

Contractor's Report to the Board

Re-Refined Motor Oil in Public and Private Fleets in California

Produced under contract by:

*California State University,
Long Beach*



September 2006

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Executive Summary

Californians consume millions of gallons of motor oil each year but only a small amount is re-refined motor oil. This project examined the use of re-refined motor oil (RRO) by managers of fleets of cars and trucks in the public and private sectors in five southern California counties: Los Angeles, Orange, Riverside, San Diego, and Ventura.

A market study projected sales of about 150 million gallons of lubricating oil intended for automobiles and trucks each year in California, with only about 5 percent being RRO. The overall demand for motor oil may decrease as manufacturers recommend longer intervals between oil changes, but increasing sales of vehicles and larger engines requiring more quarts of oil per change may moderate the decrease.

California generates a large supply of used oil each year, the majority of which is responsibly collected. Most used oil is converted into fuel oil for industrial and maritime uses, with only about 15 percent re-refined into new lubricating oil. The price of used oil is determined by its cleanliness (absence of contaminants that would render it a hazardous substance), transportation, and the demand from processors of used oil. Historically, the price for used oil has not been substantially lower than that for new oil; however, recent price increases in new oil have opened up a price gap.

Should the demand for RRO increase, it is not clear whether existing production could also increase to meet the demand. There are only two major North American re-refiners who produce RRO. There are substantial barriers to entry into the re-refinery market, including the cost of construction of a new plant, opposition from community groups, and the high cost of obtaining American Petroleum Institute (API) certification (about \$500,000) for each type of oil manufactured. However, new technology that permits smaller re-refineries to be built at a much lower cost is now being tested. Should this technology prove profitable, there would be sufficient used oil generated in California to support additional re-refining capacity.

One potential source of increased demand could be managers of fleets of automobiles and trucks in California. One hundred fleet managers responded to a survey on their experience with and attitudes toward using RRO in their fleets. Focus groups with public and private sector fleet managers confirmed and elaborated upon the findings from the survey.

Nearly 70 percent of the fleet managers surveyed had never used RRO; about 10 percent had used it in the past; and only 20 percent were using it now. Nearly all uses of RRO occur among public sector fleet managers. Among fleet managers who do use RRO, half do so because of concerns about the environment.

The barriers to using RRO are concerns about quality; fear of voiding a vehicle or engine warranty; and lack of knowledge about it. Many fleet managers did not know that RRO is certified by the API as meeting the same quality standards as new oil. Mechanics, drivers, and other customers are reported to be opposed to the use of RRO. Private sector managers overwhelmingly (69 percent) perceived the cost of RRO to be a barrier, compared to only 20 percent of public sector managers. There was a feeling on the one hand that RRO should be cheaper than new oil because it is used, but on the other hand there was a fear that being cheaper would render it inferior to new oil. There was also a perception that RRO did not offer any cost savings over new oil.

The availability of RRO was also a problem. Fleet managers who have used RRO in the past or who use it now are favorably impressed with its performance. However, the increasing heterogeneity of today's fleets of cars and trucks requires fleet managers to stock and use more varieties of motor oil designed to meet the needs of specific vehicle and engine types. There is a lag time between the emergence of new categories of motor oil and the ability of used oil re-refiners to respond to the new formulations and have their product certified by the API. Fleet managers would like to obtain all their lubricating oil from the same vendor, but few RRO vendors can carry all the various types of motor oil in sufficient quantities.

The majority of fleet managers in both the public (71 percent) and private (67 percent) sectors felt the State should encourage the use of RRO in both sectors. The major reason to encourage the use of RRO would be to preserve or improve the environment. However, most fleet managers thought that the environment in California has remained stable or improved over time.

At present, then, RRO is perceived as a solution waiting for a problem. Unless the environment deteriorates markedly or the price of RRO becomes more competitive, fleet managers will not feel compelled to consider its use.

From these findings a curriculum was developed for a series of workshops for fleet managers. The curriculum emphasized the facts about RRO such as its certification by API. Representatives from the major re-refiners were invited to present technical information, and fleet managers currently using RRO were invited to give testimonials about their experience. Participants were asked to pledge to consider using RRO in their fleet vehicles. Evaluations of the workshops were conducted both on-site and through later follow-up telephone calls.

The major recommendations for the State vis-à-vis other public sector entities are:

- Publicize the availability of pre-negotiated state contracts for RRO.
- Encourage local jurisdictions to promote the use of RRO, especially by contractors.

The major recommendations for the state vis-à-vis private sector fleets are:

- Offer "green fleet" certifications for fleets that use RRO.
- Publicize long-term use of RRO by large, well-known and respected fleets.
- Assist fleets to obtain "closed-loop" agreements with RRO collectors/suppliers.
- Eliminate the Motor Oil Assessment Fee for RRO.
- Launch a statewide campaign on the benefits of using RRO.
- Reexamine laws and policies governing re-refiners to eliminate disadvantages.
- Encourage manufacturers of name brand motor oils to use more RRO.
- Consider offering tax incentives to fleets that switch to RRO.
- Study the feasibility of small re-refineries based on new technology.

1. Introduction

This project was funded by a grant from the California Integrated Waste Management Board (CIWMB). The objective of this project was to test whether demand for re-refined oil (RRO) could be increased through educating fleet managers within the public (government) and private (commercial) sectors. The project consisted of a number of tasks, including:

- Identification of laws and policies affecting the use of RRO in California.
- A survey of 100 fleet managers.
- Two focus groups with fleet managers.
- Partnering with RRO distributors.
- RRO workshops for fleet managers.
- Evaluation of fleet manager workshops.
- A description of the market for re-refined motor oil in California.

The goal of these tasks was to identify the barriers to and the benefits of using RRO, develop strategies to overcome the barriers, provide training for fleet managers on the quality and successful uses of RRO, and evaluate the effectiveness of the training for increasing demand for RRO among fleet managers in the public and private sectors in California.

RRO is a lubricant made from previously used oil that has been renewed or reconstituted through a process similar to the original refining of crude petroleum. The major generators of used oil are motorized vehicles and industrial operations. Used oil includes all types of products, from lightweight engine oils to heavy manufacturing lubricants. Similarly, used oil can be recycled into a number of products, from low grade asphalt extenders and industrial fuels to the most sophisticated new motor oil formulas. This project focused primarily on the recycling and re-refining of used oil into new lubricants for fleets of automobiles and trucks in southern California.

2. Laws and Policies Affecting RRO

Introduction

Laws, regulations, and programs related to RRO exist at both the federal and state levels. The major areas that fall under regulation concern the definition and management of used oil; the labeling of new, used, and RRO products; taxes and fees levied on re-refined motor oil; and mandates on the acquisition of RRO by government entities. A few local jurisdictions have also begun to adopt policies concerning RRO.

Definition and Management

Federal Used Oil Definition

In 1978, the Resource Conservation and Recovery Act (RCRA) specified how hazardous wastes were to be managed over their life cycle. RCRA authorized the Environmental Protection Agency (EPA) to list materials considered to be hazardous wastes. Congress added the Used Oil Recycling Act in 1980 to encourage more recycling and promote products with recycled content. The Comprehensive Environmental Response, Compensation, and Liability Act of 1980

(CERCLA or superfund) determined liability for clean-up of hazardous substances.

In 1985, the EPA considered listing all used oil as a hazardous waste but decided against it after complaints that this would discourage recycling, since at that time the majority of DIY-generated used oil was not being properly disposed of (Volkh, 1995, p.15). It was feared that service stations, which sold most motor oil to individuals, would be reluctant to accept used oil and do-it-yourself (DIY) oil changers would resort to illegal dumping. Many service stations and others involved with motor oil were fearful of being labeled as hazardous sites; however, most service stations were exempted if they conformed to used oil management standards (US EPA, 1999, p.5).

The EPA was taken to court by parties who wanted used oil to remain listed as a hazardous waste. In 1991, the EPA issued guidelines for used oil management standards that only classified used oil as a hazardous waste if it contained specific contaminants, e.g., chlorine (Volkh, 1995, p.16). These federal regulations govern the management of used oil destined for recycling and prescribe procedures for notification, testing, labeling, and record-keeping. They also cover prevention of and cleanup of spills during storage and transit. Used oil is not defined as a hazardous waste but is subject to the Toxic Substances Control Act of 1976, which mandates tracking of over 75,000 different chemical substances (US EPA, 1999). Regulations allow uncontaminated used oil to be burned as a fuel in furnaces or boilers. More restrictions are placed on contaminated used oil but it can still be burned as a fuel, with proper filters. In certain situations, generators of small amounts can burn their own used oil for space heating even if it is contaminated.

States have been directed to adopt statewide programs and management practices for used oil. The American Petroleum Institute (API) has developed a draft for model legislation that has been adopted by some states to formalize their used oil management systems.

State Used Oil Definition

California is one of the few states that provide for used oil to be considered a hazardous waste. Most of the regulations concerning the definition and management of used oil are contained in the California Health and Safety Code (especially sections 25250-25250.28 and 25140-25145.4) and the Public Resources Code (especially sections 48610-48691). These regulations specify how used oil must be managed and reported by generators, collectors, transporters, and processors.

Transportation is a special concern, as evidenced by the California Oil Transfer and Transportation Emission and Risk Reduction Act of 2002, which is also section 8780-8789 of the Public Resources Code (PRC). Transporters of used oil must register with the state, have special insurance and be subject to vehicle inspections. They are required to check used oil for the presence of substances that would render it hazardous when collecting it, so that a small batch of contaminated oil does not ruin a large truckload of good quality used oil (Volkh, 1995, p.17). Transporters may have to make multiple trips to collect used oil at separate times from other types of hazardous wastes or invest in trucks with partitioned tanks so that other wastes do not contaminate the used oil (Arner, 1996, p.2).

Labeling of RRO

Generally all existing regulations pertaining to the labeling of lubricating oils also apply to RROs. These requirements concern the display of information on product labeling and are intended to protect consumers. Federal and state regulations differ as to requirements for labeling a product as "re-refined." Federal standards require oil blends to contain at least 25 percent re-refined base oil content while California standards require at least 70 percent.

Federal Guidelines

The Energy Policy and Conservation Act of 1975 adopted a "used oil rule" to require advertising, promotional material, and labels on containers of lubricants made from used oil to disclose that fact. However, the Used Oil Recycling Act of 1980 suspended the rule because of claims that such labeling gave consumers the impression that the product was inferior. Under the premise that oil should be labeled on the basis of performance characteristics and fitness for intended use, and not on the basis of its origin, manufacturers are not now required to add any qualifiers to labels such as "used" or "re-refined" if that oil is substantially equivalent to new oil.

The equivalency to new oil is determined by tests on RRO performed by the API. The API is a professional organization with an independent licensing and certification system that provides consumers with technical information about the performance and recommended use of engine oils from various manufacturers. All oils meeting the same standards established by the International Lubricant Standardization and Approval Committee are awarded the same API certification. This allows both virgin and RROs to be compared on their relative merits as certified by API testing (see Appendix A). Re-refiners providing oil for retail sale prefer to label their products with the API certification awarded to the oil and not indicate the re-refined content of the oil.

State Guidelines

As in the federal case, there is no state regulation requiring oil to be labeled as re-refined. Again, the API certification is presumed to present the consumer with all the necessary information about the product and its capabilities. The only difference is that California requires 70 percent re-refined base oil in any product sold as "re-refined" whereas the federal government requires only 25 percent re-refined content.

Taxes and Fees

Federal Government

There are currently no taxes imposed on the production or sale of any motor oil by the federal government, nor is there any fee applied to the disposal or recycling of used oil. A previous excise tax on new lubricants was extended to RROs as well, leading to the demise of the demand for this product; but all federal excise taxes on oil were repealed in 1983.

State of California

The California Oil Recycling Enhancement (CORE) Act of 1992 (PRC 48600-48695) addresses the potential environmental problems posed by used oil by encouraging the appropriate disposal or recycling of used oil. One of the provisions of the CORE Act establishes a motor oil fee. section 48650 establishes that every motor oil manufacturer must pay a 4 cent fee for every quart or a 16 cent fee for every gallon of lubricating oil sold or transferred in the state or imported into the state for use in California. Other sections of the CORE Act set the procedures for motor oil manufacturers to follow when paying this fee to the CIWMB or when requesting a refund from the CIWMB. The CIWMB collects these fees pursuant to the Fee Collection Procedures Law (Part 30, commencing with section 55001, of Division 2 of the Revenue and Taxation Code).

The CORE Act also mandates that the CIWMB deposit all amounts paid pursuant to these sections into the California Used Oil Recycling Fund (Fund). The money in the Fund can be appropriated for the purpose of complying with the requirements in the CORE Act. One requirement is to provide monetary incentives to recycle to every industrial generator, curbside collection program, and certified used oil collection center. Also, the CIWMB is directed to provide a reserve for contingencies and for grants. A major provision of the Act is the creation of

used oil block grants that help local governments fund the establishment of programs that encourage recycling and/or other appropriate disposal of used oil. Used Oil Block Grants to cities and counties for the implementation of local used oil collection programs provide a significant source of income for local governments. The amount of each Block Grant takes into account the population of the city or county. In 2005, 237 grant awards totaling \$10 million were funded representing 98 percent of eligible jurisdictions in California.

In addition to the motor oil fee imposed by the CORE Act, sections 13430 - 13434 of the Business and Professions Code impose a Motor Oil Assessment Fee on the first production, sale or distribution of motor oil in California. The fee does not apply to motor oil exported for sale outside of California. The amount is established at 2 cents per gallon of motor oil and the Department of Food and Agriculture is responsible for its collection. For the purpose of fee responsibility, the California Code of Regulations (Chapter 8, sections 43000 - 43008) defines motor oil as including natural, synthetic and re-refined motor oils, whether or not in retail containers, and in addition, any product used as an additive to motor oil for the lubrication of internal combustion engines.

Procurement

Both the federal and state governments have issued policies promoting or mandating the acquisition and use of products made from re-refined used oil for public agencies.

Federal Executive Orders

Reversing previous bans on re-refined from the 1960s, the EPA in 1988 required all federal agencies, and all state and local agencies and contractors that use federal funds, to implement preference programs that promote the purchasing of RROs to the maximum extent possible. Products containing at least 25 percent re-refined base oil qualify as re-refined; standards for RRO cannot exceed those for virgin oil. The Defense Logistics Agency (DLA), a major supplier of lubrication products to federal agencies, has carried re-refined products since 1996 at competitive prices.

Two executive orders promulgated under President Clinton directed federal agencies to buy lube oils made from re-refined base oil and allow for preference for these oils. Executive Order 13101 (September 14, 1998) called for "Greening the Government through Waste Prevention, Recycling, and Federal Acquisition." It specifically directs federal agencies to adopt EPA guidelines for procurement of RRO and re-treaded tires. Executive Order 13149 (April 21, 2000) called for "Greening the Government through Federal Fleet and Transportation Efficiency." It prohibits federal agencies from using virgin oils when RROs of the same quality are reasonably available (US DOE, 2006, p. 6-1). However, a report from the Government Accountability Office indicated that the success of efforts to purchase recycled-content products is largely uncertain (GAO, 2002, p. 3). The major reason is that the federal government does not collect data on the recycled content of products purchased directly nor does it monitor whether contractors (who account for the vast majority of expenditures) are purchasing goods with recycled content.

State Mandates

California was one of the first states to adopt legislation to promote the procurement of re-refined lubricants with SB 734 in 1994. State agencies are required to purchase products that contain greater percentages of recycled oil when they are of the same quality, availability, fitness and price as virgin products, and cost no more than five percent more than the lowest priced virgin oil. California State Garages also offer RRO products. A management memo from the director of the California Department of General Services (DGS) in 2001 urged drivers of state cars to

request RRO when using state garages or other authorized vendors for oil change services.

As of January 2000, state agencies were required to spend at least 50 percent of their total lubricating oil purchase dollars on re-refined products. California's Public Contract Code Section 12400 on environmentally preferable purchasing (2002) directed the state's DGS to provide information and assistance with environmentally preferable purchasing. The DGS now establishes a contract for some 600 categories of lubricating oil and grease, including many re-refined products, with prices fixed for the life of the contract (2004-2007). California Public Contract Code section 10298 allows local government agencies to use the state contract when negotiating for purchases of these products. Some cities and/or counties have established preference policies that allow RRO to be purchased at prices up to 5 percent over the cost of similar virgin oil.

However, from our survey of fleet managers (below), it appears that many are not in compliance with these requirements.

3. Survey of Fleet Managers

This section summarizes the results of a survey of 100 fleet managers in Southern California concerning their use of re-refined motor oil. The purpose of the survey was to find out the attitudes of fleet managers in both the public and private sectors toward the use of re-refined motor oil in the vehicles in their fleets as well as their experiences with RRO.

Methods

This project used a cross-sectional survey of fleet managers in five counties in southern California, including Los Angeles, Orange, Riverside, San Diego, and Ventura. Managers of fleets in both the public and the private sector were surveyed about their knowledge of, use of, and attitudes toward re-refined motor oil. Additional descriptive information was gathered about each fleet, as well as about each fleet manager.

The Survey Instrument

The survey instrument consisted of a questionnaire with about fifty questions. Most of the questions had closed-ended (forced choice) response categories. The questions were developed by the project participants in consultation with grant management staff at CIWMB. The questionnaire asked about the size and type of vehicles in the fleet, the quantity and type of oil used, and the use of RRO. It also asked about fleet managers' perceptions of RRO and their opinions on whether the use of RRO should be encouraged. A copy of the questionnaire, along with the required informed consent form, is included in Appendix B.

The survey instrument was pilot tested with five fleet managers who were typical of the population of fleet managers in the five-county area. The findings from the pilot test were used to revise both the questionnaire and the method of its implementation.

The survey was originally designed to be administered by a trained project staff member over the telephone. However, many fleet managers preferred to complete the questionnaire on their own time. Accordingly, a large number of fleet managers requested that the questionnaire be faxed to them by the project staff, and they sent it back by return fax. A few fleet managers preferred to have the questionnaire sent to them as an e-mail attachment, and to return it in the same fashion. As a fourth alternative, the questionnaire was made available as a self-administered survey online using a secure University server.

The Sample

Building the Sample Frame

The target population was managers of both public and private sector fleets in the five southern California counties of Los Angeles, Orange, San Diego, Riverside, and Ventura. Fleets could include any type of vehicles, from passenger cars, vans, and small trucks to busses, semis, and off-the-road (construction) vehicles. Fleets operating in southern California were included, even if their headquarters were located elsewhere.

Identifying the target population was challenging. There are a number of sources for data about fleets, but none of them are comprehensive. Fleet managers in the public sector were somewhat easier to identify than their counterparts in the private sector. The public sector was defined as municipalities, counties, or state agencies. The private sector was defined as everything else.

Several contact lists were used to construct the sampling frame from which to draw the sample. These included lists from professional organizations such as the National Association of Fleet Administrators (NAFA), government agencies, and various directories (described below). As each list was added to the overall data base, it was compared to the other lists used for this study to eliminate duplicates.

