Report Prepared for The Michigan Department
of State Highways and Transportation

AN ASSESSMENT OF WASTE OIL UTILIZATION POTENTIAL IN THE STATE OF MICHIGAN

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16. Abstract

Waste oil use in public transit operations in Michigan is assessed for two options: diesel fuel extender, and re-cycled lubricating oil. Several processes for producing re-refined lubricating oil are described. A federal demonstration program involving the "solvent/distillation" re-refining process is discussed. It is concluded that there are specific benefits to the State of Michigan from oil re-cycling and waste oil use. It is recommended that the State of Michigan establish legislation to improve the waste oil collection system in the state, and that in concert with the Michigan waste oil re-refining industry, a Department of Energy grant be sought to construct a major re-refining facility in Michigan.

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1. INTRODUCTION

This is the final report of a study of the potential uses of waste lubrication oils. Petroleum-derived products are expected to become more scarce and expensive in the future as the United States increases its dependence upon foreign petroleum products. It is expected that there will be increasing pressures to conserve and to recycle petroleum-derived products. Waste crankcase lubricants are no exception in this regard. Each year there are nearly 38 million gallons of waste lubricating oils to be disposed of in Michigan. The state also has an additional 20 million gallons coming from waste from industrial sources.[1] The ability to reuse these products would result in significant savings of virgin petroleum crude stocks, and hopefully would also result in savings to the general economy. For this reason, it is important that the public transit systems examine the potential techniques for lubricating oil reutilization, and develop whatever procedures are necessary to effectively recapture these products. The results will be reduced costs and a contribution toward national resource conservation.

The State of Michigan Department of State Highways and Transportation has sensed this overall need and requested the Michigan Transportation Research Program to investigate the possibility of obtaining a demonstration grant that would support the evaluation of lubricating oil recycling concepts in the public transit systems. In a letter to Dr. Charles G. Overberger, Director of the Michigan Transportation Research Program, Mr. Charles Uray, Chief Deputy Director of the Department of the State Highways and Transportation,requested that "...an assessment should be made to determine funds available, types of viable demonstration programs, and how the State of Michigan can obtain federal support for one or more reclaimed oil demonstration projects..... A report should be prepared to address these questions and discuss the fiscal effect of such ventures with respect to capital cost and payback periods. The reports should also address engine warranty problems, oil collection distribution problems,

quality control/additive problems and participation by public agencies and private enterprises." This report is the response to Mr. Uray's request.[2]

II. WASTE LUBRICANT OVERVIEW

A. The Problem

In the United States waste oil is generated from industrial and automotive sources at the rate of approximately 1.1 billion gallons each year.[3] This is equivalent to 70,000 bbl/day, or approximately seven percent of the President's energy conservation goal for 1975.

Although waste oil is normally heavily contaminated, it is composed almost entirely of "lube oil fractions," which are a valuable portion of a barrel of crude. It can be added to diesel fuel for use in diesel engines or it can be re-refined as a lubricant or as a feed stock for some other petroleum product.

Today as much as 50 percent of all waste oil is totally lost, and is not reclaimed for any use. Much of it is disposed of in an environmentally hazardous manner. The reasons for these losses are primarily economic, but they are complicated by a number of other issues, the main ones being environmental or controversial governmental policies.

As seen in Table I, 1.1 billion gallons of waste oil generated each year results from original sales of approximately 2.2 billions gallons. And, over 50 percent of the waste oil that is recovered is from automotive sources. In 1974 this category accounted for about 616 million gallons of waste oil.

Waste lubricating oil collects many contaminants. While the exact types of contamnants are functions of the original use of the oil, in general these are oxidation products, sediment, water, and metallic particles resulting from machinery wear. Waste automotive oils also contain gasoline, diesel fuel, organic and inorganic chemicals used in oil additives, and metals which were in the gasoline and were transferred to the crankcase during the combustion blow-by. Traditionally lead has been the major metallic contaminant found in waste automotive oils. However, it is expected that this concentration will continue to decline as the use of non-leaded gasoline is increased.

TABLE 1. Waste Oil Generation by Source

Automotive Lube Oils	Sales (gallons)	Waste Oil (gallons)
Service Stations	270,000,000	170,000,000
Garages, auto supply stores	60,000,000	38,000,000
New car dealers	102,000,000	92,000,000
Retail sales for commercial engines	90,000,000	57,000,000
Auto fleet & other lube oil uses	136,000,000	68,000,000
Factory fills (auto & farm equip.)	60,000,000	54,000,000
Discount stores	168,000,000	37,000,000
Commercial engine fleets	200,000,000	100,000,000
	1,086,000,000	616,000,000
Industrial and Aviation Lube Oils		
Hydraulic & circulating system oils	325,000,000	137,000,000
Metal working oils	150,000,000	105,000,000
Railroad engine oils	60,000,000	32,000,000
Gas engine oils	62,000,000	56,000,000
Aviation & other	137,000,000	64,000,000
	734,000,000	394,000,000
Other Industrial Oils		
Process oils	310,000,000	31,000,000
Electrical oils	57,000,000	51,000,000
Refrigeration oils	10,000,000	5,000,000
	377,000,000	87,000,000
Lube Oils Purchased by U.S.	37,000,000	18,000,000
GRAND TOTALS	2,234,000,000	1,115,000,000

Waste Oil Study, A Report to the Congress, Environmental Protection Agency, April 1974.

The best estimate of the ultimate fate of the waste oil is that about 43 percent is currently being used as a fuel; about eight percent finds its way back into the lube oil market as re-refined products; about 18 percent is used as a road oil or as an asphalt; and the remaining 31 percent is disposed of in unknown manners.[4] It is generally believed that most of these unknown dispositions are discharged directly to the environment (includes road oiling, dust control, weed control, or indiscriminate dumping into the waterways, municipal sewers, or onto land surfaces).

Waste oil is collected by a specialized industry that handles approximately 70 percent of all waste oil that is recycled. The industry has between 1000 and 2000 operators that are concentrated in the urban centers. Most of the operators are "one truck operations," with the largest being companies having approximately five to ten collection vehicles. The collection is carried out by tank wagons normally having capacities of 2000 gallons, and the collection is confined almost exclusively to areas of less than 100 miles from the collection terminal. Table 2 shows the list of oil reclaimers that are located in Michigan. And as indicated earlier, almost all are in the southeast quadrant of the state.

Because the collection of waste oil has not been adequately regulated in the past, the product has often been dumped or burned in an ecologically unsound manner during times of low market demand. In times of high market demand the product has been often sold for questionable purposes, such as "discount home heating oil" sold to unsuspecting homeowners and others.

The two major ways in which waste oil can be reutilized in a public transit operation are as a diesel fuel extender, and as a re-refined lubricant.

B. Waste Oil Utilization in Transit Operations

1. Waste Oil Used as a Diesel Fuel Extender

Waste oils have often been burned as a fuel. The increasing price of diesel fuel has created a possible utilization of waste oil as a diesel

TABLE 2

OIL RECLAIMERS LOCATED IN MICHIGAN

Astro Oil Company
27801 Cooke Street
Flat Rock, Michigan 48134
(Raymond Fifelski)

Dearborn Refining Company
Phillips Waste Oil Pick-Up)
3901 Wyoming, P.O. Box 525
Dearborn, Michigan 48121
(Charles O. Horton)

Edward's Waste Oil & Road
Oiling Service, Inc.
530 So. Rouge Street
Detroit, Michigan 48217
(Elizabeth Gorecki)

Environmental Waste Control, Inc.
24901 Northwestern Highway
Suite 210
Southfield, Michigan 48075
(Carl W. Hornby, Jr.)

General Oil Company, Inc.
12680 Beech Daly Road
Detroit, Michigan 48239
(Timothy Westerdale)

Michigan Environmental Service
Company
28032 Arsenal Road
Flat Rock, Michigan 48134
(Joseph H. Wilds)

John Peloquin Enterprises, Ltd.
1252 Dowling
Westland, Michigan 48185
(John Peloquin)

C. Stoddard & Sons Company
325 Cedar Court
Wayland, Michigan 49348
(Gerald J. Stoddard)

D.A. Stuart Oil Company, Ltd.
175 Railroad
Northville, Michigan 48167
(Richard O. Kageff)

Thrall Oil & Chemical Company, Inc.
603 Pingree Avenue
Flint, Michigan 48053
(William Thrall, Jr.)

U.P. Petroleum Conservation, Inc.
1502 Michigan Avenue
Gladstone, Michigan 49837
(Norman Thivierge)

Usher Oil Service, Inc.
9000 Roselawn Avenue
Detroit, Michigan 48204
(Morris Usher)

Systeck Waste Treatement Center
3030 Wood Street
Muskegon Heights, Michigan 49444

Michigan Petroleum
13650 Helen
Detroit, Michigan 48212

SOURCE: Michigan Department of State Highways and Transportation

extender by adding the waste oil directly into the diesel fuel storage tanks. Many common carrier operations today routinely pass their lubricating oil through a simplified filter system,to remove the solids from the oil,and then dump it into the diesel fuel storage tanks.

The major advantage of the use of waste oil as a diesel fuel extender is essentially one of economics. When used as a diesel fuel extender the waste oil has an economic value equilvalent to the price of diesel fuel. The disadvantage of this use is that the oil is lost forever, and it is impossible to reutilize this premium stock in any other process once it has been burned.

Some research has been conducted on the effects of waste oil on diesel engine wear. However, the research has been limited, and in most cases has been confined to relatively slow-speed diesel engine evaluations.[5] The research has shown, though, that there is no seriously detrimental effects to the use of waste oil, provided that the total fuel has no more than a five percent waste oil constituent. As the concentration increases above the five percent, problems associated with maintenance and wear increase at extremely rapid rates.

2. Re-refined Lubricants

Re-refined lubricants have been available in the United States almost since the automobile has been a generally accepted means of mass transportation. However, the industry has been declining since the early 1960's. At that time there were approximately 150 refiners producing about 300 million gallons of re-refined oil products. Today, fewer than 40 companies are still in business, are producing less than 100 million gallons of product and many of these refiners are operating at abcut 50 percent of capacity.

The reasons for the decline in the use of refined lubricants are both technical and economic. In the last decade lubricating oils have become much more complex because of the use of 15 or more chemical additives. The complexity of these additives makes the re-refiner's task much more difficult. As a result he is confronted with increasing costs for each

gallon of product that moves through his system. Additionally, there has been general increased drain periods for lubricating oils: The quantities of oils that come on the market from each source are not as great, and the collection calls have increased as well.

The re-refiner was dealt a setback when the Internal Revenue Service declared the re-refiner ineligible for refund of the tax on the virgin oil component that goes into a blended product. The inability to obtain relief on this tax refund, plus some losses that occurred from the excise tax reduction act, caused the re-refiner to absorb about 9¢ per gallon adjustment, relative to his position prior to 1965. Because profit margins in the industry have traditionally been very narrow (on the order of about 2¢ per gallon or less), the actions of the federal government have been cited by the re-refiners as the major cause for the decline of the industry.

Other setbacks that the re-refiners have had to face in the last ten to 15 years are related to labeling requirements on the oil can, and to military specifications prohibiting the use of re-refined lubricants. In the labeling requirement area, the Federal Trade Commission ruled that all re-refined products must be clearly labeled "made from previously used oils." The industry contends that this is grossly unfair, and that the wording implies an inferior quality of product. As a result of this inference, many middlement have stopped handling the re-refiners' products, and the re-refined oil now must compete in price with low quality virgin oil.

The Department of Defense issued procurement regulations about ten years ago prohibiting the use of re-refined lubricants in military vehicles. This regulation still exists, even though the Defense Department is now developing a program to experiment with recycled oils. If the results of this program are positive, the policy would probably change.

To assist the re-refining industry, the U.S. Department of Energy is attempting to have the excise tax provisions amended on virgin lubricating oils that are used in re-refined lubricants.[6] The amendment

would exempt re-refiners who blend virgin of less that 50 percent from paying the tax on the virgin oil component.

The Department of Energy has also been attempting to improve the methods of collecting oils. They have developed a model "waste oil" bill that sets up procedures for licensing the collectors and receivers of waste oil so as to encourage recovery and pollution abatement.

The Department of Energy has also been working with local governments to establish successful waste oil recycling demonstration programs. Materials have been developed that can be used at the local level to organize collection programs. The material describes who are the most likely organizations that will have waste oil available for collection, and the methods of publicizing the benefits of the collection program to the general public. A sample of the material is in the Appendix.

C. Conclusions

There will be a growing effort throughout the United States to improve the collection of waste oil. This factor and other system improvements will enhance the economics associated with re-refining of waste oils. The U.S. Department of Energy has undertaken programs to encourage the collection of oils. In addition, the Department has been expending considerable amounts of money to develop more ecologically acceptable re-refining programs. The re-refining processes are being continually upgraded to improve the capability of accepting the wide variety of waste oils, and to control the processing of these waste oils once they are in the refining system.

It appears inevitable that increased waste oil recovery and expanded reutilization will soon be a fact in the U.S. Such a condition already exists in Europe, where lubricating oils and virgin oil feedstocks are more expensive than in the United States. Most experts believe it is only a matter of time before the same types of programs will be in place in this country.

III. ANALYSIS OF SPECIFIC OPTIONS.

A. Waste Oil Used as Motor Fuel Extenders

One opportunity for public transit reutilization of waste lubricating oil is to recycle the oil back into the system as a motor fuel extender. The attributes of the lubricating oils, however, are such that the most appropriate use is as an extender for diesel fuel. In this regard, there have been programs underway for a number of years in commercial fleet operations where the waste lubricating oil is recycled by flowing the crank case drainage through a filter system. This filtering removes the solids and the water; the lubricant is then placed directly into the diesel storage tanks. The commercial operators have learned that the program operates relatively successfully as long as the mixture of waste lubricant remains at fairly low concentrations. This is consistent with a study by the U.S. Coast Guard that investigated methods of utilizing the waste lubricating oil in the ship's main power systems.[7] A conclusion of that study was that mixing of waste oil with diesel fuel was satisfactory at mixing ratios of 5:100 or less.

Another diesel fuel extender program was performed by Cummins Engine Company for their diesel engines in the Coors Beer Company truck fleet. This program consisted of filtering the drain diesel lube oil through four filters identical to "spin-on" diesel bypass filters, except for a final Luber-Finer (the Luber-Finer is a trademark of Luber-Finer, Inc., division of Rockwell International). This filtered oil is mixed with fuel oil at a ratio of three percent by volume and burned in the Coors truck fleet. Since the Coors test, Cummins Engine Company has released a service bulletin on the use of treated five percent lube oil in No. 2 diesel fuel. The bulletin indicates that there is no serious problem with the use of the lube as long as the treatment procedures follow those as described in the service bulletin.[8]

Kroger Company, Cincinnatti, Ohio, has also developed a lube oil burnoff program for its fleet of trucks equpped with Detroit diesel 8V-71 engines. Four engines are operated on a five percent lube oil/fuel oil mixture. The filtering system used is a specifically designed

Fram unit. The International Harvester Company has also issued a service bulletin for its diesel engine users which recommends filtering the waste lube oil through a funnel with a fine mesh screen. The filtered oil is added to the trucks'fuel tanks,which are then filled with diesel fuel up to a maximum of six and one-half percent lube oil/fuel oil ratio.[9]

There has been no known test operations involving attempts to utilize lube oil as an extender for gasoline. Common engineering judgment would indicate that such an attempt would produce severe engine function problems,since the waste lubricating oil has a very low octane number. Unless extremely low mixture ratios ocurred (on the part in the range of one-tenth of one percent) the resulting mixture would be a sufficient reduction in octane number; this would cause detonation problems in the engine.

