected used oils is substantially improving."

Its key conclusions are:

> "For the majority of impact categories regeneration (re-refining) is shown to be more beneficial than direct burning. In the case if the global warming impact however direct burning is shown to be more beneficial when coal is displaced.
>
> As the proportion of synthetic compounds in used oil increase, the benefit for global warming by burning directly is significantly reduced.
>
> The conclusion in relation to global warming is sensitive to the type of fuel that is displaced by the burning of used oil. If fuels other than coal or pet coke are to be displaced in cement kilns by the direct burning of used oil the analysis would conclude that the regeneration of used oil is overall beneficial compared to direct burning."

7.3.4 Caution in Translating Results from Europe to the United States

One consideration should be taken into account in attempting to translate European study conclusions to the United States. Not all of the assessment bases are equivalent. For example, the primary combustion-related outlets for used oil in Europe are high efficiency, large-scale industrial combustion processes like cement kilns, coal fired power plants and steel mills[43] which are equipped with air pollution controls. In fact, cement kilns are widely used as effective incinerators for hazardous materials and other waste material, including used tires, due to high particulate collection efficiencies and to metal capture in the product streams[44].

However, while cement kilns, coal fired power plants and steel mills burn approximately 25 percent of the used oil burned in the United States, asphalt plants are most common (37 percent) followed by space heaters (15 percent); see Table 5. This may be important because one of the major conclusions of the Sofres report is that "for almost all of the environmental impacts considered, burning in cement kilns (where waste oil replaces fossil fuels) is more favorable than burning in an asphalt kiln (where waste oil replaces gas oil)." This suggests the possibility that the environmental conclusions in Europe noted above might be different if the asphalt plant were the primary outlet for used oil combustion instead of cement kilns or other major industrial combustion processes. In any update study that may be conducted, these factors could be explored in further detail.

Furthermore, another study[45] concluded that the results from environmental impact studies are especially sensitive to assumptions made concerning: the type of re-refining technology; the type of fuel that is being displaced by the burning of waste oil; and the scale and type of incineration plant. Again, this suggests caution when translating results from one geography to another.

[43] "Ecological and Energetic Assessment of Re-refining Used Oils to Base Oils", IFEU, February 2005, page 46.
[44] "Stationary Source Sampling Report" Published by Entropy Inc. Reference No. 14505C July 1995, page v.
[45] "Working Group on Waste Prevention and Recycling" published by Organization for Economic Cooperation and Development, September 26, 2005, page 51, http://www.oecd.org/dataoecd/14/9/35438706.pdf.

7.3.5 1995 Entropy Study

A 1995 study funded by the Used Oil Recycling Coalition conducted by Entropy Inc. reported that[46]:

> "In Phase II of the project, Entropy Inc. conducted emissions test programs at two asphalt plants that combust used oil. Testing at one of the plants also involved the combustion of virgin oil. Asphalt plants were chosen for emissions testing because they are the single largest category of sources that burn used oil, and they consume approximately 43 percent of the total used oil collected and used as fuel in the United States.
>
> The information from the study demonstrates that the combustion of used oil in asphalt plants equipped with baghouses in good working condition resulted in emissions of lead below detection limits. In fact, the emissions of lead and other metals from the combustion of used oil at both test facilities did not differ significantly from the emissions associated with the combustion of number 2 virgin oil at one of the test facilities."

It further stated that:

> "A large fraction of the metals contained in used oil fuel stays within the combustion chamber and is not emitted into the effluent stream. The metals are trapped as deposits on combustion chamber walls; and heat exchange surfaces; for industrial boilers, commercial boilers, space heaters, and other small combustion sources the quantities retained as permanent deposits are probably 50 percent of the total quantity of metals entering with the fuel."

7.3.6 Summary

The prior sections of this report present a range of views and studies that focus on the environmental and energy aspects of used oil management options. However, final conclusions are drawn from the impartial and unbiased studies conducted by the DOE and the California EPA / University of California (Berkeley). These studies are judged to be more applicable to the United States and more representative of the industry.

It can also be reasonably concluded from all of these studies that there is a hierarchy for limiting environmental impact for used oil combustion which reveals that the best mechanisms (with lowest air emissions) are cement kilns, followed by asphalt plants followed by space heaters. Other large scale industrial processes generally fall between cement kilns and asphalt plants but have to be analyzed as a function of the air pollution control equipment efficiencies for each individual application. This also suggests that the environmental impact can be improved, for example, by shifting combustion from space heaters to cement kilns.

Combustion of used oils that have been treated to eliminate the additive components is more environmentally beneficial than combustion of used oils that contain motor oil additives with heavy metal components. Diesel fuel used in marine applications is a typical end use product where the additives have been separated out by distillation.

Aside from distillation, centrifuging used oil can also produce a fuel that has lower additive concentrations which is more environmentally suitable for combustion compared to normal untreated used oil.

[46] "Stationary Source Sampling Report" published by Entropy Inc. Reference No. 14505C, July 1995, page iv, v.

7.4 Space Heaters

Space heaters are small fuel combustion devices that are used in garages and mining operations during cold weather conditions and for heating water. These devices are normally fueled with heating oil or natural gas but can also be designed to combust used oils in order to save on heating costs. Considering the economic impact on small garages and mining operations and the opportunity to avoid improper disposal of used oils, used oil generators may utilize space heaters to burn their used oil. Exemptions are provided to allow burning used oils as long as: 1) the oil that is burned is self-generated or is DIY used oils received from households, and 2) the heater capacity is less than 500,000 Btu/hr. The opportunity to save on heating costs presents advantages to the owner to use space heaters. In so doing, he also provides a convenient outlet for used oil that otherwise might find its way into landfills, waterways or other improper disposal outlets.

Environmental studies contend (see Section 7.4.1 below) that burning used oils in these space heater devices (which are not equipped with air pollution controls) emit more pollutants into the atmosphere than burning the same used oil in other larger industrial combustion processes that are equipped with air pollution controls. For example, a European study has concluded that "It can surely be claimed that production of lubricants from the re-refining process is more environmentally friendly than direct burning in individual small space heaters or in unregulated industrial furnaces using old technologies.[47] It is possible that the space heaters have a detrimental impact on air quality particularly in "non-attainment" areas as defined by the National Ambient Air Quality Standards. Considering that there are no federal regulations requiring permitting, reporting, maintenance, volume, fuel quality reporting obligations or controls, specific steps that could be taken are proposed to address these issues in areas not attaining air quality standards.

Although the emissions from space heaters are limited due to the regulated maximum size (500,000 Mbtu/hr capacity), the Entropy Study mentioned earlier did highlight one other potential issue. It states[48] "emissions from these units (space heaters) could create locally high concentrations of metal containing particulates due to the limited dispersion characteristics of the stacks". This consideration is one of the motivating factors behind the suggestion to re-assess the impact of space heaters in non-attainment areas.

These environmental considerations coupled with the energy analysis presented in Section 7.2.2, Table 7, favor re-refining or combustion in larger industrial applications. However, in the case of used oil combustion in space heaters which are consumed onsite and receive minimal processing, the energy balance is essentially neutral (energy credit goes from 8.1 percent to less than 1 percent for re-refining) as highlighted in Table 12. This analysis is presented to provide a balanced perspective for the environmental and energy implications on the question of burning used oils in space heaters.

[47] "Working Group on Waste Prevention and Recycling", published by the Organization for Economic Cooperation and Development, Environment Policy Committee, Sep 26, 2005, page 51.
[48] "Metals Emissions from the Combustion of Used Oil Fuel, Phase I, Literature Search and Survey", page 5-6. April 27,1994, Entropy Inc.

Table 12: Energy Savings for Re-refining vs. Burning of Used Oils[49]

	Source DOE 1995 Study (4)	TMS Analysis (11-05)	Source DOE 1995 Study (4)	TMS Analysis (11-05)
Energy Balance Thousand Btu/Bbl of Waste Oil	**Process to Fuel & Burning**	**Burn in Space Heaters**	**Re-refining**	**Variance Burn in Space Heater vs. Re-refining**
Transportation [1]	-144	0	-198	+198
Processing consumed [2]	-294	0	-742	+742
Processing saved [3]	745	745	1,722	-977
Energy Recovered	5,564	5,564	5,564	0
Net Energy Recovered	5,871	6,309	6,346	-37 (<1%)

Notes: [1] Fuel Burning: Transportation to burning facility from collection facility; Re-refining transportation to re-refining facility, also takes into account indirect crude oil transportation. In the case of space heaters, no transportation debit applies as it is consumed onsite.
[2] Fuel Burning: Reduce water and sediment content; Re-refining: energy consumption in re-refining process including distillation and hydrotreating. In the case of space heaters no (or minimal) energy is consumed in processing.
[3] Fuel Burning: saved energy to produce alternative fuel for combustion; Re-refining: energy saved in virgin base oil refining.
[4] see Table 7.

[49] TMS, Inc., November 2005.

7.4.1 Vermont Used Oil Study

In 1994, the state of Vermont conducted a study[50] to characterize the constituents and properties of generated used oils and the resultant emissions and ambient impacts associated with the combustion of used oils in small waste oil furnaces. The study concludes "The fuel analyses and emissions testing clearly shows that used oil combustion has higher emissions than No. 2 fuel oil combustion for most contaminants. A prohibition on the burning of used oils would thus have an air quality benefit near facilities currently burning these oils." There were other considerations involved with the question of space heaters and, ultimately, no action was taken to limit the use of space heaters in Vermont.

7.5 Source Reduction

Source reduction is another strategic element to minimize the environmental impact of used oils. General Motors addressed this subject in a worldwide lubricants conference in 2005 and they indicated[51]:

> "Drivers of General Motors 2005 model year vehicles equipped with its engine Oil LIfe System – and nearly all of them have onboard technology – will typically be able to go 8,500 miles between oil changes".
>
> Furthermore, "Drain intervals are a very specific goal for GM, and are being managed in a logical and planned fashion. Longer drain intervals are desirable to meet customer demands for reduced maintenance and convenience and for the environmental benefits that come with less oil handling".
>
> They added: The savings for GM customers going forward will be enormous …. over the life of the vehicles, this represents a savings of 6.6 million gallons of engine oil and $145 million dollars for our 2005 model year customers".
>
> They also cautioned for the "need to strive for fuel economy, durability and no impact on the emissions systems".

It has also been noted that the oil drain interval in Europe is on the order of 10,000[52] miles but the fuel efficiencies may not be comparable to the U.S. statistics.

Detailed studies have been conducted[53] that conclude that fuel efficiencies erode with extended oil drain intervals. They recommend that automobile manufacturers need to take into consideration the impact on emissions and fuel economy when setting recommended oil drain intervals both in the owners manual and through the vehicle on board oil change indicator system.

This is a complicated subject and it will continue to evolve as motor oil product technologies advance and engine design and filtering system technologies improve.

Perhaps the subject was best summarized by an API member oil company as follows:

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[50] "Vermont Used Oil Analysis and Waste Oil Furnace Emissions Study, Vermont Agency of Natural Resources, September, 1994, http://www.anr.state.vt.us/air/docs/wasteoilstudyrpt.pdf

[51] James Spearot of GM from a speech at the World Tribology Congress September 15, article in Lubes'N Greases, October 2005.

[52] David McFall "Drain Intervals How Long Must We Wait" Lubes and greases March 2003, http://www.amsoil.com/lit/lng_article/march_lng_new.pdf.

[53] "The Effect of Engine Age, Engine Oil Age and Drain Interval on Vehicle Tailpipe Emissions and Fuel Efficiency" by Thomas R. Smith, Victor Kersey and Thomas Bidwell; published by the Society of Automotive Engineers, 2001, page 13.

"(We) believe that such (i.e., extended oil drain) initiatives, when carefully and well designed, can contribute materially to minimizing used oil. Improvements in oil quality, enhanced engine oil filtration techniques, and vehicles equipped with on-board oil monitoring systems are three separate approaches shown to extend oil drains and reduce used oil generation."

8 Specific Steps That Could be Taken to Improve Collections and Increase Re-refining and Other Beneficial Re-use of Used Oils

1. **Utilize an Information Exchange Activity to Encourage Progress on Used Oil Management and Recycling**. In order to stimulate further progress in the area of used oil management and recycling, an information exchange activity could be established among

   a) all state personnel involved in used oil management to serve as a focal point of information exchange, and

   b) industry stakeholders to address technical issues dealing with used oil management.

   Broad Objectives

   The broad objectives are twofold:

   - Allow states that do not have active recycling programs to benefit from the experiences of those that have well established and successful programs. This activity would seek to identify the best practices, guidelines for states to follow including funding mechanisms, and the provision for financial incentives for collectors and recyclers, and
   - Serve as focal point for establishing a program to update the technically oriented environmental and energy related issues involved with used oil management.

   Rural and Farming Community Focus

   Another key program objective is to consider providing more focus in rural and farming communities. It appears that the high density population areas already have effective recycling programs in place, reflecting ready availability of used oils for collection and close proximity to recycling centers. Industrial oil recycling is also adequately addressed with most existing programs. On the other hand, cost conscious DIY consumers in the rural and farming communities offer high growth potential for recovering additional volumes of used oils. Thus, increasing the recovery of DIY oil is an important factor in making substantial progress in used oil recycling.

   Public Awareness and Education Programs

   It is also important to evaluate the need for effective public awareness and education programs to communicate the benefits of recycling used oils, particularly to the cost conscious DIY consumer. Depending on local factors, special consideration could also be given to the needs to communicate in a bilingual manner if foreign languages are predominant in the targeted areas. EPA's Used Oil Program for Hispanics could be used as a model for this effort.

   Several major lubricant marketers have also sponsored a Web-based public information dissemination tool that could serve as a model for expanded outreach. The "www.Earth911.org" Web site features a helpful zip code based collection center locator for used oils that can be accessed either by toll-free

telephone or through the Web site. It also provides important informational items that relate to used oils and the environment.

Liabilities Involved with Handling of Used Oils

The activity could assess the magnitude of added costs associated with collectors handling used oil that has become contaminated with hazardous or unsafe materials. Programs that already exist at the magnitude to provide liability safe harbor and or financial assistance (e.g., state of Florida and the city of Albuquerque New Mexico[54]) could be used as successful models, if deemed appropriate.

Retail Sales

Consider statewide initiatives to require all retail establishments that sell quart and gallon containers of motor oils to proactively communicate locations of local recycling centers that accept used oil free of charge.

Technical Issues

- Consider whether to update the key major studies that relate to used oil management, both from an environmental and energy consumption perspective, which could take into account the latest technology developments for both used oil processing and re-refining and the resultant life cycle analyses. This study could also take into account the growing role of synthetic lubricants and assess to what extent synthetics alter the energy balances.
- Consider whether to update studies of used oil recycling programs and current used oil dispositions to assess how much progress has been achieved.
- Consider whether to update studies of the health and safety aspects of used oils and re-refined oils, including specific health and safety or toxicity issues and quality standards.

2. **Encourage States to Adopt Used Oil Management System Standards.** Pursuant to Section 3006 of Resource Conservation and Recovery Act (RCRA), encourage those states that have not yet adopted the Used Oil Management Standards in 40 CFR Part 279 to do so.

3. **Space Heaters.**

   For those geographic areas not attaining the National Ambient Air Quality Standards ($PM_{-2.5}$ and PM_{-10}) consider reassessment of used oil-fired space heaters. Estimating the number of units and quantifying hazardous air pollutant emissions from those units could also be considered. The purpose of this assessment is to establish the impact of these combustion units on non-attainment of NAAQS.

   For those states that offer state tax incentives to small businesses to buy space heaters in order to promote responsible recycling of used oils, suggest that surveys be conducted to confirm whether the current results of those programs justify the costs involved. It is possible that the state would be better served by

[54] References provided by the Automotive Oil Change Association, January 2006.

channeling those public funds into expansion of collection centers and financing recycling efforts as opposed to subsidizing space heaters.

9 Appendix

9.1 Key Stakeholders Involved With Used Oil Management in the United States

To better understand the key drivers of the used oil recovery and re-refining business, it is instructive to elaborate on the functions and roles of the key stakeholders in the used oil business.

The following section describes the role of the key stakeholders in the used oil business and some important characteristics and limitations of their operations[55]. It should be noted that in some cases the distinction between types of stakeholders may be somewhat misleading as many fulfill multiple roles depending on the specific customers involved, geographies served, and the pricing arrangements.

Many of the points considered in this report were tabled at the Stakeholders Meeting conducted on November 2, 2005. Table 13 presents the attendee list of that meeting, including dial-in participants.

[55] "An Overview of Stakeholder Interests in the Used Oil Industry", PetroTex Hydrocarbons, November 2005

Table 13: Used Oil / Re-refining Stakeholders Meeting November 2, 2005—Washington D.C. Attendees/Participants

Attendees	Agency/Company/Association	email
Art Hartstein	Department of Energy – Meeting Chair	Arthur.Hartstein@hq.doe.gov
Olayinka Ogunsola	Department of Energy	Olayinka.Ogunsola@hq.doe.gov
Dexter Sutterfield	Department of Energy	Dexter.Sutterfield@netl.doe.gov
Mike Svizzero	Environmental Protection Agency	Svizzero.Michael@epa.gov
Gabe Rozsa	Safety-Kleen	gabe_rozsa@was.bm.com
Mark Phariss	Safety-Kleen	mark.phariss@safety-kleen.com
Mike Ebert	Safety-Kleen	mike.ebert@safety-kleen.com
Keith Rainwater	PetroTex Hydrocarbons	krainwater@petrotx.com
Martin MacDonald	PetroTex Hydrocarbons	mmacdonald@petrotx.com
Steve Burkhardt	PetroTex Hydrocarbons	sburkhardt@petrotx.com
Rob Dingess	PetroTex Hydrocarbons	rdingess@petrotx.com
Tim Westerdale	General Oil	twesterdale@generaloilco.com
Adam Westerdale	General Oil	awesterdale@generaloilco.com
Dave Peel	General Oil	dpeel33@aol.com
John Williams	Holston Environmental Services, Inc.	jwilliams@holstonenv.com
Scotti Lee	AOCA (Automotive Oil Change Organization)	www.aoca.org
Scott Parker	National Oil Recyclers Association (NORA)	sparker@noranews.org
Jeff Obermiller	API	obermiller@api.org
Monica Sharma	National Auto Dealers Association	msharma@nada.org
Jack Waggener	URS / NORA	jack waggener@urscorp.com
Scott Slesinger	Environment Technology Council	sslesinger@etc.org
John Anderson	TMS, Inc	john.anderson@hq.doe.gov
Mauri Lappinen	TMS, Inc.	mlappinen@tms-hq.com
Dial In Participants		
Sue Brauer	EPA Region V	brauer.sue@epa.gov
Bob Boughton	California Dept of Toxic & Controlled Substances	bboughto@dtsc.ca.gov
J. Voogd	Evergreen Oil	simone@evergreenoil.com
Cal Barnes	Evergreen Oil	simone@evergreenoil.com
Jim Ennis	DeMenno/Kerdoon	jennis@asburyenv.com
Phil Pierce	Titan Group	ppierce@omegabiz.net
Bill Briggs	Oil Re-Refining Co (ORRCO)	billb@orrco.biz
Jim Letteney	Clean Harbors Oil Recycling Service	letteneyj@cleanharbors.com
Kevin Ferrick	API	ferrick@api.org
Chris Harris	NORA	gallating@aol.com

9.1.1 Generators

Generators is a term used to characterize the group of lube oil users that generate used oil when they replace old, dirty, spent lube oil with fresh new oil. The largest volume and most common users relate to automotive lube oil products but industrial oil users are also a very important part of the used oil management process.