The first list was obtained from NAFA, a not-for-profit professional society serving the needs of members who manage fleets of automobiles, SUVs, trucks, and vans, and a wide range of specialized mobile equipment for organizations in the United States and Canada. A membership was purchased in NAFA that entitled project staff to have access to the NAFA membership list. The complete membership list contains information on both public and private sector fleets in all 50 states in the U.S. For the purposes of sampling fleet managers for the RRO survey, the membership list was sorted to include listings for only the five southern California counties of Los Angeles, Orange, Riverside, San Diego, and Ventura. This produced 315 listings. A second source of data was obtained from the Federal Motor Carrier Safety Administration (FMCSA). These records are available on-line, at no cost, through the Bureau of Transportation Statistics of the U.S. Department of Transportation. FMCSA maintains and administers the Motor Carrier Management Information System (MCMIS). The MCMIS collects computerized records of the safety performance of motor carriers that are subject to federal licensing and regulation, including companies that carry either passengers or freight, either privately or for hire. This data base also contains information from regional transit agencies, private bus operators, and the American Trucking Association. The complete MCMIS data set lists entries for all U.S. states; it was sorted to select only those fleets listed at addresses within the five-county area in southern California included in this study. Listings for fleets that included fewer than two vehicles were also eliminated. This produced 7,050 listings for mostly private sector fleets.

A third set of data was purchased from Transportation Technical Services (TTS) Private Fleet Directory. This directory contains data on corporate fleets of ten or more vehicles in California that haul their own goods or deliver intra-company services. The TTS list represents entries from seven different trucking data bases, including U.S., Mexican, and Canadian for-hire truckers; private fleets (e.g., Home Depot), and owner-operators. The listings were sorted to contain only those fleets operating in the five-county area under study. This produced 802 listings.

Trade associations furnished another source of data. These included the California Delivery Association, the American Ambulance Association, and the California Bus Association. These sources produced a few additional listings.

Information was also compiled on firms that lease or rent fleets of vehicles, manage fleets on behalf of clients, or provide services to fleet managers. This information was derived from

internet research as well as from industry publications such as Automotive Fleet Magazine, Fleet Owner Magazine, and professional associations such as Fleet-Central.com, the Automotive Fleet and Leasing Association, and the American Association of Automotive Fleet Administrators. There were 28 such firms identified in the five-county area being studied.

Information was also obtained on city, county, and state organizations that manage their own fleets. This information was obtained from the lists above, as well as from associations such as the Municipal Equipment Maintenance Association (MEMA), the California County Fleet Managers Association (CCFMA), and internet searches of public sector web sites. This produced 194 listings.

A list of public and private sector transit agencies was compiled from an internet search and from lists provided by regional transportation agencies. This produced 57 unique listings. Finally, the CIWMB also provided a list of fleets in California. This list was incorporated into the sample after comparison to the other lists to eliminate duplications.

For the public sector, a master list was produced that contained 317 listings for local government fleets, 47 for state fleets, 25 for public college and university fleets, 25 for public school district fleets, 35 for public utilities, ports, and water districts, 42 for public law enforcement agencies, and 36 for public bus agencies. For the private sector, a master list was produced that included listings for 8,427 private fleets.

Selecting the Sample

The project required that the survey be administered to at least 100 fleet managers, 50 from the public sector and 50 from the private sector. For that reason, separate master lists were compiled for public sector and private sector fleet managers. On each of the two master lists, each fleet was assigned an identification number. From each master list, a simple random sample of fleet managers was drawn using a computer-generated sequence of random numbers.

Project staff had considered the idea of constructing a more elaborate sampling design, such as stratified sampling. However, there were too many possible ways of stratifying the population, for example, by size of fleet (number of vehicles), by type of vehicle (cars, vans, trucks), by industry (transportation, freight, services), or by geographic area (five counties). Also, it would not be possible to select a large enough number of fleets to provide an adequate representation of each stratum with a total of only 100 fleets. In addition, some of the lists that formed the sampling frame did not include the information necessary to classify each fleet into various possible strata. For example, most of the listings did not include information on the total size of the fleet or all the types of vehicles included in the fleet.

Because there were many more private than public fleets, private fleet managers had a lower chance of being included in the sample compared to public fleet managers. However, the chances of being in the sample were equal for all private fleet managers compared to other private fleet managers (approximately one chance in 168). Similarly, each public fleet manager had an equal chance of being in the sample compared to other public fleet managers (approximately one chance in four).

There were some problems with the lists. For example, it was noticed that several hundred fleets were listed at the same post office box address in San Diego. It was determined that these were Mexico-based fleets with few if any operations in the counties in the study, and so they were excluded from the sample. Many listings were found to be invalid because the fleet no longer existed or had relocated. Telephone numbers included on listings were often wrong numbers or no longer in service. Most listings did not include the name of the fleet manager, which made it more difficult to reach the manager by telephone. In other cases the fleet manager had changed

and so the old information was no longer valid. There appears to be quite a bit of turnover in the position of fleet manager in smaller fleets, as well as a great deal of entry into and departure from the fleet business in the private sector over time, given that listings only a year or two old contained many invalid entries.

Data Collection

Two project staff were trained as interviewers. For each fleet in the sample, one of the staff made an initial contact by telephone. In some cases, the name of the fleet manager was available, while in other cases only the name of the organization was available. Project staff often had to look up telephone numbers for sampled fleets, using internet searches, telephone directories, and other sources of information.

Initial telephone calls were made to a total of 964 individual fleets to obtain 100 completed surveys (Table 1), about a 10 percent completion rate. Another way to calculate response rate would be to consider the 330 managers (who did not contract out for all oil services) who were reached directly by project staff, of whom 230 (69.7 percent) declined to participate and 100 (30.3 percent) did participate.

During the initial contact, project staff requested to speak with the fleet manager. This is known in the business world as “cold calling,” that is, calling someone who does not know you, does not expect your call, and, frankly, is probably not interested in taking your call. In the public sector, the initial call was often successful in reaching the fleet manager, but in the private sector the initial contact was often unsuccessful. In the private sector, project staff often had to communicate with two or three levels of contacts before reaching the fleet manager. It was learned that fleet managers, especially in the private sector, are inundated with calls (and faxes) from sales representatives from a myriad of companies. Fleet managers attempt to protect themselves by using two or three levels of telephone operators, receptionists, secretaries, or assistants to intercept unexpected calls. Of 824 private fleet organizations initially contacted by telephone, only 44 fleet managers eventually completed a survey (for a completion rate of 5.3 percent), whereas of 149 public sector fleets initially contacted by telephone, 56 fleet managers eventually completed a survey (for a completion rate of 37.6 percent).

Table 1. Response Rates for RRO Survey

RESPONSES	N	%
Number of fleet managers' offices contacted	964	100.0
Managers who did not respond to messages left for them	586	60.8
Managers who were reached but declined to participate	116	12.0
Managers who requested survey by fax but did not return it	83	8.6
Managers who requested survey by e-mail but did not return it	31	3.2
Managers whose organization contracts out all oil services	48	5.0
Managers who completed the survey	100	10.4

An estimated 3,000 separate telephone calls were required to produce 100 completed interviews, because multiple calls were made to each of the 964 fleet managers offices contacted. Telephone interviewing proved to be much more difficult to complete for the private sector fleets in this project than in other social science research, for example, in calling private households. The original interviewing script that project staff were trained to use had to be redesigned several times. Fleet organization personnel were very skeptical of the initial telephone contact, even when the interviewer stated that the purpose of the call was research, not sales. It was found that our project staff only had a few seconds to convince fleet personnel of the legitimacy of their call (i.e., “get their foot in the door”), and that referring to themselves as graduate students doing research (which was true) produced better results than referring to either the University or the CIWMB in the initial moments of contact. Public sector fleet managers were not only easier to reach, but they were also more familiar with the idea of research on this issue and appeared to be more willing to participate after learning about the purpose of the research.

When the manager was not available, a message was left either on voice mail or with a message taker. Multiple calls were made to each fleet where a message had been left on the initial call. Each fleet was called at least three times on different days and at different times in an attempt to reach the fleet manager directly. After three calls with no success, that fleet was dropped and the next fleet in the sample was contacted. A total of 586 fleets did not respond to messages that were left on voice mail or with message takers.

When the fleet manager was reached directly, he or she was invited to participate in a ten-minute survey over the telephone. Also, specific appointments could be made for project staff to call back at a time and date convenient for the fleet manager. A total of 116 managers who were reached directly declined to participate in the survey. An additional 48 managers who were reached directly indicated that they could not answer the questions on the survey because the organization contracted out all oil-related services.

At the manager’s request, the questionnaire could alternatively be faxed or sent by e-mail, with the response to return via the same method. A total of 83 managers requested the questionnaire be faxed to them, but did not fax it back. A total of 31 managers requested the questionnaire be e-mailed to them, but did not e-mail it back.

Of the 100 completed questionnaires, 38 participated by telephone, 31 completed it on-line, 23 participated by fax, and 8 completed it via e-mail (Table 2).

Table 2. Method of Survey Completion

SURVEY METHOD	NUMBER	PERCENT
In-person telephone Interview	38	38
On-line self-administered survey	31	31
Fax	23	23
E-mail attachment	8	8
Total	100	100

Of the 100 fleet managers who completed the survey, 44 were private fleet managers, 47 were local (city or county) fleet managers, and 9 were fleet managers from state agencies.

The distribution of responses by county included 49 from Los Angeles, 21 from San Diego, 13 from Orange, 11 from Riverside, and 6 from Ventura (Table 3). A comparison of the percentage of respondents from each county with the percentage of the general population represented by each county shows a slight under-representation for Los Angeles and Orange counties and a slight over-representation for Riverside, San Diego, and Ventura counties. Information from the California Department of Motor Vehicles (DMV) was used to calculate the percentage of vehicles registered under fleet ownership represented by each county. Again, our sample is slightly under-representative of Los Angeles and Orange counties and slightly over-representative of Riverside, San Diego, and Ventura counties.

Table 3. Geographic Distribution of Respondents

County	Percent of Survey Respondents	County Population (% of Five-County Total)	% of Five-County Fleets from DMV 2002
Los Angeles	49	54.2	51.2
Orange	13	16.2	17.3
Riverside	11	9.2	9.3
San Diego	21	16.1	17.2
Ventura	6	4.3	5.0
Total	100	100.0	100.0

Because we used a random sampling method to select these respondents, we could assume that our sample is representative. However, because of the very low response rate, our respondents may not be typical of all fleet managers included in the listings used to select the sample. Nevertheless, the considerable variation among the responses of the fleet managers who participated leads us to believe that our findings provide information on a good cross-section of public and private fleet managers in southern California.

Findings

Characteristics of Fleet Managers

The majority of the respondents work as full-time fleet managers, although a sizable group in both the public and private sectors carry additional responsibilities. These fleet managers are a relatively experienced group, averaging 17.1 total years of experience in the public sector and 17.6 total years of experience in the private sector (Table 4). Public sector managers are more likely to be full-time fleet managers while private sector fleet managers are more likely to also carry other responsibilities or job titles.

Table 4. Characteristics of Fleet Managers

CHARACTERISTICS	Public Sector	Private Sector
Time spent on Fleet Manager duties (average)	77%	67%
Years in Present Job (average)	8.2	12.1
Years in Previous Job (average)	8.9	5.6
Total Years as Fleet Manager (average)	17.1	17.6

Characteristics of Fleets

The characteristics of the fleets included in this survey are shown in Table 5. The majority of the public sector fleets operated only in one city or one county whereas the majority of the private sector fleets operated in multiple counties. Public sector fleets tended to be smaller on the average and to have fewer leased vehicles than private sector fleets.

The definition of vehicle types was taken from classification commonly used by those in the fleet industry, based on vehicle size, weight, and function. These are as follows:

Passenger Cars: includes standard passenger cars and vans, mini-vans, sport utility vehicles (SUVs), and police vehicles weighing up to 6,000 pounds.

Light Trucks: includes pickup trucks, parcel delivery trucks and vans, and ambulances weighing from 6,000 to 14,000 pounds.

Medium Trucks: includes city cargo vans, beverage delivery trucks, most school busses, wreckers, and other vehicles weighing from 14,000 to 33,000 pounds.

Heavy Trucks: includes tractor trailers, concrete mixers, dump trucks, fire trucks, city transit busses, and others weighing over 33,000 pounds.

Off-the-Road Vehicles: includes large vehicles not designed for road travel, such as most construction equipment.

The vast majority of fleets consist of more than one type of vehicle, but the public sector has a higher presence of passenger cars and vans in their fleets than the private sector. Among the "other" types of vehicles reported are electric carts; landscaping equipment; motorcycles; boats; and stationary generating equipment.

Table 5. Fleet Characteristics

	PUBLIC SECTOR	PRIVATE SECTOR
AREA OF OPERATIONS		
One City only*	52.6%	4.9%
One County only	26.3%	22.0%
Multiple counties*	21.1%	73.1%
SIZE OF FLEET		
Average number of vehicles owned	325	411
Average number of vehicles leased*	21	172
FLEETS USE THIS VEHICLE TYPE		
Passenger Cars*	84%	44%
Light Trucks	91%	80%
Medium Trucks	86%	77%
Heavy Trucks	77%	77%
Off-the-Road Vehicles*	61%	32%
Others	49%	21%

*Public-private sector differences are statistically significant at $p < .05$ using Chi Square

Because most fleets consist of more than one type of vehicle, each fleet manager was asked to identify the predominant type of vehicle in the fleet (Table 6). Subsequent questions about lubricating oil referred only to this predominant vehicle. If all questions had been asked about each type of vehicle in the fleet, the questionnaire would have been too long and too cumbersome.

Table 6. Predominant Type of Vehicle in Fleet

TYPE OF VEHICLE	PREDOMINANT VEHICLE TYPE		MEDIAN NUMBER OF VEHICLES		MEDIAN MILES DRIVEN PER YEAR	
	Public Sector	Private Sector	Public Sector	Private Sector	Public Sector	Private Sector
Passenger Cars*	29%	0%	55	-	20,089	-
Light Trucks	37%	31%	140	80	14,472	17,012
Medium Trucks	18%	26%	57	45	4,293	7,788
Heavy Trucks	11%	38%	8	22	32,350	27,876
Off-the-Road*	0%	5%	-	115	-	400
Others**	5%	0%	-	-	-	-

*Public-private sector differences are statistically significant at $p < .05$ using Chi Square.

**The most common "other" vehicle type in public sector fleets is the electric cart.

The most common type of vehicle in public sector fleets is the light truck, with passenger cars second. The most common type of vehicle in private sector fleets is the heavy truck, with light trucks second and medium trucks a close third.

The number of vehicles in the fleet of the predominant type differed between the public and the private sector and depending on the class of vehicle. Public sector fleets were larger than private sector fleets for light trucks and medium trucks, but private sector fleets were larger for heavy trucks.

The ways the vehicles are used, as measured by miles driven per year, are similar between the public and the private sector for light trucks and heavy trucks, but medium trucks are driven nearly twice as far per year in the private sector as in the public sector. This is consistent with the finding that most public sector vehicles operate within a limited jurisdiction (one city or one county), while most private sector vehicles operate across multiple counties.

Vehicles in the private sector are mainly fueled by diesel whereas vehicles in the public sector are mainly fueled by unleaded gasoline (Table 7). The public sector also has a higher proportion of vehicles using alternative fuels, such as electric, natural gas, and hybrids. This is an important distinction because vehicles using diesel fuel require a different formulation of lubricating oil than vehicles using unleaded gasoline. It may indicate a higher willingness on the part of the public sector to try innovations or alternatives to the status quo, because of differing public expectations, or it may reflect policy that mandates more environmentally aware strategies.

Table 7. Fuel Used in Fleet Vehicles

FUEL TYPES	Public Sector	Private Sector
Unleaded gasoline	75%	31%
Diesel	14%	67%
Other	11%	2%
Total	100%	100%

Fleet Uses of Lubricating Engine Oil

This study only asked about the use of motor oil and did not consider other types of lubricants (e.g., transmission oil, bearing lubrication, etc). The major use of motor oil is for oil changes. There may also be some motor oil that is used to "top up" an engine between changes, but this was not directly measured in this study.

The median number of oil changes per year varies according to the type of vehicle, as does the amount of oil used per oil change (Table 8).

Table 8. Characteristics of Oil Changes

OIL CHANGES	Oil Changes per Year	Quarts per Oil Change
Passenger cars	4.1	5
Light trucks	4.4	6.6
Medium trucks	3.5	12
Heavy trucks	8.6	26.8
Off-the-road vehicles	4	13
Other vehicles	4.7	5.5

The majority of fleets rely on in-house staff for oil changes (Table 9). The primary responsibility for oil changes rests not with the vehicle's driver but with another member of the organization. More private fleets (24 percent) contract out for oil changes compared to public sector fleets (9 percent). In a few fleets, the responsibility for oil changes is shared (or unclear).

Most fleet managers (81 percent) indicated that they do recycle their used oil. The managers who indicated that they do not recycle explained that they contract out oil changes.

Table 9. Responsibility for Oil Changes*

JOB TITLE	Public Sector	Private Sector
Driver	0%	2%
Organization staff	89%	62%
Outside contractor	9%	24%
Combination	2%	12%
TOTAL	100%	100%

*Public-private sector differences are statistically significant at $p < .05$ using Chi Square

The decision of which motor oil to purchase is left, in most cases, to the fleet manager. However, in the private sector, the decision of what motor oil to purchase is more often made by company policy, a contractor or customer, a purchasing agent, another manager, or a mechanic (Table 10). In the public sector, the fleet manager is significantly more likely to be able to make the oil purchasing decision him or herself.

Table 10. Oil Purchasing Decision

OIL PURCHASING	Public Sector	Private Sector
Fleet manager*	81.5%	54%
Purchasing Agent	5.5%	7%
Other manager	0%	7%
Organization policy	5.5%	20%
Mechanic	2%	2.5%
Contractor	0%	9.7%
Other	5.5%	0%

*Public-private sector differences are statistically significant at $p < .05$ using Chi Square

Fleet Managers Use of RRO

The majority of fleet managers in California in both the public (61 percent) and the private (80 percent) sectors have never used RRO (Table 11). A few managers in both the public and private sectors had previous experience with RRO but do not use it now. Nearly all the managers in this study who currently use RRO are found in the public sector ($n=16$) rather than the private sector ($n=3$). Similarly, public sector fleet managers were significantly more likely to know of another organization using RRO (24 percent) than were private sector fleet managers (10 percent).

Table 11. RRO Use

RE-REFINED OIL*	Public Sector		Private Sector	
	Number	Percent	Number	Percent
Fleet manager has never used RRO oil	35	61.4%	32	80.0%
Fleet manager currently uses RRO	16	28.1%	3	7.5%
Fleet manager used RRO previously	6	10.5%	5	12.5%
Total	57	100.0%	40	100.0%

*All public-private sector differences are statistically significant at $p < .05$ using Chi Square

Eleven fleet managers used RRO in the past but were not using it now. In an open-ended question, these fleet managers described their past experience with using RRO. An analysis of their responses revealed that one fleet manager had an insufficient length of time using it to form any judgment. Three fleet managers expressed positive experiences, that using it was no different than using virgin oil. The remaining seven fleet managers expressed negative experiences, including higher costs (n=2), concerns about quality (n=2), and problems with availability or support from the vendor (n=3). One of the concerns about quality was a tendency to lose viscosity or thermal breakdown. Although their prior experience using RRO spanned a range from one to 29 years ago, there was no pattern between the years since using RRO and the type of concerns expressed by the fleet managers.

The sixty-seven fleet managers who had never used RRO cited a variety of reasons (Table 12). The most often cited reason was a concern over the quality of RRO. Private sector fleet managers cited problems with quality (33.3 percent of responses) more often than public sector managers (15.8 percent of responses). A related concern was that use of re-refined motor oil might void the vehicle or engine manufacturer's warranty. Cost and availability were also cited by some fleet managers. Some fleet managers reported they did not know about or have enough information about RRO.