The main advantage of using waste lube oil as a diesel fuel extender is that there is very little capital investment required, and the transit operator can quickly realize savings from implementation of a program. The investment required for a typical operation would be $1000 or less, which would be the cost for a filtering mechanism to remove the solid particles from the lubricant when it is taken from the crankcase. Presently, the benefits or savings would be approximately 40-60¢ per gallon, which is the approximate price range for diesel fuel. (Since the waste lubricant has approximately the same heat value as regular diesel fuel, the savings would be approximately equal to the cost for diesel fuel).

B. Re-Refined Lubricants

Lube oils are only partially consumed during their lubricating service. Their quality is generally degraded by oxidation decomposition of mineral oil and/or additives, and by contamination. The fact remains, however, that a large proportion of the used oil consists of high-quality hydrocarbons contained in the original lube. Recovering these hydrocarbons from their decomposition products, contaminants, and dilutents, so they can be reblended and reused,provides the framework by which re-refined oils are handled.

The re-refiner uses essentially the same unit processes as the virgin oil refiner. However, re-refining is a less complex operation because there is no need to separate the hydrocarbons within a common boiling range (this was done by the virgin Luber-Finer). This reduces the number of operations required to remove impurities and contaminants. Also, waste lube oils typically contain between 70 to 90 percent recoverable lube stocks. Therefore, the total volume of oil handled per volume of product is much lower.

Re-refining consists of three sequential processing steps:

1) light contaminants are removed by heating and are flashed off as an overhead product;

2) the heavy contaminants, such as dirt and metallic particles, are removed; the most common processes used to do this treat the contaminents with sulfuric acid, use vacuum distillation, or perform the the extraction process using propane;

3) the color and oxidation stability of the product is then improved by the process of clay treating or by using one of the new processes, such as hydro-treating.

Even though many processes have been proposed for re-refining lubricating oils, only four processes have been commercially or experimentally proven. A fifth process has received considerable research funds from the Department of Energy. The four proven processes are the acid/clay process, the extraction/acid/clay process, the process, and the distillation/hydrotreating process.[10] The fifth system that has been supported by the Department of Energy is a solvent/distillation process.

1. The Acid/Clay Process

This process is the most common; there are approximately 45 such plants known to exist in the United States and in Canada. The process is the oldest and is similar to the acid/clay treating processes that once were used in virgin lube oil manufacture, but now have been supplanted by other means. This process involves the use of sulfuric

acid,which reacts with and dissolves or settles the suspended solids and other impurities to form a sludge, which is removed from the oil for disposal. The waste oil is then heated and clay is added to remove any color bodies remaining after the acid treating. This mixture is finally cooled, the clay is removed by filtration for disposal,and the remaining product is the re-refined lube oil.[11]

2. Extraction Acid Clay Process

In this process the waste lube oil is dehydrated by heat and is then mixed with liquid propane and charged to an extraction tower operating at high pressure. The propane containing the dissolved oil is taken off the top of the tower while the soluble residues are drawn off the bottom. The propane is extracted from the waste oil by a reduction of pressure which causes the propane to flash off. The extracted oil, free of propane, is sent to an acid and clay treating process, similar to the one described in the preceding section.[12]

3. Distillation/Clay Process

The basis of this process is a combination of vacuum distillation to recover the lube oil fraction from the waste oil, followed by clay treating for color improvement of the recovered oils. The suspended solids are concentrated in the vacuum tower bottom stream. The lube oils are separated as distillation products from the suspended solids, additives,and other impurities. If desired, the vacuum tower can produce varying grades of lube oils by extracting them from two or more locations. These "side cuts" can have varying ranges of boiling points and viscosities. This gives the re-refiner more flexibility in blending to meet different products specifications.[13]

4. Distillation/Hydrotreating Process

Presently there are no plants of this type in operation in the United States, although one is reported to be in the planning stage for location in Canada. In the distillation/hydrotreating process the lube stocks are treated with hydrogen rather than clay.[14]

The distillation/process is identical to the distillation/clay process through the vacuum distillation step. At this point, the streams are mixed with hydrogen that has been heated and charged with a catalyst filled reactor. The treated lube oils are eventually stripped of their hydrogen and any oils that boil below the range of lube oils.[15]

5. The Solvent/Distillation Process

The solvent distillation process, developed at the Bartlesville Energy Research Center[16], is presently being considered for installation by several companies. The uniqueness of the solvent process is that the dehydrated waste oil is treated with solvent to effect separation of the sludges and additives, rather than with concentrated sulfuric acid (as occurs in the acid/clay process). The main advantages of the solvent process are (1) that the costs of solvent are significantly less than costs of the sulfuric acid used in the acid clay process; (2) the costs of clay are significantly reduced; (3) the costs in NaOH are eliminated; and (4)the sludge disposal problems are reduced by one-third. These advantages in total are more than enough to offset the greater capital costs associated with the solvents process (with the result that the solvent process is a significantly cheaper process to operate), assuming that the market is sufficiently large to handle the refiner's output.

Numerous programs in the past have evaluated the quality of re-refined oil products. In many instances the products have met all of the standards of the most severe rating scales used for virgin oil products. However, on many occasions the products have had poor quality ratings. These instances have been sufficiently frequent to result in a generally bad image for the entire re-refined oil industry.

Typical of the problems associated with the refined products having a bad image is the fact that Detroit Diesel does not recommend or support mixing any drain lube oil either as a diesel fuel extender or using re-refined lube oil as lubricating oils. They indicate that their experience has convinced them that the use of these oils as a lubricant or as a diesel fuel extender places the engine in a jeopardy, and should be avoided by the prudent operator.

Presently, the U.S. Military has a specific provision prohibiting of using re-refined oils as a lubricant in any military vehicles. When this provision was implemented, the Army Material Command believed that the use of the oils would be extremely risky and should be avoided.

For any transit operation, the crucial element in the use of re-refined oils is the quality of the product. The industry is apparently taking strides in improving the specification performance of its products. This has been especially true in the last three to four years. The National Bureau of Standards has been asked to assist in this regard by developing standards of performance for re-refined products. The Bureau has sponsored a series of workshops directed at bringing together interested persons, from both the public and private sectors, to obtain their input and opinion on current status, needs, and problems relating to standard test methods and standards for the evaluation of recycled oil products.

In addition to the work that has been done by the National Bureau of Standards, numerous pieces of federal and state legislation have been passed to encourage the use of re-refined oil products. Public Law 94-163, passed in 1975, entitled "The Energy Policy and Conservation Act of 1975," was the first significant piece of legislation with provisions directly related to the re-refined oil industry. It was in fact this legislation that directed the National Bureau of Standards to develop test procedures for determination of substantial equivalency of performance between used oil and new oil. Later legislation was the Resource Conservation and Recovery Act of 1976 (Public Law 94-580.) This legislation gave the Environmental Protection Agency broad responsibilities in resource conservation and hazardous waste management. Because re-refined oil products are directly related to conservation, this piece of legislation has direct applicability to stimulation of the re-refining industry.

At the state level there have been numerous pieces of legislation and action taken. Over ten states have ratified laws relating to used oil, and legislation is pending in seven others. Appendix A contains a model used oil recycling act that has been presented to all state offices by the Federal Energy Administration (now part of Department of Energy). This act has been proposed as legislation by several of the states.

In summary, the re-refined oil industry has had major problems in the area of quality control in the past. The major problems have resulted from the inconsistency of the specifications of incoming products, and the inability of the refiners to maintain adequate quality control of the refining process itself. Other problem areas have been (1) the Federal Trade Commission's labeling requirements on re-refined oil containers, and (2) Internal Revenue Service's position not allowing tax rebates on virgin oil used as mixing components with re-refined oils. It appears these depressing influences are being overcome, however. The major thrust, in this regard, has come from the Federal Energy Administration (with strong support from the National Re-refiners Association). Further progress should be made in the future toward improving the specification and quality of the re-refined products. Many people are forecasting that the trend of improvement will be similar to that experienced in Europe, where the re-refined oil products have shown themselves to be comparable in quality to most of the virgin oils available in the marketplace.

IV. MICHIGAN PUBLIC TRANSIT ACTION OPPORTUNITIES

A. Potential Benefits

There are two main benefits from waste oil utilization. The first is the potential economic savings; the second, the conservation of a precious resource.

Relative to the potential economic savings, it appears that for the entire State of Michigan the dollar amount is significant. If it were possible to realize a savings of five to ten cents per gallon on the lubrication oil over the presently purchased virgin oil, the potential savings to the State of Michigan and/or the public transit properties would easily be in the hundreds of thousands dollars per year. The savings in the area of potential fuel economies would be equally as interesting, when it is considered that the fuels would be replacing a diesel fuel that costs fifty to sixty cents per gallon.

Because of the apparent savings potential, many state governments have implemented programs to encourage their own operating agencies to examine the use of waste oil, either as a re-refined lubricant or as a diesel fuel extender. Several states are implementing a used-oil recycling act that gives favored treatment to firms that utilize recycled oil in their system. Some of the states are requiring licenses for waste oil collectors in an attempt to better control the collection systems for waste oil. It is believed such controls will better assure consistency of the waste oils delivered to the re-refinery for processing.

The U.S. Department of Energy has issued a used oil recycling kit to assist local citizens in developing programs for collecting waste oils within their own community. The document, publication number DOE/CS-0015, dated February, 1978, "Used Oil Recycling Kit," is available without charge to any interested local community. A copy is attached as Appendix B.

B. Demonstration Support

At present it does not appear that demonstration funds are available to public transit properties for participation in any program dealing with recycled oils. However, the U.S. Department of Energy does intend to issue an "investment opportunity" bulletin in the near future that will announce its willingness to subsidize the construction of a solvent/distillation re-refining operation.[17] It is estimated that this subsidy will be equal to approximately 80 percent of the initial capital cost of the facility. The operator will be required to operate the facility for a set period of time (it is presently estimated this requirement will be three years). In addition, the Department of Energy indicates that the selected participant in the program should have certain ongoing facilities presently available to him. Among these capabilities are a guaranteed inflow of approximately ten-million gallons of waste oil per year; it is also hoped that the participant will have a market for approximately ten million gallons of re-refined oils per year.

The purpose of the demonstration program is to prove the feasibility by actual operations of the solvent/distillation re-refining process. Officials at Bartlesville Energy Research Center estimate that the project will cost approximately three to four million dollars and that the federal subsidy will be approximately 80 percent of that amount.

Except for the announced intention of participating in a joint construction process program to test the feasibility of the solvent/distillation technique, there are no other known opportunities for demonstration support from the Federal government.

C. Program Needs for Full Realization of the Benefits of the Recycled Waste Oil Program.

Several important steps should be taken by the State of Michigan to assure maximum benefits from recovering waste oils. One of the first is that the state and the individual public transit purchasing agents should develop specifications for crankcase oil that are generally consistent with reasonable engineering practice, rather than

being excessive and impractical, as is presently acknowledged by many lubrication experts. If that were done, then it would be possible for re-refined oils to effectively compete against virgin stock lubricants in many applications. This has been proven in several states. West Virginia in its own state motor pool has proven the use of using re-cycled oil, and other states and communities are also using re-refined crankcase and oils with good results. Certainly it would be appropriate for Michigan's procurement practices to be given a more critical examination in this regard.

Individuals within the Michigan State Department of Transportation have already had extensive contacts with representatives of the re-refining industry within the State of Michigan. They have an understanding of the facilities existing at each of the companies involved in re-refining operations, and their future plans for expansion. There is not, however, an overall statewide comprehensive program of collecting waste oils in an efficient manner. It is generally conceded by most experts that one of the major keys to an effective recycling industry is to have an efficient collection system. In that regard, the state government should encourage the establishment of such collection systems at the local and regional levels.

A technical evaluation of the specifications of presently available re-refined oils in Michigan should be made. In addition, Michigan should make a detailed evaluation of the potential implications of using re-refined oils in their state vehicles and in other appropriate applications. The re-refining industry that now exists in Michigan has indicated to representatives of Michigan's State Department of Transportation a willingness to participate in any program of evaluation that may be undertaken. It is imperative, therefore, that there be a detailed and definitive assessment of the effects of re-refined oil on the state's equipment.

Because of the rapid changes occurring in re-refining technology, it is important that the State of Michigan continue to monitor (almost on a daily basis) activities throughout the nation. This is especially true in having representatives of Michigan's Department of Transporta-

tion maintain continuous contact with the National Bureau of Standards, the National Association of Petroleum Re-refiners, the Department of Energy, and any agencies in other states that are dealing in the programs on how to utilize re-refined products. The most effective way to do this is by close liaison or attendance at all appropriate conventions and meetings dealing with the use and manufacture of re-refined lubricant products.

V. CONCLUSIONS AND RECOMMENDATIONS

The most important conclusion of the study was that there is a significant potential benefit available to the State of Michigan by the utilization of waste oil products. Even though the study was initially charged with evaluating the benefits of the use of waste oil products in public transit properties, it is believed that the benefits also can be extended to all vehicles in the Michigan's motor fleet.

First there is the benefit occurring from the conservation of any expendable resource. Associated with this conservation will be significant economic benefits. Examination of the literature and discussion with responsible technical representatives in the waste oil industry indicates that significant progress has been made in the quality control of re-refined lubricant products. As a result the main economic dis-incentive of potential engine damage from use of poor quality products is diminished.

Secondly, the use of waste oil as a diesel fuel extender is an effective method of utilizing waste oil. The benefits of such use indicate that the savings will be roughly the equivalent of the cost of diesel fuel on a gallonage basis. Most researchers indicate there will be no harmful effects on the wear and durability of engines utilizing waste oil as diesel fuel extender, provided the ratio of waste oil to diesel fuel is less than five percent. However, a concentration of one to one-hundred would be a preferable relationship.

A third conclusion of the study was that any effective waste oil recovery program within the State of Michigan needs the support of the state government, particularly in establishing model legislation to encourage the development of an effective collection system. The Appendix A of this report contains a draft legislative engabling act (recommended by the U.S. Department of Energy).

A fourth conclusion was that the downward trend of re-refining operations in the United States is expected to stop, and future upward growth of the re-refining industry is expected. It is believed that most negative and inhibiting elements will be eliminated in the near future.

Foremost among these is the elimination of a U.S. Internal Revenue tax on virgin oil used in re-refined lubricants. Elimination of this tax will provide a significant economic incentive to the re-refiners. Effective steps are also being taken by the U.S. Government, especially the U.S. Department of Energy, in attempting to eliminate negative labeling provisions.

Finally, there will soon be effective specifications (developed by the National Bureau of Standards) by which users can evaluate the quality and actual lubricating capabilities or re-refined lubricants.

There are several study recommendations. The first recommendation is that the State of Michigan should actively pursue the possibility of incorporating re-refined lubricants into the state's vehicle fleet.

Secondly,the Department of Transportation should encourage the Michigan Legislature to enact enabling legislation that will assist in the development of a more effective and healthy re-refining and waste oil utilization industry in the State of Michigan.

Thirdly, Michigan should develop close liaison and continuing relationships with appropriate personnel within the U.S. Department of Energy, and with organizations in other states that are pursuing the utilization of re-refined lubricating products.

Fourthly, there should be a complete survey of local programs throughout the United States involved in the collection and reuse of re-refined products. This would be most appropriately done by maintaining contacts with the National Bureau of Standards, the U.S. Department of Energy, and other states that are involved.

Fifthly, an economic analysis of the current state of the oil recycling industry in the State of Michigan should be conducted. This analysis should include data on the production, feed stock supplies, collection, transportation, and end use of these products. It should also include recommendations on appropriate fiscal and legislative actions that the state could and should implement to more effectively encourage the growth of this industry.

A final recommendation is that the State of Michigan should pursue the possibility of obtaining the Department of Energy construction subsidy for the establishment of a solvent/distillation re-refining plant. This would be done by developing close contacts with the state's existing re-refiners, and determining if any of these refiners, singly or as a group, are interested in the project. If it is determined that sufficient interest exists, then the State of Michigan should develop a well-coordinated proposal to present to the Department of Energy to have the facility constructed in the state.