This group of used motor oil handlers is broken down into two broad groups: DIFM and DIY. The DIFM group includes the increasingly popular quick lube oil change outlets, service stations, fleet maintenance shops, and automobile dealerships. Industrial oils are also addressed starting in Section 9.1.5.

9.1.2 DIY Oil Change Group

The most significant challenge from a used oil management point of view is to achieve proper disposal of used oil resulting from the DIY operation. It has been estimated that the more than 80 percent of the DIY oil change activities result in improper disposal of the used oil[56]. Convenience is a major factor encouraging this consumer to collect and recycle his oil. There are many mechanisms that are used to provide the collection points for used oil for the DIY consumer including retail gas stations, auto shops, garages, quick lube change shops, municipal recycling centers, and even curbside pickup services.

In 1993, recycling of used oil from DIY consumers took a major step forward when the Superfund liabilities were relaxed as outlined in CERCLA §114(e). However, it required collectors to comply with EPA regulations on handling of used oil and satisfying requirements of a SSD (the regulatory term "service station dealer" is used when referring to garages, quick lube change stores, etc.) Without this relaxation, there would be less incentive for a SSD to accept DIY oil considering the exposure to Superfund liabilities. Operators have to meet the definition of an SSD (ref: CERLCA §101(37)) before qualifying for this CERCLA liability exemption.

Regardless of the collection services provided, there is a certain segment of the consuming public that is not convinced that the small amount of oil they dispose of is significant enough to cause serious harm to the environment, and the proximity of local collection points is a major factor in this perception.

Changing consumer recycling habits is a long-term activity that requires frequent reinforcement from educational and awareness programs. There are encouraging signs of progress in this area but it will require continued effort.

9.1.3 DIFM Oil Change Group

Aside from the convenience that DIFM outlets provide their customers in terms of oil change services, in many states the DIFM operators serve an important role in that many offer to collect DIY used oils free of charge. Experience has shown that the added costs of handling this oil can be offset by the revenue received by selling the used oil. It is not a risk-free operation because providing the freedom for DIY'ers to drop off their oil also opens the door to unintended or illegal dumping of contaminants including paints, solvents, gasoline, or otherwise contaminated oils. The risk in this operation is that once contamination is detected, it could deem the receipt tank as being hazardous waste which requires a disposal fee on the order of $0.80 to $1.00 per gallon. The typical tank sizes range from several hundred gallons up to 3,000 gallons so the penalty can range

[56] American Petroleum Institute Web site: http://www.recycleoil.org/backup/About_us.htm

from several hundred to several thousand dollars per incident. The average quick lube operator generates monthly revenue on the order of $400–$500 from used oil sales so this can easily represent several months of revenue.

According to the America Petroleum Institute[57]:

> "In 1991, when records were first kept, API members operated 1,800 collection drop-off centers. In 1997 that number increased to over 12,200 drop-off collection centers. In addition, there are an estimated 26,021 public and private collection centers being operated by states, municipalities, automotive, and oil-change service centers. An estimated 240–259 million gallons of used motor oil was collected for recycling in 1997."

Although the 1997 API[58] survey assessed that only 66 percent of the DIFM used oil was collected and recovered, today industry analysts indicate that essentially 100 percent of the used oil that is collected at DIFM sites is recycled[59]. Some portion is recycled to internal heating requirements in space heaters, and the balance is sold to collectors and gatherers. The API estimates[60] that there are approximately 75,000 space heaters in use in garages that in total consume approximately 113 million gallons of used oil annually.

One very encouraging sign of progress is that there is a growing trend toward DIFM oil changes on the part of the consuming public. Table 14 shows how the popularity of DIFM oil changes has grown nearly 40 percent over the last 10 years.

Table 14: Sales of Motor Oils: DIY vs. DIFM Trends

	% DIY	% DIFM
1997[61]	60	40
2004[62]	45	55

This means that the U.S. consumer is becoming more environmentally conscious and that less used oil is polluting the environment through landfill disposal or other improper methods.

The Automotive Oil Change Association has developed very effective guidelines for distinguishing the quality of used oil transporters. This is available in Appendix 9.5 and is recommended for others that are involved in used oil transportation.

Regarding the future outlook for the DIFM operators, there is concern that as lube oil technology evolves and drain intervals grow, this may have a negative impact on the DIFM operators. As the profit margin decreases, it is possible that the ability to accept DIY used oils may be at risk. This is an important factor that needs to be evaluated periodically. If the DIY consumers find that their drop off points are no longer convenient and or willing to accept their used oils, then the volumes of used oil that are improperly disposed may grow in the future.

[57] American Petroleum Institute Web site: http://www.recycleoil.org/backup/About_us.htm
[58] http://www.recycleoil.org/Usedoilflow.htm#Re-Refining.
[59] Automotive Oil Change Association discussions, November 2005.
[60] American Petroleum Institute, http://www.recycleoil.org/Usedoilflow.htm#Re-Refining.
[61] Ibid.
[62] Kline and Company "Opportunities in Lubricants, North America", Volume II, Consumer Automotive, 2004.

9.1.3.1 Used Oil Sales

Regarding the sales of used oils to collectors, the most significant factors affecting prices include the volume of used oil collected and the location. As the volume decreases and the distance from the ultimate end user increases, the price received for used oil decreases. In some cases, the volumes are so small or remote that the generator has to pay the collector to recover his oil. The typical sales prices in urban areas are on the order of $0.20-0.30/gallon, but with the recent increase in fuel prices, used oil sales prices have occasionally exceeded $0.50/gallon[63]. Municipalities also resell their oils to collectors similar to the DIFM operators. And similarly, they also are exposed to the risks of illegally dumping hazardous wastes into their facilities.

In contrast to the risks associated with potential contamination incidents, generators can benefit from collecting used oils that are made from synthetic lube oils. These synthetic compounds render the used oil much more valuable compared to conventional base oils. However it appears that currently most generators and collectors are not equipped to recognize and reimburse generators for these higher valued used oil components.

Generators will ideally sell their used oil to the highest bidder, be it a collector that is reselling to a burner, or a re-refiner. Sales terms range from term contracts to spot sales depending on many factors, including the seller's knowledge of the market. But the price is very much a function of the transportation costs involved, the volume recovered, and the quality of the used oils.

9.1.3.2 Handling Oil Filters

Another important aspect of the used oil collection business is to ensure that oil filters are included in the context of the recycling programs. Oil filters can contain up to 4–6 ounces of used oil, and if not properly handled, it represents a missed opportunity for energy savings[64]. Collecting and recycling oil filters can help avoid polluting landfills with over 20,000,000 gallons of used oil annually based on industry statistics that reveal over 500,000,000 million automotive filters used annually. The Filter Council reports that recycling rates have improved from approximately 10-15 percent ten years ago to nearly 50 percent today due to continued emphasis on these environmental programs[65].

Based on the observations of an experienced group in the realm of used oil management, the California Integrated Waste Management Board[66] indicates that these pollution statistics could be understated. Their analysis reveals that upwards of 10-11 ounces of retained used oil is contained in each used oil filter.

9.1.4 Collectors / Transporters

Used oil "collectors" gather oil from generators, test the oil to ensure minimum quality requirements are met, consolidate volumes into commercial quantities, and sell it to end users. These companies typically employ from 1 to 50 trucks to collect oil from the various generating sources. In some instances, they pay the generator for their used oil and, in other instances (depending on volume, distance, and quality), they get paid by the generator to pick up the oil. Gathering is typically a highly competitive, marginal business that is highly influenced by market fluctuations.

[63] Scotti Lee, representative of Automotive Oil Change Association, personal correspondence, November 2005.
[64] Bill Briggs, Oil Re-Refining Company, personal correspondence, November 2005.
[65] http://www.filtercouncil.org/envinfo/newsletter/Feb2002.pdf
[66] Kristin Yee, California Integrated Waste Management Board, personal correspondence, February 2006.

The collector must find a margin between the generator and the used oil end user. The generator wants to dispose of his used oil in the most economical manner, whereas the "end user" does not want to pay any more than necessary for what is perceived to be a "waste" product.

Generators will sell to the highest bidder be they collectors, re-refiners, or independent haulers. In many cases the re-refiners do their own collections thus they compete directly with the collectors who generally sell to the clients who burn the used oil for process heat generation. In areas where both re-refiners and collectors operate, when fuel pries are high, the burners and collectors can afford to pay higher prices for used oils. These market dynamics can affect the profitability of the re-refiners as detailed in Section 9.1.6.1.

9.1.5 Used Oil Processors

This group, which involves over 200 separate corporate entities, handles approximately 750 million gallons of used oil annually and partially clean it by treating with demulsifiers, removing water and filtering sediments. In addition to these offsite processors, there are used oil processing operations that are conducted within a plant site, but time did not allow for detailed analysis of this segment of used oil management. But they are nonetheless an important element of the overall used oil recycling program.

Used oil processing is also referred to as a reclaiming operation. Limited atmospheric distillation may be utilized in this process to remove volatile compounds but generally no vacuum distillation is used. The end user of the process depends on the type of oil originally collected.

- Collected motor oils — the processors will sell their reprocessed oil into the burner market as it is unsuitable for use as a base oil because it contains spent motor oil additives that have not been cleansed to the extent necessary to render the oil for use as either a motor oil or even as an industrial oil.
- Collected industrial oils — in many cases industrial oils can be reprocessed back into an industrial oil finished product after topping up additives that were lost in the process.

In fact, there are many forms of processing for industrial oils. Some high volume treatment operations are performed directly at the customer's plant site where the lube oil is used, and in other cases it is trucked to a facility. In many cases the oil is treated in a closed loop operation whereby the used oil is processed several times to protect the quality and then returned to the customer after injection of additives to meet customer specifications. The number of cycles that can be achieved is a function of the severity of the application. This type of closed loop process offers the customer the maximum amount of security in the quality of his used lube oils and is also preferred to burning due to energy and environmental factors.

9.1.5.1 Used Oil from Industrial Oil Sources

Industrial oils are managed more carefully than consumer automotive used oils and consequently a higher percentage of these used oils are recycled. Industrial generators are generally more aware of their liabilities with regard to used oil management and many have to monitor and report on their used oil activity[67]. Furthermore, the opportunity for energy savings may be even greater with industrial oils than automotive oils because

[67] David Peel, General Oil Company, personal correspondence, November 2005.

many industrial generators are also end users of reclaimed products. Such operations are referred to as “closed loop” where lube oils can be recycled almost indefinitely. Another important feature of the closed loop customer is that they can be shielded from the effect of high crude prices.

The key difference in processing used oil to manufacture automotive oils, industrial oil, and fuels is energy and processing severity. A more severe process is needed to produce base oil for automotive use and this requires higher capital investment. Industrial oil processing is less severe. Processing automotive oils for recovery of base oils will be discussed in further detail in Section 9.2. Also, whereas most motor oils contain up to 20–25 percent additives, most industrial oils contain in the range of 2–5 percent additives.

Some slightly more sophisticated processors utilize atmospheric and vacuum distillation to separate out fuel oil and vacuum gas oil from the used oils. Typical end products of this partial refinement operation include marine diesel fuel, fluidized catalytic cracker or coker feedstock, fuel oil, and asphalt flux.

From an industrial oil consumer perspective, significant cost savings can result from reusing lubricating oils. For example, large industrial oil consumers like General Motors (GM) have successfully implemented innovative oil recycling programs to improve profitability in their highly competitive business[68].

In the past, used oils generated in GM’s automobile manufacturing processes were sold to recyclers who, in turn, supplied the used oils into combustion end uses. This disposition, although acceptable from an environmental point of view, did not take full advantage of the remaining lubricating qualities of the used oils.

Since approximately 2000, GM’s enhanced used oil recycling program has evolved to where it currently regenerates and re-uses 4.8 million gallons of oil annually with a cost saving in excess of $2 million. This program relies on used oil processors to provide the manufacturing facilities and know-how to regenerate the inherent lubricating oil qualities of their used oils to meet GM's stringent specifications to ensure the safety and performance of the returned products. Their future plans include more onsite efforts to reduce used oil generation, better segregate different types of used oil streams for more efficient recycling and to recycle the oil onsite where feasible.

9.1.6 Used Oil Re-refiners & Re-refining Economics

Currently there are a handful of re-refining companies in the United States that process used oils to manufacture clean base oils that are suitable for blending into finished motor oil or other lube oil products. Generally the re-refiners also operate their own collection facilities so they compete with collectors for access to used oils from gatherers. Collectors sell most of their used oil as a low grade black fuel oil.

Re-refiners are distinguished by two factors:

- They utilize the same technology used by partial re-refiners as noted in Section 9.1.5 plus they use hydrogenation technology or other regeneration technologies to remove sulfur, improve stability, and to control the color and odor characteristics of the used oils, and
- They produce a base oil that can be used in the production of motor oils and industrial oils comparable to virgin base oils. The lube oils used to blend motor oil

[68] Donald Smolenski, General Motors, personal correspondence, December 2005.

> meet API certification and International Lubricant Standardization and Approval Committee (ILSAC) standards. These can be advertised and displayed on product packaging by showing API's motor oil quality marks — the API Service Symbol "Donut" and Certification Mark "Starburst" which help consumers identify quality motor oils for their gasoline and diesel-powered vehicles[69].

Among the major issues with re-refiners is that the investment required to build and operate a re-refining facility is much higher than the used oil processor discussed in the Section 9.1.5. The major cost factor is the hydrogenation step and the vacuum distillation step. There are no industry standard designs or good public references available on the cost of new plants and it is noteworthy to mention that the industry has several expensive examples of failed attempts to commercialize re-refining technology[70]. Noted in Table 15 are three estimates of the investment for a new re-refining plant:

[69] American Petroleum Institute Web site, http://www.recycleoil.org/index.htm.
[70] Bill Briggs, Oil Re-Refining Company, personal correspondence, November 2005.

Table 15: Re-refining Plant Investment Cost Range, $ Million

Investment range, $ Million	Capacity range, Million gallons/yr of base oil	Comments
4–17 [71]	5–24	Hydrogen source required.
5–7 [72]	7–10	Clay regeneration.
17–21 [73]	15	Partial hydrogenation, in process of being commercialized.

As noted, the plant investment is a strong function of the technology employed, hydrogenation being a very important determinant in cost.

Also, the re-refiner has to bear the burden of certifying their base oils meet the API and other industry lube base oil quality requirements, which can involve an investment of $300,000 to as much as $500,000. Without this certification their end product would not be able to achieve its maximum value in the marketplace because it would be limited to use as an industrial oil or fuel component.

It is possible for some stakeholders to fulfill multiple roles in the management of used oils. For example, it is not unusual that re-refiners act as collectors for used oils, and in some cases they may also act as processors for specific customers.

Some of the key characteristics of used oils are detailed in Section 9.1.10 which explains some of the unique challenges that processors and re-refiners face in dealing with used oil.

9.1.6.1 Re-refining Economics

There are two major economic factors that should be noted. The cost of re-refining raw material (used oils) is a strong function of the cost of fuel oil and, indirectly, crude oil. On the other hand, the value of the re-refining plant product (base oil) is relatively independent of crude as shown in Figure 2[74]. While there is little time lag between crude prices and fuel prices, base oil prices lag crude price changes by weeks and even months or more. This phenomenon can impact re-refiner operations and profitability until the market prices achieve parity.

[71] J. Voogd, Evergreen Holdings, Inc., “New Developments In Re-Refining of Used Oil”, December 2005.
[72] Bill Briggs, Oil Re-Refining Company, personal correspondence, November 2005.
[73] “Martin MacDonald, PetroTex Hydrocarbons, personal correspondence, November 2005.
[74] Working Group on Waste Prevention and Recycling, Improving Recycling Markets, Organization for Economic Co-operation and Development, 26-Sep-2005, http:www.oecd.org/dataoecd/14/9/35438706.pdf, page 48.

Figure 2: Relationship Between Crude and Base Oil Prices 1997 – 2003, $/Tonne

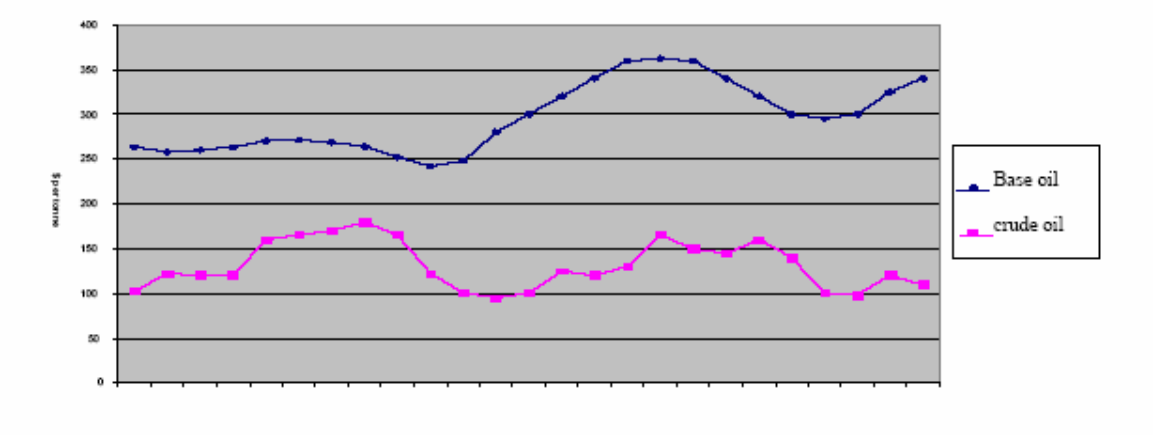

Table 16 presents a very simplified and approximate overview of re-refining economics based on one individual's assessment and has not been independently verified. It includes the impact of raw material costs, processing, and the revenues received for the base oil product[75] based on crude prices in the $45 - $55 per barrel range. This serves to quantify the relative magnitude of the key cost parameters as they impact profitability. One important point is that the used oil feed costs are highly variable as they are driven directly by fuel prices. On the other hand, base oil prices have a long time lag from crude and fuels prices, and as such, re-refiner profitability can erode for periods of time due to this pricing phenomenon. For example, during the third quarter of 2005, fuel prices increased dramatically with crude prices and, during this spike in prices, used oil purchase prices occasionally exceeded 0.50 $/gallon. Likewise, transportation and plant operating costs also increased, both having a negative impact on re-refining profitability.

Table 16: Re-refining Economics, $/Gallon

	$/Gallon
Used oil feed	0.30 – 0.45
Used oil transportation	0.10 – 0.30
Re-refining operating costs	0.50 – 0.75
Net realization	1.60 – 1.80
Product transportation	0.10 – 0.30
Overhead	0.20 – 0.30
Margin	(0.05) – 0.60

[75] Mike Ebert, Safety-Kleen Company, personal correspondence, December 2005.

9.1.7 Used Oil Burners

The vast majority of the used oil collected is recycled and burned in industrial burners (factories, utilities, cement plants, asphalt aggregate production facilities, and space heaters in garages). It amounts to 780 million gallons annually as noted in Table 5. Large industrial used oil consumers that combust the oil for heating value incorporate pollution abatement devices to minimize the environmental effects.

However, exceptions have been made for small garage operators to allow them to burn their internally produced used oils on premises as long as the capacity of the burner does not exceed 500,000 Btu/hr. Were it not for used oils, these companies would burn only natural gas or an industrial grade fuel oil. Therefore, burning used oil offers them an opportunity to reduce costs because used oil is typically purchased at a 25–35 percent discount compared to their alternative fuel.

9.1.8 Simplified Flow Schematic

Figure 3 presents a simplified schematic that details the major used oil flows and how the stakeholders interact with each other. Specifically it shows how motor oils and industrial oils are handled once they are collected as used oils.