The results for public sector fleet managers suggest that they are not adhering to state guidelines or mandates for the purchase of re-refined motor oil addressed in the first part of this report.

Table 12. Reasons for Never Having Used Rro

REASONS (multiple responses)	Number of Fleets	Percent of Responses	
		Public	Private
Quality concerns	23	15.8	33.3
Warranty concerns	18	10.5	21.4
Did not know about it	11	7.0	16.7
Cost	10	8.8	9.5
Availability	9	10.5	7.1
Refused by driver/mechanic/customer	5	1.8	9.5

Some of these concerns were echoed in a closed-ended, forced choice question about the reasons

for discontinuing use of RRO. Among the eleven fleet managers who had discontinued using RRO, the most common reason was lack of availability, which included leaving the prior organization (Table 13). Dissatisfaction with cost and concerns about the lack of research on long-term consequences of the use of RRO were also cited.

However, no fleet manager indicated that concerns about voiding the vehicle or engine warranty led to discontinuance of RRO. Other reasons included that it was more time-consuming to find and buy RRO; that the oil-buying decision was switched to a national headquarters; and that buying a small quantity of RRO had been an experiment that did not lead to any changes. Only one fleet manager expressed that the vehicles manifested a lack of proper lubrication while using RRO.

Table 13. Reasons for Discontinuing Use of Rro

REASONS (allows multiple responses)	Number of Managers	Percent of All Responses
Availability	4	30.7%
Cost	3	23.1%
Quality	3	23.1%
Warranty	0	0%
Other	3	23.1%
Total	13	100.0%

The few fleet managers who currently use RRO generally do so because they believe it is beneficial for the environment (Table 14). The second most common reason cited in the public sector was an organizational policy or mandate. Quality and cost were also mentioned as reasons for using RRO. Public sector fleet managers were significantly more likely to say they use RRO due to all the reasons listed than were private sector fleet managers. Overall, 94 percent of fleet managers now using RRO indicated they were either satisfied or very satisfied with it; only one fleet manager was dissatisfied. Public sector managers were significantly more satisfied with RRO than were private sector managers; the only dissatisfied fleet manager was in the private sector.

Table 14. Reasons for Using RRO Now

REASONS (allows multiple responses)	Public Sector	Private Sector	Total	
			N	%
Environment	13	1	14	50.0
Policy/Mandate	5	0	5	17.8
Quality	4	0	4	14.3
Cost	3	1	4	14.3
Other	0	1	1	3.6
Total	25	3	28	100.0

Fleet Managers' Knowledge and Attitudes About RRO

Only about half (n=52) of the fleet managers indicated any source of information for their knowledge of RRO. Fleet managers who did indicate a source cited reading professional and industry publications as their primary sources (Table 15). The second most common source was sales representatives or advertising. On-the-job training was the third most common source, followed by school or training, and friends. Professional conferences were added as an information source by public sector managers.

Table 15. Sources of Information About RRO

Knowledge of RRO from: (allows multiple selections)	Public Sector (%)	Private Sector (%)
Reading	51	61
Ads/Sales Reps*	44	26
On the job	29	36
School/training	11	14
Friends	9	15
Professional conferences	2	0
Other	0	2

*Public-private sector differences are statistically significant at $p < .05$ using Chi Square

Since only half the fleet managers indicated a source of knowledge about re-refined motor oil, it is not surprising that only one-third of the managers were familiar with the certification by the prestigious API that RRO meets the same quality standards as virgin oil; the other two-thirds were either unaware of the API's certification or not sure (Table 16). Public sector fleet managers were significantly more likely to know about the API certification (47 percent) than were private sector fleet managers (17 percent).

Table 16. API Certification of RRO

Knows of API certification of RRO*	Public Sector	Private Sector
Yes	47%	17%
No	44%	69%
Not sure	9%	14%

*Public-private sector differences are statistically significant at $p < .05$ using Chi Square

About half of both groups thought that RRO costs less than virgin oil, and about one quarter of both groups thought that re-refined costs the same as virgin oil (Table 17). However, more public sector managers thought RRO was more costly than virgin (26.3 percent) than private sector managers (4.7 percent), while more private sector managers were unsure about the price (16.7 percent) than public sector managers (7.0 percent).

Three-quarters of public sector managers thought that RRO was very or somewhat easy to obtain compared to about half of private sector managers. Only private sector managers indicated that RRO is not available to them at all (Table 17).

Half of private sector managers believe that RRO is less reliable than virgin oil compared to about a third of public sector managers. Twice as many private sector managers (14 percent) were unsure of the reliability of RRO compared to public sector managers (7 percent) (Table 17).

Two-thirds of private sector managers were unsure whether RRO will meet vehicle or engine manufacturers' warranties compared to about 40 percent of public sector managers (Table 16). About 40 percent of public sector managers thought that RRO does meet (or exceed) manufacturers' warranties compared to only about 17 percent of private sector managers.

Table 17. Attitudes Toward RRO

Attitudes Toward RRO	Public Sector (%)	Private Sector (%)
*RRO costs:		
Less	42.1	52.4
The same	24.6	26.2
More	26.3	4.7
Don't know	7.0	16.7
RRO availability:		
Not at all available	0.0	11.1
Very difficult to obtain	12.5	7.4
Somewhat difficult to obtain	12.5	29.7
Somewhat easy to obtain	45.0	33.3
Very easy to obtain	30.0	18.5
*RRO reliability:		
Less	31.6	50.0
The same	56.1	35.7
More	5.3	0.0
Don't know	7.0	14.3
*RRO and vehicle warranty:		
Does not meet warranty requirements	15.8	16.7
Meets warranty requirements	40.3	16.7
Exceeds warranty requirements	1.8	0.0
Not sure	42.1	66.6

*Public-private sector differences are statistically significant at $p < .08$ using Chi Square

Encouraging the Use of RRO

Fleet managers are not completely convinced that the use of RRO should be encouraged by the state (Table 18). Both public and private sector fleet managers believe the state should make it easier to use RRO. However, only about half of fleet managers think the state should actively encourage its use in both the private and public sectors.

Table 18. Should Use of RRO Be Encouraged?

ENCOURAGE USE OF RRO	Public Sector (%)	Private Sector (%)
Should the state make it easier to use RRO:		
Yes	71	67
No	29	33
Should use of RRO be encouraged:		
No	35.1	31.0
Yes, public sector only	7.0	11.9
Yes, private sector only	1.8	7.1
Yes, both public and private sectors	49.1	47.6
Not sure	7.0	2.4

Two-thirds of fleet managers suggested reasons to encourage the use of RRO, such as to cut the cost of maintaining the fleet, benefit the environment, and reduce dependence on foreign oil. Private sector fleet managers were significantly more likely than public sector fleet managers to cite possible cost savings as a reason to encourage the use of RRO. Another reason would be to stress the quality of RRO (Table 19).

Table 19. Reasons to Encourage RRO Use

REASONS TO ENCOURAGE USE OF RRO	Public Sector (%)	Private Sector (%)
Reasons to encourage use of RRO (multiple responses possible):		
Environment	63.3	53.3
Cost	14.3	34.0
Quality	8.2	10.6
Reduce dependence on foreign oil	12.2	0.0
Other	2.0	2.1

However, half the fleet managers also indicated there are reasons to not encourage the use of RRO (Table 20). These include concerns about preserving vehicle and engine warranties; quality of RRO; and a lack of cost savings. Other reasons included the lack of ready availability of RRO; a belief that it will not benefit the environment; and to preserve fleet managers' freedom to choose the motor oil they believe will do the best job.

Table 20. Reasons to Not Encourage RRO Use

REASONS TO NOT ENCOURAGE USE OF RRO	Public Sector (%)	Private Sector (%)
Reasons to not encourage use of RRO (multiple responses possible):		
Problems with vehicle warranty	27.6	18.5
Problems with quality	24.0	37.0
No cost savings	10.4	18.5
Problems with availability	17.2	11.1
Environment won't benefit	10.4	11.1
Freedom of choice	10.4	3.7

The environment was the top reason cited by fleet managers to encourage the use of RRO, and half of fleet managers who currently use RRO mentioned the environment as a reason. Hence, appeals to fleet managers to use re-refined might be based on concern for the environment. However, the majority of both public and private sector managers believe the environment in California has gotten better or stayed the same (Table 21). That is, the reason to encourage the use of RRO is not because the environment has recently deteriorated but rather to preserve the current positive state of the environment in California.

Table 21. Perceptions of the California Environment

ENVIRONMENT	Public Sector (%)	Private Sector (%)
In your years as a fleet manager, the environment in California has:		
Gotten worse	15.8	19.0
Stayed the same	14.0	31.0
Gotten better	63.2	45.2
Not sure	7.0	4.8

Finally, other barriers exist to the use of RRO that must be overcome (Table 22). The major barrier perceived by private sector fleet managers is the cost, followed by concerns about quality and about vehicle warranties. Public sector managers were not as concerned about cost, but perceived a number of barriers of equal importance, including quality, warranty, availability, and lack of knowledge.

Table 22. Perceived Barriers to the Use of RRO

REASONS (allows multiple reasons)	Public Sector (%)	Private Sector (%)
Cost*	20	69.2
Quality	20	23.1
Warranty	20	7.7
Availability	6.7	0
Lack of knowledge about it*	20	0
Other	13.3	0
Total	100.0	100.0

*Public-private sector differences are statistically significant at $p < .05$ using Chi Square

Differences by Fleet Size

There are some significant differences between fleets with only a few vehicles and fleets with a large number of vehicles. The small fleets in this study were significantly more likely to consist mainly of trucks, with few passenger cars or vans, whereas the mid-sized and large fleets were more likely to have passenger cars and vans along with trucks. Larger fleets tend to be more heterogeneous in terms of the types of vehicles in them, whereas smaller fleets tend to be more homogeneous. Medium and large fleets were also more likely to have off-the-road vehicles, such as electric carts or landscaping equipment. The mid-size and larger fleets in this study were also more likely to be in the public sector while the smaller fleets were more likely to be in the private sector. Finally, the fewer the number of vehicles in the fleet, the more likely the manager is to be a part-time fleet manager.

The larger the fleet, the more oil is used per year and the more funds are spent on oil. Managers of larger fleets are more likely to currently use RRO, or to have used RRO in the past, and to know of another fleet that uses RRO. The larger the fleet, the more sources of information they have about RRO (Table 23).

Table 23. Knowledge About RRO by Fleet Size

Learned about RRO from:	SMALL FLEET	MID-SIZE FLEET	LARGE FLEET
On-the-job*	17.6%	34.3%	50.0%
Training*	6.0%	8.6%	33.3%
Reading	50.0%	50.0%	76.5%
Ads or Sales Reps*	20.6%	43.2%	56.3%
Friends	6.0%	8.6%	20.0%

*Differences among fleets by size are statistically significant at $p < .05$ using Chi Square.

The larger the fleet, the more likely the fleet manager was to cite concerns about the environment as the reason for using RRO. Managers of large fleets were significantly more likely to know that RRO meets API certification (56 percent) compared to managers of small fleets (14 percent), whereas managers of small fleets were more convinced that RRO does not meet API certification (73 percent) compared to managers of large fleets (28 percent). Managers of large fleets are significantly more likely to say that the use of RRO should be encouraged based on evidence of quality.

Small fleet managers were more often unsure about the cost, reliability, or ability of RRO to meet manufacturers' warranties. Managers of smaller fleets were less enthusiastic about the state making it easier to use RRO or encouraging the use of RRO (Table 24).

Table 24. Opinions About RRO by Fleet Size

RRO compared to new oil	SMALL FLEET	MID-SIZE FLEET	LARGE FLEET
COST			
Less	43.8	60.0	50.0
Same	40.6	20.0	25.0
More	15.6	20.0	25.0
RELIABILITY			
Less	42.4	44.0	44.4
Same	54.5	53.0	50.0
More	3.1	3.0	5.6
VEHICLE WARRANTY*			
Falls short	23.5	16.7	11.8
Meets	14.7	38.9	58.8
Exceeds	0.0	0.0	5.9
Not sure	61.8	44.4	23.5

*Differences among fleets by size are statistically significant at $p < .05$ using Chi Square.

There is an interesting pattern that arises by fleet size concerning the responsibility for deciding on what oil to buy. Fleet managers of mid-sized fleets are the most likely to be able to make the oil buying decision (86 percent), followed by managers of small fleets (59 percent). Interestingly, only one-third (33 percent) of managers of large fleets say they have that ability. It may be that in larger fleets, the decision is delegated either to a lower level assistant fleet manager or head mechanic or determined by a centralized purchasing agent or organizational headquarters. In some cases it will not be enough to change fleet oil-buying habits by educating fleet managers about RRO if they do not have the power to make (or influence) the purchasing decision.

Differences by Vehicle Type

The predominant type of vehicle in the private sector fleets in this study is the heavy truck (40 percent of fleets), followed by the light truck (33 percent) and the medium truck (27 percent). The composition of public sector fleets was more mixed, with light trucks predominant in 40 percent of fleets, passenger cars in 30 percent, medium trucks in 19 percent and heavy trucks in 11 percent. Fleets where either passenger cars or light trucks predominate have more vehicles, whereas fleets where medium or heavy trucks predominate have fewer vehicles (Table 25).

Organizations are most likely to change the oil in-house for off-the-road vehicles, since by definition these vehicles are too cumbersome to be taken to an oil changing facility. Fleets are also highly likely to change the oil on passenger cars in-house, probably because passenger cars require fewer oil changes per year on average, the operation is rather quick, and it involves only a relatively small amount of oil. Fleets where light trucks or passenger vehicles predominate are the most likely to have managers who currently use RRO, compared to fleets where medium or heavy trucks predominate. Heavy trucks are the most likely to have the oil changed by a

contractor, followed by medium and light trucks. In these cases, if the fleet manager does not specify a type of oil to be used, it most likely will not be RRO. Rather, it will be important to approach commercial oil-changing organizations about using RRO for contract oil changes.

Table 25. Oil Change Strategy by Type of Vehicle

	Organization	Contractor	Other	Total
Passenger Car	94	0	6	100%
Light Truck	79	12	9	100%
Medium Truck	64	18	18	100%
Heavy Truck	59	27	14	100%
Off-the-Road Vehicle	100	0	0	100%

Small fleets are more likely to contract out oil changes, especially on heavy trucks, because they do not want to invest in expensive oil-changing equipment for a small number of vehicles, or because they do not have enough staff for the task (Table 26).

Table 26. Oil Change Strategies by Fleet Size and Vehicle Type

Percent of oil changes*	SMALL FLEET		MID SIZE FLEET		LARGE FLEET	
	In house	Contract	In house	Contract	In house	Contract
Passenger Car	100	0	100	0	80	20
Light Truck	75	25	88	6	67	17
Medium Truck	70	20	50	25	40	20
Heavy Truck	40	40	100	0	75	17
Off-Road Vehicle	100	0	100	0	100	0

*Percentages for some vehicle types do not add to 100percent because there are other strategies for oil changes, such as the using the driver, or a combination of strategies is used.

There are some differences among the managers of fleets where different types of vehicles predominate. For example, managers of fleets of passenger cars and light trucks are more likely to have used RRO because of concerns for the environment, compared to managers of fleets where medium or heavy trucks predominate.

Managers of fleets where medium trucks or heavy trucks are the predominant vehicle are more likely to think that RRO does not earn API certification than managers of fleets where passenger cars predominate. The same pattern holds for whether RRO meets manufacturers' warranties: medium and heavy truck fleet managers are more negative and passenger car fleet managers are more positive (Table 27). Managers of passenger car (33 percent) and light truck (24 percent) fleets are more likely to know about another fleet that uses RRO than managers of medium truck (5 percent) or heavy truck (10 percent) fleets.

Table 27. Opinions About RRO by Type of Fleet

RRO compared to new oil	Passenger Cars	Light Trucks	Medium Trucks	Heavy Trucks
*VEHICLE WARRANTY				
Falls short	13	19	20	9
Meets	56	42	15	23
Exceeds	6	0	0	0
Not sure	25	39	65	68
*API CERTIFICATION				
Does not meet	19	53	73	64
Not sure	6	12	9	9
Does meet	75	35	18	27
Knows about a fleet that uses RRO	33	24	5	10

*Differences among groups are statistically significant at $p < .08$ using Chi Square.

Differences by Public or Private Sector

Public sector fleets are twice as likely to contain passenger cars and vans (84 percent) as well as off-the-road vehicles (61 percent) than are private sector fleets (44 percent and 32 percent, respectively). Heavy trucks, medium trucks, and light trucks appear about equally in both public and private sector fleets.

Looking at the predominant type of vehicle in each fleet, the number of oil changes per year varied between the public and private sectors, even for the same vehicle type (Table 28).

For light trucks, private sector fleets changed the oil twice as often (about every 2,600 miles) as the public sector (about every 4,700 miles); even though light trucks were driven about the same number of miles per year on average in the private sector (17,000) as in the public sector (14,500). Differences may be due to the specific makes and models of vehicles used by each sector within each overall vehicle classification or to the age of the vehicles in each fleet; driving conditions may also vary.

Another possibility is that public sector fleets are more closely following vehicle manufacturers' recommendations for longer intervals between oil changes, while private sector fleet managers are sticking to the old rule of thumb of an oil change about every 3,000 miles (which is encouraged by oil companies). This possibility is supported by the practice in the public sector to change the oil for passenger vehicles about every 5,000 miles.

For medium trucks, private sector fleets changed the oil about every 2,000 miles while public sector fleets changed the oil about every 1,400 miles. For heavy trucks, private sector fleets changed the oil about every 3,500 miles while public sector fleets changed the oil about every 3,100 miles. Again, differences are likely due to the specific engines being used, the age of the vehicles, and their driving conditions.

Table 28. Variations in Oil Changes

PREDOMINANT VEHICLE TYPE	OIL CHANGES PER YEAR		MILES PER OIL CHANGE	
	PUBLIC	PRIVATE	PUBLIC	PRIVATE
Passenger Car	4.1	-	4,900	-
Light Truck	3.1	6.5	4,668	2,617
Medium Truck	3.1	3.8	1,384	2,049
Heavy Truck	10.4	7.9	3,110	3,528

Public sector organizations are more likely to do oil changes in-house (81 percent) than are private sector organizations (61 percent). Conversely, private sector organizations are more likely to contract oil changes (24percent) than are public sector organizations (9 percent). Private sector organizations are also more likely to use a combination of oil change strategies, including having the vehicle driver responsible for oil changes in one case.

Since private sector fleets tend to have more trucks, they typically use more quarts of oil for each oil change on average than public sector fleets do. Private sector fleets are handling larger quantities of oil each time they do an oil change than are public sector fleets. This could have implications for the type of oil delivery service preferred by private sector fleets, and can partially explain the greater propensity to contract out oil changes. They may be especially interested in "closed loop" used oil collection and replacement oil delivery services.

Differences by Years of Experience

This survey did not ask fleet managers for their age, but instead asked for the number of years in the current job as well as the number of years in any previous fleet management jobs. The total range of experience was from 1 to 48 years. There were not many differences by experience for fleet managers in terms of the size of the fleet or the type of vehicles in the fleet.

There were some differences, however, terms of experience with, knowledge of, and attitudes toward RRO. More experienced fleet managers were a rather homogeneous group.

More experienced fleet managers were the least likely to have ever used RRO, and if they had previous experience, it was over 20 years ago on average. These fleet managers are the least supportive of using RRO because they believe it is less reliable than virgin oil and falls short of meeting the vehicle or engine manufacturer's warranties.