References

1. Waste Oil Fact Sheet, Federal Energy Administration, Office of Industrial Programs, June, 1975.
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3. Ibid., Waste Oil Fact Sheet, FEA.
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5. J.R. Hobbs, and R.A. Welter, Waste Oil Burn-Off in Coast Guard Power Plants. Final Report, June,1976, U.S. Department of Transportation. Report No. CG-D-78-76.
6. Personal Interview, Legal Counsel, Association of Petroleum Re-refiners, Washington, D.C., August, 1978.
7. Ibid., J.R. Hobbs, et al.
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10. Waste Oil Recycling Study, TEKNEKRON, Inc., Berkley, California, March, 1976. Sponsored by Ministry of Energy, Provision of Ontario.
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17. Personal Interview, Mr. Jerry Collins, Department of Energy, August, 1978.

APPENDIX "A"

A Model Used Oil
Recycling Act

Prepared by
Environmental Law Institute

for

Federal Energy Administration
Office of Conservation
State Programs

A Bill

To encourage recycling of used oil.

Short Title

SECTION 1. This Act may be cited as the "Used Oil Recycling Act."

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Definitions

SECTION 2. As used in this Act:

(a) "used oil" means a petroleum-based oil which through use, storage or handling has become unsuitable for its original purpose due to the presence of impurities or loss of original properties;

(b) "recycle" means to prepare used oil for reuse as a petroleum product by refining, rerefining, reclaiming, reprocessing or other means or to use used oil in a manner that substitutes for a petroleum product made from new oil, provided that the preparation or use is operationally safe, environmentally sound, and complies with all laws and regulations;

(c) "Director" means the [chief executive officer] of [the agency for environmental protection];

(d) "person" means any individual, private or public corporation, partnership, cooperative, association, estate, municipality, political or jurisdictional subdivision, or government agency or instrumentality.

Commentary:

(a) "Used oil" is preferable to "waste oil" since it indicates possibilities for further use rather than readiness for disposal. Used oil includes, but is not limited to, crude oil, fuel oil, lubricating oil, hydraulic oil, electrical oil, refrigeration oil, cutting oil, oil emulsion, kerosene, diesel fuel, and other non-chlorinated industrial oil, that are discarded as waste or recovered from oil separators, oil spills, tank bottoms or other sources. Used oil does not include an insoluble or partially soluble organic chemical or petroleum derivative which requires special handling precautions because of toxicity, composition, or flammability including but not limited to gasoline, a petroleum solvent, a chlorinated solvent or oil, an aromatic, organic pesticide, polychlorinated biphenyl, and a low-boiling ketone, alcohol or ether.

(b) "Recycle" is now a popularly understood word for recovery and reuse of resources. Recycling of used oil is defined as any preparation for reuse or use in place of new oil which is operationally safe (*i.e.*, will not pose risks of fire or explosion), environmentally sound (*i.e.*, will not endanger public health or environmental quality), and complies with all laws and regulations.

The listed means of preparation, *i.e.*, refining, rerefining, reclaiming and reprocessing, have more or less defined vernacular meanings:

> The term "refine or rerefine" means to use refining technology in the treatment of used oil to remove physical and chemical contaminants and enhance used oil quality so as to produce lubricating oil or other petroleum products that are similar to new oil intended for the same purpose. The technology includes, but is not limited to, the use of distillation, chemical treatment, oil additives, hydrogen treating, and various physical treatments.
>
> The term "reclaim" means to use physical methods, short of those used in rerefining, to cleanse used oil for further use for its original or similar purpose. The methods include settling, heating, dehydration, filtration and centrifuging and may entail use of oil additives.
>
> The term "reprocess" means to use minimal physical methods to remove water and suspended solids from used oil in preparation for its use primarily as a fuel or fuel supplement. The methods may include settling, chemical pre-treatment, filtration, and dehydration.

(c) The director of an agency responsible for energy conservation or public health could also be named.

Findings

SECTION 3. The [legislature; council] finds that [millions] of gallons of used oil are generated each year in the [State; municipality]; that used oil is a valuable petroleum resource which can be recycled; and that, in spite of this potential for recycling, significant quantities of used oil are wastefully disposed of or improperly used by means which pollute the waters, land and air and endanger the public health and welfare.

Commentary:

As the following table shows, in all states the amount of industrial and automotive used oils generated exceeded one million gallons in 1971. For local jurisdictions the amounts would depend on population and industrial characteristics.

Although dirty and contaminated, used oil is composed mostly of lube oil fractions, a small but valuable portion of a barrel of crude oil, and has high heating value.[1] Used oil can be rerefined into lubricating oil[2] or used as a feedstock in the manufacture of other petroleum products. It can be reclaimed and used again for its original purpose, can be reprocessed to fuel oil and, under controlled conditions, can be safely burned untreated.[3]

The best estimate of the ultimate fate of the 1.1 billion gallons of used oil generated annually in the United States is: 480 million gallons (43 percent) used as fuel, treated or untreated; 90 million gallons (8 percent) rerefined to lube oil; 200 million gallons (18 percent) used as road oil or in asphalt; and the fate of 340 million gallons (31 percent), including the 30 million gallons of rerefining wastes, is unknown. Better estimates of the ultimate fate of used oil are not possible because of the lack of means of accounting for it across the fragmented collection, rerefining and disposal systems.[4]

Most used oils contain heavy metals and organic compounds which are toxic and, in some instances, carcinogenic, if ingested or inhaled.[5] Disposal on land contributes to water pollution either directly or by leaching, and may make the land unproductive and result in ground water contamination.[6] Incineration or uncontrolled burning releases metallic oxides, principally lead, to the air; the Environmental Protection Agency has determined that concentrations of certain airborne metals, including lead, endanger public health.[7]

References:

1. Waste Oil Study: Preliminary Report to Congress, U.S. Environmental Protection Agency, April 1973.

2. Report to Congress: Waste Oil Study, prepared by the Environmental Protection Agency, Washington, D.C. 20460, April 1974, Section VI.

3. *Id.*, Section VII.

4. *Id.*, page 25.

5. *Id.*, Section IV. *See also*, Irwin and Liroff, Used Oil Law in the United States and Europe, U.S. Government Printing Office, EPA-600/5-74-025, July 1974, pages 16–20.

6. *Id.*, p. 33.

7. *Id.*, pages 66–67. The EPA regulations requiring reduction of lead in gasoline were upheld by the District of Columbia Court of Appeals on March 19, 1976 (*Ethyl Corp. v. EPA*, 6 ELR 20267).

Table I:
Used Oil Generation by State (1971 Data)

State	Automotive (gallons)	Industrial (gallons)
Alabama	12,182,640	4,719,116
Alaska	1,395,900	190,920
Arizona	6,358,600	1,279,087
Arkansas	8,008,590	3,085,107
California	72,034,320	20,021,638
Colorado	8,229,900	1,920,620
Connecticut	6,743,770	3,652,711
Delaware	1,624,870	435,653
Florida	14,445,970	5,056,982
Georgia	14,495,260	6,442,547
Hawaii	1,857,600	*
Idaho	3,435,230	392,549
Illinois	37,263,020	26,383,747
Indiana	17,722,970	12,991,233
Iowa	11,103,710	2,400,122
Kansas	14,381,400	2,979,826
Kentucky	14,075,660	639,301
Louisiana	15,163,310	12,070,643
Maine	3,339,070	822,170
Maryland	7,286,110	3,102,488
Massachusetts	13,404,420	6,129,556
Michigan	37,488,000	19,571,150
Minnesota	14,533,400	3,213,530
Mississippi	9,185,500	2,707,690
Missouri	19,701,790	4,283,712
Montana	4,191,070	503,289
Nebraska	8,846,970	1,633,035
Nevada	2,381,820	257,644
New Hampshire	1,680,430	257,769
New Jersey	18,071,960	18,459,034
New Mexico	4,760,980	1,548,790
New York	32,016,880	15,546,678
North Carolina	13,832,020	4,585,158
North Dakota	4,046,060	271,254
Ohio	36,627,970	29,795,774
Oklahoma	12,295,480	4,249,737

State	Automotive (gallons)	Industrial (gallons)	State	Automotive (gallons)	Industrial (gallons)
Oregon	12,020,320	2,977,082	Washington, DC	1,638,780	*
Pennsylvania	35,728,740	27,823,461	West Virginia	6,530,830	7,432,560
Rhode Island	1,912,560	770,858	Wisconsin	17,262,010	5,073,985
South Carolina	6,432,670	1,678,776	Wyoming	2,563,700	470,723
South Dakota	4,400,210	203,592			
Tennessee	12,665,700	10,442,178			
Texas	47,222,230	32,778,546			
Utah	4,647,950	1,062,643			
Vermont	1,330,400	190,565			
Virginia	10,839,430	3,017,776			
Washington	11,047,210	2,845,560			

* Not available

Source: GCA Corporation, *Waste Automotive Lubricating Oil Reuse as a Fuel*, published report EPA-600/5-74-032, Environmental Protection Agency, September 1974.

Policy

SECTION 4. Used oil shall be collected and recycled to the maximum extent possible, by means which are economically feasible and environmentally sound, in order to conserve irreplaceable petroleum resources, preserve and enhance the quality of natural and human environments, and protect public health and welfare.

Commentary:

The statement of policy provides a general purpose and constitutional foundation (protection of public health and welfare), two principal components of that purpose (resource conservation and environmental protection), two means for achieving the purpose (collection and recycling) and two flexible concepts for implementing the means for achieving the purpose (economically feasible and environmentally sound).

Subsequent sections of this Act empower the Director, through a system of rules, licenses, special permits, and prohibitions, to execute this policy.

The implementation of this policy in a particular area will depend on what the environmental constraints and economic markets are. From the viewpoint of environmental soundness, if air pollution standards are stringent and hazardous waste disposal facilities for recycling wastes are available, more used oil may flow to rerefining or reclaiming or both. Conversely, if environmental standards permit, more used oil may flow to other uses.

Economic feasibility is the other key concept. An activity is economically feasible if the revenues from it are at least equal to the costs of doing it, including a competitive return on the investment in the activity.

The amount of used oil collected depends on many factors, including, but not necessarily limited to, the concentration of used oil collection sites within an area, the quantities of used oil available, the type and quality of used oil to be collected, and, most importantly, whether a market exists for the collected oil.

Prohibitions

SECTION 5. (a) No person shall collect, transport, transfer, store, recycle, use, or dispose of used oil in any manner which endangers the public health or welfare, or violates any law or regulation.

(b) Disposal of used oil by discharge to sewers, drainage systems, surface or ground waters, watercourses, or marine waters; or by incineration or deposit on land, unless in accordance with a special permit authorized by section 10, is prohibited.

Commentary:

The means of disposal named here are those which are most clearly wasteful and harmful to the environment. The general prohibition is intended to cover other uses or means of disposal which endanger public health, such as emissions or residues from recycling and depositing used oil in one's garbage. Applicable environmental and other laws and regulations are also included.

Public Education

SECTION 6. The Director shall conduct a public education program to inform the public of the needs for and benefits of collecting and recycling used oil in order to conserve resources and preserve the environment. As part of this program, the Director shall:

(a) adopt rules, in accordance with section 11(a), requiring sellers of more than 500 gallons of lubricating or other oil annually in containers for use off the premises to post and maintain at or near the point of sale durable and legible signs informing the public of the importance of proper collection and disposal of used oil, and how and where used oil may be properly disposed of, including locations and hours of operation of conveniently located collection facilities;

(b) establish, maintain and publicize a used oil information center that will explain local, state and federal laws and regulations governing used oil and will inform holders of quantities of used oil on how and where used oil may be properly disposed of; and

(c) encourage the establishment of voluntary used oil collection and recycling programs and provide technical assistance to persons organizing such programs.

Commentary:

Public education is potentially a very effective component of the Director's used oil program.

Signs posted where those who change their own oil purchase it informing them of the location of the collection facilities established in accordance with section 7 would promote both the establishment of the facilities and public knowledge of why and how they should be used.

Public understanding of the law is important to the acceptance and success of the Director's program and should be a part of his public education efforts. Provisions of federal law, such as EPA rules for

labels on oil containers concerning proper disposal of oil after use (when that requirement of section 383 of the Energy Policy and Conservation Act becomes effective) should also be explained.

Public information and education functions—such as telling a member of the public or commercial generator where the nearest used oil deposit facility is or who the collectors in an area are—could best be coordinated and performed by a member of the staff responsible for a used oil information and education center. Some state agencies have such personnel; they are also available from extension services.

Technical assistance for voluntary recycling programs would include providing local groups with materials which contain a how-to-do-it manual for creating community recycling programs, along with a suggested brochure, poster and bumper sticker and case histories of successful local programs, and would stimulate interest and effort which complement the state or municipal regulatory activities.

In addition, brochures could be provided for distribution by all retailers of oil and by the department of motor vehicles in conjunction with drivers' licensing or testing or vehicle registration. Used oil units could be prepared for inclusion in driver or automotive education courses.

Collection Facilities

SECTION 7. The Director shall by rule adopted in accordance with section 11(a) prescribe means for the provision of safe and conveniently located collection facilities for the deposit of used oil by persons possessing not more than 5 gallons at one time at no cost to those persons. The Director may require public persons or sellers of more than 500 gallons of lubricating or other oil annually in containers for use off premises, or both, to provide or contract for the provision of such facilities.

Commentary:

Within the last ten years, there has been a significant upturn in "do-it-yourself" oil changes. This trend is reflected in the large volume of retail automotive lubricating oil sales in mass-market retail stores. It is estimated that retail sales today of lubricating oils at non-service station outlets constitute between 40 and 60 percent of all automobile lube oil sales, and few provide facilities for return of used oil. For lack of an alternative, individuals who change their oil, in doing so, often discard the used product where they can—in the garbage, down storm sewers, and in vacant lots. Such disposal wastes a valuable resource, and may create a fire hazard or produce water pollution. Many "do-it-yourselfers" interviewed in a recent survey conducted for EPA indicated a willingness to return used oil, provided a convenient mechanism for doing so existed. This section is designed to require the provision of convenient places for the deposit of small quantities of used oil.

Creation and maintenance of collection facilities could be the responsibility of those who retail oil, or of municipal governments (*e.g.*, fire stations, sanitary landfills, etc.) or of state government, or of a combination of any of these. The responsible persons could of course contract for the provision of the facilities.

Collection facilities should be located as conveniently as possible for the benefit of those who change their own oil. Those who change their own oil will probably neither travel far nor pay anything to deposit their used oil. The Director's rules could require that private and public facilities combined be made available on a per capita or per square mile basis.

The limitation on gallons deposited at one time is designed to prevent overloading of facilities. Those who generate larger amounts of used oil should create their own storage facilities and arrange for regular pick-up by collectors licensed in accordance with section 8.

Whoever maintains collection facilities should secure them from theft, tampering or threat of fire and should post a sign at each site stating clearly that they are only for used oil, not for paints, solvents, gasoline, pesticides, or other wastes.

Licenses for Used Oil Collectors

SECTION 8. (a) A person who transports more than 500 gallons of used oil annually over public ways, hereinafter referred to as a used oil collector, or any storage facility that receives more than 10,000 gallons of used oil annually from one or more used oil collectors, also referred to as a used oil collector, shall do so in accordance with a license issued by the Director.

(b) A licensed used oil collector shall transfer used oil only to another used oil collector licensed under this section; a recycler licensed under section 9; a person with a valid special permit issued under section 10; or a person outside the [State; municipality].

(c) A licensed used oil collector shall provide a receipt to any person to whom used oil is transferred; maintain a complete record of all such transactions, documented by reproducible receipts, for two years; and make fully available to the Director, upon request, all records and copies of receipts for the purpose of review and audit.