Motor oils are sold either to DIY or DIFM channels. DIY oils can be gathered by collectors or improperly disposed of in landfills. DIFM oil is gathered and then either burned as a fuel or transferred to re-refining operations. From there the regenerated oil is either burned or sold as base oil for fresh motor oil or industrial oil blending.

Industrial oils generally follow the same path as motor oils except that they do not flow through the DIY and DIFM operations but rather are handled more directly by processors or reclaimers where the industrial oils are cleansed either for fuel applications or for fresh new industrial oil blending. Rarely would industrial oils end up being processed into new motor oil components.

Both oils have some portion that is consumed in operation which is unavailable for recycling or regeneration.

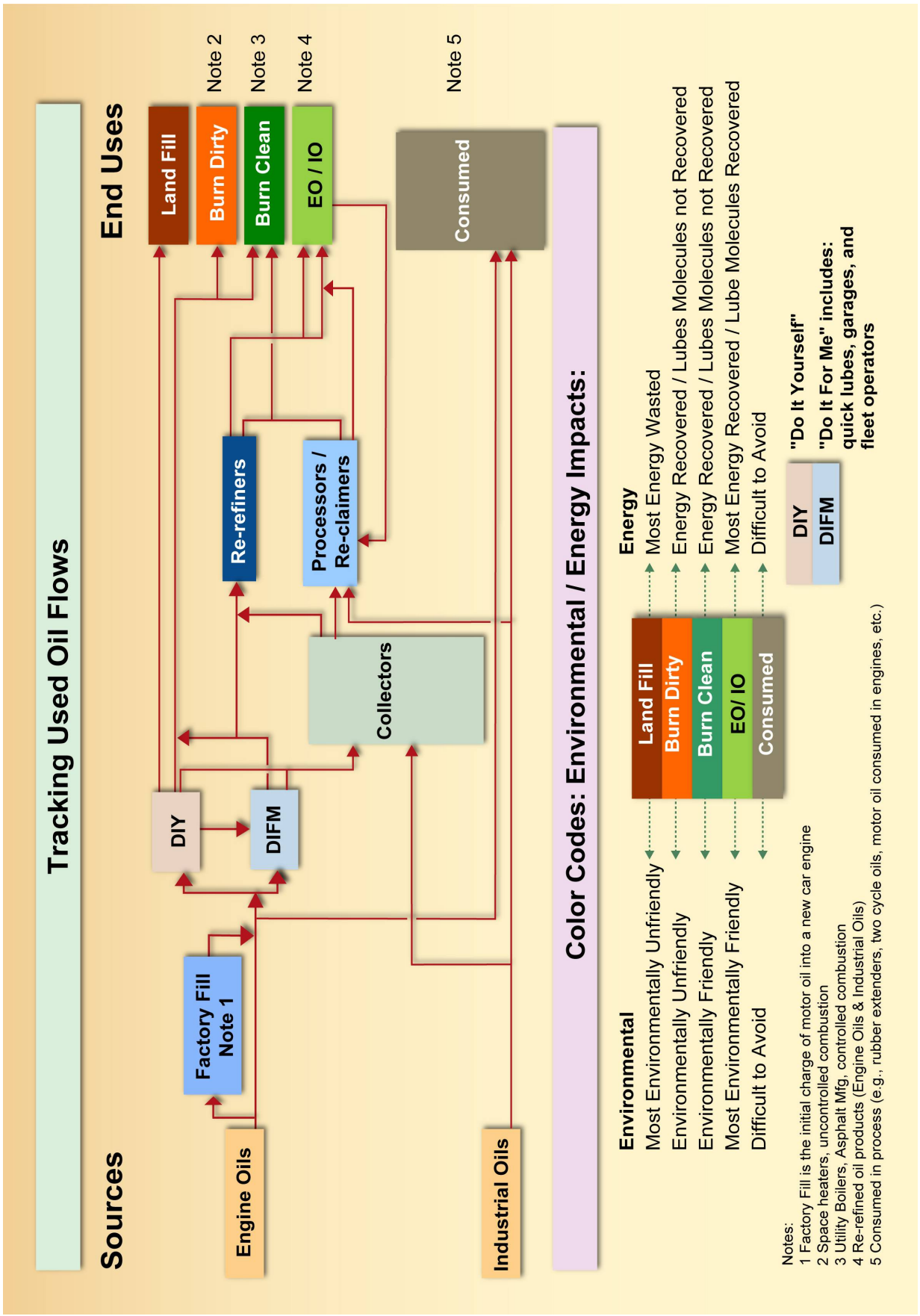

Figure 3: Used Oil Flow Diagram

9.1.9 Oil Consumed In Operation

One of the difficulties involved in assessing total used oil volumes and recycling progress is that there is a significant portion of oil that is consumed in process and is never made available for recycling. A summary of oil "consumed in operation" is noted below:

- Annually automobiles travel 1.65 trillion[76] miles in the United States, and a consumption level of 1 quart every 1,000 miles[77] is not unusual. However, using a typical average consumption level of 1 quart every 5,000 miles translates to more than 80 million gallons of motor oil consumed annually.
- Other types of lube oil demand that are not recoverable include[78]: two cycle motor oils that are designed to be combusted with the primary fuel; food processing equipment; white oils used as protective coating for fruits and vegetables; dust control of grain; de-foaming agents; pharmaceutical products - baby oils, skin, hair and facial products, cosmetics; printing inks; textile processing lube oils; carrier oils chemicals, friction lube oils, wire rope lube oils, chain oils, chain saw oil, arbor oil; some refrigeration oils; machining oils (e.g., drilling, tapping, boring, milling, grinding, tapping, sawing, shaping); forming oils (e.g., drawing, ironing, rolling, forging and stamping); protecting oils (e.g., corrosion protection of metals); treating oils (e.g., steel and metal quenching and tempering); dust suppressant; agricultural spray oils; rubber and plastic oils (e.g., plasticizers, extender oils and mold release oils).

One significant change will occur in 2007 involving heavy duty engine vehicles. Due to the implementation of more stringent diesel engine particulate emissions limitations, the catalyst systems will require ultra low sulfur diesel fuel to protect catalyst activity. Additionally, the current practice of burning used oil in these heavy duty engines will no longer be allowed as it would poison the catalyst systems. This will in turn result in an estimated 2,000,000 gallons of additional used oil that will be drained and collected starting in 2007 for the new model year vehicles. This assumes 200,000 new Class 7 and Class 8 2007 model year vehicles[79], one oil change annually, and a 45 quart crankcase.

9.1.10 Characteristics of Used Oils

Re-refining used oil is complicated by the fact that the oil is difficult to characterize. It is very much dependent upon the source of the used oil, the types of used oil, how it was collected, and the intended end-use of the oil[80]. The highly variable quality of used oils drives the complexity of the facilities necessary to treat it for re-use. Used oil is made up of base oils and various additives that impart the desired quality characteristics to the finished product. High tech motor oil, for example, contains as much as 20–25 percent additive components in the finished product. This includes additives like viscosity improvers, demulsifiers, detergents, and antiwear additives, to name a few.

[76] U.S. Department of Energy, Transportation Databook, Edition 24, December 2004, page 3.1.
[77] http://www.performanceoiltechnology.com/motor_oil_consumption.htm
[78] PetroTex Hydrocarbons, personal correspondence, November 2005.
[79] U.S. Department of Energy Transportation Energy Databook, Table 5-3, New Retail Truck Sales, page 5-4.
[80] "End Uses for Used Oil, A Market Perspective", by Don Kress Par Excellence Developments Inc., Sudbury Canada, http://www.ped.vianet.ca/article1.pdf.

On the other hand, used oils comprise the original base oils and additives plus water, non-combustible ash, heavy metal compounds, sulfur, and solids such as dirt and grit from blow-by carbon in diesel engines. Water can exist in free form or in emulsified form by the chemical additives in motor oils that are designed to prevent free water from accumulating in engine reservoirs. Heavy metals come from certain additives and from the engine itself while sulfur is an important part of the antiwear and detergent additives. Finally, used oils can also contain chlorinated solvents, PCBs, paints, solvents, and other extraneous materials that may require special handling.

9.2 Processing Technology

Processing (or reprocessing or reclaiming) is a fairly low-cost process for treating used oils and can be applied in the following situations:

- Process used industrial oils to the point where they can be re-used as industrial oils or sold for combustion applications; and
- Process used motor oils so that they can be sold into combustion applications.

Most industrial oils contain up to approximately 2–5 percent of additives to enhance the performance of the lube oils. Mostly they involve antioxidants, wear protection additives, and defoamants to extend the life of the oils and enhance performance.

The process technology involves[81]:

- removal of water and heavy sediment by settling;
- removal of particulates by filtration, and
- control of ash by blending.

Some larger volume processors remove water light fuels and chlorinated solvents by distillation, employ centrifuges, or use chemical treatment to break emulsions or reduce content of ash and sulfur. Processing products are marketed as discounted fuel oils to asphalt plants, industrial boilers, utility boilers, steel mills, cement kilns, marine boiler pulp and paper mills, and commercial boilers.

Re-Refining Technology

The following is a description of the Safety Kleen re-refining process[82] which focuses on two basic processes: distillation and hydrotreating.

Used oil is distilled in a three-stage distillation system. The first step removes the water and any light hydrocarbons (e.g. gasoline and solvents). These materials are removed as a vapor, then condensed and separated. A fractionation unit separates the water and the light fuel which is used as a supplemental fuel in the process heaters at the site, or is sold as either an on- or off- specification used oil fuel.

The water generated in the re-refining process contains contaminants which are removed through further distillation prior to treatment in the waste water treatment facility. These contaminants include sulfur compounds, ammonia, gasoline, alcohols, solvents and ethylene glycol from anti-freeze. The pretreatment step occurs in the

[81] "Assessment of Opportunities to Increase the Recovery and Recycling of Waste Oil" By D.J. Graziano and E. J. Daniels; Department of Energy Argonne National Laboratory, August 1995, page 43.

[82] Safety-Kleen Oil Recovery Co., Environmental Information Package, East Chicago Re-refinery, October 2005, pages 5-7.

stripper section. The water present in the incoming used oil and any process waters are fed to the stripper at different points depending on their physical and chemical characteristics. The stripper is a fractionation tower with a combination of trays and packing as internal components. The lower section of the stripper is designed to concentrate the higher boiling contaminants including trace amounts of oil and the ethylene glycol. The ethylene glycol rich stream is segregated and sold as a recyclable product. The upper section of the stripper concentrates any low boiling point contaminants including gasolines, solvents, sulfur and nitrogen compounds. This stream is condensed and recovered as a fuel which is utilized in the re-refining process. The stripped water is removed as a side product and directed to the on-site waste water treatment plant.

The dehydrated oil is then subjected to a second, more severe distillation step, or vacuum fuel stripping where the remaining fuel oils are removed using vacuum distillation. During vacuum distillation, the oil is moderately heated under a vacuum, which causes the light fuels present to boil at lower temperatures. This avoids the high temperature conditions which would otherwise cause the hydrocarbon chains to crack or coke up. The vapor generated during this vacuum distillation stage is condensed to form a fuel similar to home heating fuel. This fuel is either used as fuel at the re-refinery, or sold as an on-specification used oil fuel.

The third distillation step utilizes a vacuum flash tower and two thin film evaporators. In the vacuum tower, the oil is subjected to high temperatures and low pressures, vaporizing the lighter lube oil fraction. This vapor is condensed and collected as lube oil. A set of wiper blades spread the heavier oil against the wall of the vessel, a heat exchanger, to help this material evaporate. A special high temperature heat transfer fluid is used to heat up the exchanger. Two grades of lube oil are produced in this third stage. Any material that does not evaporate in the evaporators is recovered and sold as an asphalt extender material, for use in refining and asphalt paving.

The oil fractions produced in the third distillation stage, are then treated in the hydrotreater to purify the oil. This step uses hydrogen gas in a high temperature, high pressure, catalyzed reaction to remove sulfur, chlorine, oxygen, and other impurities from the oil and improves product stability, color and odor. The lube oil produced is considered base stock. The subsequent blending in of a variety of additives will produce the products familiar to most: motor oil, transmission fluid, hydraulic fluid, etc.

Evolving Technology

PetroTex Hydrocarbons has developed a unique manufacturing scheme that is in process of being commercialized[83]. The patent pending ReGen™ process utilizes a combination of proprietary and conventional refining technologies to efficiently produce base oil and other valuable hydrocarbon products from used oil. The three-stage process results in 75 percent base oil (60 percent API Group II and 15 percent API Group I), 13 percent asphalt flux, and 12 percent fuel oil. Both grades of base oil are suitable for use in automotive or industrial applications where high quality lubricants are required. The process does not produce environmentally hazardous waste streams and with the exception of water, all of the used oil is turned into readily marketable petroleum products.

In the first stage of the process, the used oil is treated using In-Situ Distillation™, a proprietary process which separates the base oil molecules from bulk contaminants such

[83] Martin MacDonald, PetroTex Hydrocarbons, personal correspondence, November 2005.

as water, fuel oils, glycols, and spent additives. The second stage employs a conventional partition technology operated in an enhanced way to separate the base oil molecules containing contaminants such as sulfur, oxygen, and nitrogen as well as those that have less favorable molecular structure such as olefins and aromatics from the "good" base oil molecules. The "good" molecules form a high quality base oil product. The removed, lower quality, base oil molecules are upgraded in the final stage of the process by treating with hydrogen. This process more fully saturates the molecules and removes molecular contaminants from the oil, thereby improving its quality.

9.3 Used Oils Re-refining and Processing Plants

Table 17: Used Oil Re-refining and Processing Plants

Processor / Re-refinery	Location	Capacity M gallons/yr (Base Oil)	Process description	Source of used oil
Safety Kleen[84]	East Chicago, IN	100	Vacuum distillation, wiped film evaporation, hydrotreatment.	80% automotive, 20% closed loop industrial, API approved base oils.
Evergreen[85]	Newark, CA	13 (26)	Vacuum distillation, wiped film evaporation, hydrotreatment.	90% automotive
Oil Re-Refining Co. (ORRCO)[86]	Portland, OR	8.5[87]	Vacuum distillation, thin film vacuum wiped tower, re-generation clay polish unit.	Products include fresh base oils, diesel fuels, and asphalt flux.
PetroTex Hydrocarbons[88]	Texas; 2008 start up	15	Proprietary Petrotex Regen™ technology.	TBD
General Oil[89]	Detroit, MI	25		Primarily closed loop industrial oils.
Demenno/ Kerdoon[90]	Compton, Los Angeles, CA	100	Atmospheric and vacuum distillation, no post treatment.	90% automotive, processed to marine distillate oil.
Consolidated Recycling (NV)	Troy, IN	12	Vacuum distillation; wiped film evaporation, chemical treatment.	Industrial lube oils 80% closed loop.
US Filter (NV)	TX, LA, DE, FL	90 +/-		
Mid-America Distillations (NV)	Hot Springs, AR	3	Vacuum Distillation	Industrial Synthetics
Chevron Texaco (NV)	LA	n/a	Vacuum distillation to produce marine diesel oil.	n/a
Wallover Oil (NV)	OH	n/a	n/a	n/a

Source: "Assessment of Opportunities to Increase the Recovery and Recycling of Waste Oil" by D.J. Graziano and E. J. Daniels; Department of Energy Argonne National Laboratory, August 1995, page 45.

Note: NV: Not verified or updated since 1995 report.

[84] Gabe Rozsa, personal correspondence, November 2005.
[85] Cal Barnes, Evergreen Company, personal correspondence, November 2005; Evergreen Company has an expansion project currently underway to double processing capacity.
[86] Bill Briggs, personal correspondence, November 2005.
[87] ORRCO are reportedly planning another re-refining plant in Nevada as published in Industry News from Lube-n-Greases, March 2, 2005, Volume 5, Issue 9.
[88] Martin MacDonald, PetroTex Hydrocarbons, personal correspondence, November 2005.
[89] Dave Peel, General Oil, personal correspondence, November 2005.
[90] Bill Ennis, DeMenno-Kerdoon, personal correspondence, November 2005.

9.4 European Used Oil Management Statistics

Table 18: European Waste Oil Collection Statistics by Country

Year 2002	Consumption (*)	Collectable		Collected (dry waste oil)	
	A	B/A	B	C/B	C
	Tons	%	Tons	%	Tons
Austria	109.000	49	53.622	62	33.500
Belgium	173.100	36	63.105	95	60.000
Denmark	71.718	65	46.909	75	35.000
Finland	88.809	56	49.596	80	39.677
France	841.356	50	422.197	57	242.500
Germany	1,032.361	45	463.304	99	460.000
Greece	87.800	46	40.161	55	22.000
Ireland	38.900	46	17.794	86	15.303
Italy	617.594	32	196.737	96	189.595
Luxembourg	10.170	46	4.652	98	4.564
The Netherlands	152.694	44	66.468	90	60.000
Portugal	102.000	52	52.842	75	39.620
Spain	510.980	50	255.236	63	160.000
Sweden	142.814	54	77.232	80	61.786
U.K.	840.834	48	401.474	88	352.500
E.U.	4.820.130	46	2.211.329	80	1.776.044

(*) source: Europalub “About GEIR”, (Groupement Européen de l’Industrie de la Régénération) Web site : http://www.geir-regeneration.org/en/about_geir ; key figures

Note 1: “Collectable” defined as the amount of lube oil that is available for collection and recycling. The difference between the total consumption and collectable is the oil that is consumed in the process of being used as a lube oil or otherwise not practically available for collection. Examples of oils consumed in operation include process oils, two cycle motor oils for motorcycles, oils unintentionally burned in internal combustion engines due to overheating, blow by, grease applications, and used oils contaminated to such an extent that recycling is not feasible.

Table 19: European Used Oil Re-refining/Processing Operational Name Plate Capacity

Country	Company	Million Gallons/Yr	Comment
Belgium	Mottay & Pisart Co WOS Hautrage	1.0	base oil 3.500 tons
	WOS Hautrage	6.7	base oil and gas oil
Denmark	Dansk Olie Genbrug	13.2	base oil 30.000 tons
France	Eco Huile	26.5	only base oil
Germany	Baufeld Duisburg	29.4	base oil 80.000 tons
	Baufeld Chemnitz	14.7	only base oil
	MRD Dollbergen	67.6	base oil 120.000 tons
	Horst Fuhse Hamburg	29.4	base oil 55.000 tons
	KS Recycling	13.2	only fuel
	Südöl Eislingen	11.76	base oil 20.000 tons
Greece	Cyclon Hellas	8.8	only base oil
Italy	Distoms	5.9	base oil 12.000 tons
	Ecener	4.4	only base oil
	R.A.M. Oil Napoli	10.3	only base oil
	Siro	2.6	only base oil
	Viscolube	54.4	only base oil
Spain	Cator Barcelona	12.3	only base oil
	Ecolube Madrid	7.9	only base oil
	Santoil	5.9	only base oil
United Kingdom	OSS Group	2.9	only base oil

Memo: Total used oil re-refining capacity that is used to produce base oils in Europe = 263 million gallons/year

Projects			
France	Osilub c/o Sarp Industries	35	project 2005 & 2006
			(base oil 80.000)
Germany	Anista Duisburg	29.4	project 2004
	Petrus Germany	23.5	project
	Puralube Marl	23.5	project

Table 20: European Standard Base Oil Qualities: Virgin vs. Re-refined Stocks

	Re-refined	Virgin	Re-refined	Virgin
Base Oils	***NR 130***	***SN 150***	***NR 500***	***SN 500***
Appearance	B&C	B&C	B&C	B&C
Color	0	L 1,0	0,5	L 2,0
Viscosity@40°C,cSt	24+25	30	106+107	97
Viscosity@100°C	4,5+4,7	5	11,6+11,8	11
Viscosity Index	99	101	96	97
C.O.C. (°C)	226	225	284	260
Noack (wt%)	17,8	15	1,8	3,7
PNA IP-346 (%)	0,62	1,4	0,27	1,2
N.N. (mgKOH/g)	0,006	0,04	0,008	0,01
Chlorine (ppm)	<10	<10	<10	<10
Conradson (wt%)	< 0,01	0,05	< 0,01	0,08
Pour Point (°C)	-12	-12	-9	-9

Noack: a measure of volatility (somewhat similar to Reid Vapor Pressure (RVP); but specifically designed to simulate an internal combustion engine crankcase internal operational dynamics. The better the oil, the lower the Noack volatility.
PNA: Poly nuclear aromatics (carcinogen)
N.N: Neutralization number
Conradson: Conradson carbon
B&C: Bright and Clear

Source: “About GEIR”, (Groupement Européen de l’Industrie de la Régénération)

Website: : http://www.geir-regeneration.org/en/about_geir ; key figures

9.5 Automotive Oil Change Association Green Recycler Program[91]

The AOCA (Automotive Oil Change Association] have adopted the following checklist to help them distinguish and give preference to collectors/recyclers that meet their needs. This checklist serve as a best practice for others in the used oil business to consider.