More experienced fleet managers are the least likely to support the use of RRO because it will benefit the environment.

More experienced fleet managers get their information predominantly from ads and sales reps, and are the least likely group to know of another organization that uses RRO.

More experienced fleet managers, however, are among the most likely to be making the decision about which oil to purchase for the fleet.

The least experienced fleet managers were more likely to manager smaller fleets made up of heavy trucks that had more oil changes per year and used more quarts of oil per change. Less experienced fleet managers were a more heterogeneous group, whose opinions varied depending on whether or not they had ever used RRO.

One group was more likely to use RRO now or to have used it in the past than the most experienced fleet managers, although there was no one major reason as to why they now use or

previously used RRO.

The other group of less experienced fleet managers, those who have never used RRO, were the least knowledgeable about RRO, for example, they are the least likely to know that RRO meets API certification, and they are unsure about the cost for RRO compared to virgin oil. They are also the least likely to think that RRO meets vehicle warranties.

The least experienced fleet managers are also the most pessimistic about California's environment, with only 48 percent saying it has gotten better. Less experienced fleet managers are also less likely than other managers to make the decision regarding which motor oil to purchase.

Differences by Full- or Part-Time Job Status

There were some differences between full-time and part-time fleet managers, but much of it was due to the fact that full-time fleet managers are more likely to work with larger, more heterogeneous fleets of light trucks and passenger cars, whereas part-time fleet managers are likely to work with smaller, more homogeneous fleets that have mainly heavy trucks. Part-time fleet managers are more likely to contract out oil changes, as was the case for small fleets (shown in Table 26 above).

Full-time fleet managers are more likely to have not used RRO due to cost, whereas part-time fleet managers are more likely to not have used RRO due to availability. Part-time fleet managers are also less likely to think that the use of RRO should be encouraged based on the environment. Finally, part-time fleet managers are less likely to get information about RRO from reading than full-time fleet managers.

Differences by Experience with RRO

Once fleet managers have used RRO, their attitudes toward it differ significantly from those of fleet managers who have never used it (Table 29).

In terms of the size or composition of the fleet, there were few differences between fleet managers who had ever used RRO, whether currently or in the past, and fleet managers who had never used RRO.

However, in terms of years of experience, fleet managers with between 10 and 20 years of total experience were more likely to use RRO than fleet managers with either more than 20 years of experience or less than 10 years of experience.

Fleet managers who currently use RRO have the most favorable opinions about the reliability of RRO, are the most confident that it meets manufacturers' warranties, and are the most likely to know about API certification of RRO. Fleet managers who had never used RRO scored lowest on both knowledge and attitudes; fleet managers who had previously used RRO fell in between these other two groups.

Table 29. Opinions About RRO by Experience With RRO

Opinions about RRO compared to new oil	Never Used	Previously Used	Currently Use
RELIABILITY*			
Less	59	36	10
Same	41	64	74
More	0	0	16
VEHICLE WARRANTY*			
Falls short	21	9	11
Meets	18	45.5	74
Exceeds	0	0	5
Not sure	61	45.5	10
API CERTIFICATION*			
Does not meet	68	54	16
Not sure	8	18	5
Does meet	24	28	79

*Differences among groups are statistically significant at $p < .05$ using Chi Square.

Fleet managers who currently use RRO are more positive toward having the state encourage the use of RRO in both the public and private sectors than fleet managers who used RRO previously or never used it (Table 30).

Both fleet managers who previously used RRO and those who currently use it are more likely to encourage its use based on information about its quality and appeals to environmental benefits than are managers who have never used RRO.

Fleet managers who have never used RRO find it much more difficult to obtain than fleet managers who previously used or currently use RRO.

Table 30. Attitudes Toward RRO

Attitudes Toward RRO	Never Used	Previously Used	Currently Use
*Encourage the use of RRO			
Neither sector	44%	27%	11%
Public sector only	10%	18%	5%
Private sector only	5%	9%	5%
Both public and private	41%	46%	79%
*Encourage based on:			
Quality	4%	0%	26%
Environment	41%	82%	89%
*RRO availability:			
Very or somewhat difficult to obtain	50%	25%	5%
Somewhat easy to obtain	37%	75%	32%
Very easy to obtain	13%	0%	63%

Attitudes Toward RRO	Never Used	Previously Used	Currently Use
*My organization has a policy on RRO			
Yes	6%	9%	68%
No	84%	81%	32%

*Differences among groups are statistically significant at $p < .10$ using Chi Square

One interesting finding for policy purposes is that 68 percent of fleet managers who currently use RRO report that their organization has a policy regarding RRO, compared to less than 10 percent of fleet managers who previously or never used RRO. Fleet managers who currently use RRO were also much more likely to have learned about it on the job (56 percent) compared to other fleet managers (20 percent). Finally, fleet managers who use RRO are over three times more likely to know of another organization that uses RRO (37 percent) than fleet managers who have never used RRO (11 percent). If more organizations adopted policies concerning the use of RRO, offered on-the-job training, and publicized their successes, more fleet managers would be encouraged to use it.

Estimates of Potential RRO Use

Using the information provided by the respondents, we calculated that the private sector fleets participating in this study purchased a combined total of over 193,900 gallons of motor oil per year, with a median of 1,300 gallons per year per fleet. The public sector fleets used a combined total of over 46,600 gallons per year, with a median of 600 gallons per year per fleet.

The total spent by private sector fleets participating in this study on motor oil exceeds \$962,000 per year, with a median of \$4,062 per fleet per year, while the total spent by public sector fleets on motor oil exceeds \$232,000 per year, with a median of \$4,000 per year. The average cost is about \$4.00 per gallon for both the public and the private sectors.

4. Focus Groups

Introduction

Focus groups were held with fleet managers from the public and private sectors to discuss the findings from the survey and to gather more detailed qualitative information from fleet managers about the use of RRO. A summary of the findings from the survey was prepared for focus group participants (Appendix C).

Methods

Participants for the focus groups were recruited in several ways. For the first focus group, project staff used a "snowball" method. Fleet managers at several University of California and California State University campuses were contacted and asked to participate and/or to recommend another fleet manager in either the public or private sector.

For the remaining focus groups, participants were recruited by additional methods. One was to invite survey participants who had indicated an interest (through a question on the survey) to also attend a focus group. A second was to send e-mail notifications to several professional fleet manager organizations. The notification listed the times, dates and locations of several focus groups and asked interested parties to respond by e-mail, telephone or fax. The third was to place

a paid advertisement in a trade journal for fleet managers with circulation in southern California. Project staff identified the zip codes nearest the focus group locations and then did zip code sorts of the lists of fleet managers used to draw the sample to identify nearby fleets. Then they used reverse directories to provide telephone numbers for those fleets and invite their participation. Project staff also continued to tap fleet manager networks.

Recruiting fleet managers for these focus groups proved to be challenging. Many private sector fleet managers asked pointedly how much they would be paid or what the giveaways would be for their participation. We came to understand that most professional focus group companies do pay a going rate of \$75 to \$150 for each focus group attended, plus refreshments. While we were able to offer light refreshments, it was not possible under the terms of the contract to pay focus group participants or to give away merchandise purchased with contract funds. Again, many telephone calls and e-mails had to be sent for each actual focus group participant. Finally, even when participation was confirmed and re-confirmed before each focus group, only about half of those confirmed actually attended.

Once the fleet managers arrived for the focus groups they were quite willing to participate actively in the discussion. The managers provided valuable insights into the results of the survey and offered plausible explanations for many response patterns. They also made practical suggestions for dealing with the barriers identified in the survey, future marketing efforts, and for recruiting fleet managers for the subsequent workshops.

The focus groups were held in public meeting rooms at various locations in Los Angeles, Orange, San Diego, and Ventura counties. The sessions lasted an average of 90 minutes. Light refreshments were provided. The format of the focus groups involved several project staff and the fleet manager participants. The fleet managers were invited to sit around a table with a microphone in the middle for recording comments. One of the project staff took on the role of focus group facilitator whose major function was to initiate and guide the discussion. Other project staff not seated at the table took notes during each focus group session, both as a backup in case of tape failure and as an additional source of information.

Each tape recorded session was typed verbatim by a professional transcriber. These draft transcripts were then edited by project staff to ensure that the information was rendered accurately and to fill in missing information such as names of people, products, or companies with which the transcriber was not familiar. The major findings from the focus groups are discussed below. Electronic copies of the transcripts from the focus group sessions are included with the final report.

Findings

Availability of RRO

For fleet managers who have used or are using RRO, there are three problems with availability. In most cases suppliers are not able to satisfy all three requirements.

The first problem is finding a reliable, nearby supplier who can deliver in a timely fashion. The major refiners or distributors of RRO (Safety-Kleen, Evergreen) may have large quantities of oil available, but many local suppliers operate on a smaller scale with lesser quantities on hand. Sometimes the RRO is not available when the fleet needs it and it will take some time for the supplier to order it and have it delivered.

A second problem is being able to get the quantity of oil needed. Many fleets have a need for bulk deliveries, as much as one or two thousand gallons, not just one or two 55-gallon drums.

And the third is being able to acquire all the types of oil needed (i.e., the specific formulations). Most fleets have several types of vehicles, not just one standard type, and therefore have needs for a variety of oils of different viscosities and with different additives. In the past, most vehicles used the same type of oil (e.g., 30-weight), but now there are many more formulations specified by the manufacturers of different vehicle engines. Again, while the large distributors may formulate all the various types of oil being used today, local suppliers often have many fewer varieties on hand.

RRO Reliability

Some of the managers have heard that RRO is better than regular oil. It is supposed to be cleaner, purer and lasts longer. However, they are skeptical of this information until it is verified. They know it meets API standards, but this does not make a difference because the mechanics and technicians have no confidence in it. They may think there is no way to really get all the contaminants out of it. The real problem is that there is no qualitative or quantitative data on the consequences of long terms use of RRO (see suggestions below).

Suitability

Fleet managers differed in their opinions of the suitability of RRO for various types of vehicles. There was some agreement that it would be acceptable for cars and light trucks, but more disagreement about medium and heavy trucks or off-the-road vehicles. There was also uncertainty about whether RRO can be used in vehicles that use alternative fuels such as diesel or bio-diesel, vehicles with hybrid engines, and so on.

Warranties

Fleet managers indicated that the fear that a manufacturer's warranty could be voided by the use of RRO was a major concern. The vehicles they purchase often represent large capital outlays for medium and large trucks, construction vehicles, and so forth. Fleet managers wanted to have written guarantees from the manufacturers that the use of RRO (of the suitable formulation) would not jeopardize the engine warranty

Mechanics' Bias

Most fleet managers rely on their mechanics to determine the quality of the oil they use. Most mechanics are firmly against RRO. Fleet managers perceive mechanics to be suspicious of RRO, to underestimate its quality, and to be unaware of where or how to obtain it.

Realizing it will take time to change these ingrained beliefs, fleet managers suggested that verification of the quality, suitability, and availability of RRO be conducted by an unbiased third party. In addition, fleet managers suggested that vehicle manufacturers unequivocally state that RRO is acceptable as a regular lubricant when they specify the recommended formulations of oil they recommend. Articles could appear in trade magazines that are widely read by mechanics, and the curriculum at trade schools could be modified to include this information.

Cost

There was substantial variability in what fleet managers indicated they paid for RRO in comparison to virgin oil. Very few fleet managers reported paying less for RRO; some reported paying the same and others reported paying more. Some who paid more attributed the higher costs to the smaller supply of RRO that is readily available, in other words, they were charged a premium for RRO. Other fleet managers attributed the higher costs to contracts that do not specify the price for RRO, where RRO is priced like a boutique item, not an everyday commodity. There was not much awareness of the availability of the state contract with already

negotiated prices for RRO.

Another element of cost is the need to manage different formulations of lubricating oil for different vehicle needs. Fleet managers want to deal with as few suppliers as possible and to obtain as much of their oil as possible from one supplier. Fleet managers already face challenges to managing the different formulations of oil for their various vehicles. If in addition they need to manage different suppliers for virgin and RRO, or different suppliers for different formulation of oil, it adds to their administrative workload as well as the potential for costly errors (i.e., using the wrong formulation of oil in a vehicle).

Public Sector

Most of the users of RRO were public sector fleet managers. Most public sector managers who use virgin oil, however, believed they would keep on using virgin oil until required to change (especially if there were no cost savings). Some managers were now using RRO only because their jurisdiction mandated it (whether it cost less, the same, or more). However, other fleet managers felt it was the right thing to do to be environmentally friendly, even if it did not save money, and that the public sector had a responsibility to set an example for the private sector. There were some discussions of whether suppliers charge them more because the public sector is seen as having deep pockets and the funds do not come out of an individual's pocket, as opposed to having a bottom line and a profit motive in the private sector.

Recommendations

What is the Problem?

For most fleet managers, RRO is a solution to a problem they don't have. Most people are naturally resistant to change, so if there is no perceived problem, there is no incentive to change. Just being (more) environmentally friendly is not enough of a reason. If there is no cost savings, or if the acquisition and management costs increase, then they are not likely to turn to RRO.

However, many of these comments were made in the days before the spectacular rise in the price of crude petroleum. It may be that the rise in the price of virgin lubricating oil will push some fleet managers over into the situation of having a problem to solve. If the price of RRO becomes more competitive, more fleet managers may give it a second look. Suppliers and distributors need to stress cost savings as much as they do quality with RRO.

Model Fleet

One idea is to use RRO over an extended period of time where its performance could be extensively documented and a reliable track record built up. A large private sector company such as UPS or FedEx could use it and track the results. This information could be widely shared with the general public. It would have to be a reputable, well-known company that values excellence in performance. A large public sector fleet could also provide a model for the use of RRO over time, but this would only add evidence to the primary model of private sector fleet use. Engines from this model fleet could be put on display for inspection by mechanics, drivers, fleet managers, and purchasing agents.

Experts

Especially for young people, it would be important to have trusted experts endorse the use of RRO. There was some disagreement about the relevance of certain types of experts, for example, race car drivers, whose experience is so different from that of most people, or famous people who probably know little about cars (movie stars, musicians, etc.). The most convincing experts would be people from the major manufacturers of motor oil, but these seem reluctant to endorse

RRO even when they make it themselves. Nevertheless, it is important to have experts on hand at workshops, expos, and schools as well as in print and broadcast media. Tours of re-refining plants (virtual or on video) or training for fleet managers and mechanics could be offered by industry experts at local RRO locations (distributors, formulators, suppliers).

Expert testimony and evidence would be crucial to convincing fleet managers and mechanics that the use of RRO would not damage engines. Trade magazines, trade and industry shows, and professional associations could be used as vectors of dissemination of this information.

Branding

One of the keys is to have better packaging and better marketing of RRO. For example, bulk RRO is delivered in plain black (sometimes dirty looking) oil drums, while bulk virgin oil is delivered in (clean looking) drums emblazoned with the refiner's logo. RRO refiners need to show pride in their product.

Having RRO available from the major brands of virgin oil would help people to trust RRO just as they have trusted other products from this brand. Marketing by recognized brands would help RRO be accepted in the market for motor oil at the fleet level as well as at the individual consumer level. The dearth of RRO packaged for the retail consumer market has contributed to the lack of information about RRO among fleet managers as well as the general public. Having recognized brands of RRO available on store shelves would help people to become more accepting.

It is entirely probable that many major manufacturers of motor oil now use some re-refined base oil in their formulations of 'virgin' oil. Regulations only require that oil sold as re-refined contain at least 25 percent RRO base oil; there is no rule regarding oil that is not sold as re-refined. In fact, there is probably a disincentive for the major brands to reveal whether (or how much) RRO base oil goes into their traditional oils, given public sentiment against RRO.

At the present time there is no incentive for major brands to formulate or market their own RRO. If the price were the same as virgin oil, they would be concerned about losing market share to other major brands. If the price were lower than virgin oil, they would in effect be competing against themselves and cutting into the profits of their virgin oil sales. An incentive program for major brands could be some form of tax break for manufacturing and marketing RRO. An incentive for consumer could be that no sales tax would be charged on motor oil sold as RRO.

It may be that quiet encouragement of the use of RRO base oil by the large, national brands in the manufacturing of 'new' oil for the retail market (as well for the wholesale market) would help to achieve the desired result more than attempts to package and market RRO to the rather skeptical general public.

5. Workshops

Introduction

After completing the analysis of the survey and the focus groups, workshops were developed to inform fleet managers about and motivate them to adopt RRO. The format and content of the workshops were derived from the comments fleet managers made in the survey and focus groups as well as from principles of good educational practice.

Recruitment

Five workshops were planned: three in Los Angeles county and one each in Orange and San Diego counties. Eventually two of the Los Angeles county workshops were collapsed into one, but the others were held as planned. RRO was the major topic at two of the workshops, and a secondary theme at the other two.

Feedback from the focus groups indicated that the workshops should be held in a professional meeting venue such as a hotel conference room that was close to major freeways with easy access to on-ramps and off-ramps. They also suggested that workshops be held at the noon hour and that a light lunch be provided. They indicated that the early mornings were not good because fleet managers are busy preparing the fleet for the day's activities. Also evenings were ruled out because fleet managers tend to work from 6 am or 7 am until about 3 pm or 4 pm. Weekends were also considered inauspicious times. Project staff observed that local chapter meetings of professional organizations were often held at the noon hour and lunch was provided free of charge (often underwritten by vendors). Our workshops did not have vendor underwriting but they did have the presence of industry experts, who also provided some complementary materials to participants.

Securing participation in all phases of the research project was problematical, and participation by fleet managers in the final (workshop) phase was fairly weak. Less than 1 in five fleet managers contacted agreed to participate in the survey phase; less than 1 in 200 fleet managers contacted by any means agreed to participate in a focus group. The workshop phase faced similar difficulties as the other phases in terms of fleet manager participation. While it was not always possible to determine the reason(s) for a fleet manager's refusal to participate in the survey, focus group, or workshop phases of the project, the most likely reasons were suspicion about the ultimate use of the research; reluctance to allocate the time necessary to complete a survey or attend a focus group or workshop (either due to pressing job demands or to the lack of incentives for participation in the project); or, in a few cases, company policies against participating in research.

As has been reported above, massive efforts were required to ensure fleet manager participation at the workshops, especially from the private sector. A five inch square printed invitation was mailed to over 5,500 southern California fleet managers. These included fleet managers from the lists used to pull the sample for the survey as well as two lists purchased from commercial sources. Again, project staff identified all fleets within a 25-mile radius of each workshop location and contacted them by telephone. In addition, a display advertisement and a feature story ran in the California Fleet News, a private subscription electronic industry newsletter, further reaching a large number of fleet managers. Despite these efforts, attendance at the workshops averaged less than 1 in 60 of those invited by any of these methods. One workshop had to be cancelled due to a lack of response. Of the remaining four workshops, a total of only 63 fleet managers attended the workshops. For the workshops, a fleet manager's proximity to a particular workshop location seemed to be the most important factor in his/her decision to attend.

Format

The format for each workshop followed this agenda (see sample workshop curriculum in Appendix D):

- Talk and video presentation by experts in the field
- Testimonials by fleet managers using RRO
- Question and answer period

Experts in the field were selected both for their knowledge on the topic and for their personal reputations (credibility). There was good cooperation from the experts invited. It was found that

expert testimony was the best way to deal with fleet managers' beliefs that RRO is not as good as virgin oil. Representatives from oil distributors were able to address fleet managers' belief that RRO costs more than virgin oil. And testimonials by fleet managers currently using RRO were the best means of convincing other fleet managers to consider giving RRO a try.