(d) A licensed used oil collector shall submit an annual report to the Director on his activities during the calendar year based on the records kept in accordance with section 8(c). The report shall state simply the quantities of used oil possessed at the beginning and end of the reporting period, the total amount collected and the amounts transferred during this period. The amounts transferred shall be itemized as follows: to collectors, recyclers and special permit holders in the [State; municipality], and by State or foreign country for those persons outside the [State; municipality].

Commentary:

A used oil collector is defined to exclude those who transport only on their own property or who transport small amounts. Licensing of collectors should limit the number of unreliable or unscrupulous "gypsy" operations which flourish when used oil is in demand. The 500 gallon threshold permits storage and transport by persons not in business to collect used oil.

Subsections (b), (c) and (d) are designed to permit control of the flow of used oil

into approved uses and to provide information which will enable monitoring and eventual management of those flows.

In many metropolitan areas collectors pick up oil in one jurisdiction and deliver it in another. In order that receiving states are notified of the amount and locations of delivery, out-of-state as well as intra-state information should be recorded on the collector's annual report and the Director should send to his counterparts in another state the information contained in the reports pertaining to that state.

Licenses for Used Oil Recyclers

SECTION 9. (a) A person who recycles 5,000 gallons or more of used oil annually shall do so in accordance with a license issued by the Director.

(b) A licensed used oil recycler shall provide a receipt to any person from whom used oil is received; maintain a complete record of all such transactions, documented by reproducible receipts, for two years; maintain records on the quantities of used oil recycled; and make fully available to the Director, upon request, all records and copies of receipts for the purpose of review and audit.

(c) A licensed used oil recycler shall submit an annual report to the Director on his activities during the calendar year based upon the records kept in accordance with section 9(b). The report shall state simply the quantities of used oil possessed at the beginning and end of the reporting period, the total amount received, and the amounts recycled during this period. The amounts recycled shall be itemized as follows: prepared for reuse as a petroleum product; consumed in the process of preparing for reuse, including wastes generated; and other uses, specifying each type of use.

Commentary:

This section authorizes licensing of those who recycle used oil in order to provide outlets for the oil collected and to control potential adverse environmental effects of recycling or its byproducts. In addition, these persons should be identified in conjunction with section 12 dealing with recycled oil products.

The 5,000 gallon threshold could be different, depending on the desired trade-off between scope of coverage and administrative burden.

Subsections (b) and (c) are designed to complement sections 8(c) and 11(e).

Special Permits for Other Uses or Disposal

SECTION 10. (a) A person who uses or disposes of more than 55 gallons of used oil annually by means other than recycling, including

but not limited to road oiling, incineration and landfilling, shall do so only in accordance with a special permit issued by the Director.

(b) A special permit holder shall provide a receipt to any person from whom used oil is received; maintain a complete record of such transactions, documented by reproducible receipts, for two years; maintain records on the quantities of used oil used or disposed of; and make fully available to the Director, upon request, all records and copies of receipts for the purpose of review and audit.

(c) A special permit holder shall submit an annual report to the Director on his activities during the calendar year based on the records kept in accordance with section 10(b). The report shall state simply the quantities of used oil possessed at the beginning and end of the reporting period, the total amount received, and the amounts used and disposed of during the period. The amounts used or disposed of shall be itemized as follows: type of use and method of disposal.

Commentary:

In certain circumstances, for example, where it would be unreasonably expensive to bring used oil in for recycling, or where the capacity for recycling is not available, other uses or means of disposal may be permitted provided that they are environmentally sound, even though they may involve the loss of resource.

This section provides the Director necessary flexibility in implementing the Act's policy, that is, in determining economic feasibility and environmental soundness.

Use or disposal of less than 55 gallons a year does not require a special permit. This would exempt several uses of used oil on the farm or in small shops, for example.

Subsections (b) and (c) are designed to complement sections 8(c) and 11(e).

Administration

SECTION 11. (a) The Administrative Procedure Act [or other appropriate statute or ordinance governing rule making and adjudication] applies to all actions taken under this Act.

(b) The Director shall adopt rules in accordance with section 11(a) governing contents of and fees for applications for licenses and special permits under this Act and procedures for review of applications and for issuance, renewal, denial, and revocation of licenses and special permits. These rules shall provide for joint licenses or special permits for persons requiring more than one authorization under this Act or other acts administered by the Director. The Director shall also adopt rules prescribing provision of receipts, the keeping of records and the filing of reports by license or special permit holders.

(c) The Director shall issue a license or special permit upon determining that the proposed means for collection, transport, transfer, storage, recycling, use, or disposal is operationally safe, environmentally sound and consistent with the policy of this Act and shall impose terms in a license or special permit requiring the license or special permit holder to install or effect controls, processes, or practices necessary to insure continuous compliance with existing laws and regulations.

(d) A license or special permit shall be valid for one year, but may be renewed upon application.

(e) The Director shall prepare and submit an annual report to the [legislature; council], based in part on information submitted in accordance with sections 8(d), 9(c), and 10(c), summarizing information on used oil collection and recycling, licenses and special permits, analyzing the effectiveness of the Act's provisions in implementing the policies of section 4, and making recommendations for necessary changes in the provisions or their administration.

(f) The Director shall fully implement all sections of this Act as soon as practical, but in no event later than two years after the effective date of this Act.

Commentary:

(a) Adherence to an administrative procedure act, in addition to ensuring due process, makes administration of this Act consistent with existing statutes.

(b) The extent of information required on an application may vary among states and kinds of activities applied for. The Director's rules could call for name and address; kind and capacity of recycling facilities (or location of site and means of proposed disposal or use under special permits); amounts of used oil to be recycled, used or disposed of; kinds and amounts of wastes generated and waste management practices, etc.

Fees for applications should not be so high as to discourage entering the business; other means of funding this program are available.

Keeping of records enables monitoring and evaluation of practices and programs designed to regulate them.

(c) Whatever the recycling, use, or disposal authorized, the authorization should require compliance with all current laws, regulations and environmental standards. Licenses could prescribe a schedule for achieving compliance by a facility needing time to do so.

(d) The term of a license or permit could be shorter or longer. The relatively short term of a year is suggested as an accommodation between the ease of administration of a longer term and the greater flexibility of control of a shorter term.

Recycled Oil Products

SECTION 12. (a) A person may represent any product made in whole or in part from used oil to be substantially equivalent to a product made from new oil for a particular end use if substantial equivalen-

cy has been determined in accordance with rules prescribed by the Federal Trade Commission under section 383(d)(1)(A) of the Energy Policy and Conservation Act, P.L. 94-163, or if the product conforms fully with the specifications applicable to that product made from new oil. Otherwise, the product must be represented as made from previously used oil.

(b) All officials of this [State; municipality] shall encourage the purchase of recycled oil products represented as substantially equivalent to products made from new oil in accordance with section 12(a).

Commentary:

This section is designed to facilitate the sale of recycled oil products of sufficient quality to meet their intended uses and to proscribe misrepresentation of recycled oil products. There have been numerous alleged instances of selling used oil which has merely been decanted as "home heating oil;" burning such oil poses risk of damage to furnaces.

State and local officials should encourage the purchase of recycled oil products by public and private persons in order to provide a market for them and an example of their utility.

Enforcement and Penalties

SECTION 13. (a) The Director shall enforce compliance with the provisions of this Act and with the terms of licenses and special permits issued in accordance with this Act.

(b) The Director is authorized to employ the following means of civil enforcement: inspection of the operations of a license or special permit holder; issuance of an administrative order directing specified actions in accordance with a specified schedule; imposition of a civil administrative penalty of up to $500 per day for each violation; revocation of an issued license or special permit, after providing an opportunity for a hearing; and a civil action seeking equitable relief or civil penalties of up to $1000 per day for each violation or both.

(c) A person who violates sections 5 or 12, or any term of a license or special permit issued under this Act, is guilty of a misdemeanor and may be fined up to $5000 per day for each violation.

Commentary:

Enforcement is essential to the credibility of any regulatory system and is therefore required of the Director. A selection of administrative actions and civil enforcement techniques is authorized in order to provide the flexibility needed to tailor an enforcement action to the nature of the violation. Civil administrative penalties, although not so common at the state level as at the federal, have proved effective where states have employed them, *e.g.*, Illinois, Pennsylvania, and Connecticut. Violation of the central provisions of

the Act is made a misdemeanor for each day of violation.

Where state law requires, the Director would utilize the authority provided in this section in collaboration with the office of the attorney general.

Severability

SECTION 14. If any provision of this Act or the application of it to any person or circumstance is held invalid, the invalidity does not affect other provisions or applications of the Act which can be given effect without the invalid provision or application, and to this end the provisions of this Act are severable.

Commentary:

This section enables the continued validity of the remainder of the Act if a part of it is found unconstitutional.

Repeal

SECTION 15. The following acts are repealed:

Commentary:

Sections of existing law which conflict with provisions of this law should be specifically referred to and expressly repealed in order to avoid questions of interpretation.

Effective Date

SECTION 16. The effective date of this Act is 90 days after the date of enactment.

Commentary:

This section postpones the effective date of this Act 90 days in order to provide the Director time to organize implementation. This section ties in with section 11(f), in which the Director is allowed a maximum period of two years after the effective date to fully implement all provisions.

APPENDIX "B"

USED OIL RECYCLING KIT

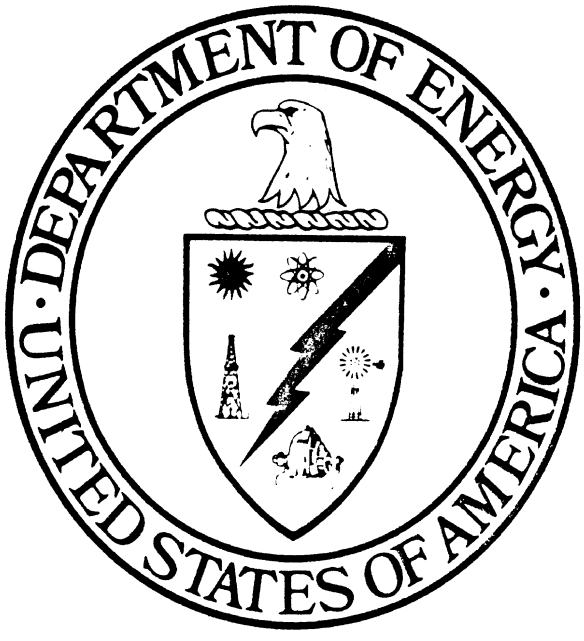
DOE/CS-0015

February 1978

United States
Department of Energy

Assistant Secretary for
Conservation and Solar Applications

USED OIL RECYCLING KIT



For additional copies of this report, write:

U.S. Department of Energy
Office of Administrative Services
Washington, D.C. 20545

DOE/CS-0015

February 1978

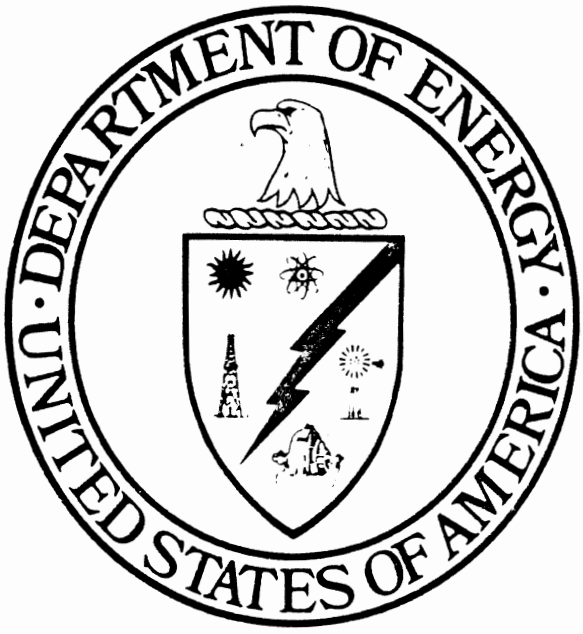
UC-13

United States
Department of Energy

Assistant Secretary for
Conservation and Solar Applications

Washington, D.C. 20461

USED OIL RECYCLING KIT



FROM THE OFFICE OF STATE-SPECIFIC PROGRAMS
CONSERVATION AND SOLAR APPLICATIONS

We are pleased to send you this "Used Oil Recycling Kit." It provides basic facts, ideas, and sample tools necessary to start a communitywide used oil recycling program built around the theme: CONSERVE OUR ENERGY. PRESERVE OUR ENVIRONMENT. Our slogan is: RECYCLE USED OIL!

Each year more than 100 million gallons of valuable used lubricating oil are wasted by America's car owners who change their own oil. Much of this used lubricating oil is disposed of in an environmentally hazardous manner. That's a staggering figure; particularly with today's energy problems.

It doesn't have to be this way--as an increasing number of States and communities are realizing. Successful used oil recycling programs have been established in various parts of our country; programs that involve all sectors of the community, from industry to the "do-it-yourself" mechanic who changes his or her own automobile oil.

However, the overall success of this program is dependent, in large part, upon your help and that of all citizens concerned with the utilization of such a viable resource as used oil.

It is felt that your community's information package should include each of the items listed below. However, our "Kit" merely provides a portion of them. The remaining (i.e., Citizen Brochure, Poster and Bumper Sticker) should be tailored explicitly to your determined needs and can be as simplistically or comprehensively designed as you consider appropriate. Information from either the USED OIL REPORT or POLICY AND PROGRAM paper (also included) can prove useful in brochure preparation.

- Instruction Booklet - a step-by-step outline on how to proceed.
- Citizen Brochure - promoting your program.
- Press Release - to all media and community groups.
- Poster - for a collection point.
- Bumper Sticker - for use also as a sign.
- Letter to civic leader - asks civic leaders and others to help.
- Letter to Manager - asks service stations to be collection points.
- Letter of thanks - to anyone helping your program.
- USED OIL REPORT - DOE background on the national problem.

The sample press release and letters are merely intended to serve as a guide. Feel free to rewrite them in your own individual style. You will, of course, want to be assured of conveying all pertinent facts, information and names before submission.

This kit can be a valuable tool for anyone interested in energy conservation. Study the ideas presented here; add your own; share and exchange them with others who will go into action with you.

Now, you can start a sound and successful used oil recycling program in your community!

HOW TO SET UP
A USED OIL RECYCLING PROGRAM
IN YOUR COMMUNITY

INTRODUCTION

The importance of a used oil recycling program is twofold. It salvages a valuable energy resource and significantly reduces environmental pollution caused by indiscriminate dumping.

One part of oil can contaminate a million parts of water. Oil that is poured down storm drains, emptied onto the ground, or carted off to garbage dumps eventually seeps into our streams, our lakes, and our water supply.

If used lubricating oil from automobile crankcases and lawnmowers is conserved through a recycling program, it can be rerefined and put back to work as a lubricant or fuel. Also, it can be utilized as a feedstock in the manufacture of other petrochemical products.

The purpose of this booklet is to show you how to set up a used oil recycling program, establish collection points, and how to enlist the cooperation of concerned individuals and civic-minded groups. Maximizing public participation in this worthwhile endeavor and suggested ways to publicize your program will also be addressed in the booklet.

GETTING STARTED

One of the key elements in a used oil recycling program is teamwork. The more skills you can draw upon, and the more willing hands available to share the workload, the more effective your efforts will be and the greater your chance of success.

Many States are actively encouraging the establishment of used oil programs. Some States have even passed laws which make the task of setting up a program easier. It is a good idea to check with your State energy office to ascertain what activity may be taking place at the State level.

Step one in getting the project under way is to locate a community group or organization to sponsor your program.