A "Green" Recycler must do the following:

(a) Maintain ISO-9001 or ISO-14001 certification;

(b) Maintain environmental liability insurance coverage above and beyond CGL coverage;

(c) Maintain adequate financial assurance (closure & clean up funding) per state law or, where not required by state law, otherwise provide a certified public accountant (CPA) certified demonstration of financial stability;

(d) Demonstrate first-hand knowledge that every third-party company to which it markets currently operates in compliance with all applicable environmental requirements. The only exception is for Transporters/Recyclers who market on-specification used oil directly to licensed burners;

(e) Maintain Spill Response Plans for storage facilities certified by a Professional Engineer pursuant to the federal Spill Prevention, Control and Countermeasure (SPCC) regulation as well as Oil Pollution Response Plans for all vehicles;

(f) Transporters must test used oil for halogens onsite, prior to transport, and document the results of such testing;

(g) Transporters must take samples of used oil onsite and provide generator with written procedure documenting the company's sample retention policy;

(h) Test loads of used oil prior to commingling with general storage and document the results of such testing;

(i) Transporters must provide detailed shipping/manifest paperwork;

(j) Complete thorough facility safety and environmental compliance audits on a regular basis. As part of this process the transporter/recycler should maintain a written audit protocol that covers a comprehensive set of environmental, health, and safety (EH&S) requirements;

(k) Request voluntary government or other third-party inspection on an annual basis; and

(l) Used oil processors and re-refiners must provide proof that emergency response arrangements have been made (or attempted) with local authorities and must also maintain a facility contingency plan.

[91] Joanna Johnson, Automotive Oil Change Association, personal correspondence, November 2005.

9.6 Executive Orders Dealing with Used Oils

9.6.1 RCRA 6002

Resource and Conservation Recovery Act 6002

TITLE 42--THE PUBLIC HEALTH AND WELFARE

CHAPTER 82--SOLID WASTE DISPOSAL

SUBCHAPTER VI--FEDERAL RESPONSIBILITIES

Sec. 6962. Federal procurement

(a) Application of section

Except as provided in subsection (b) of this section, a procuring agency shall comply with the requirements set forth in this section and any regulations issued under this section, with respect to any purchase or acquisition of a procurement item where the purchase price of the item exceeds $10,000 or where the quantity of such items or of functionally equivalent items purchased or acquired in the course of the preceding fiscal year was $10,000 or more.

(b) Procurement subject to other law

Any procurement, by any procuring agency, which is subject to regulations of the Administrator under section 6964 of this title (as promulgated before October 21, 1976, under comparable provisions of prior law) shall not be subject to the requirements of this section to the extent that such requirements are inconsistent with such regulations.

(c) Requirements

(1) After the date specified in applicable guidelines prepared pursuant to subsection (e) of this section, each procuring agency which procures any items designated in such guidelines shall procure such items composed of the highest percentage of recovered materials practicable (and in the case of paper, the highest percentage of the postconsumer recovered materials referred to in subsection (h)(1) of this section practicable), consistent with maintaining a satisfactory level of competition, considering such guidelines. The decision not to procure such items shall be based on a determination that such procurement items--

(A) are not reasonably available within a reasonable period of time;

(B) fail to meet the performance standards set forth in the applicable specifications or fail to meet the reasonable performance standards of the procuring agencies; or

(C) are only available at an unreasonable price. Any determination under subparagraph (B) shall be made on the basis of the guidelines of the National Institute of Standards and Technology in any case in which such material is covered by such guidelines.

(2) Agencies that generate heat, mechanical, or electrical energy from fossil fuel in systems that have the technical capability of using energy or fuels derived from solid waste as a primary or supplementary fuel shall use such capability to the maximum extent practicable.

(3)(A) After the date specified in any applicable guidelines prepared pursuant to subsection (e) of this section, contracting officers shall require that vendors:

(i) certify that the percentage of recovered materials to be used in the performance of the contract will be at least the amount required by applicable specifications or other contractual requirements and

(ii) estimate the percentage of the total material utilized for the performance of the contract which is recovered materials.

(B) Clause (ii) of subparagraph (A) applies only to a contract in an amount greater than $100,000.

(d) Specifications

All Federal agencies that have the responsibility for drafting or reviewing specifications for procurement items procured by Federal agencies shall--

(1) as expeditiously as possible but in any event no later than eighteen months after November 8, 1984, eliminate from such specifications--

(A) any exclusion of recovered materials and

(B) any requirement that items be manufactured from virgin materials; and

(2) within one year after the date of publication of applicable guidelines under subsection (e) of this section, or as otherwise specified in such guidelines, assure that such specifications require the use of recovered materials to the maximum extent possible without jeopardizing the intended end use of the item.

(e) Guidelines

The Administrator, after consultation with the Administrator of General Services, the Secretary of Commerce (acting through the National Institute of Standards and Technology), and the Public Printer, shall prepare, and from time to time revise, guidelines for the use of procuring agencies in complying with the requirements of this section.
Such guidelines shall--

(1) designate those items which are or can be produced with recovered materials and whose procurement by procuring agencies will carry out the objectives of this section, and in the case of paper, provide for maximizing the use of post consumer recovered materials referred to in subsection (h)(1) of this section; and

(2) set forth recommended practices with respect to the procurement of recovered materials and items containing such materials and with respect to certification by vendors of the percentage of recovered materials used, and shall provide information as to the availability, relative price, and performance of such materials and items and where appropriate shall recommend the level of recovered material to be contained in the procured product. The Administrator shall prepare final guidelines for paper within one hundred and eighty days after November 8, 1984, and for three additional product categories (including tires) by October 1, 1985. In making the designation under paragraph (1), the Administrator
shall consider, but is not limited in his considerations, to--

(A) the availability of such items;

(B) the impact of the procurement of such items by procuring agencies on the volume of solid waste which must be treated, stored or disposed of;

(C) the economic and technological feasibility of producing and using such items; and

(D) other uses for such recovered materials.

(f) Procurement of services

A procuring agency shall, to the maximum extent practicable, manage or arrange for the procurement of solid waste management services in a manner which maximizes energy and resource recovery.

(g) Executive Office

The Office of Procurement Policy in the Executive Office of the President, in cooperation with the Administrator, shall implement the requirements of this section. It shall be the responsibility of the Office of Procurement Policy to coordinate this policy with other policies for Federal procurement, in such a way as to maximize the use of recovered resources, and to, every two years beginning in 1984, report to the Congress on actions taken by Federal agencies and the progress made in the implementation of this section, including agency compliance with subsection (d) of this section.

(h) ``Recovered materials'' defined

As used in this section, in the case of paper products, the term ``recovered materials'' includes-

(1) postconsumer materials such as--

(A) paper, paperboard, and fibrous wastes from retail stores, office buildings, homes, and so forth, after they have passed through their end-usage as a consumer item, including: used corrugated boxes; old newspapers; old magazines; mixed waste paper; tabulating cards; and used cordage; and

(B) all paper, paperboard, and fibrous wastes that enter and are collected from municipal solid waste, and

(2) manufacturing, forest residues, and other wastes such as--

(A) dry paper and paperboard waste generated after completion of the papermaking process (that is, those manufacturing operations up to and including the cutting and trimming of the paper machine reel into smaller rolls or rough sheets) including: envelope cuttings, bindery trimmings, and other paper and paperboard waste, resulting from printing, cutting, forming, and other converting operations; bag, box, and carton manufacturing wastes; and butt rolls, mill wrappers, and rejected unused stock; and

(B) finished paper and paperboard from obsolete inventories of paper and paperboard manufacturers, merchants, wholesalers, dealers, printers, converters, or others;

(C) fibrous byproducts of harvesting, manufacturing, extractive, or wood-cutting processes, flax, straw, linters, bagasse, slash, and other forest residues;

(D) wastes generated by the conversion of goods made from fibrous material (that is, waste rope from cordage manufacture, textile mill waste, and cuttings); and

(E) fibers recovered from waste water which otherwise would enter the waste stream.

(i) Procurement program

(1) Within one year after the date of publication of applicable guidelines under subsection (e) of this section, each procuring agency shall develop an affirmative procurement program which will assure that items composed of recovered materials will be purchased to the maximum extent practicable and which is consistent with applicable provisions of Federal procurement law.

(2) Each affirmative procurement program required under this subsection shall, at a minimum, contain--

(A) a recovered materials preference program;

(B) an agency promotion program to promote the preference program adopted under subparagraph (A);

(C) a program for requiring estimates of the total percentage of recovered material utilized in the performance of a contract; certification of minimum recovered material content actually utilized, where appropriate; and reasonable verification procedures for estimates and certifications; and

(D) annual review and monitoring of the effectiveness of an agency's affirmative procurement program.

In the case of paper, the recovered materials preference program required under subparagraph (A) shall provide for the maximum use of the post consumer recovered materials referred to in subsection (h)(1) of this section.

(3) In developing the preference program, the following options shall be considered for adoption:

(A) Case-by-Case Policy Development: Subject to the limitations of subsection (c)(1)(A) through (C) of this section, a policy of awarding contracts to the vendor offering an item composed of the highest percentage of recovered materials practicable (and in the case of paper, the highest percentage of the post consumer recovered materials referred to in subsection (h)(1) of this section). Subject to such limitations, agencies may make an award to a vendor offering items with less than the maximum recovered materials content.

(B) Minimum Content Standards: Minimum recovered materials content specifications which are set in such a way as to assure that the recovered materials content (and in the case of paper, the content of post consumer materials referred to in subsection (h)(1) of this section) required is the maximum available without jeopardizing the intended end use of the item, or violating the limitations of subsection (c)(1)(A) through (C) of this section.

Procuring agencies shall adopt one of the options set forth in subparagraphs (A) and (B) or a substantially equivalent alternative, for inclusion in the affirmative procurement program.

(Pub. L. 89-272, title II, Sec. 6002, as added Pub. L. 94-580, Sec. 2, Oct. 21, 1976, 90 Stat. 2822; amended Pub. L. 95-609, Sec. 7(n), Nov. 8,

1978, 92 Stat. 3082; Pub. L. 96-482, Sec. 22, Oct. 21, 1980, 94 Stat. 2346; Pub. L. 97-375, title I, Sec. 102, Dec. 21, 1982, 96 Stat. 1819; Pub. L. 98-616, title V, Sec. 501(a)-(e), Nov. 8, 1984, 98 Stat. 3274-3276; Pub. L. 100-418, title V, Sec. 5115(c), Aug. 23, 1988, 102 Stat. 1433; Pub. L. 102-393, title VI, Sec. 630, Oct. 6, 1992, 106 Stat. 1773; Pub. L. 103-355, title I, Sec. 1554(1), title IV, Sec. 4104(e), Oct. 13,
1994, 108 Stat. 3300, 3342.)

Codification

Pub. L. 102-393, title VI, Sec. 630, Oct. 6, 1990, 106 Stat. 1773, which directed that this title be amended by adding a new section 6962j,relating to a preference for recycled toner cartridges, and which had been executed by adding the provisions of purported new section as subsec. (j) of this section, to reflect the probable intent of Congress, was repealed by Pub. L. 103-355, title I, Sec. 1554(1), Oct. 13, 1994, 108 Stat. 3300. Similar provisions were contained in Pub. L. 103-123, title IV, Sec. 401, Oct. 28, 1993, 107 Stat. 1238, prior to repeal by Pub. L. 103-355, title I, Sec. 1554(2), Oct. 13, 1994, 108 Stat. 3300.

Amendments

1994--Subsec. (c)(3). Pub. L. 103-355, Sec. 4104(e), designated existing provisions as subpar. (A), redesignated subpars. (A) and (B) as cls. (i) and (ii), respectively, and added subpar. (B).

Subsec. (j). Pub. L. 103-355, Sec. 1554(1), struck out subsec. (j).
See Codification note above.
1992--Subsec. (j). Pub. L. 102-393 added subsec. (j).
See Codification note above.

1988--Subsecs. (c)(1)(C), (e). Pub. L. 100-418 substituted ``National Institute of Standards and Technology'' for ``Bureau of Standards''.

1984--Subsec. (c)(1). Pub. L. 98-616, Sec. 501(c), inserted ``(and in the case of paper, the highest percentage of the postconsumer recovered materials referred to in subsection (h)(1) of this section practicable)''.

Subsec. (d)(1). Pub. L. 98-616, Sec. 501(e), substituted ``eighteen months after November 8, 1984'' for ``five years after October 21, 1976''.

Subsec. (e). Pub. L. 98-616, Sec. 501(b)(2), substituted ``for paper within one hundred and eighty days after November 8, 1984, and for three additional product categories (including tires) by October 1, 1985'' for ``for at least three product categories, including paper, by May 1, 1981, and for two additional product categories, including construction materials, by September 30, 1982.'' in provisions following par. (2).

Subsec. (e)(1). Pub. L. 98-616, Sec. 501(b)(1), inserted ``, and in the case of paper, provide for maximizing the use of post consumer
recovered materials referred to in subsection (h)(1) of this section''.

Subsec. (g). Pub. L. 98-616, Sec. 501(d), substituted ``the requirements of'' for ``the policy expressed in'' and inserted ``, and to, every two years beginning in 1984, report to the Congress on actions taken by Federal agencies and the progress made in the implementation of
this section, including agency compliance with subsection (d) of this
section''.

Subsecs. (h), (i). Pub. L. 98-616, Sec. 501(a), added subsecs. (h) and (i).

1982--Subsec. (g). Pub. L. 97-375 struck out provision requiring the

Office of Procurement Policy to report annually to Congress on actions taken by Federal agencies and the progress made in the implementation of the policy expressed in this section.

1980--Subsec. (c)(1). Pub. L. 96-482, Sec. 22(1), (2), in provision preceding subpar. (A), substituted ``After the date specified in applicable guidelines prepared pursuant to subsection (e) of this section, each procuring agency which procures any item designated in such guidelines shall procure such'' for ``After two years after October 21, 1976, each procuring agency shall procure'', and in subpar. (C), ``subparagraph (B)'' for ``clause (B)''. Subsec. (c)(2). Pub. L. 96-482, Sec. 22(3), substituted ``energy or fuels derived from solid waste'' for ``recovered material and recovered-material-derived fuel''. Subsec. (c)(3). Pub. L. 96-482, Sec. 22(4), substituted subpars. (A) and (B) for provision requiring certification of the percentage of the total material utilized for the performance of the contract which is recovered materials. Subsec. (d). Pub. L. 96-482, Sec. 22(5), in par. (1), substituted provision requiring Federal agencies to eliminate from specifications as expeditiously as possible, but in no event later than 5 years after Oct. 21, 1976, any exclusion of recovered materials and any requirement that items be manufactured from virgin materials for provision that Federal agencies in reviewing specifications, ascertain whether those specifications violate prohibitions in par. (2)(A) to (C), with such review undertaken not later than 18 months after Oct. 21, 1976, and in par. (2), substituted provision that Federal agencies act within 1 year from publication of applicable guidelines under subsec. (e) of this section for provision that in drafting or revising specifications after Oct. 21, 1976, any exclusion of recovered materials be eliminated and specifications not require the item to be manufactured from virgin materials.

Subsec. (e). Pub. L. 96-482, Sec. 22(6), designated provision relating to requirements of guidelines as cl. (2) and subpars. (A) and (C), added cl. (1), subpars. (B) and (C), and provision preceding subpar. (A), and struck out provision requiring information on source of supply.

1978--Subsec. (c). Pub. L. 95-609, Sec. 7(n)(1), (2), redesignated subpar. (1)(A) as par. (1), subpars. (1)(B) and (C) as pars. (2) and (3), respectively, and cls. (i) to (iii) of former subpar. (1)(A) as subpars. (A) to (C), respectively, of par. (1), and in par. (3), as so redesignated, inserted ``After the date specified in any applicable guidelines prepared pursuant to subsection (e) of this section,'' before ``contracting''. Subsec. (e). Pub. L. 95-609, Sec. 7(n)(3), inserted provision dealing with certification by vendors of the materials used.

Effective Date of 1994 Amendment

For effective date and applicability of amendment by Pub. L. 103-355, see section 10001 of Pub. L. 103-355, set out as a note undersection 251 of Title 41, Public Contracts.

Transfer of Functions

For transfer of certain enforcement functions of Administrator or other official of Environmental Protection Agency under this chapter to Federal Inspector, Office of Federal Inspector for the Alaska Natural Gas Transportation System, and subsequent transfer to Secretary of Energy, see note set out under section 6903 of this title.

Greening the Government Through Waste Prevention

Executive agency heads to develop and implement affirmative procurement programs in accordance with this section and Ex. Ord. No. 13101, and specifications, standards, and product descriptions inconsistent with this section or Ex. Ord. No. 13101 to be revised, and guidance for use in determining Federal facility compliance with this section and Ex. Ord. No. 13101 to be prepared with evaluations to be based on this implementing guidance, see Ex. Ord. No. 13101, Secs. 402, 403, 501(a), Sept. 14, 1998, 63 F.R. 49646, 49647, set out as a note under section 6961 of this title.

Section Referred to in Other Sections

This section is referred to in sections 6905, 6941, 8102 of this title.

9.6.2 Executive Order 13101

September 14, 1998

GREENING THE GOVERNMENT THROUGH WASTE PREVENTION, RECYCLING, AND FEDERAL ACQUISITION

By the authority vested in me as President by the Constitution and the laws of the United States of America, including the Solid Waste Disposal Act, Public Law 89-272, 79 Stat. 997, as amended by the Resource Conservation and Recovery Act (RCRA), Public Law 94-580, 90 Stat. 2795, as amended (42 U.S.C. 6901-6907), section 301 of title 3, United States Code, and in order to improve the Federal Government's use of recycled products and environmentally preferable products and services, it is hereby ordered as follows:

PART 1 – PREAMBLE

Section 101. Consistent with the demands of efficiency and cost effectiveness, the head of each executive agency shall incorporate waste prevention and recycling in the agency's daily operations and work to increase and expand markets for recovered materials through greater Federal Government preference and demand for such products. It is the national policy to prefer pollution prevention, whenever feasible. Pollution that cannot be prevented should be recycled; pollution that cannot be prevented or recycled should be treated in an environmentally safe manner. Disposal should be employed only as a last resort.

Sec. 102. Consistent with policies established by the Office of Federal Procurement Policy (OFPP) Policy Letter 92-4, agencies shall comply with executive branch policies for the acquisition and use of environmentally preferable products and services and implement cost-effective procurement preference programs favoring the purchase of these products and services.