Project staff obtained a display from the Solana Center for Environmental Information that was set up at each workshop location. The display featured three large clear glass containers, each with a different brand of motor oil. Three empty plastic bottles of motor oil were also presented (virgin, synthetic, and re-refined). The workshop participants were asked to guess which glass held the virgin oil, the synthetic oil, and the RRO. Participants most often guessed that the darkest colored oil was the re-refined, when in reality that was the synthetic oil. This display provoked much comment among the participants. Key chains given out to the fleet managers by industry experts that featured small glass vials with samples of very clean-looking RRO also made a favorable impression.

Workshop Evaluations

At the conclusion of each workshop, fleet manager participants were asked to complete a workshop evaluation form. The evaluation form contained four questions concerning their opinion of the workshop session, as well as two questions about their practices as a fleet manager. Overall, the workshops were well-received, with 89 percent of all respondents saying they would recommend the workshop to other fleet managers.

RRO

One of the two questions about fleet manager practices asked about current use of RRO. Prior to the workshops, 21 percent of fleet managers were already using RRO, with the remainder not currently using RRO.

The other question about fleet manager practices asked whether the fleet manager would consider changing their practices and would now be more likely to use RRO. 53 percent of the fleet managers indicated they would now be more likely. When combined with the 21 percent already using RRO, this means that nearly three-quarters of the fleet manager participants were already using or would consider changing to RRO in their fleets.

Post Workshop Evaluations

After the workshops, a sample of fleet manager participants was contacted for a follow-up interview. Due to the short time between the end of the workshops and the end of the contract period, some managers were contacted only a few weeks after their workshop.

The fleet manager was thanked for attending and asked if any fleet management practices had changed since the workshop; they were also asked for additional comments about the workshop. Only 10 fleet managers were willing to respond to the post-workshop evaluation telephone call. Most indicated that they had given all the relevant feedback during the workshop or on the workshop evaluation form. However, in general the comments received back from the managers during the post-workshop evaluation telephone calls were again favorable, with the same proportions indicating that they were now using or were considering the use of RRO. Some sample comments from the post workshop evaluations are included below.

Domenic Del Re, Associate Director / Physical Plant, CSU Dominguez Hills:

The gentlemen I brought with me (auto mechanics) discussed what they learned at your workshop with the entire maintenance crew at our weekly meeting....

Prior to your workshop we were using re-refined oil, but we were buying it in drums. Because we are a small operation, the drum re-refined oil was not working out very well. The cost was rising from our supplier because we were not using as much re-refined oil as they would like us to use. After your workshop, we are now looking at purchasing re-refined oil in quart containers, which may suite our needs better, as opposed to buying it by the drum.

Your time and effort is appreciated and gave us information too help us improve our motor pool operation....

David Lawson, Long Beach Unified School District:

We have been using re-refined 15W40 motor oil since about 1990. Prior to the change, we had about six years of oil analysis history to work with. I have not seen any change in wear characteristics, viscosity change, or metal wear. We are very satisfied with the re-refined motor oil. We purchase from Rosemead oil.

Victor S. Reinaga, Probation Fleet Manager, County of Los Angeles:

Thank you again, the Workshop was very informative. While the practice of using recycled oil has been in use for in the last few years, [we] cannot give you [exact] figures on the amounts of recycled oil that is being used on the 4,000+ units being serviced.

Gene Manley, San Diego Police Department:

Re-refined oil meeting API standards and warranty requirements sounds awesome. We are not currently using re-refined oil but if the price is right, meaning a substantial dollar savings over virgin oil, then why wouldn't everyone give it a try? This will be recommended to management once the price and availability has been established

William Peterson, San Diego Police Department:

After hearing information along with the testimonials regarding re-refined oil, I agree that it would be worth looking into and giving it a try if there is a substantial cost savings.

Arturo Maldonado, Village Nurseries LLC:

Thank-you for your note.... Our fleet manager Leo Orozco is testing the re-refined oil on a couple trucks and if he is satisfied with the results we will be using it on all our trucks.

Karl Hopper, City of Anaheim, said he plans on starting a pilot program using re-refined oil.

David Claypool, San Diego Police Department, expressed some reservations about adopting RRO:

Better do some more research on re-refined oil. If there are any problems we will pay a lot more than we would have if buying the virgin oil!

Recommendations

Mandate RRO for Public Fleets

There is currently a contract from the state to provide RRO at a negotiated price to local jurisdictions. However, many fleet managers (or contracting or purchasing offices) do not know about it. There is also a state mandate for local jurisdictions to use RRO, but many state agencies opt not to participate. Yet public fleets constitute a significant percentage of fleets in the state and their use of RRO can set an example for the private sector. To encourage broader

participation, the state can:

- Offer "green fleet" or "green shop" certifications for fleets that use RRO.
- Extend and more effectively publicize the availability of pre-negotiated contracts with RRO manufacturers, distributors, and suppliers.
- Help suppliers to establish electronic links to their databases that provide detailed information about the specifications of RRO and allow easy on-line ordering.
- Put in place an automatic default to RRO whenever motor oil is ordered electronically.
- Place "green" symbols in paper and electronic catalogs to help purchaser identify products with recycled content.
- Encourage local jurisdictions to promote the use of RRO among subsidiary entities (towns, school districts, utilities, transportation agencies, and contractors).
- Help local governments to encourage the use of RRO among private sector fleets and contractors within their jurisdiction.
- Work with local governments to implement "close the loop" programs (to contract with providers of collection services for used oil as well as delivery of new RRO).
- Extend "close the loop" programs to private sector fleets through publicity and information as well as small grants.

Educate Mechanics

As previously mentioned, one major obstacle faced by fleet managers who choose to switch to RRO is opposition from mechanics who are skeptical about change and doubt the product's quality. Mechanics' bias against the product is natural since most learned nothing about RRO when they were originally schooled; negative attitudes about RRO were probably reinforced during on-the-job training. Remedies must be provided to counteract the lack of knowledge about the product and biases against the product among current mechanics, their apprentices, and future trainees. The facts about RRO as well as its benefits should be introduced in the junior high school and high school shop classes and reinforced in community colleges as well as in private training programs. This information can also be presented at technical and professional workshops, industry expos, and through trade journals.

Incentives

Currently, there are no incentives for private fleets to switch to RRO. The state may be able to use the "stick" approach (mandate) to RRO in the public sector but a mandate would be perceived as too heavy handed for the private sector, where the carrot (incentive) approach is perceived to be more appropriate.

- Give incentives to car and engine manufacturers to officially endorse the use of RRO for their products. Car and engine manufacturers hold the power to convince customers about the good qualities of RRO by publicly approving its use.
- Eliminate double taxation on RRO. The state of California currently collects a Motor Oil Assessment Fee for all lubricant oil manufactured or distributed in California regardless of its nature and whether that oil has been re-refined. Since RRO comes from used oil that has already paid the fee, in effect RRO suffers double taxation. Exempting RRO from this fee should boost its manufacturing and sales.

- Create a better marketing program. A statewide campaign targeted at all citizens marketing the benefits of RRO should be undertaken (in addition to the specialized efforts to reach fleet managers and mechanics). In the early 1990s, when modern re-refining technology was introduced, there were more high-profile marketing campaigns in place, such as sponsoring a racing car team. Today, little or no effort is put into effectively marketing RRO.
- Encourage “closed loop” contracts. A closed loop contract is one in which the same agency picks up the used oil and delivers newly minted RRO. This would result in an additional cost savings for those using RRO, by not having to contract for disposal of used oil from one company and the provision of fresh oil from another.
- Ease up regulations for re-refiners. Currently re-refiners are at a disadvantage when competing with the much larger major refiners of virgin crude oil. They also face the same challenges and one-size-fits-all policies when expanding or increasing production, even though they are using a renewable resource (unlike the refiners of crude oil). It is important to encourage efforts by re-refiners to increase their capacity to meet the anticipated demand for RRO stimulated by marketing and educational campaigns or by hikes in the cost of crude oil.
- Encourage manufacturers of “virgin” motor oil to increase the amount of re-refined motor oil in their “virgin” motor oil brands. In the past years, manufacturers have increased the amount of re-refined base oil in their “virgin” motor oil formulas. Estimates put the RRO content of brand name 'virgin' oil at approximately 4 percent now, up from 2 percent in 1997. Because of proprietary formulas, it cannot be known exactly what the RRO content of 'virgin' oil is today. However, the state should make an effort to require all motor oil manufactured or imported into California to contain some RRO.
- Encourage the adoption of RRO in the private sector by offering "green fleet" or "green shop" certifications for fleets that use RRO. Encourage motor vehicle fleets in California to be perceived as “environmentally friendly” or “environmentally conscious” in sync with the general positive attitude in the state toward good stewardship of resources.
- Consider the extension of tax incentives or tax credits to fleets that switch to RRO and continue its use during a defined period of time (for example, within the next five years). The state could also extend technical support or other incentives to private sector fleets that commit to using RRO.

6. Market Study

Introduction

When recovered, used oil can be put to a number of productive uses. The bulk of recovered used oil (about 85 percent) is processed as an industrial fuel, asphalt extender, hydraulic oil, or for space heaters. Only about 15 percent of all recovered used oil is currently re-refined into new motor oil. The market for RRO is affected by a number of factors. These include:

- Generation of used oil and its recovery (recycling).
- Collection and transportation of used oil.
- Price of used oil compared to new crude oil.

- Processing options for used oil.
- Demand for used oil products.

Each of these factors will be more fully described below.

Generation of Used Oil and Its Recovery (Recycling)

All used oil starts out as new oil destined for use either as industrial oil or lubricating oil. Industrial oil is generally a lower grade product. Lubricating oil is a higher grade product composed of base oil plus additives. Base oil can be extracted from crude petroleum through refining or from used oil through re-refining. The additives vary from producer to producer. Lubricating oil must be changed periodically because the additives degrade and the oil gets dirty or contaminated; but the oil itself does not wear out.

The potential amount of used oil generated in California depends on the number of motor vehicles that have oil changes, the amount of oil used per change, and the frequency of oil changes; as well as the amount produced from industrial sources.

The amount of used oil available in the future may decline slightly. As refining technology improves, the newest types of oils being produced can perform for longer intervals. Automotive and light truck manufacturers have lengthened the recommended interval between oil changes from 3,000 miles to 5,000 miles for gasoline engines and extended it to 7,500 or even 15,000 miles. This could cut the amount of lubricating oil dedicated to replenishment of vehicle engines nearly in half compared to previous years (North Carolina, 1998, p. 4).

Diesel engines are generally able to go longer between oil changes; this is especially true for larger engines. For commercial vehicles, stopping for an oil change means the vehicle is out of service and not earning revenues. There is pressure on filter makers to produce higher quality filters that can extend the time between oil changes. In some applications, the oil filter can be changed alone and the engine oil is only topped up with fresh oil and/or additives. These developments may also reduce the amount of used oil available for recycling.

From the total amount of oil sold one must subtract oil that is lost to combustion or leaks during use; the amounts trapped in product containers or discarded oil filters; spillage; and otherwise unavailable for recycling. Up to one third (30 percent) of new oil may be lost to these causes. Other losses accrue from failure to recycle or improper use or disposal of used oil.

Estimates of the amount of used oil recycled in California hover around 60percent of total oil sales (CIWMB, 2003). For 2003, over 286 million gallons of new oil were sold in California, with just over half (150.2 million gallons) for lubricating oil and just under half (135.8 million gallons) for industrial oil. Of these amounts sold, 124.2 million gallons total were recycled from lubricating and industrial sources (91.8 million and 32.4 million, respectively) for a total of 62 percent. Adjusting for oil lost through its use, a much lower proportion of industrial oil is recycled (23.9 percent) than automotive oil (82.7 percent) because more oil is consumed during industrial uses. If the percent recycled increased from either automotive or industrial sectors, there could be substantially more used oil available for the used oil market.

Collection and Transportation of Used Oil

The collection and transportation of used oil presents a major challenge in California due to its categorization as a hazardous waste (see Section 1, Laws and Policies). In California, the laws and policies that govern its storage, collection, and transportation require specialized equipment and licensing, which add to the cost of recycling. Some collectors merely transport used oil from the point of generation to a company that will convert the used oil to another product. Collectors

may also deliver used oil to railroads, barges, or other forms of long-distance transportation. Most collectors prefer to limit the number of miles they will travel to collect used oil.

The cost of collection and transportation is relatively predictable (cost of trucks, fuel, tires, labor, maintenance, fees, and taxes). One industry source estimated that typical charges include about \$50 for making the stop and up to 15 cents per gallon collected (Nagler, 2004, p. 93). Another source estimated transportation costs at about five cents per gallon per 100 miles (not including depreciation on the transporting equipment) (Voogd and Magnabosco, 2003, p. 2.).

While costs are predictable, the responsibility for payment of costs is variable. When the price of crude oil is low, then used oil is perceived to be a waste product for which collectors can charge the generator. When the price of crude oil is high, then used oil is perceived as a raw material for processors. Collectors may not charge generators at all or may even compensate them for the used oil, so the cost is ultimately paid by the processor.

Some used oil processors (e.g., Safety-Kleen) have their own fleets of collection trucks. These processors may offer their customers a "closed loop" service by collecting used oil and delivering new oil. This allows the customer to deal with only one vendor, and the processor typically does not charge extra for collecting the used oil.

These closed-loop processors may insist on a long-term contract that specifies what type of used oil will be collected and penalizes generators for contaminating their used oil with other substances (e.g., antifreeze). A contract is advantageous for the processor because it guarantees a steady source of used oil of known quality, rather than having to compete with other processors for used oil of unknown quality.

Price of Used Oil Compared to Crude Oil

The price of used oil has generally been lower than that for crude petroleum before processing. However, the price of used oil is also affected by such things as its relative purity (lack of other contaminants), the distance it has to be transported, and the demand from processors. A publication from Evergreen Oil estimated the average price of used oil at 34 cents per gallon, with range of prices from 15 to 74 cents per gallon (Voogd and Magnabosco, 2003, p. 2). More recent estimates hover around fifty cents per gallon (US DOE, 2006, p. 10-5). When the used oil is considered a hazardous waste (i.e., contains some contaminants) the price will be lower.

It is difficult to compare the price of used oil to the price of a barrel (42 gallons) of crude petroleum. At \$42 per barrel, crude petroleum would average about one dollar per gallon. In reality, only a very small percentage of crude petroleum can be transformed into lubricating oil, generating approximately one-half gallon per barrel (the remainder is processed into gasoline and other fuels, raw materials for plastics, and other products). At a price of \$42 per barrel, the cost of one gallon of crude petroleum to be made into lubricating oil would equal roughly \$1.00 if all parts of the crude oil were of equal value, but the part that can be made into lubricating oil may be the most valuable part of the whole. At \$60 per barrel, the price would increase to roughly \$1.43 per gallon of crude petroleum.

Processing Options for Used Oil

There are a number of ways to process used oil, depending on the end product. All the major North American processors use the same technology to produce re-refined base oil from used oil. A report from Evergreen Oil (Voogd and Magnabosco, 2003, p. 2) estimated the refining cost for base oil at less than 50 cents per gallon, assuming a re-refinery with a capacity to produce ten million gallons of base oil per year.

To produce new motor oil, the re-refining process essentially cleans used oil of all contaminants to produce base oil that is very similar to that produced directly from crude oil. This base oil then receives fresh additives, also similar to those added to new (virgin) oil. The result is a lubricating oil of equal or better quality than one made directly from crude. RROs that have been API-certified have passed all tests for performance for cold starts, pumpability, rust corrosion, engine wear, high temperature viscosity, deposits, and phosphorous (see Appendix A).

The supply of all base oil produced in the US is limited. Of the 200 petroleum processors operating in the US, only about 20 are able to produce any type of base oil. These twenty are mostly large companies with a combined base oil capacity of about three billion gallons. National production of all base oil is projected to increase from 2,440 million gallons in 1993 to 2,635 million gallons in 2008 (Freedonia Group, 2004, p.47).

The percentage of this base oil that is derived from sources other than crude oil is expected to grow from 4.5 percent in 1993 to 9.5 percent in 2008. This is an increase from approximately 110 to 250 million gallons of "other" base oil. The majority of the base oil in this "other" category comes from synthetics, with smaller portions contributed by re-refined base oil and vegetable base oil. Re-refined base oil production is expected to nearly double from 43 million gallons in 1993 to 78 million gallons in 2008, but its percentage of "other" base oil will decrease (because of greater increases in the production of synthetic and vegetable base oils) (Freedonia, 2004, p.54).

The supply of re-refined base oil is limited. In the 1960s, several events contributed to a decline in the re-refining industry. The Internal Revenue Service extended the excise tax on virgin oil to apply to RRO as well. The Department of Defense banned the use of RRO in its equipment because of concerns about quality. And the Federal Trade Commission required the labeling of RRO to indicate it was made from used oil (Pennsylvania, 1992, p. 4). The number of re-refiners diminished substantially.

Today there are only two major US re-refiners: Evergreen Oil and Safety-Kleen. Evergreen collects used oil and oil filters throughout California for its re-refining plant in Newark, California. Safety-Kleen collects used oil nation-wide for processing in its two re-refineries in East Chicago, Indiana, and in Breslau, Ontario (Canada). Both Evergreen and Safety-Kleen sell their base oil to other companies that repackage it with their own additives. Some of these are major crude petroleum refiners, such as UNOCAL, which produces the Firebird brand of RRO, and Chevron-Texaco, which produces the ECO brand. Safety-Kleen also markets its own brand of re-refined motor oil under the America's Choice label.

Other purchasers of re-refined base oil are not in the refinery business, but are known as blenders. Blenders acquire re-refined base oil, supplement it with their own package of additives, and sell it under their own label or brand. Rosemead Oil is one of the better known blenders selling RRO under its own SOAR brand. Other major brands of RRO available in California include Coast, 76 products, and Lyondell.

Some of these blenders may also acquire virgin base oil produced directly from new crude. It is possible that some blenders mix base oil from both sources (re-refined and crude). It is difficult to know the extent of this practice since there is no requirement to indicate the presence of RRO in lubrication products. Nevertheless, this practice is implied by federal government regulations stating that motor oil can be sold as re-refined as long as it is made up of at least 25 percent re-refined base oil. California requires at least 70 percent re-refined base oil content for an oil to be sold as re-refined.

Most RRO is provided to the end-user by smaller local or regional distributors. These distributors

may carry virgin oil in addition to RRO and generally operate only on a wholesale basis and do not offer products for individual consumers. For the government sector, it is advantageous to identify a product as re-refined if procurement regulations mandate the purchase of or stipulate a preference for products with recycled content. For the retail sector, however, at the present time it is felt to be disadvantageous for a product to indicate that it contains some re-refined base oil. A check of auto supply stores and other retailers during this project revealed that they generally do not carry any re-refined motor oil packaged for sale to individual consumers. None of the oil for sale to individuals indicates whether any of the content is derived from re-refined base oil.

There is little attempt to market RRO directly to the consumer. Larger companies that might be able to use brand loyalty would be competing against themselves if they marketed RRO at a lower price. Smaller companies cannot afford the fees that retailers charge to provide shelf space for a product, often up to \$10,000 for a single product, and do not have recognition among the public for their brand name.

Used oil can be processed into a number of products, but there is not enough re-refining capacity to transform all the used oil collected in the US into new motor oil. There will be even less capacity if the percentage of used oil recycled increases. The two companies that do re-refining (Evergreen and Safety-Kleen) produce re-refined base oil, generally from waste oil that they collect themselves. If they are now operating at full capacity, they would not be able to increase their supplies of re-refined base oil without opening new refineries.