Sponsorship by an established organization is a lot better than trying to go it alone. You will want to work with people who know how to get things done at the local level. (Publicity coverage in local newspapers and broadcast media will be easier to arrange and you will be in a far greater position to win the cooperation of local officials, business and community leaders.)

If you already belong to a group that is willing to tackle such a project, you are well ahead of the game. If not, listed below are some of the civic-minded community groups and organizations you many want to approach:

American Association of University Women
American Legion
Audobon Society
Boy Scout
Church Groups
Civic Groups
Educational Organizations
Elks Club
4H Clubs
Fraternal Groups
Friends of the Earth
Future Farmers of America
Jaycees
League of Women Voters
Lions Club
Kiwanis Club
Rotary Club
Sierra Club
Veterans of Foreign Wars
Volunteer Fire Departments
Women's Clubs

To determine which of these organizations are represented in your area, check the local telephone book. If any of them express interest, you might consider running your program as a joint venture. Not only will this broaden your base of operations, but it will place considerably more expertise and influence at your disposal.

Next, you will want to brief all participants in the program on general and specific objectives, on problems that must be faced, and on steps that must be taken to get the project moving.

At this point, it would be a good idea to solicit the advice of individuals or groups with experience in various other public service activities in your community.

In addition to getting in touch with the organizations mentioned earlier, it might be useful to consult people involved in such projects as local hospital drives, United Fund appeals, and Community Chest campaigns.

ESTABLISHING COLLECTION POINTS

The next logical step in developing a used oil recycling program is to set up your field organization: a network of clearly designated and conveniently situated points where containers of used oil can be delivered.

These points can be located wherever facilities exist for storing large quantities of used oil in special holding tanks. The more widely these sites are distributed throughout the community, the easier it will be to enlist the active participation of the public.

Ideal collection point locations are individual service stations, municipal garages, private garages, state inspection stations, local oil distribution facilities, and retail outlets that provide oil-changing service for their customers. In some cases, high school shop classes also have facilities for collection. School officials can tell you if these facilities are available for your program.

Convincing the owners, operators, etc., of these sites of the advantages derived from joining your program should be a relatively easy matter. Participation will entail little or no work on their part, and may even generate considerable consumer goodwill. Such display of cooperation will enable them to assume a significant role in fighting environmental pollution and in helping to deal with the energy situation. In addition, the used oil they collect can often be sold at a small profit to rerefining companies. They possibly could be persuaded to turn these profits over to your used oil recycling program or to other worthwhile projects, thereby improving their status in the community even more.

There are several tried-and-true techniques for approaching--and selling--prospective site managers:

1. Visit the prospect site yourself and do an on-the-spot selling job.

2. Send a personal letter which provides background on your community group or organization and solicit the participation or use of his establishment.

3. Arrange to have a personalized form-letter mailed to all establishments in your area by your sponsor or a local public official, urging them to cooperate in this important program. For your convenience, we have enclosed a sample of such a letter.

Whichever approach you decide upon, be sure to follow up every successful solicitation with a letter reiterating the importance of the program and expressing your thanks for their cooperation.

WINNING SUPPORT

The level of support you are able to elicit from important and influential people in your community can make all the difference between a program that succeeds and one that **fails.**

You need their support to get your program started, to promote its expansion, and to ensure its continued success.

Support can come from many sources. In seeking it, here are some of the people and organizations you may wish to approach:

City Council President
Environmental Protection Groups
Fire Chief
Mayor
Newspaper editors
Radio and TV personalities and station operators
Sanitation Commissioner
Senators and Representatives
Sewer treatment plant officials
State Energy Office
Water Commissioner
School Board
Other Officials

Support can take many forms. One of the most effective means is to receive endorsement by a local dignitary or celebrity, a civic leader, businessman, or respected community organization.

Endorsements trigger news breaks, feature articles, and editorials. Well-known individuals who endorse your program may be available for appearances on radio or television programs, or speaking engagements at local clubs and educational institutions.

Cooperation by local oil retailers in displaying your posters and making your handbills available on their counters is another form of endorsement. This form of support effectively demonstrates their concern for proper utilization of the products they sell, and in so doing, enhances their public image.

Support of another kind can come from local re-refiners or other individuals who haul used oil. They can help you organize the basic structure of your program: the establishment of convenient collection points and schedules.

One final word on the subject of support. As with the "selling" of collection site prospects, when individuals endorse your program, or make significant contributions to its success, or they go out of their way to help you achieve your objectives, be sure to thank them for their cooperation. A brief, personal letter will not only show your appreciation, but will encourage their continued efforts of your behalf. For your guidance, we have enclosed a typical thank-you letter.

PUBLICIZING YOUR PROGRAM

A used oil recycling program may be one of the best things that ever happened to your community, but it will never get off square one unless people know about it. The only way they will ever know about it is for you and the people with whom you are associated to make yourselves heard.

Once the basic framework of your program has been set up--your committee organized, individual responsibilities clearly defined, and a network of collection points established throughout the area--your next step is to make the public aware of what you are doing. The bigger the splash you make the better.

One of the first procedures is to get a press release off to all your local newspapers. You will find a typical release enclosed in this kit. It should, of course, be reworded to suit your local situation.

When distributing press releases, be sure to include radio and television stations on your mailing list. In addition to getting off releases, try to set up interviews with members of the communications media. This will give you an opportunity to sell them in person on the merits of what you are trying to achieve.

You will find that newspapermen and program directors are extremely interested in projects of this type. Anything that involves energy and the environment is newsworthy. Programs that struggle to cope with these vital problems make "good copy."

Newspaper and broadcast people may be able to help you in many other ways, too. After all, they are experts in the business of communication. They know how to dramatize a good story, how to flesh it out, and how to keep public interest high. So don't simply mail out press releases and wait for publicity to happen. Get on the phone. Talk to your local communications people. Tell them what your aim is. Seek their advice, and ask for their help.

Here are just a few of the possibilities to explore:

- Letters to the editor from prominent people in the community.
- Feature articles by environmental editors.
- Editorials supporting your program.
- Follow-up stories whenever adverse--or favorable-environmental and energy reports become available.
- News releases covering progress reports on your program; major contributions to your program; new endorsements and testimonials; newly established collection sites; and tie-ins with other environmental or energy groups, business, industry, or local government.
- Public service announcements on local radio and television stations. Program directors are required by the FCC to air a substantial number of public service announcements during their daily broadcast schedules. There is no charge for these announcements.
- Participation in radio or television "talk" shows by local celebrities or officials who endorse your program.
- On-the-air interviews with members of your group.
- Radio and television "reports" by officials or businessmen with expertise in energy conservation or environmental protection.
- It would be helpful to your program if you could "place" a story on the types of containers in which used oil should be stored for delivery to collection sites.

In the process of publicizing your program, seize every opportunity you can to make yourself seen and heard. The more individuals aware of what you are trying to do, the more likely they are to pitch in and help you do it.

COLLECTION POINT POSTER

In addition to getting exposure through the communications media, you'll want to make sure that all your collection points are "selling themselves" through the use of highly visible identifying posters designed expressly for this purpose.

BUMPER STICKER

Another high-visibility device for calling attention to your efforts is the bumper sticker. Bumper stickers should be distributed to all who are actively involved in promoting your program, and anybody else who will support cause. A bumper sticker can be produced by one of your local print shops for a relatively modest cost.

CITIZENS BROCHURE

A key item in your program is the Citizens Brochure. Its brief message warns against pollution, tells how to handle drained dirty oil, and--most important--lists the local collection points where used oil will be accepted for recycling.

You need to get this type of brochure into the hands of every do-it-yourself oil changer in the community. One way is to supply a quantity of these brochures to the manager of a cooperating retail store where lubricating oil is sold over-the-counter. You might ask the manager to put a special point-of-sale poster (RECYCLE USED OIL!) and a stack of brochures right where cans of oil are sold. Alternatively, a supply could be maintained by the cash register, and one placed into each bag carried away by an oil customer.

As a public service, local banks, department stores and utility companies may help you publicize your program, and the collection points, by enclosing the brochure in their monthly mailings.

CONTAINER

Another key item is a suitable container to help the citizen handle the used oil, carry it to the collection site, and neatly empty it. The container should be leak-proof, with a tight-fitting cap--like a plastic gallon milk jug or a detergent container--or something similar which can be bought at a local hardware store. There are a number of different types of containers available. Local inventors and do-it-yourselfers have often developed their own devices and would be happy to talk to you about them.

You will want to impress the do-it-yourselfer with the importance of a proper container. Mishandled, dirty oil can be very messy. Try to make containers available to citizens who participate in your recycling program, and publicize accordingly.

FUND RAISING

Think, too, of the modest financial help you'll want for postage posters, and printing. Remember, service is the same as money. A businessman, company, or group may mail for you, contribute printing, or provide containers free or at cost to citizens willing to bring used oil to collection points.

Plan a modest budget. Ask your sponsor and other supporters for help--in dollars or service--for specific items in your community campaign.

A FINAL NOTE

There are no hard and fast rules for setting up a used oil recycling program, or for winning official endorsement, group support, and public participation. However, the techniques outlined in this booklet provide a good solid basis for tackling some of the problems that will confront you, and thus allow you to take advantage of some of the opportunities that will lead to the success of your endeavor.

In the end, your program will bear the unmistakable stamp of the imaginative, dedicated and hardworking people who have successfully helped your community "conserve our energy and preserve our environment."

Because this program is yours to conceive and direct in your local community, reference or credit to the Department of Energy should not be necessary in your program literature. However, if you wish to refer to the Department, please use the following: "The Department of Energy endorses the recovery and reuse of used oil."

SAMPLES OF

COMMUNICATIONS

(IN DRAFT)

I. PRESS RELEASE

II. LETTER TO CIVIC LEADER

III. LETTER TO SERVICE STATION MANAGER

IV. LETTER OF THANKS

D R A F T (Press Release)

FROM: (Name)
(Org.)
(Address)

Date:
Contact: (Name)
Phone: (Number)

FOR RELEASE ON _____
Date, time, etc.

USED OIL RECYCLING PROGRAM

BEGINS IN (COMMUNITY, CITY, STATE)

(Date) marks the kickoff of (community) used oil reclamation and recycling program.

"We only wish that every community in the Nation could be kicking off it's own recycling program today also", said (Name, Title) of (Organization).

The Program, initiated in (date), by (identify and give desired specifics) will be the first effort of its kind staged in (community). "The objectives are many. However, of utmost importance will be our desire to impress upon the do-it-yourself oil changers of (community) the significance of keeping their drainings away from such places as storm drains, garbage and trash recepticles, empty lots and on the ground", said (name). (Name) also cited the need to attract others interest in becoming their own oil-changers and how they could be introduced to the proper ways in which it should be done.

(Community) desire to aid in doing its share to combat the harm done to the environment by improper disposal, was yet another reason and last but by far, not least, (name) said "we want to take a giant step for energy conservation by recovery and re-use of this valuable energy resource."

The Department of Energy and the Environmental Protection Agency estimate that in excess of 100 million gallons of used oil are wasted annually.

The (community) program has established a network of collection centers for used oil. Service stations (and whichever other establishments agreeing to do so) have agreed to serve as used oil collectors. One of the incentives is that the collector will be able to sell the used oil to recycling conglomerates and use the proceeds as they wish (use statement only if applicable). The collection points will be identified by posters and their locations publicized area-wide. (Name) said, "for our residents, the rest is easy. All they need is a suitable container and a cooperative frame of mind". (Organization) will have brochures, pamphlets and other informational materials to place in circulation. The (organization) has received endorsements from a number of (civic groups, organizations, etc.) and officials in the area, including: (list).

(Name of person) anticipates excellent cooperation and participation on the part of collectors and community residents. Anyone interested in obtaining more information or helping with this campaign should contact (name) at (address) or call (phone number).

D R A F T (Letter to Civic Leader)

(Name)
(Title of Civic Leader)
(Address)

Dear _____:

Can we count on you to help our community recover a potential source of energy while at the same time, eliminate an environmental hazard?

We are in the process of establishing a public service "Recycle Used Oil" program which, we feel, would benefit both our community and the Nation and would appreciate your advice and assistance in its development.

Used oil is a neglected but valuable energy resource. It can be recycled and put back to work as a lubricant or fuel. Not recycled and improperly discarded, it could present a serious hazard to our environment. Throughout our community, used oil is being wasted in surprisingly large amounts. (The Department of Energy and Environmental Protection Agency estimates that the amount of oil wasted annually exceeds 100 million gallons.)

The reason for this occurrence stems basically, from the fact that automobile owners who change their own oil do not have proper disposal facilities for the drainings. As a result, it ends up in garbage or trash cans, down storm sewers or in vacant lots and eventually reaches (and pollutes) our streams and rivers. A combined effort to end the pollution, save and re-use the oil, thus conserving energy, will benefit all.

Our theme is: CONSERVE OUR ENERGY. PRESERVE OUR ENVIRONMENT.

Our slogan: RECYCLE USED OIL.

The stronghold of our program will be the availability and establishment of a network of convenient used oil collection points in our community and our ability to encourage citizens to discard their used automobile oil at those sites. Thus, we hope to enlist the voluntary participation of civic-minded service station managers and businesspersons who are equipped and would be willing to handle used oil.

Collection facilities might also be set up on public properties such as municipal garages, fire stations or the area dump sites. Each collection point can be identified by a sign or poster.

Publicity of the program and the collection points will be attained through the literature distributed and the media.

The oil discarded can then be sold to a recycler who will ultimately reprocess and prepare it for future marketing.

Your interest and active support of our endeavor will be of tremendous value and will help make this much needed public service a success.

Specifically, we would welcome your endorsement of our effort. Would you, or someone you designate, meet with us to share additional ideas and discuss approaches aimed at creating a sound program?

We welcome a response at your earliest convenience. You may call us at (Phone or write us at the following address: (List). Thank you for your consideration.

Sincerely,

D R A F T (Letter to Service Station Manager)

We would appreciate your help in a community used oil recycling project designed to conserve energy and preserve our environment.

We are planning a broad-scale program aimed at capturing used oil in which the residents of our town will be encouraged to participate. They will be informed of its energy potential and of the value recycled oil can yield -- that it need not be wasted but can be reprocessed and used again.

As you know, many of our citizens change their own oil and would be willing to cooperate with us in this endeavor. However, they need to have a convenient location to deposit their drainings. We choose to call the site a "collection point". Not only will used oil be received there, it will be picked up by a reprocessor to be re-refined and prepared for use once again.

As a station manager, you provide many essential services to car owners in your surrounding area. Would you consider extending your service by establishing collection points for our project? You would be assisting many individuals who, today, dispose of their drained oil in ways that harm our environment and waste a valuable energy resource. The used oil brought to the station would be yours to sell and while rendering a significant service you're also playing an important role in a community project that benefits you, the car owner and the Nation.

It is our belief that such a program can and will be successful if we work at it TOGETHER. Sponsors of the program include: (NAMES)

We hope that you will join with us, place a sign at your station "Used Oil Welcomed Here," and let us commend your cooperation by including your station in our publicity and printed materials.

Please let us know at your earliest convenience if we can count on you. Write us at the following address: _____ or call (Phone).

Thank you for giving the program your consideration.

Sincerely,

D R A F T (Thank You Letter)

(Name of Participant)
(Company Name, if any)
(Address)

Dear (Name):

We would like to take this opportunity to express our deep appreciation for your interest in (or contribution to) our Used Oil Recycling Program.

Thanks, in part, to your cooperation, more and more used lubricating oil in our community is being collected for recycling. This means we are not only conserving a valuable energy resource, but also reducing the environmental damage caused by indiscriminate dumping of used oil.

Again, our thanks for your help in getting this important program underway.