Sec. 103. This order creates a Steering Committee, a Federal Environmental Executive (FEE), and a Task Force, and establishes Agency Environmental Executive (AEE) positions within each agency, to be responsible for ensuring the implementation of this order. The FEE, AEEs, and members of the Steering Committee and Task Force shall be full-time Federal Government employees.

PART 2 – DEFINITIONS

For purposes of this order:

Sec. 201. "Environmentally preferable" means products or services that have a lesser or reduced effect on human health and the environment when compared with competing products or services that serve the same purpose. This comparison may consider raw materials acquisition, production, manufacturing, packaging, distribution, re-use, operation, maintenance, or disposal of the product or service.

Sec. 202. "Executive agency" or "agency" means an executive agency as defined in 5 U.S.C. 105. For the purpose of this order, military departments, as defined in 5 U.S.C. 102, are covered under the auspices of the Department of Defense.

Sec. 203. "Postconsumer material" means a material or finished product that has served its intended use and has been discarded for disposal or recovery, having completed its life as a consumer item. "Postconsumer material" is a part of the broader category of "recovered material."

Sec. 204. "Acquisition" means the acquiring by contract with appropriated funds for supplies or services (including construction) by and for the use of the Federal Government through purchase or lease, whether the supplies or services are already in existence or must be created, developed, demonstrated, and evaluated. Acquisition begins at the point when agency needs are established and includes the description of requirements to satisfy agency needs, solicitation and selection of sources, award of contracts, contract financing, contract performance, contract administration, and those technical and management functions directly related to the process of fulfilling agency needs by contract.

Sec. 205. "Recovered materials" means waste materials and by-products that have been recovered or diverted from solid waste, but such term does not include those materials and by-products generated from, and commonly reused within, an original manufacturing process (42 U.S.C. 6903 (19)).

Sec. 206. "Recyclability" means the ability of a product or material to be recovered from, or otherwise diverted from, the solid waste stream for the purpose of recycling.

Sec. 207. "Recycling" means the series of activities, including collection, separation, and processing, by which products or other materials are recovered from the solid waste stream for use in the form of raw materials in the manufacture of new products other than fuel for producing heat or power by combustion.

Sec. 208. "Waste prevention" means any change in the design, manufacturing, purchase, or use of materials or products (including packaging) to reduce their amount or toxicity before they are discarded. Waste prevention also refers to the re-use of products or materials.

Sec. 209. "Waste reduction" means preventing or decreasing the amount of waste being generated through waste prevention, recycling, or purchasing recycled and environmentally preferable products.

Sec. 210. "Life cycle cost" means the amortized annual cost of a product, including capital costs, installation costs, operating costs, maintenance costs, and disposal costs discounted over the lifetime of the product.

Sec. 211. "Life cycle assessment" means the comprehensive examination of a product's environmental and economic aspects and potential impacts throughout its lifetime, including raw material extraction, transportation, manufacturing, use, and disposal.

Sec. 212. "Pollution prevention" means "source reduction" as defined in the Pollution Prevention Act of 1990 (42 U.S.C. 13102), and other practices that reduce or eliminate

the creation of pollutants through: (a) increased efficiency in the use of raw materials, energy, water, or other resources; or (b) protection of natural resources by conservation.

Sec. 213. "Biobased product" means a commercial or industrial product (other than food or feed) that utilizes biological products or renewable domestic agricultural (plant, animal, and marine) or forestry materials.

Sec. 214. "Major procuring agencies" shall include any executive agency that procures over $50 million per year of goods and services.

PART 3 – THE ROLES AND DUTIES OF THE STEERING COMMITTEE, FEDERAL ENVIRONMENTAL EXECUTIVE, TASK FORCE, AND AGENCY ENVIRONMENTAL EXECUTIVES

Sec. 301. Committees, Executives, and Task Force.

(a) Steering Committee. There is hereby established a Steering Committee on Greening the Government through Waste Prevention and Recycling ("Steering Committee"). The Steering Committee shall be composed of the Chair of the Council on Environmental Quality (CEQ), the Federal Environmental Executive (FEE), and the Administrator for Federal Procurement Policy (OFPP). The Steering Committee, which shall be chaired by the Chair of the CEQ, is directed to charter a Task Force to facilitate implementation of this order, and shall provide the Task Force with policy direction in such implementation.

(b) Federal Environmental Executive. A Federal Environmental Executive, Environmental Protection Agency, shall be designated by the President. The FEE shall chair the Task Force described in subsection (c), take all actions necessary to ensure that the agencies comply with the requirements of this order, and generate a biennial report to the President.

(c) Task Force. The Steering Committee shall charter a Task Force on Greening the Government through Waste Prevention and Recycling ("Task Force"), which shall be chaired by the FEE and composed of staff from the major procuring agencies. The Steering Committee, in consultation with the agencies, shall determine the necessary staffing and resources for the Task Force. The major procuring agencies shall provide, to the extent practicable and permitted by law, resources and support to the Task Force and the FEE, upon request from the Steering Committee. The Task Force shall have the duty of assisting the FEE and the agencies in implementing this order, subject to policy direction provided by the Steering Committee. The Task Force shall report through the FEE to the Chair of the Steering Committee.

(d) Agency Environmental Executives (AEEs). Within 90 days after the date of this order, the head of each major procuring agency shall designate an AEE from among his or her staff, who serves at a level no lower than the Assistant Secretary level or equivalent, and shall notify the Chair of CEQ and the FEE of such designation.

Sec. 302. Duties.

(a) The Federal Environmental Executive. The FEE, working through the Task Force, and in consultation with the AEEs, shall:

(1) Develop a Government-wide Waste Prevention and Recycling Strategic Plan ("Strategic Plan") to further implement this order. The Strategic Plan should be initially developed within 180 days of the date of this order and revised as necessary thereafter. The Strategic Plan should include, but is not limited to, the following elements:

(a) direction and initiatives for acquisition of recycled and recyclable products and environmentally preferable products and services;

(b) development of affirmative procurement programs;

(c) review and revision of standards and product specifications;

(d) assessment and evaluation of compliance;

(e) reporting requirements;

(f) outreach programs to promote adoption of practices endorsed in this order; and

(g) development and implementation of new technologies that are of environmental significance.

(2) Prepare a biennial report to the President on the actions taken by the agencies to comply with this order. The report also may incorporate information from existing agency reports regarding Government-wide progress in implementing the following Executive Orders: 12843, Procurement Requirements and Policies for Federal Agencies for Ozone Depleting Substances; 13031, Federal Alternative Fueled Vehicle Leadership; 12845, Requiring Agencies to Purchase Energy Efficient Computer Equipment; 12856, Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements; 12902, Energy Efficiency and Water Conservation at Federal Facilities; and 12969, Federal Acquisition and Community Right-to-Know.

(3) In coordination with the Office of Federal Procurement Policy, the Environmental Protection Agency (EPA), the General Services Administration (GSA), and the Department of Agriculture (USDA), convene a group of acquisition/procurement managers and environmental State, and local government managers to work with State and local governments to improve the Federal, State, and local governments' use of recycled products and environmentally preferable products and services.

(4) Coordinate appropriate Government-wide education and training programs for agencies.

(5) Establish committees and work groups, as needed, to identify, assess, and recommend actions to be taken to fulfill the goals, responsibilities, and initiatives of the FEE. As these committees and work groups are created, agencies are requested to designate appropriate personnel in the areas of procurement and acquisition, standards and specifications, electronic commerce, facilities management, pollution prevention, waste prevention, recycling, and others as needed to staff and work on these initiatives. An initial group shall be established to develop recommendations for tracking and reporting requirements, taking into account the costs and benefits of such tracking and reporting. The Steering Committee shall consult with the AEEs before approving these recommendations.

(b) Agency Environmental Executives. The AEEs shall:

(1) translate the Government-wide Strategic Plan into specific agency and service plans;

(2) implement the specific agency and service plans;

(3) report to the FEE on the progress of plan implementation;

(4) work with the FEE and the Task Force in furthering implementation of this order; and

(5) track agencies' purchases of EPA-designated guideline items and report agencies' purchases of such guideline items to the FEE per the recommendations developed in subsection 302(a)(5) of this order. Agency acquisition and procurement personnel shall justify in writing to the file and to the AEE the rationale for not purchasing such items, above the micropurchase threshold (as set out in the Office of Federal Procurement Policy Act at 41 U.S.C. 428), and submit a plan and timetable for increasing agency purchases of the designated item(s).

(6) one year after a product is placed on the USDA Biobased Products List, estimate agencies' purchases of products on the list and report agencies' estimated purchases of such products to the Secretary of Agriculture.

PART 4 – ACQUISITION PLANNING, AFFIRMATIVE PROCUREMENT PROGRAMS, AND FEDERAL FACILITY COMPLIANCE

Sec. 401. Acquisition Planning. In developing plans, drawings, work statements, specifications, or other product descriptions, agencies shall consider, as appropriate, a broad range of factors including: elimination of virgin material requirements; use of biobased products; use of recovered materials; re-use of product; life cycle cost; recyclability; use of environmentally preferable products; waste prevention (including toxicity reduction or elimination); and ultimate disposal. These factors should be considered in acquisition planning for all procurement and in the evaluation and award of contracts, as appropriate. Program and acquisition managers should take an active role in these activities.

Sec. 402. Affirmative Procurement Programs.

(a) The head of each executive agency shall develop and implement affirmative procurement programs in accordance with section 6002 of RCRA (42 U.S.C. 6962) and this order and consider use of the procurement tools and methods described in 7 U.S.C. 5909. Agencies shall ensure that responsibilities for preparation, implementation, and monitoring of affirmative procurement programs are shared between the program personnel and acquisition and procurement personnel. For the purposes of all purchases made pursuant to this order, EPA, in consultation with such other executive agencies as appropriate, shall endeavor to maximize environmental benefits, consistent with price, performance, and availability considerations, and constraints imposed by law, and shall adjust solicitation guidelines as necessary in order to accomplish this goal.

(b) Agencies shall establish affirmative procurement programs for all EPA-designated guideline items purchased by their agency. For newly designated items, agencies shall

revise their internal programs within 1 year from the date the EPA designated the new items.

(c) Exclusive of the biobased products described in section 504, for the EPA-designated guideline items, which are contained in 40 CFR part 247, and for all future designated guideline items, agencies shall ensure that their affirmative procurement programs require 100 percent of their purchases of products to meet or exceed the EPA guideline unless written justification is provided that a product is not available competitively within a reasonable time frame, does not meet appropriate performance standards, or is only available at an unreasonable price. Written justification is not required for purchases below the micropurchase threshold. For micropurchases, agencies shall provide guidance regarding purchase of EPA-designated guideline items. This guidance should encourage consideration of aggregating purchases when this method would promote economy and efficiency.

(d) Within 90 days after the date of this order, the head of each executive agency that has not implemented an affirmative procurement program shall ensure that the affirmative procurement program has been established and is being implemented to the maximum extent practicable.

Sec. 403. Federal Facility Compliance.

(a) Within 6 months of the date of this order, the Administrator of the EPA shall, in consultation with the Federal Environmental Executive, prepare guidance for use in determining Federal facility compliance with section 6002 of RCRA and the related requirements of this order.

(b) EPA inspections of Federal facilities conducted pursuant to RCRA and the Federal Facility Compliance Act and EPA "multi-media" inspections carried out at Federal facilities will include, where appropriate, evaluation of facility compliance with section 6002 of RCRA and any implementing guidance.

(c) Where inspections of Federal facilities are carried out by authorized States pursuant to RCRA and the Federal Facility Compliance Act, the Administrator of the EPA will encourage those States to include evaluation of facility compliance with section 6002 of RCRA in light of EPA guidance prepared pursuant to subsection (a), where appropriate, similar to inspections performed by the EPA. The EPA may provide information and technical assistance to the States to enable them to include such considerations in their inspection.

(d) The EPA shall report annually to the Federal Environmental Executive on the results of inspections performed by the EPA to determine Federal facility compliance with section 6002 of RCRA not later than February 1st for those inspections conducted during the previous fiscal year.

PART 5 – STANDARDS, SPECIFICATIONS, AND DESIGNATION OF ITEMS

Sec. 501. Specifications, Product Descriptions, and Standards. When developing, reviewing, or revising Federal and military specifications, product descriptions (including commercial item descriptions), and standards, executive agencies shall consider recovered materials and any environmentally preferable purchasing criteria developed

by the EPA, and ensure the criteria are complied with in developing or revising standards. Agencies shall report annually to the FEE on their compliance with this section for incorporation into the biennial report to the President referred to in section 302(a)(2) of this order.

(a) If an inconsistency with section 6002 of RCRA or this order is identified in a specification, standard, or product description, the FEE shall request that the Environmental Executive of the pertinent agency advise the FEE as to why the specification cannot be revised or submit a plan for revising it within 60 days.

(b) If an agency is able to revise an inconsistent specification but cannot do so within 60 days, it is the responsibility of that AEE to monitor and implement the plan for revising it.

Sec. 502. Designation of Items that Contain Recovered Materials. In order to expedite the process of designating items that are or can be made with recovered materials, the EPA shall use the following process for designating these items in accordance with section 6002(e) of RCRA.

(a) The EPA shall designate items that are or can be made with recovered material, by promulgating amendments to the Comprehensive Procurement Guideline (CPG). The CPG shall be updated every 2 years or as appropriate after an opportunity for public comment.

(b) Concurrent with the issuance of the CPG, the EPA shall publish for comment in the Federal Register Recovered Materials Advisory Notices that present the range of recovered materials content levels within which the designated items are currently available. These levels shall be updated periodically, after opportunity for public comment, to reflect changes in market conditions.

(c) Once items containing recovered materials have been designated by the EPA in the CPG, agencies shall modify their affirmative procurement programs to require that, to the maximum extent practicable, their purchases of products meet or exceed the EPA guidelines unless written justification is provided that a product is not available competitively, not available within a reasonable time frame, does not meet appropriate performance standards, or is only available at an unreasonable price.

Sec. 503. Guidance on Acquisition of Environmentally Preferable Products and Services.

(a) The EPA shall develop guidance within 90 days from the date of this order to address environmentally preferable purchasing. The guidance may be based on the EPA's September 1995 Proposed Guidance on the Acquisition of Environmentally Preferable Products and Services and comments received thereon. The guidance should be designed for Government-wide use and targeted towards products and services that have the most effect. The guidance may also address the issues of use of the technical expertise of non-governmental entities and tools such as life cycle assessment in decisions on environmentally preferable purchasing. The EPA shall update this guidance every 2 years, or as appropriate.

(b) Agencies are encouraged to immediately test and evaluate the principles and concepts contained in the EPA's Guidance on the Acquisition of Environmentally

Preferable Products and Services through pilot projects to provide practical information to the EPA for further updating of the guidance. Specifically:

(1) These pilot projects shall be focused around those product and service categories, including printing, that have wide use within the Federal Government. Priorities regarding which product and service categories to pilot shall be developed by the individual agencies and the EPA, in consultation with the OFPP, the FEE, and the appropriate agency procurement executives. Any policy disagreements shall be resolved by the Steering Committee.

(2) Agencies are encouraged to use all of the options available to them to determine the environmentally preferable attributes of products and services in their pilot and demonstrating, and documenting the results of these pilot and demonstration projects, including the use of technical expertise of nongovernmental entities such as labeling, certification, or standards-developing organizations, as well as using the expertise of the National Institute of Standards and Technology.

(3) Upon request and to the extent practicable, the EPA shall assist executive agencies in designing, implementing, and documenting the results of these pilot and demonstration projects.

(4) The EPA, in coordination with other executive agencies, shall develop a database of information about these projects, including, but not limited to, the number and status of pilot projects, examples of agencies' policy directives, revisions to specifications, solicitation procedures, and grant/contract policies that facilitate adoption of environmentally preferable purchasing practices, to be integrated on a commonly available electronic medium (e.g., Internet Web site). These data are to be reported to the FEE.

(c) Executive agencies shall use the principles and concepts in the EPA Guidance on Acquisition of Environmentally Preferable Products and Services, in addition to the lessons from the pilot and demonstration projects, to the maximum extent practicable, in identifying and purchasing environmentally preferable products and services and shall modify their procurement programs as appropriate.

Sec. 504. Designation of Biobased Items by the USDA. The USDA Biobased Products Coordination Council shall, in consultation with the FEE, issue a Biobased Products List.

(a) The Biobased Products List shall be published in the Federal Register by the USDA within 180 days after the date of this order and shall be updated biannually after publication to include additional items.

(b) Once the Biobased Products List has been published, agencies are encouraged to modify their affirmative procurement program to give consideration to those products.

Sec. 505. Minimum Content Standard for Printing and Writing Paper. Executive agency heads shall ensure that their agencies meet or exceed the following minimum materials content standards when purchasing or causing the purchase of printing and writing paper:

(a) For high speed copier paper, offset paper, forms bond, computer printout paper, carbonless paper, file folders, white wove envelopes, writing and office paper, book paper, cotton fiber paper, and cover stock, the minimum content standard shall be no less than 30 percent postconsumer materials beginning December 31, 1998. If paper containing 30 percent postconsumer material is not reasonably available, does not meet reasonable performance requirements, or is only available at an unreasonable price, then the agency shall purchase paper containing no less than 20 percent postconsumer material. The Steering Committee, in consultation with the AEEs, may revise these levels if necessary.

(b) As an alternative to meeting the standards in sections 505(a), for all printing and writing papers, the minimum content standard shall be no less than 50 percent recovered materials that are a waste material byproduct of a finished product other than a paper or textile product that would otherwise be disposed of in a landfill, as determined by the State in which the facility is located.

(c) Effective January 1, 1999, no executive branch agency shall purchase, sell, or arrange for the purchase of, printing and writing paper that fails to meet the minimum requirements of this section.

Sec. 506. Revision of Brightness Specifications and Standards. The GSA and other executive agencies are directed to identify, evaluate, and revise or eliminate any standards or specifications unrelated to performance that present barriers to the purchase of paper or paper products made by production processes that minimize emissions of harmful byproducts. This evaluation shall include a review of unnecessary brightness and stock clause provisions, such as lignin content and chemical pulp requirements. The GSA shall complete the review and revision of such specifications within 6 months after the date of this order, and shall consult closely with the Joint Committee on Printing during such process. The GSA shall also compile any information or market studies that may be necessary to accomplish the objectives of this provision.

Sec. 507. Procurement of Re-refined Lube Oil and Retread Tires.

(a) Agencies shall implement the EPA procurement guidelines for re-refined lube oil and retread tires. Fleet and commodity managers shall take immediate steps, as appropriate, to procure these items in accordance with section 6002 of RCRA. This provision does not preclude the acquisition of biobased (e.g., vegetable) oils.

(b) The FEE shall work to educate executive agencies about the new Department of Defense Cooperative Tire Qualification Program, including the Cooperative Approval Tire List and Cooperative Plant Qualification Program, as they apply to retread tires.

PART 6 – AGENCY GOALS AND REPORTING REQUIREMENTS

Sec. 601. Agency Goals.

(a)

(1) Each agency shall establish either a goal for solid waste prevention and a goal for recycling or a goal for solid waste diversion to be achieved by January 1, 2000. Each agency shall further ensure that the established goals include long-range goals to be

achieved by the years 2005 and 2010. These goals shall be submitted to the FEE within 180 days after the date of this order.

(2) In addition to white paper, mixed paper/cardboard, aluminum, plastic, and glass, agencies should incorporate into their recycling programs efforts to recycle, re-use, or refurbish pallets and collect toner cartridges for remanufacturing. Agencies should also include programs to reduce or recycle, as appropriate, batteries, scrap metal, and fluorescent lamps and ballasts.