Another option is to increase the number of re-refineries, but there are substantial barriers to entry into the re-refining market. No new large-scale refineries have been built in the US for some time, making estimates of costs difficult. The US DOE (2006, p. 10-8) put the cost of constructing a re-refinery with a capacity of 15 million gallons of base oil per year at \$8 to \$10 million, excluding the cost of the very expensive technology necessary to produce a competitive grade of base oil. Re-refineries are generally more expensive to build and to operate than crude oil refineries, which is one reason given for why RRO has not been markedly cheaper than new oil.

As an alternative, new technologies have been recently developed that would allow the construction of smaller used oil re-refining plants at a substantially lower cost, about \$3.5 million (Sullivan, 2004, p. 1). Smaller re-refineries are used in many countries around the world to process used oil into a variety of products, including fuel oil and engine lubricants. Building several small re-refineries rather than only a few large ones could boost the availability of RRO products substantially in a short period of time.

Nevertheless, a significant barrier to the expansion of existing or the creation of new re-refineries is the traditional citizen opposition (NIMBY) to nearby industrial facilities. Citizens' reluctance to approve new facilities would probably require extensive demonstrations that re-refining can be linked to lower prices for motor oil as well as better overall environmental conditions.

Another substantial barrier for new entrants is the need to earn API certification for motor oil. Stringent API testing processes can cost from \$300,000 to \$500,000 for each grade of base oil produced by each separate manufacturer.

The only excess capacity at present appears to exist in the crude oil refining industry. Using the Freedonia Group information (above) that US base oil production capacity is about 3 billion gallons per year, and the actual production of base oil is about 2.5 billion gallons per year, then there is roughly a half billion gallon excess capacity that could be used to produce more base oil. It is not clear, however, whether any of that excess capacity could be tapped to produce re-refined base oil. Any change in production would likely involve extensive modifications of equipment

since the re-refining process for used oil differs from the refining process for crude oil. Nor is the possible speed of the response known.

Apart from the re-refiners, blenders, and distributors described above, there are other processors of used oil. These processors treat used oil to remove some water and to filter out some sediment. The cost for minimal processing (or reclaiming) is much lower than for re-refining. The majority of this processed oil is used for fuel (burning) by industrial plants, utility companies, and space heaters in large garages. Some industries that generate used oil are allowed to burn it rather than send it off for recycling. Most large generators are required to use special filters to minimize pollution, but small generators may be exempt from the filter requirement (US DOE, 2006, p. 10-7).

These products are considerably less costly because they do not have competition from major brands and they do not have to meet the stringent standards set for lubricating oil by the API. A recent draft report by the Office of Fossil Energy of the US Department of Energy noted that:

Used oil burners are one of the key end users of recycled oils and they supplement their [natural] gas or liquid fuel supplies with recycled oils to lower their operating costs. Used oils are discounted compared to normal liquid fuels or natural gas on a heating value parity basis due to the added risks of handling a fuel that is highly variable in quality. These factors lead to a range of discount of 25–35 percent from No. 6 fuel oil. 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 (US DOE, 2006, p.4-2).

Demand for Used Oil Products

The demand for lubricating oil in the US is projected to reach a total of 2.7 billion gallons in 2008 with a value of over \$8 billion dollars (Freedonia Group, 2004, p.1). Engine oils constitute the largest part of this demand (nearly 50 percent or about 1.3 billion gallons); automotive engines account for 85 percent of the total engine oil demand (about 1.1 billion gallons).

Looking only at motor oil, about 10 percent of all vehicles sold in the US are sold in California. A conservative estimate would be that the demand for motor oil in California would be about 10 percent of the projected 2008 national total of 1.1 billion gallons (Freedonia Group, 2004), or about 110 million gallons in California.

Only a small part of the total demand for lubricating oils is specifically for RRO. US demand for re-refined lubricants is predicted to grow to 92 million gallons in 2008, but will represent only about 3.4 percent of the total demand for lubricants. Similar to the overall picture, over 85 percent of the demand for re-refined lubricants is for automotive engine use (about 78 million gallons) (Freedonia Group, 2004, p.58). Similarly, the demand in California for re-refined motor oil in 2008 would be about 10 percent of the national total of 78 million gallons, or about 7.8 million gallons for California (Freedonia Group, 2004). The percentage may be somewhat higher if there are more public sector programs in California mandating or promoting the use of re-refined motor oil compared to other states.

It is not clear whether there is enough demand for re-refined motor oils to justify an increase in re-refining capacity. One reason for the low level of demand specifically for RRO is the poor level of acceptance on the part of individual consumers. Early efforts to reclaim used oil were relatively unsophisticated. In some cases, used oil was merely strained to remove debris and then sold at a low price. These products carried a reputation for poor performance that lingers on.

Over the past 10 to 15 years considerable progress has been made in re-refining technology. Current re-refined motor oil products are able to meet all the standards of the API. However, many consumers still consider the terms used oil, reclaimed oil, recycled oil, and RRO to all mean roughly the same thing and to all be inferior to new (virgin) oil. Another concern among individual consumers is that the price of re-refined motor oil is not substantially lower than that of virgin oil. The attitude is, why risk ruining an expensive engine to save a dollar on an oil change?

As a consequence of poor consumer acceptance, the majority of the demand for RRO has come from the public sector, for example, the United States Postal Service (USPS). Other states (e.g., New York, Maine, Vermont) and government agencies have mandated its use as part of an environmentally-friendly procurement program. This means that the demand for re-refined automotive oil products will be constrained by the rate of growth of the public sector and/or its increased use in the public sector (generally through mandates) unless other potential areas of demand are increased.

It is important to note, however, that most previous analyses of the demand for RRO were based on prices for crude oil that were substantially lower than today's prices of \$60 per barrel. The specific demand for RRO may increase if its price becomes more competitive compared to new (virgin) oil. Another possibility is that many producers of 'new' automotive oil may increase the proportion of RRO in their products without marketing them as re-refined.

An environmental focus on the relative merits of re-refining used oil versus other applications (i.e., burning as fuel) may be helpful in increasing the demand for lubricating oil made from re-refined used oil. Some research has found that the net harmful effect on the environment is less from re-refining than from other uses such as burning used oil as a fuel--even when other fuels such as coal were substituted for fuel oil. In addition, about 8 percent more of the potential net energy contained in used oil recovered from re-refining than from burning used oil (US DOE, 2006). However, these studies are controversial and have been challenged.

The US DOE (2006, p.1-3) estimated that the re-refining of all used oil that is currently burned as fuel each year would save about \$63 million at current prices. However, eliminating this source of relatively cheap fuel oil would increase the costs of industrial users because they would need to turn to coal, natural gas, or a more expensive grade of fuel oil.

Support for Re-Refinery

A study in 1993 examined whether enough used oil was generated in the state of Michigan to justify a re-refinery. The study assumed that a minimum of 25 million gallons of used oil per year would be necessary to support a re-refinery at a profitable level.

For the present project, we obtained the number of vehicles registered in southern California identified by the DMV as either public or private sector fleet vehicles. The data included the vehicle type (from passenger cars to heavy trucks) using the common identification system based on gross vehicle weight.

We then determined from our survey data, for each vehicle type and sector (public or private), the median number of oil changes per year per vehicle and the median quart of oil per oil change. Applying these numbers to the number of fleet vehicles from the DMV, we estimated that over 63 million gallons of used oil are generated each year by public and private sector fleets in southern California (Table 31). Estimating that 60 percent of this amount is recoverable, approximately 38 million gallons of used oil would be available each year from public and private sector fleet vehicles. Used oil from fleet vehicles would be easier to track and to reclaim than used oil from non-fleet (individually owned, private) vehicles, especially where the owner is a DIY.

This amount of recoverable used oil could potentially support a re-refinery based in the southern California area, but other factors such as transportation costs would have to be taken into consideration in calculating whether the re-refinery would be profitable.

Table 31. Used Oil Generated From Fleets in California

SECTOR	Vehicle Class	Total Vehicles*	Number of Changes**	QTS per Change**	Total Quarts Used Oil	Total Gallons	60% Recycled
Commercial	Car	7,085,193	3	5	106,277,895	25,569,474	15,941,684
Government	Car	27,827	3	5	417,405	104,351	62,611
Commercial	Light truck	4,791,479	5	5	131,765,673	32,941,418	19,764,851
Government	Light truck	42,220	2.5	5	527,750	131,937	79,163
Commercial	Medium truck	150,798	3	9.5	4,297,743	1,074,436	644,662
Government	Medium truck	2,7207	3	6	489,726	122,432	73,459
Commercial	Heavy truck	52,488	5	30	7,873,200	1,968,300	1,180,980
Government	Heavy truck	3,752	5	22	412,720	103,180	61,908
Total		12,180,964			252,062,112	63,015,528	37,809,317

*From California DMV, 2002

**From fleet manager survey data, using medians

Conclusions

New grades of motor oil are being created at ever increasing speed, due to pressures on manufacturers to increase fuel economy. There is some lag time between the creation of new API categories of more sophisticated motor oil and re-refiners' abilities to meet new API standards.

Fleet managers face increasingly complex lubricating requirements for the various types and ages of vehicles in their fleets. Fleet managers need many different grades and formulations of motor oil but cannot always get them all in the necessary quantities or within the desired time frame from distributors or suppliers of re-refined products.

There is a large supply of used oil from both public and private sector fleets of automobiles and trucks in southern California (in addition to used oil from industrial sources and from privately owned vehicles) that could be transformed into re-refined motor oil.

Currently there is no re-refinery in the southern California area. Should there be an increased demand for re-refined motor oil there would be a considerable lag time to meet that demand due to the large capital investment required and substantial citizen opposition to a large-scale re-refinery. In addition, the costs of testing each new motor oil formulation required by API are substantial.

Several factors may promote the re-refining industry. At the current prices of crude petroleum, re-refining of used oil into new motor oil may be more lucrative than in the past. New

technology that permits the building of cheaper, small re-refineries is currently being tested for profitability. If new studies demonstrate that the burning of used oil for fuel is more harmful to the environment than re-refining, there may be an incentive to promote re-refining. Finally, if there are more government mandates and the mandates are enforced, demand for re-refined products will increase.

Abbreviations and Acronyms

API (American Petroleum Institute). The main professional organization for the petroleum and chemical industry; it is also a lobbying organization for the American petroleum, chemical, and natural gas industries.

ASE (National Institute for Automotive Service Excellence). A professional organization that certifies automotive technicians in various areas of repair expertise. A technician who has passed one or more tests is allowed to wear the ASE Blue Seal of Excellence on the uniform, and any repair facility that employs certified mechanics can display the ASE sign.

CRUDE Refers to unprocessed petroleum that can be separated into such products as natural gas, gasoline, naphtha, kerosene, fuel and lubricating oils, paraffin wax, asphalt and a variety of manufactured products.

GVW (GROSS VEHICLE WEIGHT). The total weight of the vehicle, including passengers, fuel, cargo and attachments.

GVWR (GROSS VEHICLE WEIGHT RATING). The maximum permissible loaded weight of the vehicle and takes into account the capabilities of the engine, transmission, frame, spring, brakes, axles and tires. The GVW must not exceed the GVWR.

MOTOR OIL A lubricant for engines that also cools the crankshaft, bearings, and pistons. As an engine runs, combustion blow-by into the crankcase contaminates the oil with moisture, soot and unburned fuel. Acids and sludge may result. Additives are designed to combat acid and sludge buildup. The oil itself never wears out but the additives do. That is why the oil must be changed periodically to replenish the additives. Dumping in an occasional can isn't enough. The oil filter traps dirt (but not moisture) so it too should be replaced at every oil change. The difference between competing brands of motor oil is mostly advertising hype. Any oil of the proper viscosity that conforms to the appropriate America Petroleum Institute (API) rating should be safe to use.

MULTIGRADE MOTOR OIL (5W-20, 5W-30, 10W-30, 10W-40, 20W-50) Oil used in four-cycle gasoline engines in passenger cars, light trucks, power boats, motorcycles and other mobile and stationary equipment; especially for high-revving engines in small cars and light trucks.

NHTSA (National Highway Traffic and Safety Administration). A government agency that is responsible for making and policing safety rules for all vehicles. NHTSA has the authority to order a vehicle manufacturer to issue a safety recall.

OIL CONSUMPTION All engines use a small amount of oil over time. It gets past the piston rings and valve guide seals and is burned in the combustion chamber. A small amount escapes through the exhaust system and a few drops usually managed to seep through a gasket or seal.

OIL CHANGE Required maintenance at 7,500-mile intervals (or every year) for gasoline engine vehicles and 5,000-mile intervals for diesel engine vehicles.

OIL VISCOSITY Measure of an oil's thickness, or resistance to flow. Lower numbers indicate thinner oil and higher numbers indicate thicker oil. There are two types of motor oils, single grade and multi-grade. Multi-grade oil such as a 10W-30, are designed to have the viscosity of an SAE 10W oil at cold temperatures combined with the viscosity of an SAE 30 oil at engine operating temperatures. The W or Winter designation indicates that the oil meets viscosity requirements for low temperatures (below 30° F).

OTR Off-the-Road vehicle; generally refers to heavy construction equipment, large lawn maintenance equipment, and so forth.

SINGLE GRADE MOTOR OIL (SAE30, SAE40). Generally used in four-cycle gasoline engines in passenger cars, light trucks, powerboats, and other mobile and stationary equipment where single grade oils are recommended. It is also recommended for two-stroke cycle diesel engines and off-road four-stroke cycle engines by producers such as Chevron Oil.

SAE (SOCIETY OF AUTOMOTIVE ENGINEERS). A professional association that among other things establishes industry standards for lubricating oil (indicated on packages of motor oil as the SAE number).

VISCOSITY A term used to describe the thickness of motor oil. The higher the number, the thicker the oil. Common straight grade viscosity ratings are 10, 20, 30 and 40, with 10 being the thinnest and 40 the thickest. A low-viscosity oil provides better lubrication at low temperatures and reduces internal drag on the engine. But they lack the staying power for high temperature or high speed protection. The heavier grade oils such as 30 and 40, on the other hand, are much better for high speed and high temperature lubrication, but they may be so thick at low temperatures as to inhibit easy cranking. The best motor oils take advantage of each. These are the multi-viscosity oils such as a 5W-20, 5W-30, 10W-30 and 10W-40. By using a blend of different viscosity oils, they have the flow characteristics of a low-viscosity oil when cold but offer the protection of a heavy oil when hot.

Appendix A
American Petroleum Institute (API)
Certification Standards

API Certification and Licensing

The American Petroleum Institute (API) is the premier organization involved in determining the quality of motor oil. The API certification has become the standard source of consumer information regarding the specific properties and capabilities of motor oil. API certification represents that the product meets the minimum standards for lubrication, maintenance and warranty requirements of original equipment manufacturers.

The API licenses two markings for motor oil: the "starburst" API Certification Mark and the "donut" API Service Symbol. No product may carry either of these markings without first obtaining a license from API after a rigorous testing process.

API Certification Mark

The API Certification Mark (Figure 1) may be located anywhere on the outside of the container. It is designed to identify engine oils recommended for specific applications (e.g., gasoline or diesel engines). To display the starburst, the oil must satisfy the most current requirements of the International Lubricant Standardization and Approval Committee (ILSAC), which sets the minimum performance standards for each application. Most automobile and engine manufacturers recommend oils that carry an API Certification Mark.

Figure 1. API Starburst



API Service Symbol

The API service symbol is to be clearly displayed on the container. This "donut" shaped symbol is divided into three parts: the top, center, and bottom. The top part carries a designation of the oil's performance level. The letter "S" refers to suitability for gasoline-powered engines and the letter "C" refers to suitability for diesel-powered engines. Additional letters after the "S" or the "C" refer to the exact set of standards met by the product (for example, an "SL" engine oil meets a more current standard than previous letters in the alphabet; higher numbers also mean that the product meets more recently developed standards than lower numbers). The specifications for each letter and/or number combination can be found on the API web site.

Figure 2. API Donut



The information in the center part of the "donut" identifies the oil's viscosity. The SAE (Society of Automotive Engineers) Viscosity Grade is a measure of the oil's flow characteristics, or thickness, at certain temperatures. Oil with a uniform viscosity will show only one number (e.g., SAE 30W), while an oil with multiple viscosity characteristics will show a range of numbers (e.g., SAE 10W-40).

The bottom part of the "donut" communicates information about other properties of the oil, such as whether the oil has demonstrated energy-conserving properties in a standard test in comparison to a reference oil.

Other Symbols

The API service symbol and certification mark are important guarantors of the quality of re-refined oil. However, some manufacturers of re-refined motor oil have opted to display other industry symbols or marks on their labels in addition to those from API. For example, Safety-Kleen's America's Choice brand displays a "Mack-Approved" symbol on its 15W-40 oil. The "Mack Approved" is intended to appeal to Mack truck owners by certifying that the oil meets the requirements set by the manufacturer. It assures purchasers that the use of the re-refined oil will not void the manufacturer's vehicle warranty.

Appendix B
Fleet Manager Questionnaire
Informed Consent Form

DATE _____ INTERVIEWER _____ ID# _____

FLEET MANAGER SURVEY
USE OF RE-REFINED MOTOR OIL

First Name

Last Name

Title

Company/Organization

Address

City

State

Zip

Tel

Fax

Instructions: Please complete the following questions about the vehicle(s) in your fleet by checking the answer categories provided or by writing your answer in the space provided.

1. What is your organization or company's basic business or service?

2. In what geographic area does your fleet primarily operate?

G this city only

G this county

G multiple counties

3. What is the total number of vehicles in your fleet:

Number owned: _____

Number leased: _____

4. What type(s) of vehicles are in your fleet? (check all that apply)

G Passenger Cars

Trucks:

G Light trucks (pickup, minivan, SUV, ambulance, parcel delivery)

G Medium trucks (cargo van, delivery truck, school bus)

G Heavy truck (semi, dump truck, fire truck, city bus)

G Off-the-road (OTR) vehicle (heavy construction)

G Other vehicle types

(specify): _____

These next questions are all about the primary type of vehicle in your fleet.