Sincerely,

(Name)
(Title)
(Organization)

USED OIL POLICY AND PROGRAM

DEPARTMENT OF ENERGY'S
(DOE)
USED OIL POLICY AND PROGRAM

o DOE regards the approximately 1.25 billion gallons of used oil generated annually in the United States as an important opportunity for energy conservation and seeks to encourage its greater recovery and re-use.

o DOE has prepared a comprehensive USED OIL REPORT which is now available to the public upon request (Office of State-Specific Programs).

o DOE seeks to promote used oil recycling, its use as a feed-stock in the manufacture of other useful petroleum products, and its use as a fuel supplement provided that it is burned in an environmentally acceptable fashion.

o DOE is studying ways to amend excise tax provisions on lubricating oil so as to equalize treatment of both virgin and re-refined oil manufacturers and to encourage greater re-refining of used oil.

o DOE has contacted each of the Governors and urged them to establish a used oil recovery program as an active project in their State Energy Conservation Program. DOE stands ready to assist the Governors on the various elements of such a program. For example, DOE has prepared "model legislation" for State and local consideration, which would discourage, where appropriate, dumping, land spreading, road oiling, incineration, discharge to waterways and municipal sewers, and sale to unsuspecting homeowners as "discount fuel oil."

o DOE has issued a "Used Oil Recycling Kit" for use by citizens' groups and community organizations on how to set up recovery programs at the local level. Such programs would be aimed at the many owners who change their own oil and now dump the drainings.

o DOE is continuing to promote both Federal and industrial used oil recovery programs.

o DOE seeks to create increased market demand for used oil in rural areas of the country where recycling schemes are now uneconomical. DOE hopes to accomplish this through its contacts with the electric utilities and members of the industrial community by advocating the use of used oil as a fuel supplement to oil and coal-fired operations properly equipped with emission control equipment.

o DOE will encourage a revision of the Federal Trade Commission's "made from previously used oil" labeling requirement and a revision of the Defense Supply Agency's procurement specifications banning the use of recycled oils, provided that the controversy over quality assurance and consistency can be resolved.

o DOE is continuing to coordinate with EPA and DOD on used oil research and demonstration programs.

USED OIL REPORT

USED OIL REPORT

Used oil is generated from automotive and industrial sources at the rate of approximately 1.25 billion gallons each year. Although this is a small part of the Nation's annual petroleum consumption, it does equate, nevertheless, to more than 81,000 barrels of oil per day.

Although dirty and contaminated, used oil has high energy value and is composed almost entirely of "lube oil fractions," a small but valuable portion of a barrel of crude oil. It can be re-refined into good lubricating oil or, as previously stated, used as a feedstock in the manufacture of other petroleum products. In industrial applications it can be reclaimed to nearly original quality by off-the-shelf equipment. It can be reprocessed to clean fuel oil and, under special conditions, burned safely untreated.

Yet today, 50 percent or more of all used oil generated in this country is lost from a resource recovery point of view through dumping, land spreading, road oiling, incineration and direct discharge to waterways and municipal sewers. Although this loss is primarily related to the adverse economics of various collection and recovery systems, especially in rural areas, the Department of Energy (DOE) believes that better used oil recovery is possible without Federal subsidization, and regards this objective as an important opportunity for energy conservation.

DOE has developed and begun to implement a used oil recovery program. This program has been designed to encourage greater used oil collection and re-use through State and local action, and public and industrial education programs.

The purpose of this REPORT is to summarize the issues, to consolidate and present the results of Federal research, to state DOE's position on these issues, and to outline the elements of our conservation program in this area.

Used Oil Sources

In 1972, approximately 2.2 billion gallons of lubricating oil were sold in the United States. Approximately 50 percent of this lube oil was consumed in use, discarded with filter cartridges, or lost through leakages, and other ways which resulted in the generation of an estimated 1.1 billion gallons of used oil.* From the approximately 2.5 billion gallons of lubricating oil sold in 1975, an estimated 1.25 billion gallons of used oil was generated and lost. The major sources of used oil are automotive operations, industrial and aviation operations, and others, such as government uses and industrial process oils. The estimates for these catagories are shown in Table 1. Not included in the estimates in Table 1 are additional amounts of used oil from sources which are very difficult to quantify. These include used oil collected from harbor oil spills, ship bilges, oil tanker bottoms, and tanker washdowns.

The generation of used oil is widely dispersed throughout the country. Table 2 displays estimates of both automotive and industrial used oil quantities for each State, demonstrating the magnitude of both the problem and the opportunity.

Lubricating oils collect contaminants in many ways, depending upon the original use of the oil. In general, used oils contain oxidation products, sediment, water and metallic particles resulting from machinery wear. In addition to these, used automotive oils also contain gasoline, diesel fuel, organic and inorganic chemicals used in oil additives and metals which were present in gasoline and transferred to the crankcase during combustion (blowby). Lead is the principal metallic contaminant found in used automotive oils, being present in amounts which sometimes exceed 1 percent by weight. It is expected that this lead concentration will decline as the use of non-leaded gasoline is increased.

Used Oil Destinations

The best estimate of the ultimate fate of the 1.1 billion gallons of used oil* is: 480 million gallons (43 percent) used as fuel, treated or untreated; 90 million gallons (8 percent) re-refined to lube oil; 200 million gallons (18 percent) used as road oil or in asphalt; and the fate of 340 million gallons (31 percent), including the 30 million gallons for re-refining wastes, is unknown. It is not possible to make better estimates regarding the ultimate fate of used oil because the means for accounting for it in the splintered collection, re-refining and disposal systems do not exist at present.

* generated in 1972

Environmental Impacts of Dumping

Altogether, perhaps as many as 625 million gallons of used oil are discharged directly to the environment each year. Disposal methods include road oiling, dust control, weed control, and indiscriminate dumping into waterways, municipal sewers or onto land surfaces. These methods are potentially detrimental to the environment. A concentration of 1 part oil to a million parts (ppm) water in surface or ground water causes taste and odor problems in drinking water. Concentrations of 50 to 100 ppm can foul waste treatment processes. Results of biological studies indicate different toxicity levels among species, among methods of introducing oil to water, and between marine and freshwater organisms, but significant chronic effects have been found at concentrations of 310 ppm on several species of freshwater fish and at as low as 1 ppm on simpler marine forms.

Road Oiling for Dust Control

Considerable amounts of used oil are being used to oil roads for dust control. A limited study has been carried out at the EPA's Water Quality Research Laboratory, Edison, New Jersey, to evaluate the environmental significance of this disposal method. Two rural roads that had been treated with waste crankcase oils were examined. It was estimated that 99 percent of all the oil applied to the road surface over a 12-year period had left the road surface either on dust particles and in water runoff (70 percent) or was volatilized and biodegraded (29 percent). Only 1 percent remained in the top inch of road surface.

"Do-It-Yourself" Oil Changers

Since the early 1960's, the sales distribution of automotive engine oil has shifted dramatically from service stations to retail stores which sell major "high reputation" brands at discount prices. In 1961, service stations accounted for about 70 percent of all sales of lube oil for passenger cars, while mass marketers accounted for only 7 percent. By 1971 the service stations' share of the market had dropped to 45 percent, while that of the mass marketers had climbed to 28 percent. Some oil industry officials predict that by the late 1970's 40 percent of all passenger car lube oil sales will be over the counter to "do-it-yourselfers."

A survey conducted in 1973 revealed that approximately 25 percent of sales to do-it-yourselfers were for "adding only," 57 percent for "oil changes only" and 18 percent were for

both adding and changing oil. Although very little data exists on the quantities of used oil generated by this group of consumers, it has been estimated that the amount could easily be as high as 100 million gallons per year.

This survey further revealed that of those who changed their own oil, most disposed of the crankcase drainings by dumping. However, a high degree of willingness to return used oil was indicated by those interviewed, provided that a convenient mechanism for doing so existed: 67 percent said that they "definitely" or "probably" would return oil, another 12 percent said that they "might," and only 21 percent said that they "definitely" or "probably" would not return the oil.

Collection of Used Oil

The largest amount of used oil, however, is not generated by do-it-yourselfers, but by commercial and industrial operations: service stations, garages, car dealers, auto fleet maintenance shops, industrial firms, railroads, airports and other.

Quantities generated at commercial and industrial sites are relatively large and stored in old 55-gallon drums or large holding tanks, 550 gallons or more. When these become filled, a used oil collector, or "scavenger," is called to haul the oil away.

The collection industry handles an estimated 75 percent of all used oil generated. The industry is comprised of between 1,000 and 2,000 operators, most of whom are concentrated in urban areas. Some are one-truck operations and few have more than five trucks. Collections are normally carried out by tank wagons with capacities of between 500 and 2,000 gallons. Until recently, hauls of over 100 miles were usually uneconomical, and this situation accounted for the concentration of collectors in urban areas. More recently, however, some collectors have been willing to travel as far as 500 miles one way for free used oil, and have generally paid for used oil within distances less than that.

Collection costs vary between 1 and 5 cents per gallon. When market demand for used oil is high, the collector will gather the used oil and sell it for a profit. If the demand is sufficiently high, the collector will pay the used oil generator for his oil, as has been the usual case since the beginning of the energy crisis. In the past, however, when the used oil market waned, the marginally profitable collectors were forced out of business and the remaining collectors levied a collection charge.

A collection charge is an incentive to the used oil generator to dispose of his used oil himself to avoid the collection costs. Further, the collector who is unable to sell the collected oil because of low market demand has an incentive to dispose of it in the cheapest way possible. Such cheap disposal methods include dumping in sewers, in waterways, at public dumps, or open burning without regard for the potential environmental damage.

Since used oil collectors are not, for the most part, adequately regulated, used oil can, in times of low market demand, be dumped or burned in an environmentally questionable manner and, in times of high market demand, sold for equally questionable purposes, such as "discount home heating oil" to unsuspecting homeowners, apartment managers and schools.

For the most part, however, used oil collectors provide a valuable service and, themselves, favor some type of regulation. Collectors usually sell their used oil as a feedstock to re-refiners or reprocessors or as a fuel supplement to large consumers of residual fuel oil, such as the electric utilities.

The Re-refining Industry

There are no technical impediments to physically recycling used lube oil. The processes applicable to petroleum refining are generally adequate, with modification, for processing used oil; however, as a matter of practice, virgin crude refineries do not recycle used oil because metallic contaminants present in the used oil can adversely affect some key catalytic refining processes.

Thus, the job of converting used oil into good lube stock becomes the responsibility of a conglomerate known as the re-refining industry. It is a small industry in the United States, generally using old process technology, and is very susceptible to economic fluctuations. Depending upon local conditions, some re-refiners are currently experiencing difficulties in competing on the open market for used oil feedstocks, as much of the used oil collected is sold for other purposes at prices as high as 25 cents per gallon.

There are several different re-refining processes, but the most commonly practiced is acid/clay treatment. An EPA study of re-refining technology concludes that this process does not appear to be an attractive approach for expanding the re-refining industry because of its high operating costs and because of the difficulty in disposing of the residual wastes, especially the acid sludge.

Several other re-refining processes are technologically and economically more attractive. Of these, the vacuum distillation/hydrogen treating process is considered the most promising. This process will also be the most environmentally acceptable. Using this technology, a re-refiner can also remain viable during periods of shortages of used oil feedstocks by processing crude oil in the same manner as a virgin oil refinery.

The re-refining industry is declining. In the early 1960's, approximately 150 re-refiners produced an estimated 300 million gallons of re-refined oil products. In 1972, less than 40 companies were still in business and they produced less than 100 million gallons, and today many are operating at 50 percent of capacity. Current estimates are that there are 28 including 3 Canadian and 4 international companies operating today.

The reasons for this decline are both technical and economic. In recent years lubricating oils have become more complex with the blending in of between 15 and 20 chemical additives, and re-refined lube oil markets have suffered somewhat from the controversy over whether or not the quality meets current-day specifications. Extended drain periods have concentrated additives and impurities in used oil, making it more difficult to re-refine. Collection costs have increased and disposal of the acid sludge by-product has become more difficult and expensive. Further, certain Federal tax advantages have been eliminated. All of the foregoing together with old and inefficient plants, operating at less than design capacity, have generally eroded whatever price advantages re-refined oil products may have had over virgin oil lubricants.

Federal Tax Treatment of the Re-refining Industry

The excise tax on lubricating oil dates to the Revenue Act of 1932 when a 4 cent per gallon tax was levied on all grades of lubricating oils, to be paid by the manufacturer or producer. This tax was increased by 1/2 cent in 1940 and an additional 1-1/2 cents in 1942, thus raising the total tax to 6 cents per gallon, which is the current tax today. In practice, this tax has been applied only to virgin lube oil products. Re-refined oil has never been nor is taxed today. As a result, re-refined products made from 100 percent used oil enjoyed a 6 cent per gallon competitive advantage over virgin oil products until 1965.

The Excise Tax Reduction Act of 1965 removed Federal taxes on all lubricating oils, except those used in highway vehicles, and then earmarked this revenue for the Highway Trust Fund. The excise tax of 6 cents, still paid by the manufacturer and

included in his price, was applied only to automotive products; thus, off-highway users, such as farmers, construction contractors and railroads, were made eligible for tax refunds. Because the primary markets for re-refined oil in 1965 were concentrated among consumers of industrial oils or off-highway users of automotive oils, the effect of this action was to equalize tax treatment of both virgin and re-refined oil in this market, and re-refiners lost their price advantage.

In theory, this lost price advantage could have been as high as 6 cents per gallon, provided that the re-refiner's product had been made from 100 percent used oil. However, most re-refiners manufacture blended products made from both used and virgin oil. Thus, in the case of a 50-50 blend, the re-refiner should have suffered a lost price advantage of only 3 cents per gallon, since the tax on the virgin component prior to the passage of the Act would have had to have been passed through "pro rata" as a cost of 3 cents.

In reality, however, the re-refiner who made a blended product was dealt an additional setback, for under IRS Ruling 68-108, unlike the virgin lube oil producer and his off-highway customer, the re-refiner and his off-highway customer were declared ineligible for the tax refund on the virgin oil component. Thus, in the case of the 50-50 blend, the combined result of the Excise Tax Reduction Act and the IRS Ruling 68-108 was to cause the re-refiner to absorb, not a 3 cent, but a 6 cent market adjustment relative to his position prior to 1965. Since proft margins in this industry have traditionally been very narrow, on the order of 1 to 2 cents per gallon, these actions have been cited by re-refiners as a major cause of the decline of the industry.

FTC Labeling Requirement for Re-refined Oils

In 1964, the Federal Trade Commission, observing that the public had a preference for new oil and was therefore entitled to know the origin of its oil purchases, stipulated that re-refined oil products must be clearly labeled "made from previously used oils." Re-refiners contend that this particular wording unfairly implies inferior quality and that as a result of this ruling many middlemen have stopped handling their products and that re-refined oil now competes directly with lower quality virgin oils.

The controversy over re-refined lube oil quality is on-going. In recent and separate tests by the Bureau of Mines and the Army Fuels and Lubricants Laboratory, some re-refined lube

oil products failed to meet SE grade of MIL-L-2104C specifications; however, so have some virgin lube oils so advertised. The industry's reputation has undoubtedly been blemished by the questionable integrity of some operators who have not produced high-quality products. As a result, current Federal procurement regulations bar the purchase of re-refined oils, although the Defense Supply Agency is now developing a pilot program to experiment with recycled oils, and the outcome of this program may lead to a change in this policy. FTC intends to make no changes to its labeling requirements until this controversy over quality has been resolved.

Although the re-refining industry has suffered a number of setbacks (the loss of tax advantages, the barring of Federal markets, the labeling requirement, the quality controversy, the environmental questions over acid sludge disposal), it nevertheless is currently experiencing more demand for re-refined oil than it can supply, and its chief problem today is in obtaining sufficient feedstocks of used oil. It finds itself in direct competition with those who burn used oil as fuel and are willing to pay as much as 25 cents per gallon, delivered in large quantities.