(b) Agencies shall set goals to increase the procurement of products that are made with recovered materials, in order to maximize the number of recycled products purchased, relative to non-recycled alternatives.

(c) Each agency shall set a goal for increasing the use of environmentally preferable products and services for those products and services for which the agency has completed a pilot program.

(d) Agencies are encouraged to incorporate into their Government Performance Results Act annual performance plans the goals listed in subsections (a), (b), and (c) above, starting with the submittal to the Office of Management and Budget of the plan accompanying the FY 2001 budget.

(e) Progress on attaining these goals should be reported by the agencies to the FEE for the biennial report specified in section 302(a)(2) of this order.

PART 7 – APPLICABILITY AND OTHER REQUIREMENTS

Sec. 701. Contractor Applicability. Contracts that provide for contractor operation of a Government-owned or -leased facility and/or contracts that provide for contractor or other support services at Government-owned or -operated facilities awarded by executive agencies after the date of this order, shall include provisions that obligate the contractor to comply with the requirements of this order within the scope of its operations.

Sec. 702. Real Property Acquisition and Management. Within 90 days after the date of this order, and to the extent permitted by law and where economically feasible, executive agencies shall ensure compliance with the provisions of this order in the acquisition and management of Federally owned and leased space. The GSA and other executive agencies shall also include environmental and recycling provisions in the acquisition and management of all leased space and in the construction of new Federal buildings.

Sec. 703. Retention of Funds.

(a) The Administrator of General Services shall continue with the program that retains for the agencies the proceeds from the sale of materials recovered through recycling or waste prevention programs and specifying the eligibility requirements for the materials being recycled.

(b) Agencies in non-GSA managed facilities, to the extent permitted by law, should develop a plan to retain the proceeds from the sale of materials recovered through recycling or waste prevention programs.

Sec. 704. Model Facility Programs. Each executive agency shall establish a model demonstration program incorporating some or all of the following elements as appropriate. Agencies are encouraged to demonstrate and test new and innovative approaches such as incorporating environmentally preferable and bio-based products; increasing the quantity and types of products containing recovered materials; expanding collection programs; implementing source reduction programs; composting organic materials when feasible; and exploring public/private partnerships to develop markets for recovered materials.

Sec. 705. Recycling Programs.

(a)

(1) Each executive agency that has not already done so shall initiate a program to promote cost-effective waste prevention and recycling of reusable materials in all of its facilities. The recycling programs implemented pursuant to this section must be compatible with applicable State and local recycling requirements.

(2) Agencies shall designate a recycling coordinator for each facility or installation. The recycling coordinator shall implement or maintain waste prevention and recycling programs in the agencies' action plans.

(b) Executive agencies shall also consider cooperative ventures with State and local governments to promote recycling and waste reduction in the community.

Sec. 706. Review of Implementation. The President's Council on Integrity and Efficiency shall request that the Inspectors General periodically review agencies' implementation of this order.

PART 8 – AWARENESS

Sec. 801. Training.

(a) Within 180 days of the date of this order, the FEE and OFPP should evaluate the training courses provided by the Federal Acquisition Institute and the Defense Acquisition University and recommend any appropriate curriculum changes to ensure that procurement officials are aware of the requirements of this order.

(b) Executive agencies shall provide training to program management and requesting activities as needed to ensure awareness of the requirements of this order.

Sec. 802. Internal Agency Awards Programs. Each agency shall develop an internal agency-wide awards program, as appropriate, to reward its most innovative environmental programs. Among others, winners of agency-wide awards will be eligible for the White House Awards Program.

Sec. 803. White House Awards Program. A Government-wide award will be presented annually by the White House to the best, most innovative programs implementing the objectives of this order to give greater visibility to these efforts so that they can be incorporated Government-wide. The White House Awards Program will be administered jointly by the FEE and the CEQ.

PART 9 – REVOCATION, LIMITATION, AND IMPLEMENTATION

Sec. 901. Executive Order 12873 of October 20, 1993, is hereby revoked.

Sec. 902. This order is intended only to improve the internal management of the executive branch and is not intended to create any right, benefit, or trust responsibility, substantive or procedural, enforceable at law by a party against the United States, its agencies, its officers, or any other person.

Sec. 903. The policies and direction expressed in the EPA guidance to be developed pursuant to section 503 of this order shall be implemented and incorporated in the Federal Acquisition Regulation within 180 days after issuance of the guidance.

WILLIAM J. CLINTON
THE WHITE HOUSE
September 14, 1998.

9.6.3 Executive Order 13149

Presidential Documents

Executive Order 13149 of April 21, 2000

Greening the Government Through Federal Fleet and Transportation Efficiency

By the authority vested in me as President by the Constitution and the laws of the United States of America, including the Energy Policy and Conservation Act, as amended (42 U.S.C. 6201 et seq.), the Energy Policy Act of 1992 (Public Law 102-486), section 301 of title 3, United States Code, and the Energy Conservation Reauthorization Act of 1998 (Public Law 105-388), it is hereby ordered as follows:

PART 1 PREAMBLE

Section 101. Federal Leadership. The purpose of this order is to ensure that the Federal Government exercises leadership in the reduction of petroleum consumption through improvements in fleet fuel efficiency and the use of alternative fuel vehicles (AFVs) and alternative fuels. Reduced petroleum use and the displacement of petroleum by alternative fuels will help promote markets for more alternative fuel and fuel efficient vehicles, encourage new technologies, enhance the United States' energy self-sufficiency and security, and ensure a healthier environment through the reduction of greenhouse gases and other pollutants in the atmosphere.

PART 2 GOALS

Sec. 201. Reduced Petroleum Fuel Consumption. Each agency operating 20 or more motor vehicles within the United States shall reduce its entire vehicle fleet's annual petroleum consumption by at least 20 percent by the end of FY 2005, compared with FY 1999 petroleum consumption levels.

Sec. 202. Performance Strategies. Agencies have numerous options for developing a strategy to meet the petroleum reduction levels established in section 201 of this order. Measures include: the use of alternative fuels in light, medium, and heavy-duty vehicles; the acquisition of vehicles with higher fuel economy, including hybrid vehicles; the substitution of cars for light trucks; an increase in vehicle load factors; a decrease in vehicle miles traveled; and a decrease in fleet size. Each agency will need a strategy that includes most, if not all, of these measures, but can develop a strategy that fits its unique fleet configuration and mission requirements. As part of the strategy, each agency should attempt to accelerate the introduction of vehicles meeting Tier 2 standards. Where feasible, agencies should also consider procurement of innovative vehicles, such as hybrid electric vehicles, capable of large improvements in fuel economy. The strategy should also attempt to minimize costs in achieving the objectives of this order. In developing its strategy, each agency shall include the following:

a. AFV Acquisition and Use of Alternative Fuels. Each agency shall fulfill the acquisition requirements for AFVs established by section 303 of the Energy Policy Act of 1992. Agencies shall use alternative fuels to meet a majority of the

fuel requirements of those motor vehicles by the end of FY 2005. Section 402 of this order addresses related issues of alternative fuel infrastructure availability and the ability to track alternative fuel usage data; and

b. Acquisition of Higher Fuel Economy Vehicles. Agencies shall increase the average EPA fuel economy rating of passenger cars and light trucks acquired by at least 1 mile per gallon (mpg) by the end of FY 2002 and at least 3 mpg by the end of FY 2005 compared to FY 1999 acquisitions.

PART 3 ORGANIZATION AND ACCOUNTABILITY

Sec. 301. Leadership Responsibilities. The Office of Management and Budget (OMB), the Department of Energy (DOE), the Environmental Protection Agency (EPA), and the General Services Administration (GSA) shall be responsible for providing leadership to the other Federal agencies in implementing programs to meet the goals of this order. Therefore, they shall perform the following activities:

a. OMB shall:
    1. designate a senior official to assume the responsibility for coordinating the collection of agency budget and data submissions pursuant to this order;
    2. amend and issue budget guidance to the agencies that requires each agency to identify in its annual budget submission the funding necessary to meet the requirements of this order;
    3. review annual agency budget submissions to determine adequacy in meeting the goal of this order and to balance requests for increased funding to support achievement of the goals against other mission priorities for the agency; and
    4. review agency submissions for the annual report to the Congress, after budget decisions are made.

b. DOE shall:
    1. issue guidance to agencies, within 90 days of the issuance of this order, on preparation and submission of agency strategies for complying with this order and the collection and annual reporting of data to demonstrate compliance with this order;
    2. review and evaluate agency strategies prior to their submission to OMB;
    3. provide OMB with copies of the agency strategy evaluations;
    4. provide whatever other support OMB requires to facilitate performance of OMB's role;
    5. establish the data collection and reporting system outlined in the DOE guidance for collecting annual agency performance data on meeting the goals of this order and other applicable statutes and policies;
    6. educate personnel from other agencies on the requirements of this order, the data collection and reporting system, best practices for improving fleet fuel efficiency, and methods for successfully acquiring and using AFVs;
    7. review agencies' annual data submissions for accuracy and produce a scorecard of agency and overall Federal compliance with this order and other applicable statutes and policies; and
    8. report to the President annually on compliance with the order, including the scorecard and level of performance in meeting the goals of the agencies' strategies.

c. EPA shall support DOE and GSA in their efforts to assist the agencies in the accelerated purchase of Tier 2 vehicles.
d. GSA shall develop and implement strategies that will ease agencies' financial and administrative burdens associated with the acquisition of AFVs, including:
    1. Agencies shall be allowed to replace their conventionally-fueled vehicles with AFVs by making an initial lump-sum payment for the additional acquisition cost of the AFV and shall be allowed to contribute to the higher replacement costs of the AFV incrementally over the term of the lease, and have the option of averaging AFV incremental costs across the agency fleet as provided by the Energy Policy Act of 1992.
    2. Within 120 days of this order, the Administrator of GSA, in consultation with other agencies, shall:
        A. provide a summary of agency AFV acquisition plans to potential AFV manufacturers to assist in their production planning. At least 4 months in advance of agency vehicle ordering cycles, GSA must provide to agencies the best available information on the production plans of AFV manufacturers;
        B. develop, in coordination with DOE and EPA, methods that will help Federal fleet managers to select vehicles to improve fleet fuel efficiency and to meet Tier 2 vehicle standards; and
        C. collaborate with its customer agencies and their procurement staff and officials to discuss and plan efforts to ensure that the GSA-leased fleet is making progress toward the goals of this order.

Sec. 302. Designation of Senior Agency Official. Within 90 days of the date of this order, the head of each agency shall designate a senior official to assume responsibility for the agency's AFV and fleet fuel efficiency programs, and for meeting the requirements of this order. Each senior agency official designated by an agency shall be responsible for:

a. preparing an agency strategy for meeting the goals of this order, in accordance with guidance issued by DOE;
b. submitting the agency strategy to DOE within 180 days of the issuance of this order for evaluation and submission to OMB;
c. implementing the data collection and reporting system outlined in the DOE guidance for collecting annual agency performance data on meeting the goals of this order and reporting the data to DOE;
d. ensuring the agency's strategy for meeting the goals of this order is incorporated in the annual budget submission to OMB; and
e. assembling the appropriate team and resources in the agency necessary to attain the goals of this order.

Sec. 303. Management and Government Performance. Agencies may use the following management strategies to assist them in meeting the goals of this order:

a. Awards. Agencies may use employee incentive programs to reward exceptional performance in implementing this order.
b. Performance Evaluations. Agencies shall, where appropriate, include successful implementation of the provisions of this order in the position descriptions and performance evaluations of agency heads, the senior official, fleet managers, their superiors, and other relevant employees.

Sec. 304. Applicability. This order applies to each agency operating 20 or more motor vehicles within the United States. Agency means an executive agency as defined in 5 U.S.C. 105. For the purpose of this order, military departments, as defined in 5 U.S.C. 102, are covered under the auspices of the Department of Defense.

PART 4 IMPLEMENTATION

Sec. 401. Vehicle Reporting Credits. When preparing the annual report to DOE and OMB, each agency acquisition of an alternative fuel light-duty vehicle, regardless of geographic placement, shall count as one credit towards fulfilling the AFV acquisition requirements of the Energy Policy Act of 1992. Agencies shall receive one additional credit for each light-duty AFV that exclusively uses an alternative fuel and for each Zero Emission Vehicle of any size. Agencies shall receive three credits for dedicated medium-duty AFVs and four credits for dedicated heavy-duty AFVs. Agencies can also receive one credit for every 450 gallons of pure bio-diesel used in diesel vehicles.

Sec. 402. Infrastructure. To support the use of alternative fuel in AFVs, agencies should arrange for fueling at commercial facilities that offer alternative fuels for sale to the public.

a. Agencies should team with State, local, and private entities to support the expansion and use of public access alternative fuel refueling stations;
b. Agencies should use the authority granted to them in section 304 of the Energy Policy Act of 1992 to establish nonpublic access alternative fuel infrastructure for fueling Federal AFVs where public fueling is unavailable.
c. Agencies are encouraged to work with DOE and GSA to resolve alternative fuel usage tracking issues with alternative and petroleum fuel providers.

Sec. 403. Procurement of Environmentally Preferable Motor Vehicle Products.

a. Consistent with Executive Order 13101 and section 6002 of the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. 6962, effective 6 months after the date of this order, no Federal agency shall purchase, sell, or arrange for the purchase of virgin petroleum motor vehicle lube oils when re- refined motor vehicle lube oils are reasonably available and meet the vehicle manufacturer's recommended performance standards.
b. Consistent with Executive Order 13101 and RCRA section 6962, in acquiring and maintaining motor vehicles, agencies shall acquire and use United States EPA-designated Comprehensive Procurement Guideline items, including but not limited to retread tires, when such products are reasonably available and meet applicable performance standards. In addition, Federal agencies should consider acquiring other recycled content products, such as tires containing a minimum of 5-10 percent post-consumer recovered rubber.
c. Consistent with Executive Order 13101, Federal agencies are encouraged to use biobased motor vehicle products when such products are reasonably available and meet applicable performance standards.

PART 5 GENERAL PROVISIONS

Sec. 501. Revocation. Executive Order 13031 of December 13, 1996, is revoked.

Sec. 502. Statutory Authority. Agencies must carry out the provisions of this order to the extent consistent with their statutory authority.

Sec. 503. Limitations. This order is intended only to improve the internal management of the executive branch and is not intended to create any right, benefit, or trust responsibility, substantive or procedural, enforceable at law by a party against the United States, its agencies, its officers, or any other person.

Sec. 504. Independent Agencies. Independent agencies and agencies excepted from coverage by section 304 are encouraged to comply with the provisions of this order.

Sec. 505. Government-Owned Contractor-Operated Vehicles. Agencies must ensure that all Government- owned contractor-operated vehicles comply with all applicable goals and other requirements of this order and that these goals and requirements are incorporated into each contractor's management contract.

Sec. 506. Exemptions for Military Tactical, Law Enforcement, and Emergency Vehicles. Department of Defense military tactical vehicles are exempt from this order. Law enforcement, emergency, and any other vehicle class or type determined by OMB, in consultation with DOE, are exempted from this order's requirements for Federal fleet fuel efficiency and alternative fuel vehicle acquisition. Agencies claiming vehicle exemptions must provide information on the number of each class or type of vehicle claimed as exempt as well as an estimate of total fuel consumption of exempt vehicles on an annual basis. Agencies should examine options for increasing fuel efficiency in these exempt vehicles and should report actions taken to increase fuel efficiency in these vehicles or fleets. All information required by this section must be submitted annually under Part 3 of this order.

Sec. 507. Compliance.

a. If an agency fails to meet requirements of the Energy Policy Act of 1992 or this order, its report to the DOE and OMB under section 302(c) must include an explanation for such failure and an updated strategy for achieving compliance using the agency's current and requested budgets.
b. OMB, in consultation with DOE, may modify the compliance requirements for an agency under Part 2 of this order, if the agency is unable to comply with the requirements of that part. An agency requesting modification must show that it has made substantial good faith efforts to comply with that part. The availability and costs of alternative fuels and AFVs can be a factor in OMB's decision to modify the agency's compliance with Part 2 of this order.

Sec. 508. Definitions. Terms used in this order shall have the same definitions as those in the Energy Policy Act of 1992 and Executive Order 13101, unless specifically changed in guidance to be issued by DOE under section 301(b) of this order.

(Presidential Sig.)

THE WHITE HOUSE,

April 21, 2000.

9.7 Example of State Used Oil Management Legislation

This section contains the legislation dialing with used oil management from the State of California and is organized in the following manner:

CHAPTER 4. CALIFORNIA OIL RECYCLING ENHANCEMENT

Article	Section
Article 1. Legislative Findings	48600
Article 2. Short Title	48601
Article 3. Definitions	48610-48625
Article 4. Used Oil Recycling	48630-48634
Article 5. Administration	48640-48645
Article 6. Financial Provisions	48650-48657
Article 7. Certification	48660-48662
Article 8. Reporting	48670-48676
Article 9. Enforcement	48680
Article 10. Local Used Oil Collection Program	48690-48691

In addition to the information provided below, the related laws in California that deal with the classification and management of used oils as hazardous wastes (meeting or exceeding the minimum requirements of CFR Part 279) can be found at the following URL (which contains the CALIFORNIA HEALTH AND SAFETY CODE SECTION 25250-25250.28):

URL: http://www.leginfo.ca.gov/cgi-bin/displaycode?section=hsc&group=25001-26000&file=25250-25250.28

PUBLIC RESOURCES CODE
SECTION 48600

48600. The Legislature finds and declares the following:

(a) The problem posed by used oil disposal requires a comprehensive, statewide response, including, but not limited to, eliminating illegal disposal, reducing landfill disposal of used oil, reducing pollution from stormwater runoff, recycling of used oil into new uses, and the promotion of secondary markets for recycled oil products.

(b) That the improper or illegal disposal of used oil, often mixed with other solid waste, is a potential source of stormwater pollution and that environmental education and mitigation efforts regarding proper management of used oil and oil byproducts is within the purposes of this chapter.

(c) California currently generates about 161 million gallons of used lubricating and industrial oil each year, and only about 50 percent of that oil is recycled.

(d) The scarcity of used oil collection centers and programs, and the charges imposed on consumers for recycling used oil, create economic disincentives for recycling that could be addressed through a recycling incentive program.

(e) Used oil represents a valuable state resource that should be reclaimed and recycled whenever possible. An abundance of used oil recycling alternatives exist that have been demonstrated to be environmentally safe. These alternatives need to be promoted in order to achieve the maximum use of used oil and prevent damage to the environment.

(f) It is the intent of the Legislature to reduce the illegal disposal of used oil and recycle and reclaim used oil to the greatest extent possible in order to recover valuable natural resources and to avoid damage to the environment and threats to public health.

PUBLIC RESOURCES CODE
SECTION 48610-48625

48610. Unless the context otherwise requires, the following definitions govern the construction of this chapter.

48610.5. "Bulk oil" means oil sold and delivered in a single transaction in an amount greater than 55 gallons regardless of the size of the container or containers in which the oil is delivered.

48611. "Container" means a drum, can, or other receptacle used primarily for storage or transportation of oil. "Container" does not mean the equipment in which oil is used.

48612. "Department" means the Department of Toxic Substances Control.

48613. "Fund" means the California Used Oil Recycling Fund created pursuant to Section 48653.

48614. "Industrial generator" means an entity which buys and uses lubricating oil only for equipment owned or used by the entity. "Industrial generator" includes state or local governmental entities, as defined by Section 5902 of the Government Code. "Industrial generator" does not include motor carriers which have received oil for which a payment has not been made pursuant to Section 48650.