5. What would be the predominant type of vehicle in your fleet?

G Passenger cars, mini-vans

G Light trucks, commercial vans

G Heavy trucks

G

Other: _____

6. How many vehicles of this type are in your fleet? _____

7. How many miles is each vehicle driven per year? _____

8. What type of fuel is used in these vehicles?

G Gasoline

G Diesel

G Propane

G Electric

G Other: _____

9. Does your organization/company recycle used motor oil?

G No

G Yes

G Don't know

10. Who is responsible for the oil changes on these vehicles?

G No one

G Driver

G Organization/Company staff

G Outside contractor

G Combination

G

Other: _____

11. About how many oil changes does each vehicle have per year, on average? _____

12. About how many quarts is needed for each oil change, on average? _____

13. How much lubrication oil is purchased per year for these vehicles, in gallons? Gallons: _____

14. What is the total cost of the lubrication oil purchased each year? Total annual cost: _____

15. Does your organization/company have any policies about the use of re-refined motor oil?

G No

G Yes

(specify): _____

G Don't know

16. Have you ever used re-refined oil in these or other vehicles?

G No, I have never used re-refined oil (skip to Q.27)

G I used re-refined oil in the past but not now (skip to Q.24)

G Yes, I use re-refined oil now (continue)

17. How many gallons of re-refined oil are purchased per year? _____

18. What is the total cost of all the re-refined oil purchased each year?

Total annual cost: _____

19. Do you require the same specifications for re-refined oil as for new oil?

G No

G Yes

20. How many years has re-refined oil been used in this fleet? _____

21. What are the main reasons you use re-refined oil in this fleet?

G Cost

G Quality

G Environmental concerns

G Mandate

G

Other: _____

22. How satisfied are you with the use of re-refined oil in this fleet?

- G Very satisfied
- G Somewhat satisfied
- G Neutral
- G Somewhat dissatisfied
- G Very dissatisfied

23. In your opinion, what are the biggest barriers to using re-refined motor oil faced by fleet managers?

- G Cost
- G Quality
- G Warranty
- G Availability
- G

Other: _____

(Now please skip to question 28)

24. How many years ago did you use re-refined oil?

25. Please describe your experience with using re-refined oil:

26. What were the reasons you stopped using re-refined oil:

- G Cost
- G Quality
- G Warranty
- G Availability
- G

Other: _____

27. If you have never used re-refined oil, what are the major reasons?

G Cost

G Quality

G Warranty

G Availability

G

Other: _____

28. How have you learned what you know about re-refined motor oil?

G On the job

G School/training

G Reading

G Ads/Sales Reps

G Friends

G

Other: _____

29. Compared to virgin oil, I think that re-refined oil:

G Costs less

G Costs about the same

G Costs more

30. Compared to virgin oil, I think that re-refined oil:

G Is more reliable

G Is about the same

G Is less reliable

31. Does re-refined motor oil meet or exceed the warranty requirements of the vehicle manufacturer for the vehicles in your fleet?

G Falls short of meeting warranty requirements

G Meets warranty requirements

G Exceeds warranty requirements

G Not sure

32. How easy is it to obtain re-refined oil in your geographic area?

- G Not available at all
- G Very difficult to obtain
- G Somewhat difficult to obtain
- G Somewhat easy to obtain
- G Very easy to obtain

33. Do you know of any other organizations or companies that use re-refined motor oil for their vehicle fleets?

G

Yes: _____

G No

34. Are you familiar with the American Petroleum Institute's certification that re-refined oil meets the same quality standards as virgin oil?

- G No
- G Yes
- G Not sure

35. Do you think that fleet managers should be encouraged to use re-refined motor oil in vehicles operating in the public (government) sector or the private (commercial) sector?

- G No, neither
- G Yes, in the public sector only
- G Yes, in the private sector only
- G Yes, in both sectors

36. If fleet managers should be encouraged, why?

- G Cost
- G Quality
- G Environmental benefits
- G

Other: _____

37. If fleet managers should not be encouraged, why not?

G Cost

G Quality

G Vehicle warranty doesn't allow it

G Availability

G Won't help the environment that much

G

Other: _____

38. Do you think state agencies should make it easier to use re-refined oil?

G No

G Yes

39. How many years have you worked as a fleet manager in your current job: _____

40. How many years have you worked as a fleet manager in other jobs: _____

41. In your years as a fleet manager, do you think the environment in California has:

G Gotten worse

G Stayed about the same

G Gotten better

42. In your current position, what percentage of your time is devoted to being the fleet manager: percent _____

43. Who makes the decision about what type of motor oil to use in the fleet?

G I (fleet manager) do

G Purchasing agent/buyer

G Another manager

G Company policy/headquarters

G

Other: _____

44. Are there any other comments you would like to add about the use of re-refined motor oil? _____

45. Would you like to receive more information about re-refined motor oil?

G No

G Yes

46. Would you be interested in participating in a focus group on this subject?

G No

G Yes

THANK YOU FOR YOUR VALUABLE PARTICIPATION IN THIS SURVEY!

CONSENT FORM: FLEET MANAGERS AND RE-REFINED OIL PROJECT— TELEPHONE INTERVIEWS

The following script is to be read to participants over the telephone. Copies may be mailed, faxed, or e-mailed to participants upon request.

“I am going to read you the informed consent form. At the end of my reading, I will ask you if we have your informed consent to participate in this project.”

“You are being asked to participate in a research study conducted by Dr. Michelle A. Saint-Germain from the Graduate Center for Public Policy and Administration at California State University, Long Beach. You were selected as a possible participant in this study because you are a fleet manager.”

PURPOSE OF THE STUDY

“The purpose of this study is to find out what managers of automotive and truck fleets in both the government and private sectors in California think about the use of re-refined motor oil.”

PROCEDURES

“If you volunteer to participate in this study, you will do two things:”

“1--Participate in an interview over the telephone concerning re-refined motor oil. You will be asked about your knowledge of re-refined motor oil, whether it is used in the vehicles in your fleet, and your opinions about re-refined motor oil. This interview should take no more than 20 minutes.”

“2--After completion of the interview, you will be asked if you would like to receive informational materials about re-refined motor oil. This should take no more than 3 minutes.”

POTENTIAL RISKS AND DISCOMFORTS

“There are no risks to you for participating in this study. We will only ask you about your experiences as a manager of an automotive or truck fleet.”

POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY

“There are some potential benefits to you for participating in this study. Your opinions will be taken into account when public policy on this issue is being considered. Best management practices will be developed and shared with you at the end of the project.”

“The outcome of the study will assist California policy makers to promote the use of re-refined motor oil in California, which should be of benefit to the environment.”

PAYMENT FOR PARTICIPATION

“You will not be offered any payment or gifts for your participation in this study.”

CONFIDENTIALITY

“Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law.”

PARTICIPATION AND WITHDRAWAL

“You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. Participation or non-participation will not affect you in any way. You may also refuse to answer any questions you don't want to answer and still remain in the study. The investigator may withdraw you from this research if circumstances arise which in the opinion of the researcher warrant doing so.”

IDENTIFICATION OF INVESTIGATORS

“If you have any questions or concerns about the research, please feel free to contact any of the following:

Michelle A. Saint-Germain, Principal Investigator	(562) 985-5383 or
msaintg@csulb.edu	
Luis Urgiles, Project Coordinator	(562) 985-5418 or
lurgiles@csulb.edu	

RIGHTS OF RESEARCH SUBJECTS

“You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights or remedies because of your participation in this research study. If you have questions regarding your rights as a research subject, contact the Office of University Research, CSU Long Beach, 1250 Bellflower Blvd., Long Beach, CA 90840; Telephone: (562) 985-5314 or email to research@csulb.edu.”

“This concludes my reading of the informed consent form. Do you understand the procedures and conditions of my participation described above?”

If yes, proceed; if no, repeat sections above as necessary.

“Have your y questions have been answered to your satisfaction?”

If yes, proceed; if no, answer questions as necessary and repeat.

“Do we have your agreement to participate in this study?”

If yes, proceed; if no, please thank the person and conclude the telephone call.

Please enter the subject’s name and telephone number, and then sign the statement below.

Subject Name: _____ Telephone
Number _____

In my judgment the subject is voluntarily and knowingly giving informed consent and possesses the legal capacity to give informed consent to participate in this research study.

Signature of Investigator

Date

Appendix C
Summary of Statistical Results for Focus
Group Participants
Focus Group Informed Consent Form

CALIFORNIA FLEET MANAGERS AND RE-REFINED OIL

A Report on Interviews with Public Sector and Private Sector Fleet Managers
in Southern California

Conducted by the Bureau of Government Research and Service Graduate
Center for Public Policy and Administration California State University,
Long Beach

Funded by a grant from the California Integrated Waste Management Board

August, 2004

To All Focus Group Participants:

Thank you for participating in this focus group on the use of re-refined motor oil by fleet managers in Southern California. As background for the focus group, we are pleased to present you with this brief report. This report summarizes the results of a survey of over 100 fleet managers in Southern California concerning their use of re-refined motor oil. The purpose of the project is to find out what fleet managers in both the public and private sectors think about the use of re-refined motor oil in the vehicles in their fleets, and their experiences with using re-refined oil. This project is funded by a grant from the California Integrated Waste Management Board.

Beginning in early 2004, we began surveying fleet managers in the counties of Los Angeles, Orange, Riverside, San Diego, and Ventura. Fleet managers were asked to complete a

questionnaire either over the telephone, by fax, by mail, by e-mail, or online. The questionnaire asked about the size and type of vehicles in the fleet, the quantity and type of oil used, and the use of re-refined oil. It also asked about fleet managers' perceptions of re-refined oil, and their opinions on whether the use of re-refined oil should be encouraged.

We are undertaking this project because many fleet managers do not know about re-refined oil. Since the early 1990s, the technology has been available to process used motor oil into re-refined oil that meets all the standards set by the American Petroleum Institute (API). This technology takes used motor oil and cleans it of all contaminants, producing a base oil that is very similar to that produced directly from crude oil. This base oil then receives fresh additives also similar to those added to new oil. The result is a lubricating oil of equal or better quality than an oil made directly from crude. API-certified, re-refined oils pass all tests for cold starts, pumpability, rust corrosion, engine wear, high temperature viscosity, deposits, and phosphorous.

Today, re-refined oil is not widely used either in the public or the private sector. There are a number of barriers to its use that have been identified in the past, and that were confirmed by our survey of Southern California fleet managers. This report will describe some of these barriers in more detail. However, the purpose of this focus group is to develop strategies to overcome these barriers that will encourage the use of re-refined oil by fleet managers. We appreciate your comments and any suggestions you can make to help promote the use of re-refined motor oils in California.

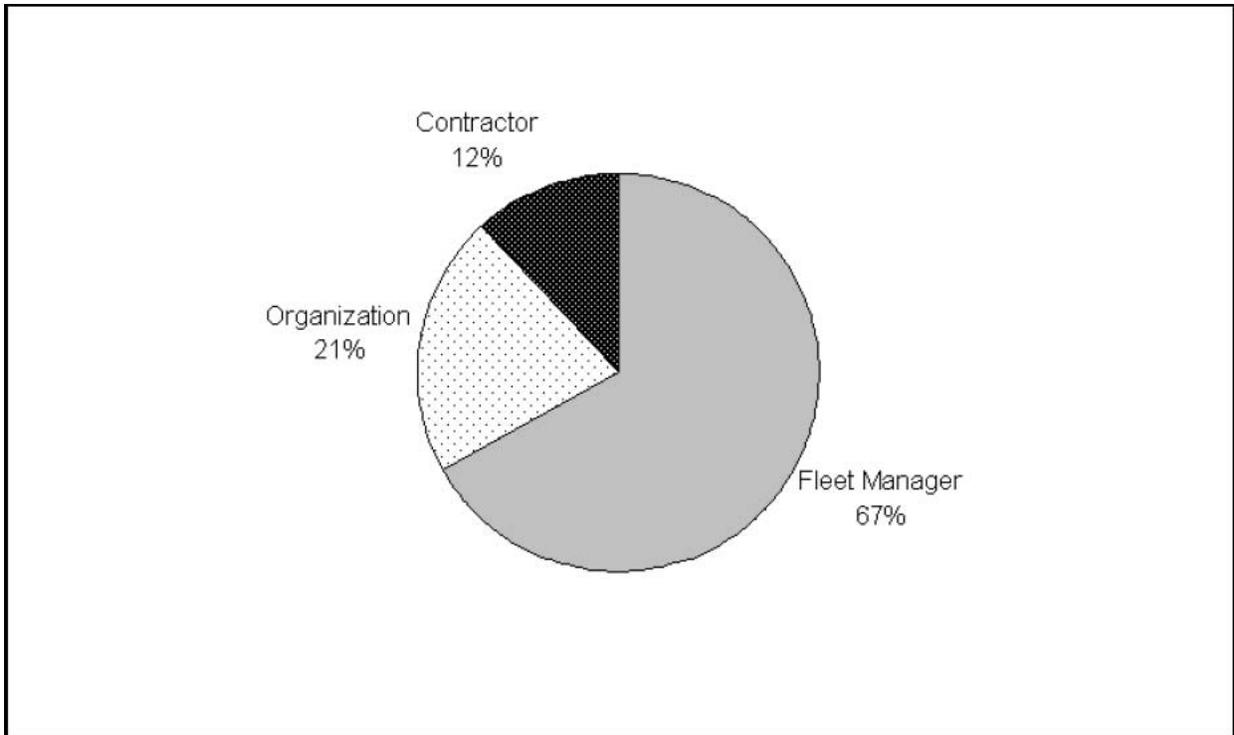
If you would like any additional information, or if you would like to make further comments, please contact any of the project personnel at the telephone, e-mail, or postal mail addresses listed below:

Dr. Michelle A. Saint-Germain, (562) 985-5383, msaintg@csulb.edu
Mr. Luis Urgiles, (562) 985-5418 lurgiles@csulb.edu
Graduate Center for Public Policy and Administration
California State University Long Beach
1250 Bellflower Blvd., Long Beach, CA 90840

SUMMARY OF RESULTS

Who Decides Which Oil to Purchase?

Most fleet managers make the decision on what type of oil to purchase for the fleet. For a few fleets, the decision is made by someone else in the organization, or by an outside contractor that performs preventive maintenance.

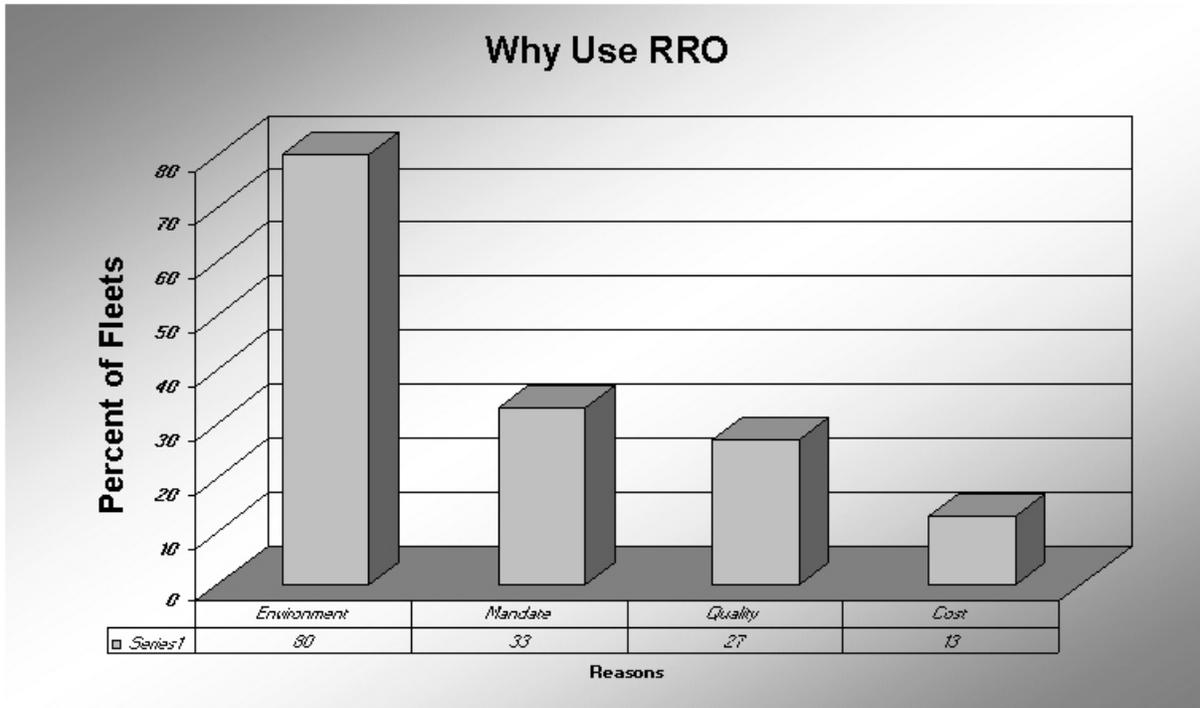


Who Uses Re-Refined Oil?

Most fleet managers have never used re-refined motor oil. Ten fleet managers used it in the past but don't use it now. Only 17 of the fleet managers in our survey currently use re-refined oil.

Why Use Re-Refined Oil?

Fleet managers list several reasons why they use re-refined oil, including lower cost, equal or better quality, and because of a policy or mandate. However, the major reason is because it benefits the environment.

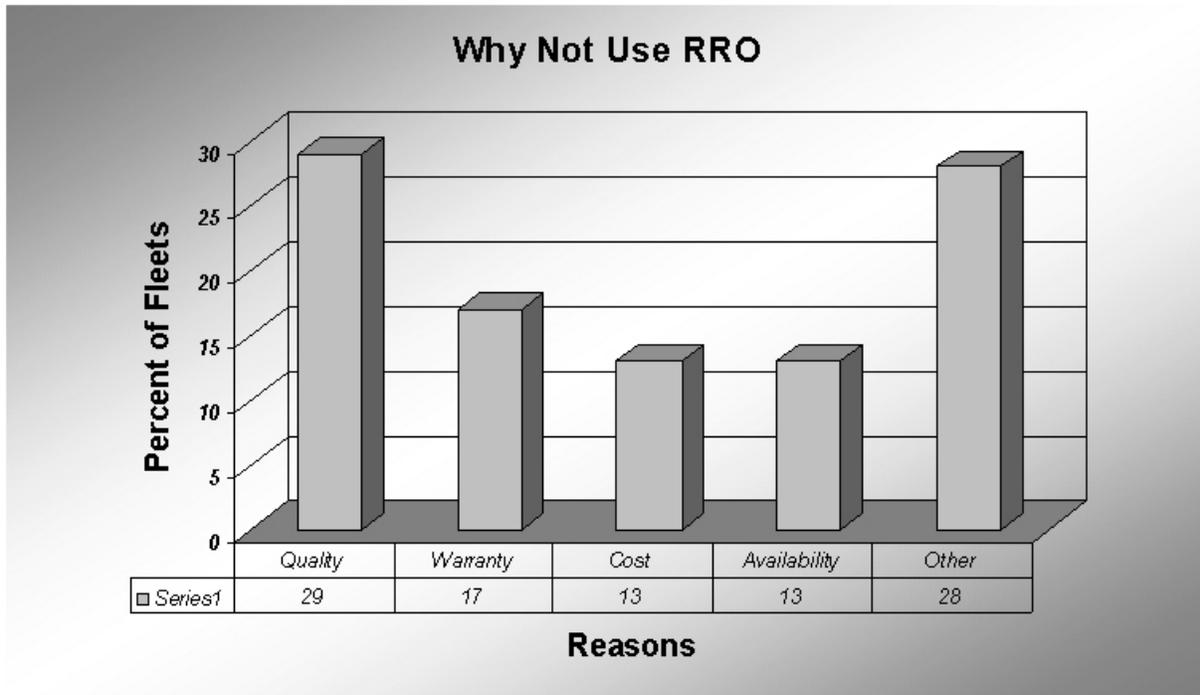


Satisfaction with Re-Refined Oil

Fleet managers who use re-refined oil are overwhelmingly satisfied or very satisfied with the results. Over nine out of 10 fleet managers (94%) are satisfied.