Used Oil as a Fuel

Burning as a fuel is a major outlet for used oils. Used oil contains approximately the same heating value per pound as virgin oil and about 30 percent more than coal. Burning used oil requires no, or minimal, new technology, has broad applicability in almost all regions of the country and offers an efficient and inexpensive alternative to dumping, land spreading, road oiling and incineration. It can be burned untreated or blended with residual oil or coal.

Unfortunately, because used crankcase oil contains high concentrations of metallic contaminants, its combustion without the removal of these contaminants can cause adverse environmental effects. From the public health point of view, lead is the most significant contaminant. If all used oil were disposed of by burning, EPA estimates that this could account for as much as 5, or even 10, percent of all atmospheric lead. Table 4 summarizes seven test results of burning untreated used oil.

Used crankcase oil can be safely burned, however, by either removing the contaminants prior to burning or by employing highly efficient particulate control systems to reduce preventable lead discharge after burning. The former is commonly practiced through solvent extraction methods known as "reprocessors." The latter can be accomplished by fabric filtration (bag houses), electrostatic precipitation and high-energy

venturi scrubbers. Recent studies indicate that these systems can remove between 95 and 99 percent by weight of submicron sized particles, which constitute the last 80 percent of lead emissions. These systems have been installed not only at electric utilities, but also at numerous industrial sites throughout the country: paper mills, steel mills, cement and rock product plants and others.

Spectrometric Oil Analysis (SOA)

Owners and managers of large automotive and truck fleets, as well as the railroads and airlines, have been saving thousands of gallons of oil annually by employing a technique known as spectrometric oil analysis, or oil analysis for short. The principal purpose of oil analysis is to predict equipment failure and schedule preventive maintenance. This can be done by testing a small sample of the crankcase oil in commercially available equipment, which will then yield readings on wear metal content. High readings of wear metal content reveal failures of bearings, gears and other internal engine parts, and indicate the need for repairs, thus allowing a fleet manager to avoid costly breakdowns, as well as unnecessary maintenance. A side benefit is that one can determine exactly when oil needs changing, rather than changing it as a matter of course every so many thousands of miles or hours of operation. This is often the case, and perfectly good oil is drained, thrown away, and replaced at needless cost. Thus, oil analysis can save a fleet manager money in his maintenance operations as well as in his lubricating oil budget.

Used Oil (from Diesel Engines only) as Diesel Fuel Supplement

Mixing used oil with diesel fuel as a fuel supplement has been recognized by at least one major diesel engine manufacturer as an acceptable method of disposing of used oil while at the same time reducing fuel costs. The process generally calls for draining the used oil, diluting it somewhat with diesel fuel, filtering it with commercially available equipment to remove water and sludge, and finally mixing it with 5 percent or less new fuel. Published test results of a process similar to this one have shown, after 100,000 miles of operation, no adverse effects upon the engine, engine performance or the fuel system, and did indicate some favorable reductions in smoke emissions. Such results have been achieved under specific test conditions and procedures, and before attempting to duplicate such a process, one should contact the manufacturer of the diesel engine in question and, perhaps, the research staffs of some trucking and fleet owner magazines.

"Oil Refiners" for installation in Your Vehicle

A number of firms now manufacture devices which can be installed in automobiles, trucks, busses, boats and on stationary engines, which are known variously as "oil refiners, electric oil refiners and oil purifiers." These manufacturers claim that once they have been installed, one never needs to change oil again, and needs only to add oil as the dipstick may indicate and to occasionally change filters. These devices are installed in the engine compartment and hooked into the oil pressure system of the engine by means of hose connections. Oil flows through the device under pressure, is filtered either through cotton and felt pads or through fuller's earth, is heated electrically so as to volatilize water and fuel contaminants, which escape as vapor, and is then returned to the oil pan by gravity flow.

Manufacturers of more sophisticated industrial oil reclamation equipment point out that while this process may remove water, fuel and suspended solids, it does not return the oil to the same quality as that of new oil. They note that after prolonged use, it is not the oil, but the special oil additives designed to enhance oil quality which break down. These devices do not replace the spent oil additives nor do they remove dissolved metal oxides which accumulate during fuel combustion. Proponents rebut by pointing out that when one adds new oil as needed, these additives are more than replaced and that spectrometric oil analysis tests do not indicate the need for oil changes.

It is generally agreed that these devices do extend the life of engine oil and can save oil. Whether or not they will allow one to never change oil again is an issue which triggers heated debates but has not been resolved. This office is not aware of any comprehensive product evaluations or tests which may have been done by independent consumer research laboratories or by the Federal Government. Before installing such a device, it would be wise to check with your vehicle manufacturer first.

DOE Used Oil Policy and Action Program

In summary, used oil is a valuable petroleum resource, high in energy value and rich in lube oil fractions. Of the 1.25 billion gallons generated annually in the United States, as much as half is lost from a resource recovery point of view through dumping, land spreading, road oiling, incineration and direct discharge to waterways and municipal sewers. There are no technological barriers to physically recycling used oil and, having yielded full respect to the economics of

various collection and recovery systems, DOE has determined that better resource utilization is possible and regards this objective as an important opportunity for energy conservation.

DOE is in full agreement with the purposes and functions of both the re-refining and the reprocessing industries. In view of the potentially hazardous environmental impacts of burning untreated and contaminated used oil and the consequent loss of lube oil fractions, DOE approves of the use of used oil as a feedstock to re-refiners, but acknowledges that in some areas of the country re-refining may not be commercially feasible. In these areas DOE seeks to encourage reprocessing to other useful petroleum products, such as residual fuel, or direct burning at oil and coal fired utilities and large industrial plants, which are properly equipped with emission control equipment.

In an effort to assist the ailing re-refining industry, DOE seeks to amend current excise tax provisions on lubricating oils so as to equalize treatment of both virgin and re-refined lube oil manufacturers. Such an amendment would exempt refiners who blend virgin oil at 50 percent or less from paying the tax on the virgin oil component. Further, DOE will seek a revision of the Federal Trade Commission's "made from previously used oils" labeling requirement and a revision of the Defense Supply Agency's procurement specifications banning government use of recycled oils, provided that the controversy over quality assurance and consistency can be resolved. DOE is an active participant on the Interagency Committee on Resource Recovery and is closely monitoring a joint effort by the Environmental Protection Agency and the Department of Defense to resolve this quality question.

DOE seeks to encourage the establishment of used oil recovery programs by State and local jurisdictions and by local community organizations. DOE has contacted the Governors and urged them to consider establishing such an effort as an integral part of the State/Federal Energy Conservation Program. DOE stands ready to assist the jurisdictions on legislative initiatives and has prepared a model used oil bill for State and local consideration. Such bill might license collectors and receivers of used oil so as to encourage recovery and pollution abatement and to control or, if so warranted, prohibit dumping, incineration, discharge to waterways and sewers, and sale to unsuspecting purchasers as "discount fuel oil."

For community organizations, DOE has compiled a "Used Oil Recycling Kit" showing how to set up a local program aimed at the do-it-yourselfer who changes his/her own oil and now dumps the drainings (an estimated 100 million gallons a year). DOE is also encouraging national support for such efforts from industry, commerce and State and local governments.

In areas of the country where collection networks are marginnally profitable and collection charges are assessed, and where oil reclamation is not feasible, DOE seeks to create increased market demand for used oil through its contacts with the electric utilities and members of the industrial community by advocating the use of used oil as a fuel supplement to oil and coal fired operations properly equipped with emission control equipment.

DOE is continuing to work with members of the industrial community towards more efficient energy and resource utilization. Included in this overall program is the promotion of industrial used oil recovery.

Used oil recovery and re-use is an active and ongoing program at DOE.

EXHIBITS

TABLE I: WASTE OIL GENERATION BY SOURCE (ESTIMATED 1972 DATA)

TABLE II: USED OIL GENERATION BY STATE (ESTIMATED)

TABLE III: BASIC DATA: EXCISE TAXES, HIGHWAY TRUST FUND RECEIPTS AND REVENUES AND STATE MOTOR VEHICLE REGISTRATIONS

TABLE 1: WASTE OIL GENERATION BY SOURCE
(ESTIMATED 1972 DATA)

	Sales (gallons)	Waste Oil (gallons)
Automotive Lube Oils		
Service stations	270,000,000	170,000,000
Garages, auto supply stores	60,000,000	38,000,000
New car dealers	102,000,000	92,000,000
Retail sales for commercial engines	90,000,000	57,000,000
Auto fleet & other lube oil uses	136,000,000	68,000,000
Factory fills (auto & farm equip.)	60,000,000	54,000,000
Discount stores	168,000,000	37,000,000
Commercial engine fleets	200,000,000	100,000,000
	1,086,000,000	616,000,000
Industrial and Aviation Lube Oils		
Hydraulic & circulating system oils	325,000,000	137,000,000
Metal working oils	150,000,000	105,000,000
Railroad engine oils	60,000,000	32,000,000
Gas engine oils	62,000,000	56,000,000
Aviation & other	137,000,000	64,000,000
	734,000,000	394,000,000
Other Industrial Oils		
Process oils	310,000,000	31,000,000
Electrical oils	57,000,000	51,000,000
Refrigeration oils	10,000,000	5,000,000
	377,000,000	87,000,000
Lube Oils Purchased by U.S.	37,000,000	18,000,000
GRAND TOTALS	2,234,000,000	1,115,000,000

Waste Oil Study, A report to the Congress, Environmental Protection Agency, April 1974*

(From the approximately 2.5 billion gallons of lubricating oil sold in 1975, an estimated 1.25 billion gallons of used oil was generated and lost.)

*Latest information available from EPA.

TABLE 2: USED OIL GENERATION BY STATE (ESTIMATED)

State	Automotive (gallons) 1971	Automotive (gallons) 1976 *
Alabama	12,182,640	14,123,015
Alaska	1,395,900	1,618,229
Arizona	6,358,600	7,371,358
Arkansas	8,008,590	9,284,149
California	72,034,320	83,507,517
Colorado	8,229,900	9,540,707
Connecticut	6,743,770	7,817,875
Delaware	1,624,870	1,883,668
Florida	14,445,970	16,746,836
Georgia	14,495,260	16,803,976
Hawaii	1,857,600	2,153,465
Idaho	3,435,230	3,982,371
Illinois	37,263,020	43,198,051
Indiana	17,722,970	20,545,776
Iowa	11,103,710	12,872,240
Kansas	14,381,400	16,671,982
Kentucky	14,075,660	16,317,544
Louisiana	15,163,310	17,578,430
Maine	3,339,070	3,870,897
Maryland	7,286,110	8,446,598
Massachusetts	13,404,420	15,539,394
Michigan	37,488,000	43,458,865
Minnesota	14,533,400	16,848,193
Mississippi	9,185,500	10,648,510
Missouri	19,701,790	22,839,772
Montana	4,191,070	4,858,598
Nebraska	8,846,970	10,256,062
Nevada	2,381,820	2,761,182
New Hampshire	1,680,430	1,948,079
New Jersey	18,071,960	20,950,352
New Mexico	4,760,980	5,519,281
New York	32,016,880	37,116,337
North Carolina	13,832,020	16,035,099
North Dakota	4,046,060	4,690,492
Ohio	36,627,970	42,461,855
Oklahoma	12,295,480	14,253,830
Oregon	12,020,320	13,934,842
Pennsylvania	35,728,740	41,419,400
Rhode Island	1,912,560	2,217,181
South Carolina	6,432,670	7,457,227
South Dakota	4,400,210	5,101,049
Tennessee	12,665,700	14,683,016
Texas	47,222,230	54,743,503
Utah	4,647,950	5,388,248
Vermont	1,330,400	1,542,298
Virginia	10,839,430	12,565,868
Washington	11,047,210	12,806,741
Washington, D.C.	1,638,780	1,899,795
West Virginia	6,530,830	7,571,022
Wisconsin	17,262,010	20,011,398
Wyoming	2,563,700	2,972,031

GCA Corporation, Waste Automotive Lubricating Oil Reuse as a Fuel, published report EPA-600/5-74-032, Environmental Protection Agency, September 1974. Current year estimates were developed by assuming an annual growth rate of 3 percent.

* DOE State Energy Conservation Programs - Staff Estimate

TABLE 3: BASIC DATA: EXCISE TAXES, HIGHWAY TRUST FUND RECEIPTS AND REVENUES AND STATE MOTOR VEHICLE REGISTRATIONS

	Net HTF Receipts from Automotive Excise Taxes ($000)	HTF Excise Revenue Receipts from Lube Oils (@ 6¢/gal.) ($000)	Estimated Federal Taxes Paid by Private & Commercial Highway Users on Lube Oil ($000)	Total State Motor Vehicle Registrations (Private & Public) (Mil.)	
				Autos	Motorcycles
CY 76	5,995	73,527	Not Available	109,675*	5,110*
CY 75	5,699	58,852	58,906	106,713	4,966
CY 74	6,104	86,065	59,705	104,898	4,961
CY 73	6,069	94,655	60,907	101,762	4,356

*Federal Highway Administration Estimate Only

Sources: Department of Transportation/FHWA News
Department of Transportation/FHWA/Highway Stat. Div., TABLE FE-1
Department of Transportation/FHWA Bulletin--FE Summary "Federal And Highway Financing"

Note: Table 3 shows lubricating oil revenue trends over recent years and the annual increase in motor vehicle usage. This data reflects the total amounts of dollars and vehicles which are involved in the use of lubricating oils. It speaks directly to the immense proportions of used oil reclamation efforts.

APPENDIX "C"

ANNOTATED BIBLIOGRAPHY

PRINT 11

ITEMS FROM THE TRIS DATA BASE

ITEM 1

ACCESSION NUMBER : 57739
REPORTING ORGANIZATION/SOURCE : BUREAU OF MINES
TITLE : WASTE LUBRICATING OIL RESEARCH. SOME INNOVATIVE APPROACHES TO RECLAIMING USED CRANKCASE
PUBLISHER/CORPORATE AUTHOR : BUREAU OF MINES
PUBLICATION DATE : 740000
DOCUMENT DATA : 20 PP
AUTHOR : WHISMAN, ML; GOETZINGER, JW; COTTON, FO
DOCUMENT CENTER/AVAILABILITY : BUREAU OF MINES PUBLICATIONS DISTRIBUTION BRAN
DOCUMENT CENTER CODE : RI 7025
SUMMARY OR ABSTRACT : THE BUREAU OF MINES DEVELOPED AND LABORATORY TESTED SEVERAL INNOVATIVE TECHNIQUES FOR RECLAIMING USED LUBRICATING OIL. THESE PROCESSES INCLUDED PERCOLATION THROUGH BOTH CHEMICALLY TREATED CLAY AND ION-EXCHANGE RESINS, DISTILLATION THROUGH BATCH AND CONTINUOUS WIPED-WALL VACUUM APPARATUS, TREATMENT WITH SOLVENT EXTRACTION SYSTEMS, AND CHEMICAL REMOVAL OF IMPURITIES WITH CHELATING AGENTS. IN EACH TREATMENT, THE CRITERIA OF EVALUATION WERE OIL RECOVERY AND REDUCTION OF ACIDIC AND METALLIC COMPONENTS. BOTH VACUU DISTILLATION AND SOLVENT TREATMENT RANKED HIGH IN THEIR ABILITIES TO REMOVE ACIDIC AND METALLIC COMPONENTS OF THE USED OIL WITH GOOD OIL RECOVERIES. A COMBINATION OF THE TWO TECHNIQUES GAVE THE BEST OVERAL RESULTS IN TERMS OF QUALITY EVALUATIONS MADE BY ESTABLISHED BENCH TESTS. THE METHODS WERE NOT RANKED ACCORDING TO ECONOMIC PRACTICABILITY.
SUPPLEMENTARY NOTE : BECAUSE OF THE LIMITED EDITION, ONLY ONE COPY OF THIS PUBLICATION CAN BE SENT TO THE PERSON APPLYING. PLEASE ENCLOSE A SELF-ADDRESSED LABEL.