48616. "Industrial oil" includes, but is not limited to, any compressor, turbine, or bearing oil, hydraulic oil, metal-working oil, or refrigeration oil. Industrial oil does not include dielectric fluids.

48617. "Local government" has the same meaning as defined in Section 30109.

48618. "Lubricating oil" includes, but is not limited to, any oil intended for use in an internal combustion engine crankcase, transmission, gearbox, or differential in an automobile, bus, truck, vessel, plane, train, heavy equipment, or other machinery powered by an internal combustion engine.

48618.4. "Mitigation" is the prevention of stormwater pollution from used oil and oil byproducts and the reduction or alleviation of the effect of stormwater pollution from used oil and oil byproducts by means of action taken on public property. Mitigation includes the installation of devices and implementation of practices that prevent used oil and oil byproducts from causing stormwater pollution. Mitigation does not include the cleanup or restoration of polluted areas.

48619. "Oil manufacturer" means the first person or entity in the state to take title to lubricating or industrial oil for sale, use, or transfer in the state.

48620. "Recycled oil" means recycled oil, as defined in Section 5250.1 of the Health and Safety Code.

48620.5. "Stormwater pollution" for purposes of mitigation does not include runoff at a specific facility even if there is no point source at the facility. This pollution is from used oil and oil byproducts, often mixed with other solid waste, and is typically dispersed by urban stormwater and marina or boating activities, or both.

48621. "Used oil" means used oil, as defined in subdivision (a) of Section 25250.1 of the Health and Safety Code. Used oil does not include articles contaminated with de minimis quantities of used oil,

such as used oil filters, oily rags, and scrap metal.

48622. "Used oil collection center" means a business, governmental entity, or nonprofit organization which accepts used lubricating oil from the public and which is exempt from hazardous waste facility permit requirements pursuant to subdivision (a) of Section 25250.11 of the Health and Safety Code.

48623. "Used oil hauler" means a hazardous waste hauler registered pursuant to Chapter 6.5 (commencing with Section 25100) of Division 20 of the Health and Safety Code who transports used oil to a used oil recycling facility certified pursuant to Article 7 (commencing with Section 48660), to a used oil storage facility, to a used oil transfer facility, or to an out-of-state recycling facility registered with the Environmental Protection Agency and operated in substantial compliance with applicable regulatory standards of the state in which the recycling facility is located.

48624. "Used oil recycling facility" means a facility which is issued a hazardous waste facilities permit or grant of interim status by the department pursuant to Section 25200 or 25200.5 of the Health and Safety Code to convert used oil into recycled oil.

48625. The following terms have the following meaning:
(a) "Used oil storage facility" has the same meaning as defined in subdivision (g) of Section 25250.1 of the Health and Safety Code.
(b) "Used oil transfer facility" has the same meaning as defined in subdivision (h) of Section 25250.1 of the Health and Safety Code.

PUBLIC RESOURCES CODE
SECTION 48630-48634

48630. On or before October 1, 1992, the board shall adopt a used oil recycling program which promotes and develops alternatives to the illegal disposal of used oil.

48631. The used oil recycling program shall include, but is not limited to, the following:
(a) A recycling incentive system as described in Article 6 (commencing with Section 48650).
(b) Grants or loans, as specified in Section 48632.
(c) Development and implementation of an information and education program for the promotion of alternatives to the illegal disposal of used oil.
(d) A reporting, monitoring, and enforcement program to ensure that all statutes and regulations relating to used oil are properly carried out.

48632. The board may issue grants or loans pursuant to subdivision (b) of Section 48631 for only the following purposes:
(a) To local governments for providing opportunities for used lubricating oil collection, which are in addition to those included in the local used oil collection programs adopted pursuant to Article 10 (commencing with Section 4 8690). Grants or loans under this subdivision may also be for those purposes identified in subdivision (d).
(b) To nonprofit entities for projects, which may include one or more of the following programs or activities:
(1) Establishing used lubricating oil collection centers.

(2) Providing containers and other materials and supplies that the public can utilize in an environmentally sound manner to store used lubricating oil for pickup or return to a used oil collection center.

(3) Obtaining equipment and establishing procedures to comply with federal, state, and local law regarding the collection, handling, and storage of used oil.
(4) For the purposes identified in subdivision (d).
(c) For either or both of the following purposes:
(1) Research, testing, and demonstration projects for collection technologies and to develop uses for products resulting from the recycling of used oil.
(2) The purposes identified in subdivision (d).
(d) (1) For education and mitigation projects relating to stormwater pollution from used oil and oil byproducts, including, but not limited to, use of storm drain inlet filter devices.
(2) A local government shall not receive a grant or loan pursuant to this section for any purpose identified in paragraph (1) unless the local government certifies that it has a stormwater management program that is approved by the appropriate California regional water quality control board and that the project approved for funding under paragraph (1) is consistent with that approved stormwater management program.

48633. The grants to nonprofit organizations and governmental entities authorized by subdivisions (a) and (b) of Section 48632 may include grants to offset operational expenses.

48634. In adopting the program required by this article, the board shall consider information developed pursuant to the Used Oil Collection Demonstration Grant Program Act of 1990 (Chapter 1.5 (commencing with Section 3475) of Division 3).

PUBLIC RESOURCES CODE
SECTION 48640-48645

48640. The board shall administer this chapter. For organizational purposes, the board may create a new division, bureau, office, or unit to administer this chapter.

48641. In addition to any other regulations which the board is required by statute to adopt, the board may adopt any other rules and regulations pursuant to Chapter 3.5 (commencing with Section 11340) of Part 1 of Division 3 of Title 2 of the Government Code which the board determines may be necessary or useful to carry out this chapter or any of the board's duties or responsibilities imposed pursuant to this chapter.

48642. The board may prepare, publish, or issue printed pamphlets, which the board determines to be necessary, for the dissemination of information concerning the activities of the board pursuant to this chapter.

48643. In carrying out this chapter, the board may solicit and use any and all expertise available in other state agencies, including, but not limited to, the State Board of Equalization, and, where an existing state agency performs functions of a similar nature to the board's functions, the board may contract with or cooperate with that agency in carrying out this chapter.

48644. The board shall maintain access to a toll-free telephone number which is to be used for the purpose of informing callers of the following:

(a) The permissible methods of recycling or disposing of used oil.

(b) Specific establishments located in the area of the caller that have notified the board that they accept used oil.

48645. Final approval of applicant and project eligibility standards, scoring and evaluation processes, and awarding of loans or grants under this chapter shall be made in a public meeting of, and pursuant to a vote of, the board.

PUBLIC RESOURCES CODE
SECTION 48650-48657

48650. (a) Every oil manufacturer shall pay to the board, on or before the last day of the month following each quarter, an amount equal to four cents ($0.04) for every quart, or sixteen cents ($0.16) for every gallon, of lubricating oil sold or transferred in the state, or imported into the state for use in the state in that quarter. For lubricating oil sold by weight, a weight to volume conversion factor of 7.5 pounds per gallon shall be used to determine the fee. Except as provided in subdivision (b), no payment is required for oil which meets any of the following:

(1) Oil for which a payment has already been made to the board pursuant to this section.

(2) Oil exported or sold for export from the state.

(3) Oil sold for use in vessels operated in interstate or foreign commerce.

(4) Oil imported into the state in the engine crankcase, transmission, gear box, or differential of an automobile, bus, truck, vessel, plane, train, or heavy equipment or machinery.

(5) Bulk oil imported into, transferred in, or sold in the state to a motor carrier, as defined in Section 408 of the Vehicle Code, and used in a vehicle designated in subdivisions (a) and (b) of Section 34500 of the Vehicle Code.

(6) The oil otherwise subject to payment pursuant to this subdivision has a volume of five gallons or less.

(b) If oil exempted from payment pursuant to subdivision (a) is subsequently sold or transferred for use, or is used, in this state, and the use does not qualify for exemption pursuant to subdivision (a), the entity which sells, transfers, or uses the oil for a purpose which is not exempt from payment, shall make the payment specified in subdivision (a).

(c) This section shall become operative on January 1, 2000.

48650.2. For the purposes of this chapter, the board may collect the fees pursuant to the Fee Collection Procedures Law (Part 30 (commencing with Section 55001) of Division 2 of the Revenue and Taxation Code).

48650.5. (a) Any person who has made a payment pursuant to Section 48650 on lubricating oil exempted from payment pursuant to subdivision (a) of Section 48650, and the payment was made either directly to the board, or indirectly to a vendor from whom it was purchased, by the adding of the amount of the payment to the price of the lubricating oil, shall be reimbursed and repaid the amount of the payment made on that oil, except as otherwise provided in this section.

(b) The claimant of a refund shall present to the board a claim supported by the original invoice showing the purchase. The claim shall state the total amount of the lubricating oil purchased by the

claimant and the manner and the equipment in which the claimant has used the lubricating oil. The claim shall not be under oath but shall contain, or be accompanied by, a written declaration that it is made under the penalty of perjury.

(c) The board, upon the presentation of the claim and the invoice, shall pay the claimant from the payments collected under Section 48650 an amount equal to the payments collected on the lubricating oil in respect to which the refund is claimed.

(d) Any person who willfully makes or subscribes to a claim for refund under this section which the person does not believe to be true and correct as to every material matter is guilty of a felony, and upon conviction thereof shall be subject to the penalties prescribed for perjury by the Penal Code. All applications for refund under this section based upon the exportation of lubricating oil from this state shall be filed with the board within the three months after the close of the calendar month in which the lubricating oil is exported or 13 months from the date of the purchase of the lubricating oil, whichever is later. Any application filed after the prescribed time shall not be considered by the board or any other agency or officer of the state for any purpose.

(e) In lieu of the collection and refund of the payment on lubricating oil used by a manufacturer in a manner that entitles a purchaser to claim a refund under this section, the board may give a credit to the manufacturer upon the filing of a return and the determination of the amount of the fee.

(f) In lieu of the collection and refund of the payment on lubricating oil exported by a licensed manufacturer for use outside the state in a manner that entitles a manufacturer to claim a refund pursuant to this section, the board may give a credit to the distributor upon his or her payment return and the determination of the amount of his or her payment, in accordance with such rules and regulations as the board may prescribe.

(g) When an amount represented by a person to a customer as constituting reimbursement for fees due under this chapter is computed upon an amount that is not subject to that fee, or is in excess of that fee amount due, and is actually paid by the customer to the person, the amount so paid shall be returned by the person to the customer, upon notification by the board or by the customer that the excess has been ascertained. If the person fails or refuses to return that amount, the person shall remit to the board the amount so paid, if the amount was knowingly or mistakenly computed by the person upon an amount that is not subject to the fee, or is in excess of the fee due.

48650.7. In any transaction involving a total volume of oil subject to payment pursuant to Section 48650 in excess of 10 gallons, the invoice or other form of accounting of the transaction shall identify the amount of the payment separately from the cost of the oil.

48651. (a) The board shall pay a recycling incentive to every industrial generator, curbside collection program, and certified used oil collection center, for used lubricating oil collected from the public, or generated by the certified used oil collection center or the industrial generator, and transported by a used oil hauler to the facilities specified in Section 48623.

(b) The board shall pay a recycling incentive to an electric utility, as defined in Section 25108, for used lubricating oil generated and used by the electric utility for electrical generation if the electric utility's use of the used lubricating oil meets the requirements of subparagraph (C) of paragraph (2) of subdivision (d) of Section 25143.2 of the Health and Safety Code and the used oil is in compliance with the standards for recycled oil established in paragraph (3) of subdivision (a) of Section 25250.1 of the Health and Safety Code.

(c) A person or entity that generates used industrial oil or a used oil storage facility or a used oil transfer facility that accepts used oil shall cause that oil to be transported by a used oil hauler to a certified used oil recycling facility or an out-of-state recycling facility registered with the Environmental Protection Agency and operating in substantial compliance with applicable regulatory standards of the state in which the recycling facility is located.

48652. The board shall set the recycling incentive amount at not less than four cents ($0.04) per quart. The amount may be set at an amount higher than four cents ($0.04) if the board determines that a higher amount is necessary to promote recycling of used lubricating oil and sufficient funds are available in the fund. The board shall not change the amount of the recycling incentive until at least one year has passed since the amount was last set. The board shall continue providing recycling incentives to certified used oil collection centers at the previous rate for one month after setting the recycling incentive at a different rate. The board shall not raise the recycling incentive amount unless it finds that the raise will not adversely affect funding required pursuant to Sections 48631, 48653, and 48660.5.

48653. The board shall deposit all amounts paid pursuant to Section 48650 by manufacturers, civil penalties, or fines paid pursuant to this chapter, and all other revenues received pursuant to this chapter into the California Used Oil Recycling Fund, which is hereby created in the State Treasury. Notwithstanding Section 13340 of the Government Code, the money in the fund is to be appropriated solely as follows:

(a) Continuously appropriated to the board for expenditure for the following purposes:

(1) To pay recycling incentives pursuant to Section 48651.

(2) To provide a reserve for contingencies, as may be available after making other payments required by this section, in an amount not to exceed one million dollars ($1,000,000).

(3) To make block grants for the implementation of local used oil collection programs adopted pursuant to Article 10 (commencing with Section 48690) to cities, based on the city's population, and counties, based on the population of the unincorporated area of the county, in a total annual amount equal to ten million dollars ($10,000,000) or half of the amount which remains in the fund after the expenditures are made pursuant to paragraphs (1) to (3), inclusive, and subdivision (b), whichever amount is greater, multiplied by the fraction equal to the population of cities and counties which are eligible for block grants pursuant to Section 48690, divided by the population of the state. The board shall use the latest population estimates of the state generated by the Population Research Unit of the Department of Finance in making the calculations required by this paragraph.

(4) For expenditures pursuant to Section 48656.

(b) The money in the fund may be expended by the board for the administration of this chapter and by the department for inspections and reports pursuant to Section 48661, only upon appropriation by the Legislature in the annual Budget Act.

(c) The money in the fund may be transferred to the Farm and Ranch Solid Waste Cleanup and Abatement Account in the General Fund, upon appropriation by the Legislature in the annual Budget Act, to pay the costs associated with implementing and operating the Farm and Ranch Solid Waste Cleanup and Abatement Grant Program established pursuant to Chapter 2.5 (commencing with Section 48100).

(d) Appropriations to the board to pay the costs necessary to administer this chapter, including implementation of the reporting, monitoring, and enforcement program pursuant to subdivision (d) of Section 48631, shall not exceed three million dollars ($3,000,000) annually.

(e) The Legislature hereby finds and declares its intent that the sum of two hundred fifty thousand dollars ($250,000) should be annually appropriated from the California Used Oil Recycling Fund in the annual Budget Act to the board, commencing with fiscal year 1996-97, for the purposes of Section 48655.

48655. The board may enter into a contract with the department that will utilize the resources of the department to provide for greater investigation and enforcement efforts for used lubricating oil handling and storage and transfer facility operations. The department shall assist the board in developing the used oil program and providing assistance to local governments in removing barriers to the establishment of used oil collection programs.

48656. After all of the expenditures pursuant to Section 48653 have been made, notwithstanding paragraph (4) of subdivision (a) of Section 48653, the balance remaining in the fund shall be available to the board for expenditure solely for the implementation of subdivisions (b) and (c) of Section 48631 and Sections 48632 and 48660.5. The board shall not expend more than two hundred thousand dollars ($200,000) to implement Section 48660.5 and at least 40 percent of the money remaining in the fund shall be expended for the purposes of subdivision (a) of Section 48632, at least 10 percent shall be expended for the purposes of subdivision (b) of Section 48632, at least 20 percent shall be expended for the purposes of subdivision (c) of Section 48631, and at least 10, but not more than 15, percent shall be expended for the purposes of subdivision (c) of Section 48632.

48657. The board shall keep accurate books, records, and accounts of all of its dealings, and these books, records, and accounts, and any amounts paid into or from the fund, are subject to an annual audit by an auditing firm selected by the board. The auditing firm or the board shall also conduct a selective audit of entities making payments to, or receiving payments from, the board to determine whether payments required by Section 48650 are being paid to the board on all lubricating oil sold in California, and that grants and recycling incentives are being paid out properly by the board.

PUBLIC RESOURCES CODE
SECTION 48660-48662

48660. (a) No used oil collection center shall be eligible for the payment of recycling incentives until the board has certified that the center is in compliance with the requirements specified in subdivision (b). Before certification, the board may require the center to submit any information that the board determines is necessary to find that the center is in compliance with those requirements. A center shall reapply for certification every two years. The board may cancel the certification of a center if the board finds, after a public hearing, that the center is not, or has not been, in compliance with subdivision (b). The board may withhold the payment of recycling incentives for used lubricating oil collected by a center if the board finds that the center was not in compliance with subdivision (b) during the time in which the used lubricating oil was collected.

(b) To be eligible for certification by the board and for the payment of recycling incentives, the used oil collection center shall do all of the following:

(1) (A) Accept used lubricating oil from the public at no charge during the hours between 8 a.m. and 8 p.m. that the entity operating as the center is open for business.

(B) The board may approve alternative hours for the acceptance of used lubricating oil by an individual center if either of the following conditions is met:

(i) The center accepts used lubricating oil for 12 continuous hours daily.

(ii) The center demonstrates that compliance with Section 279.31 of Title 40 of the Code of Federal Regulations prevents the center from complying with subparagraph (A).

(2) Pay to any person an amount equal to the recycling incentive which the center will receive for used lubricating oil brought to the center in containers by the person. Nothing in this chapter prohibits any person from donating used lubricating oil to a center. With the exception of centers that generate used lubricating oil by servicing motor vehicles, the recycling incentive may be in the form of a credit that may be applied toward the purchase of goods or services offered by the center, as determined by the board. The credit shall be in the form of a voucher or coupon with a value of at

least twice the incentive amount to be paid pursuant to Section 48652 and have no other limits for use, unless prescribed by the board.

(3) Provide information to the board for informing the public of the center's acceptance of used lubricating oil.

(4) Provide notice to the public, through onsite signs and periodic advertising in local media, of the center's acceptance of used lubricating oil from the public.

(A) Onsite signs shall be of a design prescribed by the board and exterior signs shall be posted in a location that is easily visible from a public street.

(B) A certified center shall post a combined symbolic and information exterior sign of at least two feet by three feet in size, or shall post an exterior symbolic sign of at least two feet by 18 inches in size. If the exterior symbolic sign is posted, the combined symbolic and informational sign shall be concurrently posted so that it is easily readable from the location where the used oil is received from the public. The exterior symbolic sign shall include the following words in a manner specified by the board: "Used Oil Collection Center."

(C) The informational portion of the combined signs shall include the following words, in a manner specified by the board: "Used Oil Collection Center--Recycling Incentive Paid for Used Lubricating Oil in Containers During Business Hours from Members of the Public Who Change Their Own Oil."

(D) A center that does not accept used lubricating oil from the public during all of its business hours, but meets the requirements of paragraph (1), shall indicate on the exterior sign the hours when that used oil is accepted at no charge from the public and these hours shall be posted instead of the business hours.

(E) If local zoning ordinances prevent signs of a size consistent with this paragraph, the exterior symbolic sign shall be of the maximum allowable size.

(c) Notwithstanding subdivision (b), a used oil collection center may refuse to accept used lubricating oil which has been contaminated in a manner other than that which would occur through normal use.

(d) Notwithstanding subdivision (b), no used oil collection center shall knowingly accept used lubricating oil for which a payment has not been made pursuant to Section 48650.

48660.5. (a) If the board finds that a shipment of used oil from a certified used oil collection center or a curbside collection program is contaminated by hazardous materials in excess of that which generally occurs in normal use, which renders the used oil infeasible for recycling, and requires that the used oil be destroyed at a substantially higher cost than the cost generally to recycle used oil, the board shall, upon application by the used oil collection center or curbside collection program, reimburse the center or program for the additional disposal cost, subject to the eligibility requirements of subdivision (b), except as provided in subdivision (c).