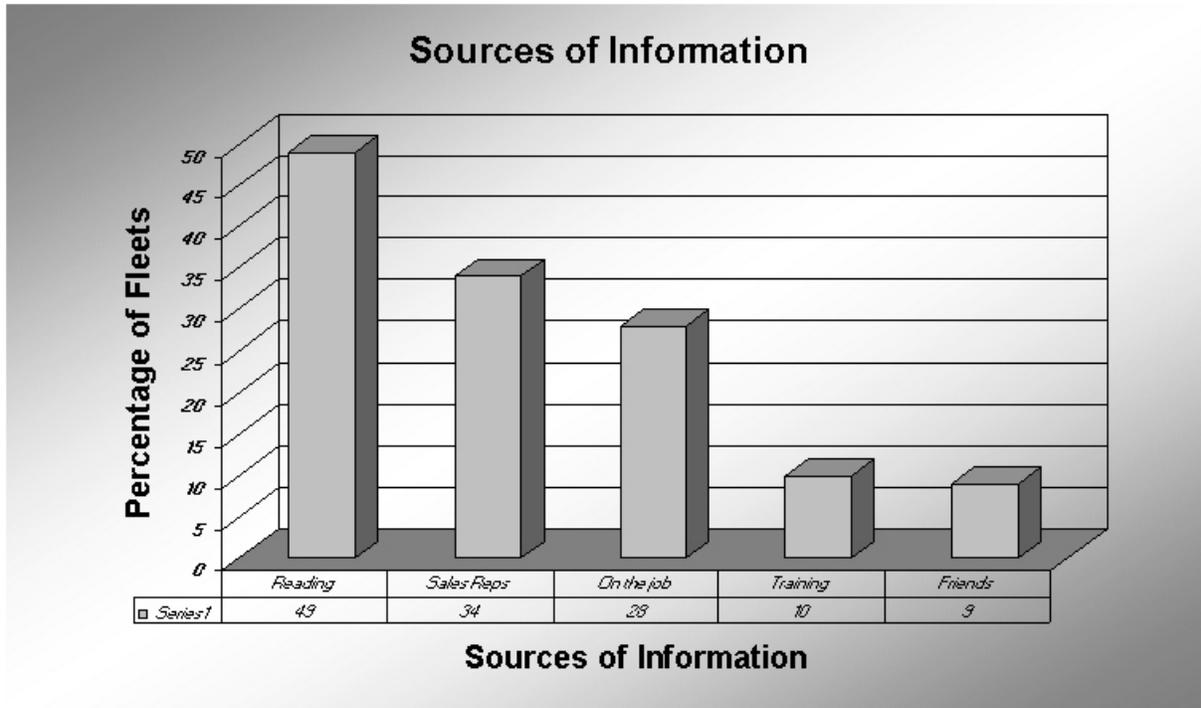
Reasons for Not Using Re-Refined Oil

The major reasons for not using re-refined oil were concerns about quality, vehicle manufacturer warranty, cost, and availability.



Sources of Information about Re-Refined Oil

Many fleet managers reported that they did not know much about re-refined oil. The majority of fleet managers learned about re-refined oil from reading. The other sources of information were sales reps or advertising; learning on the job; in training or school; and from friends.



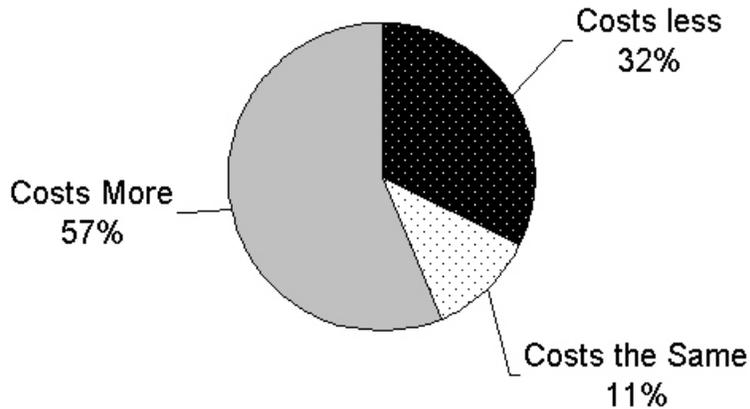
RRO Meets API Standards

Only one-third of fleet managers said they knew that re-refined motor oil meets API certification. Over half said they did not know about this, and another ten percent were not sure.

Cost of Re-Refined Oil

The majority of fleet managers thought that re-refined oil costs less than virgin oil, while about one-quarter thought it costs about the same, with the remainder thinking that re-refined costs more.

Cost of RRO



Reliability of Re-Refined Oil

About half the fleet managers thought that re-refined oil was just as reliable as virgin oil, while nearly as many thought it was less reliable. Only a few thought re-refined oil was more reliable.

Vehicle Warranty

Many fleet managers were not sure if re-refined oil would meet the vehicle manufacturer's warranty, and about 20% were sure it did not. About one-third of fleet managers said re-refined used oil would meet the warranty requirements.

Availability of Re-Refined Oil

The majority of fleet managers find re-refined oil either very easy or somewhat easy to obtain. However, one-third of fleet managers find re-refined oil either difficult to obtain or not available at all.

Should the Use of Re-Refined Oil Be Encouraged?

Half of the fleet managers said that the use of re-refined motor oil should be encouraged among both public and the private sector fleets. More than one-third said it should not be encouraged in either sector.

Should the State Make it Easier?

Two-thirds of the fleet managers agreed that the state should make it easier to use re-refined oil in fleets in California.

FOCUS GROUP TOPICS

1. What has been your experience with re-refined oil? -Benefits -Barriers
2. Should the use of re-refined oil be encouraged? -What will encourage fleet managers to use it? -Stress the benefits? -Overcome the barriers?
3. Should the state make it easier for fleet managers to use re-refined oil? -How can the state make it easier for fleet managers to use re-refined oil?
4. What would you have to do differently to purchase re-refined oil for your fleet?
5. Would purchasing and using re-refined oil be good for the environment? -What else could be done with used oil? -Would this reduce dependence on foreign oil? -Would this reduce environmental damage from drilling in the US?
6. Other comments or suggestions?

CONSENT FORM: FLEET MANAGERS AND RE-REFINED OIL PROJECT— TELEPHONE INTERVIEWS

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PURPOSE OF THE STUDY

“The purpose of this study is to find out what managers of automotive and truck fleets in both the government and private sectors in California think about the use of re-refined motor oil.”

PROCEDURES

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“1--Participate in an interview over the telephone concerning re-refined motor oil. You will be asked about your knowledge of re-refine motor oil, whether it is used in the vehicles in your fleet, and your opinions about re-refined motor oil. This interview should take no more than 20 minutes.”

“2--After completion of the interview, you will be asked if you would like to receive informational materials about re-refined motor oil. This should take no more than 3 minutes.”

POTENTIAL RISKS AND DISCOMFORTS

“There are no risks to you for participating in this study. We will only ask you about your experiences as a manager of an automotive or truck fleet.”

POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY

“There are some potential benefits to you for participating in this study. Your opinions will be taken into account when public policy on this issue is being considered. Best management practices will be developed and shared with you at the end of the project.”

“The outcome of the study will assist California policy makers to promote the use of re-refined motor oil in California, which should be of benefit to the environment.”

PAYMENT FOR PARTICIPATION

“You will not be offered any payment or gifts for your participation in this study.”

CONFIDENTIALITY

“Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law.”

PARTICIPATION AND WITHDRAWAL

“You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. Participation or non-participation will not affect you in any way. You may also refuse to answer any questions you don't want to answer and still remain in the study. The investigator may withdraw you from this research if circumstances arise which in the opinion of the researcher warrant doing so.”

IDENTIFICATION OF INVESTIGATORS

“If you have any questions or concerns about the research, please feel free to contact any of the following:

Michelle A. Saint-Germain, Principal Investigator	(562) 985-5383 or
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lurgiles@csulb.edu	

RIGHTS OF RESEARCH SUBJECTS

“You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights or remedies because of your participation in this research study. If you have questions regarding your rights as a research subject, contact the Office of University Research, CSU Long Beach, 1250 Bellflower Blvd., Long Beach, CA 90840; Telephone: (562) 985-5314 or email to research@csulb.edu.”

“This concludes my reading of the informed consent form. Do you understand the procedures and conditions of my participation described above?”

If yes, proceed; if no, repeat sections above as necessary.

“Have your y questions have been answered to your satisfaction?”

If yes, proceed; if no, answer questions as necessary and repeat.

“Do we have your agreement to participate in this study?”

If yes, proceed; if no, please thank the person and conclude the telephone call.

Please enter the subject’s name and telephone number, and then sign the statement below.

Subject Name: _____ Telephone
Number _____

In my judgment the subject is voluntarily and knowingly giving informed consent and possesses the legal capacity to give informed consent to participate in this research study.

Signature of Investigator

Date

Appendix D
RRO Workshop Curriculum
RRO Pledge Card

RRO Workshop Curriculum

The purpose of this workshop is to educate fleet managers about re-refined motor oil and to persuade them to consider adopting re-refined oil for the vehicles in their fleets. By the end of the workshop, fleet managers should know more about re-refined motor oil, should be more confident in the quality of re-refined oil, and should be more favorably disposed toward using re-refined oil.

The curriculum was developed after conducting a survey of 100 fleet managers and several focus groups in counties in southern California. The following information is provided on how to conduct the workshop. A sample agenda may be found at the end of this appendix.

Duration:	The workshop is designed to last approximately 90 minutes
Location:	The workshop requires a conference room, preferably with tables and chairs seating no more than eight participants apiece. The location should be easily accessible by freeway and provide adequate parking. The space should provide good acoustics, especially if any video will be shown.
Equipment:	The workshop generally requires a laptop computer and an LCD projector (for showing PowerPoint slides); other technical equipment as requested by the industry and fleet manager experts. A white board with markers or a flip chart may also be useful.
Staffing:	At least one moderator is required to conduct the workshop; additional persons can perform tasks such as staffing the sign-in desk, distributing materials, distributing and collecting evaluation forms, operating technical equipment, and answering questions about the facilities.
Cost:	The cost for the workshop alone can generally be calculated as the cost of the refreshments per person. Most locales will not charge a room fee if refreshments are ordered. The cost of staff time to arrange the workshop (approximately 40 hours), the cost of advertising or publicity, and the cost for supplies will be extra.

1. Pre-Workshop Preparation

Preparations for a successful workshop include a number of steps. In preparing the workshops for this project, we found the following to be the most important:

- selecting the date
- selecting the location
- arranging for refreshments
- arranging for parking
- disseminating publicity and maps
- receiving RSVPs
- preparing handout materials
- preparing audio-visuals and/or other media (backups and 'Plan B')
- recruiting industry experts to attend
- recruiting experienced fleet managers for testimonials
- recruiting re-refined oil distributors to attend
- reminding presenters of the time and date

- arranging for distribution of materials from invited guests (industry, suppliers)
- setting up the workshop site (literature tables, nametags, pens and paper, displays)
- providing a check-in or sign-in sheet
- distributing a printed agenda (order of presentations and estimated time for each)
- including a folder with handouts for each participant
- preparing evaluation forms

2. Introduction

The purpose of the introduction is to briefly describe the purpose of the workshop, the funding source (CIWMB), and the background research that informs the workshop. The introduction should be made by the workshop moderator, a person with an official role connected to the research and/or the funding source, or to some other neutral, third-party agency perceived to be unbiased, to establish the credibility and objectivity of the information that is to be presented. The moderator should obtain the names, titles, and any other relevant data about the presenters and/or other workshop staff so that they may be introduced to the attendees.

The workshop moderator should begin with a statement of welcome to the participants and an overview of the activities to take place during the workshop. The moderator can introduce all the invited workshop presenters at this time, or as they appear on the agenda. It should specify whether workshop attendees are able to ask questions during the presentations or whether they should hold their questions for a specific Q&A period. General “housekeeping” statements (refreshments, location of restrooms, requests to turn off cell phones, anticipated time the workshop will end, parking validation, and so forth) may also be made at this time.

The moderator can alert participants to what they have already been given in their packets or folders, what will be available in addition to them during or at the close of the workshop, and whether time will permit them to browse literature tables and/or exhibits at the close of the formal presentation period. If the session is to be video or audio-taped, participants should be alerted in case there are any objections.

In the RRO workshops we conducted, we spent a few minutes going over a handout that summarized the findings from our survey of fleet managers in southern California (see Appendix X). It is important to coordinate how much information is to be presented by the workshop coordinator(s) and how much is to be presented by the industry representative(s) and the fleet manager expert(s) so as to avoid duplication or confusing differences in interpretation. As an alternative, this information can be presented during the Q&A period.

3. Industry Representative(s)

The purpose of the industry representative is to speak directly to fleet managers about the latest technical and other developments in the field and to reinforce the high quality lubricating products made from re-refined oil. Fleet managers do not have many opportunities to speak directly to higher-level representatives of the re-refined oil industry. Topics to be addressed by industry representatives may include:

- Re-refining process
- API certification
- Recent changes in the industry (new products)
- Availability of re-refined products (distribution processes)
- Range of services (for example, “closed-loop” collection of used oil)
- Pricing for services
- Industry outlook over the next year or two

Fleet manager attendees will definitely be interested in pricing. Industry representatives should be alerted in advance that they may face questions about price, and they should plan on how to handle these questions before coming to the workshop (either on the spot or after the workshop with individual

follow-ups, in general or in specifics, etc.) so as not to be surprised.

Arranging for industry representatives to attend the workshop must be handled with some tact. Often there are two (or more) competing companies in the re-refined oil industry doing business with fleet managers in any large metropolitan area. The industry representatives should be given equal opportunities to participate in the workshops. However, often the representatives of one company do not want to appear at the same workshop with representatives of competing companies. Whether or not there will be more than one industry representative at any given workshop (whether presenting or merely attending to be on-hand for questions and consultation) should be worked out in advance of each workshop.

Workshop staff should also find out if the industry representatives will be bringing any displays or literature or other handouts for which they will need tables to be set up in advance. Workshop staff can assist industry representatives with the inclusion of brochures or other materials in the pre-prepared packets or folders for the attendees at the workshop.

Industry representatives can be invited to give a presentation. If there are to be two industry representatives, the topics of their presentations should be arranged in advance so as to minimize duplication. In either case, the time limit for the presentation should be clearly communicated before the date of the workshop and strictly enforced during the workshop. Industry representatives often have 'canned' video tapes or power point presentations that do not fit neatly into the workshop format. It is also important that the presentation fit the audience. For example, a video tape on the techniques of using re-refined oil for routine oil changes would not be appropriate for fleet managers.

If there are to be presentations, it is important to ascertain whether the industry representative will bring their own equipment or whether it will need to be arranged with the workshop site in advance or brought by others sponsoring the workshop. In the event of equipment failure, there should be a backup plan ('Plan B'). For example, if a power point presentation does not work, use overheads or printed handouts. If the presenters will be using a whiteboard or flip chart, make sure there are appropriate supplies on hand.

Finally, it should be determined beforehand whether questions will be taken during the presentation or presentations, or whether questions should be held for a specific Q&A period.

4. Fleet Manager Testimonial

The purpose of the fleet manager testimonial is to have a working fleet manager speak about his (or her) experience using re-refined oil in fleet vehicles under everyday operating conditions. This part of the workshop was especially well received by the attendees. Topics addressed by the fleet manager expert may include:

- Length of time using RRO
- Type of vehicles using RRO
- Source of information about RRO
- How to convince higher management to approve of using RRO
- Writing contract specifications to include RRO
- How to find a distributor for RRO
- How to overcome resistance to RRO among mechanics
- Short or medium term savings (if any)
- Environmental implications

It is important to find a fleet manager who has used re-refined oil for at least two or three years, with a variety of vehicles (if possible) to ensure that they are credible. The fleet manager should also be able to conduct a presentation or speak on the subject in a way which appeals to other professionals in the field. Workshop staff may assist the fleet manager expert to prepare the remarks or presentation to

be used at the workshop.

As with the industry representatives described above, it is possible to invite two fleet managers to give expert testimony. Most private sector fleet managers will be more likely to listen to another private sector colleague than a public sector colleague, so having at least one fleet manager expert from the private sector is important, either alone or in addition to an expert from the public sector.

One possibility that we did not test would be to have the fleet manager expert also bring a supervising mechanic or shop floor supervisor who could also testify about the quality and reliability of re-refined oil. Another possibility suggested by participants would be to have the expert bring an engine that had used RRO and been partially dismantled.

5. Questions & Answers

The purpose of the specific question and answer period at the end of the formal presentations is to allow fleet managers to ask any final questions or to make any final comments they may have. As an alternative to presenting the survey findings in the initial minutes of the workshop, they might be presented at this time to spark discussion. Any final information or handouts can also be circulated at this time.

This Q&A session can be very informative for all involved, as fleet managers share their experiences, perceptions, biases, and the barriers they face to using RRO. Most fleet manager attendees do want to give re-refined oil a chance, but want to be convinced that it will not be a negative experience. Fleet managers who have been using RRO quietly are often happy to speak up on the subject, pleased that other professionals are interested in what they have to say. However, it will be important for the workshop moderator to keep the discussion on topic and not let it drift off into other fleet manager concerns (such as the shortage of drivers and so forth.)

6. Closing Comments and Evaluation

The moderator should bring the workshop to a close by thanking the presenters and the workshop staff, as well as the attendees. The moderator should request that the attendees complete the evaluation form provided, and give instructions on how it is to be completed and returned to workshop staff (on the spot, by mail, etc.) A box or envelope should be provided so that attendees feel that their anonymity is being maintained if the evaluation forms promise it. A sample evaluation form can be found at the end of this appendix.

The moderator can inform attendees of where they might find further information and how to contact the workshop staff and/or any of the presenters. If results from the workshops will be available in the future, the moderator can inform the attendees of how the results will be disseminated or made available.

I pledge
to try
Re-Refined
Motor Oil



Fleet Manager
Name: _____

Target
date: _____

SPONSOR LOGO HERE

Title of sponsoring organization(s)
The California Integrated Waste Management Board
present

Fleet Manager Workshop:
Go Green and Cut Costs

Month, day, year
Name of workshop location
Street Address
City, State

Beginning time - Ending time

Agenda

11:30 - 12:00	Registration	Name of Room or Lobby
12:00 - 12:15	Introduction	Name & Title of Moderator, Affiliation
12:15 - 12:45	Re-Refined Used Oil: Technical Information	
	Name & Title of First Expert and Affiliation	
	(title of remarks or presentation, if applicable)	
	Name & Title of Second Expert and Affiliation	
	(title of remarks or presentation, if applicable)	
12:45 - 1:05	Re-Refined Used Oil: Expert Testimony	
	Name & Title of first fleet manager and affiliation	
	Name & Title of second fleet manager and affiliation	
1:05 - 1:20	Questions and Answers	
1:20 - 1:25	Closing Comments	
1:25 - 1:30	Workshop Evaluation	

Name of sponsoring organization(s)
FLEET MANAGER WORKSHOP EVALUATION FORM

Date: _____ Location of Workshop: _____

Thank you for attending this workshop for Fleet Managers in California. We are interested in your opinions of the workshop. Please complete the questions below.

Please rate the parts of the workshop by circling the number that represents your opinion:

	1=Poor	2=Fair	3=Good	4=Very Good
Facilitator	1	2	3	4
Industry Experts(s)	1	2	3	4
Fleet manager testimonial(s)	1	2	3	4
Audio-visual presentation(s)	1	2	3	4
Exhibit(s)	1	2	3	4
Handout(s)	1	2	3	4
Location	1	2	3	4
Food	1	2	3	4

Please write in any comments about how any of these parts of the workshop could be improved:

Prior to this workshop, did you use re-refined motor oil? ___No ___Yes

After this workshop are you more likely to use re-refined motor oil? ___No ___Yes

If yes, please let us know what part of the workshop made you more likely:

If no, what could we have done to make it more likely:

Would you recommend this workshop to other fleet managers? ___No ___Yes

May we contact you again about re-refined oil? ___No ___Yes

Optional: If you would like to receive more information about re-refined oil, please tear off and complete the following:

Name: _____ Title: _____

Organization: _____

Address, City, Zip _____

Telephone _____ E-mail: _____

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