(b) A certified used oil collection center or curbside collection program is eligible for reimbursement only if it demonstrates to the satisfaction of the board all of the following:

(1) The center or program has established procedures to ensure that the used oil it generates and accepts from the public will not be mixed with other hazardous wastes, especially halogenated wastes. These procedures shall include, but not be limited to, instructing the public and employees that used oil shall not be mixed with other hazardous waste. The board shall not require a center or program to test used oil received from the public as part of these procedures.

(2) The shipment contains not more than five gallons or pounds of contaminants combined, based on the contaminant concentrations and the total volume or weight of the shipment.

(c) In any calendar year, a used oil collection center or curbside collection program shall be reimbursed for not more than one shipment and for not more than five thousand dollars ($5,000) in disposal costs, subject to the availability of funds pursuant to Section 48656.

48661. (a) On and after July 1, 1992, the department shall annually inspect used oil recycling facilities.

(b) Within 135 days following inspection, the department shall submit a report to the board, describing all of the following:
(1) Any violations of Chapter 6.5 (commencing with Section 25100) of Division 20 of the Health and Safety Code.
(2) Any corrective actions ordered or agreed to by the department.

(3) Progress by the facility in correcting violations identified in previous inspections.
(c) In the report required by subdivision (b), the department shall specifically state whether any of the following occurred:
(1) The department has identified violations of subdivision (c) of Section 25250.1 of the Health and Safety Code regarding achievement of minimum standards of purity for recycled oil.
(2) The department has identified violations of regulations requiring financial responsibility assurance for liability, closure, and post closure obligations.
(3) Where prior contamination has been identified, the facility has an approved corrective action plan and has not been found to be in violation of its requirements.
(4) The department has identified violations that meet the criteria for class 1 violations, as defined in Section 66260.10 of Title 22 of the California Code of Regulations.

48662. The board shall certify or recertify any used oil recycling facility for which the board has received a report from the department pursuant to Section 48661, unless the board determines that the facility is engaged in a repeating or recurring pattern of noncompliance that poses a significant threat to public health and safety or the environment. If the board denies certification, the board may subsequently certify a facility if it determines that the facility meets the standards for certification.

PUBLIC RESOURCES CODE
SECTION 48670-48676

48670. To be eligible for payment of a recycling incentive, an industrial generator of used lubricating oil, a used oil collection center, or a curbside collection program shall report to the board, for each quarter, the amount of lubricating oil purchased and the amount of used lubricating oil that is transported to a certified used oil recycling facility, or to a used oil storage facility or to a used oil transfer facility, or that is transported to an out-of-state recycling facility registered with the Environmental Protection Agency and permitted to operate by the applicable regulatory agency of the state in which the facility is located, or that is used to generate electricity pursuant to subdivision (b) of Section 48651. The reports shall be submitted on or before the 45th day following each quarter, in the form and manner which the board may prescribe, and shall include copies of manifests or modified manifest receipts from used oil haulers. The board may delegate to the executive officer of the board the authority to accept reports submitted after the 45th day and to reduce, eliminate, or approve the amount of incentive fee to be paid due to the late submission of the report. The board may provide, by regulation, for a longer reporting period for industrial generators that generate less than 1,000 gallons of used oil annually.

48671. Every oil manufacturer who sells, or offers to sell, lubricating or industrial oil in this state shall report to the board for each month the amount of lubricating or industrial oil sold.

The reports shall be submitted by the day when payment required by Section 48650 is or would be due, in the form and manner which the board may prescribe. However, an oil manufacturer is not required to report to the board when the total volume of oil to be reported is five gallons or less.

48671.5. The manufacturer of every container that contains lubricating oils or industrial oils, and which is intended for sale to consumers in California, shall do either of the following:

(a) Label the containers in at least seven-point typeface as follows:

"Used oil is generally classified as a hazardous waste in California. Do not dispose of used oil in garbage, sewers, or the ground. To find out how to properly recycle used oil in your area, call (800) ____."

The toll-free telephone number on the label shall be the number maintained by the board pursuant to Section 48644.

(b) Provide signs or other written material to retailers appropriate for informing consumers of the information that would otherwise be contained in the label set forth in paragraph (a).

48672. Beginning May 1, 1992, every used oil hauler shall report to the board for each quarter the amount of used oil transported, the location to which it is transported, and the source of the used oil. The hauler shall provide estimates, where feasible, of the amount which is used lubricating oil and the amount which is used industrial oil. The reports shall be submitted on or before the last day of the month following each quarter, in the form and manner which the board may prescribe.

48673. Beginning July 1, 1992, every used oil recycling facility shall report to the board for each quarter the amount of used oil received and the amount of recycled oil produced. The facility shall provide estimates, where feasible, of the amount which is used lubricating oil and the amount which is used industrial oil. The reports shall be submitted on or before the last day of the month following each quarter, in the form and manner which the board may prescribe.

48674. After receiving a block grant pursuant to paragraph (4) of subdivision (a) of Section 48653, each local government shall submit an annual report to the board, on or before the date specified by the board, which includes any amendments to the local used oil collection program adopted pursuant to Section 48690, a description of all measures taken to implement the program, and a description of how the block grant was expended.

48675. The board shall establish procedures to protect any proprietary information concerning sales, purchases, and operations obtained while collecting information for carrying out this chapter.

48676. The board shall establish reporting periods for the reporting of accumulated industrial and lubricating oil sales and used oil recycling rates, and each reporting period shall be six months. The board shall issue a report based on the information received within 120 days of the end of each reporting period.

PUBLIC RESOURCES CODE
SECTION 48680

48680. (a) Except as provided in subdivision (b), in addition to any other civil or criminal penalties, any person convicted of a violation of this chapter is guilty of an infraction, which is punishable by a fine of not more than one hundred dollars ($100) per day for each day the violation occurs.

(b) (1) Every person who, with intent to defraud, does not accurately report the amount of oil sold, collected, or transferred pursuant to Article 8 (commencing with Section 48670), who, with intent to defraud, does not make payments as required by Section 48650, or who knowingly receives or pays a recycling incentive for oil upon which a payment has not been made pursuant to Section 48650 is guilty of fraud. If the money obtained or withheld is four hundred dollars ($400) or less, the fraud is punishable by imprisonment in the county jail for not more than six months, by a fine of not more than one thousand dollars ($1,000), or by both that fine and imprisonment. If the money obtained or withheld is more than four hundred dollars ($400), the fraud is punishable by imprisonment in the county jail for not more than one year or imprisonment in the state prison, by a fine not exceeding ten thousand dollars ($10,000), or twice the late or unmade payments plus interest, whichever is greater, or by both that fine and imprisonment.

(2) Any person who claims an exemption pursuant to this chapter which the person knows to be false, and makes that claim for the purpose of willfully evading the payment of any fee imposed pursuant to this chapter, is guilty of a misdemeanor punishable by imprisonment in the county jail for not more than one year. The person shall also be subject to payment of a fine not to exceed five thousand dollars ($5,000). The fine shall be distributed as follows:

(A) Fifty percent to the local jurisdiction which undertook the prosecution.

(B) Fifty percent to the General Fund.

(c) Any person who violates this chapter may be assessed a civil penalty by the board of not more than one hundred dollars ($100) per day for each day the violation occurs or continues, pursuant to a hearing and notice.

PUBLIC RESOURCES CODE
SECTION 48690-48691

48690. A local government is eligible for a block grant pursuant to paragraph (3) of subdivision (a) of Section 48653, if it develops and submits a local used oil collection program to the board pursuant to Section 48691 and files a report pursuant to Section 48674. The board shall make a grant to every local government that submits a program and files a report unless the board finds that the program or its implementation does not comply with criteria contained in this article. The board may make a block grant to another entity that will implement the program of a local government in lieu of making a block grant to that local government with the concurrence of that local government.

48691. (a) A local used oil collection program shall provide for used lubricating oil collection by either of the following or a combination of the two:

(1) Ensuring that at least one certified used oil collection center is available for every 100,000 residents not served by curbside used oil collection, which accepts oil from the public at no charge, at least 20 hours each week, on four days each week, of which three hours each week are outside the weekday hours of 8 a.m. through 5:30 p.m.

(2) Providing used oil curbside collection at least once a month.

(b) A local used oil collection program shall include a public education program which shall inform the public of locally available used oil recycling opportunities.

(c) A local government may implement its used oil collection program in conjunction with other similar programs in order to improve used oil recycling efficiency.

(d) (1) A local government that has implemented the used oil collection and education elements of subdivisions (a) and (b) may also include, in the local used oil collection program, provisions for the mitigation and the collection of oil and oil byproducts, including other solid waste that may be mixed with oil or oil byproducts from storm water runoff, including devices to capture that storm water runoff, such as the use of storm drain inlet filter devices.

(2) A local government shall not receive a block grant pursuant to Section 48690 for the purposes identified pursuant to paragraph (1) unless the local government certifies that it has a storm water management program that is approved by the appropriate California regional water quality control board and that the provisions in the local used oil collection program approved for funding under paragraph (1) are consistent with that approved storm water management program.

9.8 Highlights of Key Federal Statutes and Regulations that Relate to Management of Used Oil

Detailed below are highlights of specific regulations that deal with used oil management including:

1. Resource Conservation and Recovery Act (RCRA) Used Oil Management Standards

2. Toxic Substances Control Act (TSCA)

3. Clean Air Act (CAA) National Emission Standards for Hazardous Air Pollutants (NESHAP)

4. Clean Air Act Offsite Waste Rule

5. Clean Water Act Centralized Waste Treatment (CWT) Point Source Category

6. The Spill Prevention Control and Counter (SPCC) measures plan requirements

7. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

8. The Emergency Planning and Community Right to Know Act

9. The Nuclear Regulatory Commission used oil regulations

10. Coast Guard used oil regulations dealing with releases of used oil to navigable waters and shipboard management of used oil.

11. Hazardous Materials in Transportation Act (HMTA).

Highlights

1. Resource Conservation and Recovery Act (RCRA) Used Oil Management Standards (40 CFR Part 279, UOMS) are intended to protect soil, groundwater, surface water, and air. UOMS prohibit storing used oil in units other than good condition tanks and containers unless the other unit has a RCRA permit and allow mixture with hazardous wastes under limited conditions. UOMS require used oil generators, with a few exceptions, to use only tanks and containers that are in good condition, to label used oil tanks and containers, respond to releases, and use a transporter with an EPA ID number. In addition to the generator requirements, used oil transporters are required to notify the U.S. EPA or authorized state government of their used oil activities if the transporter doesn't already have an EPA ID number, to determine total halogen concentration, and to maintain tracking records. Used oil processors/re-refiners are obligated to comply with the previously mentioned requirements, to prepare a used oil contingency plan (an SPCC plan may be modified rather than preparation of a unique

plan for the UOMS), to maintain secondary containment, a used oil analysis plan, recordkeeping, and biennial reporting. Used oil marketers must also be generators, transporters, or processor/re-refiners and have tracking requirements for both on-spec and off-spec used oil fuel; the first person to claim that used oil meets the specifications must maintain documentation to support the claim. Used oil burners include industrial boilers, utility boilers, and industrial furnaces (e.g., cement kilns, asphalt aggregate dryers, blast furnaces, coke ovens, smelters). Used oil generators are also allowed to burn household used oil and used oil generated on-site for energy recovery in a used oil-fired space heater with a capacity less than 500,000 BTU/hour that is vented to the ambient air. All but 2 States (Alaska and Iowa) have achieved base program authorization for RCRA State Hazardous Waste Programs and are required to have standards for used oil management which are equivalent to 40 CFR Part 279 (40 CFR 271.26). Aside from the UOMS, RCRA Subtitle C more rigorously regulates used oil destined for disposal that is a solid and hazardous waste. RCRA Subtitle I imposes management standards on underground storage tanks. Subtitle D of RCRA provides minimum standards for States to achieve federal authorization for solid waste disposal.

2. Toxic Substances Control Act (TSCA) rules (40 CFR 761, Subpart B) prohibit the distribution in commerce of equipment containing oils with PCB concentrations above 500 ppm, dilution of the PCB concentration to avoid regulation, and manufacture of PCB-containing equipment generally. Oil used in high temperature hydraulic fluid and electrical equipment may contain PCBs due to historic use of PCBs as a fire retardant. PCB-containing equipment is still in use. Used oil containing PCBs between detection and 50 ppm is regulated by TSCA, which references RCRA UOMS when burned for energy recovery. A TSCA rule restricts the on-site burning of used oil (containing detectable PCBs) in space heaters to the automotive industry.

3. Clean Air Act (CAA) National Emission Standards for Hazardous Air Pollutants (NESHAP) rules for Off-site Waste Recovery Operations (40 CFR 63, Subpart DD or OSWRO NESHAP), apply to used oil processors/re-refiners as defined in the RCRA UOMS if the facility on which processor/re-refiner is located is a major source of hazardous air pollutants. A major source means any stationary source or group of stationary sources within a contiguous area and under common control that emits or has the potential to emit, considering controls, in aggregate, 10 tons or more per year of any HAP or 25 tons per year or more of any combination of HAPs. OSWRO NESHAP regulated sources include tanks, surface impoundments, containers, oil/water and chemical/water separators, material transfer systems, process vents, and equipment leaks. Some used oil combustion units are located at major source facilities and would be subject to Title V permit requirements. There are not specific Federal rules for the industrial boilers, utility boilers, and industrial furnaces that burn off-specification used oil fuel.

4. Clean Air Act Offsite Waste Rule. Off-site waste facilities include hazardous waste treatment, storage, and disposal facilities; industrial wastewater treatment facilities; solvent recycling facilities; and used-oil recovery facilities that manage hazardous air pollutant-containing materials generated at other facilities. A number of toxic air pollutants (including chloroform, toluene, formaldehyde, and xylene) are released from tanks, process vents, equipment leaks, containers, surface impoundments, and transfer systems at these facilities. EPA's rule combines equipment, operations, and work practice standards. For example, the rule requires that containers be covered and that process vents meet 95 percent organic emission controls. The rule affects an estimated

250 off-site waste operation facilities. It will reduce air toxics emissions by 43,000 tons per year and VOC emissions by 52,000 tons per year.

5. Clean Water Act Centralized Waste Treatment (CWT) Point Source Category (40 CFR 437) and Test Procedures for the Analysis of Pollutants (40 CFR 136) apply to facilities that accept waste from off-site, that treat and/or recover these wastes, and whose activities generate a wastewater. More specifically, recycle/recovery activities are covered by the rule unless specifically exempted. Fuel blenders that generate a wastewater are regulated by this rule. All re-refiners are regulated by this rule. Many RCRA UOMS processor/re-refiners are regulated by the CWT rule's oil subcategory. The CWT rule imposes best practicable control technology currently available for 3 conventional pollutants, 13 metal pollutants, and 6 organic pollutants. The CWT rule is intended to protect the public health or welfare, including, but not limited to, fish, shellfish, wildlife, shorelines, and beaches.

6. The Spill Prevention Control and Countermeasures plan requirements (SPCC, 40 CFR 112) originate in the Clean Water Act, as amended. SPCC plans are intended to protect surface waters from releases of oil, including vegetable oil, animal oil, and used oil, to navigable waters. SPCC rules in effect in 2005 apply to 1) non-transportation-related facilities, 2) with an aboveground storage tank capacity greater than 660 gallons in a single container or an aggregate storage capacity greater than 1,320 gallons or a total underground capacity greater than 42,000 gallons and 3) there must be a reasonable expectation of a discharge to navigable waters or adjoining shorelines of the United States. Pathways to navigable waters include street gutters and sewers that discharge to surface water. SPCC plans should address operating procedures the facility implements to prevent oil spills, control measures installed to prevent a spill from entering navigable waters or adjoining shorelines, and countermeasures to contain, cleanup, and mitigate the effects of an oil spill. The requirements include a professional engineer's certification, spill predictions, facility drainage, facility inspections, site security, three-year plan review, management approval, oil spill history, secondary containment or diversionary structures, loading/unloading rack area for tank car and tank trucks, and training and spill briefings.

7. The Comprehensive Environmental Response, Compensation, and Liability Act as amended (CERCLA) contains many used oil-related provisions. Emergency removal and site remediation authorities for 'hazardous substances' have been applied to abandoned used oil sites. The service station dealer exemption from potentially responsible party liability in Section 114 of CERCLA provides an incentive for service station dealers to accept used oil generated by households and to comply with the RCRA UOMS. CERCLA defines the term 'hazardous substance' in Section 101(14), including: non-oil hazardous substances designated pursuant to 1321(b)(2)(A) of the Federal Water Pollution Control Act (FWPCA); any element, compound, mixture, solution , or substance designated pursuant to Section 9602 of CERCLA; any hazardous waste identified pursuant to Section 3001 of the Solid Waste Disposal Act (RCRA); the toxic pollutant list as identified in section 1317(a) of the Water Pollution Control Act; hazardous air pollutants listed under section 112 of the Clean Air Act; and, any imminently hazardous chemical substance or mixture subject to an action under Section 2006 of Title 15. While the term 'hazardous substance' does not include petroleum crude oil or a fraction of petroleum crude oil, natural gas, natural gas liquids, liquefied natural gas, or synthetic gas useable for fuel, it does include oil which has been

contaminated with impurities through use. Therefore, requirements applicable to 'hazardous substances' also apply to 'used oil,' such as notice to the National Response Center upon release to the environment.

8. The Emergency Planning and Community Right to Know Act includes Toxic Release Inventory reporting requirements and notifying the local emergency planning committee of hazardous materials stored on-site. Hazardous materials are those for which the Occupational Health and Safety Administration requires a material safety and data sheet (MSDS) pursuant to its risk communication standard at 49 CFR 1910. Chlorinated ethanes (i.e., paraffins) and chlorinated naphthenes, both of which have been lubricant additives and found in used oil, are on the list. Also, cresols are listed, and one type of cresol may be present as a biocide in oil products. The 'list of lists' for EPCRA is available on EPA's website at http://www.epa.gov/ceppo/pubs/title3.pdf.

9. The Nuclear Regulatory Commission promulgated a final rule addressing the management of used oil mixed waste. Onsite incineration of contaminated waste oils generated at licensed nuclear power plants is allowed without amending existing operating licenses. Compliance with other applicable Commission regulations, for example, effluent release limitations is still required. See 57 FR 57649 - 57656, December 7, 1992.

10. Releases of used oil to navigable waters and shipboard management of used oil are regulated by the Coast Guard under the authority of the International Convention for the Prevention of Pollution by Ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/78) and subsequently revised in 1992. The 1992 revisions enter into force on January 1, 2007. MARPOL restricts the quantity, rate, and location of operational discharges of oil from tankers. An oil record book must be used to record the movement of cargo oil and its residues from loading to discharging on a tank-to-tank basis. Segregated ballast tanks are required on all new tankers of 20,000 dwt and above and are to be positioned in such a way that the cargo tanks are protected. The 1992 amendments to Annex I mandated double hulls for new oil tankers and created a phase-in schedule for existing tankers to fit double hulls.

11. The United States Department of Transportation regulates the transportation of hazardous materials in commerce under the authority of the **Hazardous Materials in Transportation Act (HMTA)** (40 CFR Parts 171 to 179). Used oil is classified as a hazardous material if it meets the definition of a combustible liquid (flash point greater than or equal to 100ºF and less than 200ºF) or flammable liquid (flash point below 100º F). DOT regulations address identification and classification, packaging, marking, labeling, and shipping papers and, for transporters, placarding, use of shipping papers, recordkeeping, reporting, and incident response.