ITEM 2

ACCESSION NUMBER : 83284
TITLE : WASTE OIL= A RESOURCE TO BE CONSERVED
PUBLISHER/CORPORATE AUTHOR : SOCIETY OF AUTOMOTIVE ENGINEERS
DOCUMENT IDENTIFICATION : SAE PAPER 740684
PUBLICATION DATE : 740000
AUTHOR : CHIOGIOJI, MH
SUMMARY OR ABSTRACT : THIS PAPER FOCUSES ON WASTE AUTOMOTIVE AND INDUSTRIAL OIL AS A PROSPECTIVE CANDIATE FOR GREATER RECYCLING AND RECLAMATION. ALTHOUGH LUBRICATING OILS REPRESENT ONLY 1% OF THE TOTAL DOMESTIC PETROLEUM PRODUCTION, CONSERVATION CAN RESULT IN SIGNIFICANT GAINS. FOR EXAMPLE, TO PRODUCE THIS OIL FROM NEW CRUDE RESERVES WOULD TAKE A INVESTMENT OF PERHAPS $80 MILLION IN REFINERY CAPACITY AND AN EXPLORATION, DEVELOPMENT, AND PRODUCTION INVESTMENT EXCEEDING $3 BILLION. THE PRESENT PRIMARY END USES OF WASTE OIL AND THE TECHNIQUES REQUIRED TO RECLAIM WASTE OIL ARE DESCRIBED. THE MAJOR IMPEDMENTS TO GREATER WASTE OIL USAGE ARE ANALYZED INCLUDING THE FOLLOWING FACTORS: ECONOMICS, TECHNOLOGY, WASTE OIL COLLECTION, GOVERNMENT ACTIONS, AND ENVIRONMENT QUALITY PROBLEMS. FEDERAL POLICY PROPOSALS ARE PRESENTED TO ENCOURAGE MORE WIDESPREAD RECLAMATION OF WASTE OIL.

ITEM 3

ACCESSION NUMBER : 97707
TITLE : WASTE OIL REPROCESSING
PUBLISHER/CORPORATE AUTHOR : EXXON RESEARCH AND ENGINEERING COMPANY
DOCUMENT IDENTIFICATION : PROJECT NO. 72-5 FINAL RPT.
PUBLICATION DATE : 730100
DOCUMENT DATA : 40 PP FIGS. TABS. 3 APP.
AUTHOR : CHAPPELL, GA
AGREEMENT NUMBER : GRA.1DJC.72
SUMMARY OR ABSTRACT : A LABORATORY PROGRAM WAS CONDUCTED ON THE REPROCESSING OF WASTE OIL. THE PROGRAM CONSISTED OF COMBUSTION TRAILS, PRECIPITATION TESTS, AND DISTILLATION EXPERIMENTS. THIS REPORT CONTAINS A DISCUSSION OF THE LABORATORY PROCEDURES AND THE RESULTS OBTAINED. THE COMBUSTION TRAILS INVOLVED THE DIRECT BURNING OF WASTE OIL IN A SMALL BOILER TO ASSESS THE PROBLEMS DUE TO THE CONTAMINANTS. THE RESULTS SHOWED SEVERE FOULING OF THE HEAT EXCHANGE TUBES WITH 5 % OF THE INORGANIC ASH COLLECTING INSIDE THE BOILER; THE REMAINDER WAS EMITTED IN THE FLUE GAS. THE BULK OF THE PARTICULATES WERE IN THE SUBMICRON RANGE WITH HIGH LEVELS OF LEAD. SLUDGE PRECIPITATION WAS USED TO REMOVE METALLICS FROM THE WASTE OIL. A PRECIPITATING SOLVENT CONSISTING ON N-HEXANE AND N-PROPLY ALCOHOL LOWERED THE INORGANIC LEVELS BY 70-97% DEPENDING ON THE SOURCE OF THE OIL. THE PRESENCE OF WATER INHIBITED PROPER SEPARATION AND WAS REMOVED. MORE THAN 87% OF THE LEAD PLUS MOST OF THE BARIUM, CALCIUM AND IRON WERE REMOVED BY PRECIPITATION. WHILE THE LEVELS OF ZINC, PHOSPHORUS, AND SULFUR WERE LOWERED, THE DECREASE WAS NOT AS GREAT AS WITH THE AFOREMENTIONED. TRACE METAL ANALYSES SHOWED THAT COOPER, NOT AS GREAT AS WITH THE AFOREMENTIONED. TRACE METAL ANALYSES SHOWED THAT COOPER, ALUMINUM, CHROMIUM, MAGNESIUM AND TIN WERE EFFECTIVELY REMOVED BUT THAT SILICON VANDIUM AND SODIUM WERE NOT. THE DISTILLATION EXPERIMENTS WERE CONDUCTED AT 20 TORR PRESSURE USING ONE WASTE OIL. THE RESULTS DEMONSTRATED IMPROVED METALS REMOVAL OVER THE PRECIPITATION TECHNIQUE WITHOUT THE ATTENDANT PROBLEM OF SOLVENT RECOVERY. HOWEVER, TO LOOK AT THE TOTAL PROBLEM THE DISPOSAL OF THE ASH CONTAINING RESIDUES HAD TO BE CONSIDERED. THE DISTILLATION RESIDUE CONTAINED OILY MATERIALS WHICH CREATED DISPOSAL PROBLEMS, WHEREAS THE PRECIPITATED SLUDGE COULD, IN PRINCIPLE, BE STRIPPED CLEAN OF OILS, THUS LESSENING THE DISPOSAL PROBLEM.
SUPPLEMENTARY NOTE : THIS REPORT WAS PREPARED FOR THE DIVISION OF WATER POLLUTION CONTROL, WATER RESOURCES COMMISSION OF THE COMMONWEALTH OF MASSACHUSETTS.

ITEM 4

ACCESSION NUMBER : 97917
TITLE : WASTE OIL STUDY (EPA)
PUBLISHER/CORPORATE AUTHOR : ENVIRONMENTAL PROTECTION AGENCY
PUBLICATION DATE : 740400
DOCUMENT DATA : 402 PP 11 FIG. 52 TAB.
SUMMARY OR ABSTRACT : THIS REPORT PRESENTS THE RESULTS OF STUDIES UNDERTAKEN TO DETERMINE THE EXTENT OF THE PROBLEM RESULTING FROM THE DISPOSAL OF WASTE OILS AND THE EFFECT OF VARIOUS DISPOSAL TECHNIQUES ON THE ENVIRONMENT. OF THE ESTIMATED 1.1 BILLION GALLONS OF WASTE OIL GENERATED ANNUALLY IN THE U.S., 480 MILLION GALLONS (TREATED OR

UNTREATED) ARE USED AS FUEL, 90 MILLION GALLONS ARE RE-REFINED TO LUBRICATING OIL, 200 MILLION GALLONS ARE USED IN ROAD OIL AND ASPHALT AND THE FATE OF 340 MILLION GALLONS, INCLUDING 30 MILLION GALLONS OF RE-REFINERY WASTES, IS UNKNOWN. THE WEAKEST LINK IN THE OVERALL WAST OIL RECYCLING/DISPOSAL SCHEME WAS FOUND TO BE THE COLLECTION OF WASTE OILS FROM INDUSTRIAL OPERATIONS AND AUTOMOTIVE SERVICE FACILITIES. THE REFINING INDUSTRY ITSELF APPEARED VIABLE, BUT WAS COMPLICATED NOT ONLY BY THE DIFFICULTY OF ACQUIRING WASTE OILS, BUT ALSO BY LABELING REQUIREMENTS WHICH CONNOTATE THAT PRODUCTS MADE FROM WASTE OIL ARE INFERIOR, INCREASINGLY MORE STRINGENT ENVIRONMENTAL CONTROLS THAT REQUIRE EXPENDITURES FOR CAPITAL IMPROVEMENTS, INCREASING DIFFICULTY IN DISPOSING OF ACID/CLAY SLUDGE WASTE RESULTING FROM THE PROCESS THA PREDOMINATES IN THE INDUSTRY, AND THE LACK OF QUALITY ASSURANCE THAT WOULD GENERATE CONFIDENCE IN THE PRODUCTS OF RE-REFINERIES. TWO RECOMMENDATIONS WERE SUGGESTED: (1) FOR CASES WHEREIN A WASTE OIL PRODUCT CAN MEET REQUIRED SPECIFICATIONS, THE LABELING REQULATICN SHOULD BE REEXAMINED TO ELIMINATE THE CONNOTATION THAT A PRODUCT MADE FROM WASTE OIL IS INFERIOR; AND (2) IRS RULING 68-1-8 SHOULD BE REEXAMINED TO DETERIMINE THE FEASIBILITY OF ALLOWING NON-HIGHWAY USER OF RE-REFINED OIL TO OBTAIN REFUNDS OF TAXES PAID ON VIRGIN OIL BLENDED WITH RE-REFINED LUBRICATING OIL. THE REPORT WAS ORGANIZED UNDER THE FOLLOWING CHAPTER HEADINGS: GENERATION OF WASTE OIL; PHYSICAL AND CHEMICAL CHARACTERISTICS OF WASTE OIL; METHODS OF COLLECTION AND DISPOSAL; RE-REFINING TECHNOLOGY; WASTE OIL REUSE AS A FUEL; THE EFFECTS OF WASTE CRANKCASE OIL ON SELECTED MARINE AND FRESHWATER ORGANISMS; ECONOMIC AND LEGAL ASPECTS OF WASTE OIL POLICY; AND FEDERAL PROCUREMENT OF PRODUCTS MADE FROM WASTE OIL.

ITEM 5

ACCESSION NUMBER : 97919
TITLE : A TECHNICAL AND ECONOMIC STUDY OF WASTE OIL RECOVERY. PART III: ECONOMIC, TECHNICAL AND INSTITUTIONAL BARRIERS TO WASTE OIL RECOVERY
PUBLISHER/CORPORATE AUTHOR : TEKNEKRON INCORPORATED; INSTITUTE OF PUBLIC ADMINISTRATION
DOCUMENT IDENTIFICATION : EPA/530-/SW-0-C.3 FINAL RPT.
PUBLICATION DATE : 731000
DOCUMENT DATA : 143 PP FIGS. TABS. REFS. 2 APP.
AUTHOR : CUKOR, PM; KEATON, J; WILCOX, G
DOCUMENT CENTER/AVAILABILITY : NATIONAL TECHNICAL INFORMATION SERVICE
DOCUMENT CENTER CODE : PB 237620
AGREEMENT NUMBER : 68-01-1806
SUMMARY OR ABSTRACT : IN ORDER TO UNDERSTAND THE REASONS FOR THE DECLINE OF THE RE-REFINING INDUSTRY, A STUDY WAS MADE OF THE ECONOMICS, STRUCTUR AND COMPETITIVE ASPECTS OF THE BUSINESS. AS A PART OF THIS ANALYSIS, INTERVIEWS WERE CONDUCTED WITH 13 RE-REFINING COMPANIES THROUGHOUT TH U.S. ONE ASPECT REVIEWED WAS WASTE OIL COLLECTION. IT WAS FOUND THA THE DEGREE TO WHICH RE-REFINERS ARE ABLE TO SECURE ADEQUATE VOLUMES O FEEDSTOCK DEPENDS ON THE RELATIVE MARKET PRICES OF VIRGIN LUBRICATING OIL AND FUELS. HIGHER FUEL PRICES PRICES IN RELATION TO THOSE FOR LUBRICATING OIL DIRECT WASTE OILS TO THE FUEL MARKET. CONVERSELY, HIGHER LUBRICATING OIL PRICES IN RELATION TO FUEL ENABLE RE-REFINERS TO COMPETE SUCCESSFULLY FOR SCARCE SUPPLIES OF USED OILS. ANOTHER ASPECT REVIEWED WAS THE RE-REFINING PROCESS ITSELF, WHICH IS PRIMARIL BY ACID-CLAY TREATMENT. BASED ON INTERVIEWS WITH THE 13 RE-REFINERS DURING THE SUMMER OF 1973, AVERAGE COST FIGURES FOR EACH STEP IN THE

RE-REFINING OF WASTE OILS WERE OBTAINED. EXCLUDING TAXES AND ADMINISTRATIVE COSTS, THE AVERAGE TOTAL PRODUCTION COST FOR THE FIRM INTERVIEWED WAS 17.5 CENTS PER GALLON. DEPENDING ON THE PRODUCT SPECIFICATIONS, A VARIETY OF ADDITIVES ARE BLENDED WITH THE RE-REFINED BASE STOCK. BLENDING COSTS FOR HIGH PERFORMANCE, TOP QUALITY LUBRICATING OILS ARE AS LARGE AS THE TOTAL COST OF RE-REFINING. IN REVIEWING THE MARKETING OF RE-REFINED OILS, TWO MAIN MARKETING PATHS WERE FOUND≠ FINAL USERS SUCH AS INDUSTRIAL AND COMMERCIAL ESTABLISHMENTS WHO PURCHASE HIGH QUALITY RE-REFINED OILS BLENDED WITH ADDITIVES, AND INDEPENDENT JOBBERS WHO DO THEIR OWN PACKAGING AND DISTRIBUTION AND PURCHASE THE UNBLENDED, RE-REFINED OILS IN BULK. SALES TO FINAL USERS WERE FOUND TO BE HIGHLY PROFITABLE, BUT THOSE INDEPENDENT JOBBERS, WHICH ACCOUNT FOR THE LARGER PART OF THE TOTAL PRODUCTION SOLD, SHOWED LOW RATES OF RETURN. IT WAS FOUND THAT THE FAILURE OF THE RE-REFINING INDUSTRY TO MONITOR THE QUALITY OF ITS PRODUCTS AND A FEDERAL TRADE COMMISSION RULING WHICH REQUIRES THAT RE-REFINED OILS SOLD IN INTERSTATE COMMERCE BE LABELLED TO INDICATE THAT THEY WERE PRODUCED FROM PREVIOUSLY USED OILS HAVE CONTRIBUTED TO THE PUBLIC≠S LACK OF CONFIDENCE IN THE QUALITY OF RECYCLED LUBRICATING OILS. AS A RESULT, CONSUMERS PURCHASE RE-REFINED OILS BASED ON THEIR LOW PRICE, MAKING VOLUME THE KEY TO SUCCESS IN THIS MARKET. AN EXAMINATION WAS ALSO MADE OF SPECIFICATIONS FOR LUBRICATING OILS, SINCE UNCERTAINTY AS TO THE QUALITY OF RE-REFINED OILS IS THE PRINCIPAL BARRIER TO INCREASED RECYCLING OF USED LUBRICANTS. A CLOSED-CYCLE EXPERIMENT WAS DESCRIBED FOR RESOLVING THE QUESTION OF THE QUALITY OF RE-REFINED OIL AND IT WAS SUGGESTED THAT FEDERAL PROCUREMENT AND LABELLING POLICIES BE REVISED TO REFLECT THE QUALITY OF RE-REFINED OILS.

ITEM 6

ACCESSION NUMBER : 97920
TITLE : STATE OF MARYLAND WASTE OIL RECOVERY AND REFUSE PROGRAM
PUBLISHER/CORPORATE AUTHOR : ENVIRONMENTAL QUALITY SYSTEMS, INCORPORATED
DOCUMENT IDENTIFICATION : TECH SER
PUBLICATION DATE : 704100
DOCUMENT DATA : 248 PP 10 FIG. 93 TAB. 51 REF.
AUTHOR : MARTIN, EJ; GUMTZ, GD
DOCUMENT CENTER/AVAILABILITY : NATIONAL TECHNICAL INFORMATION SERVICE
DOCUMENT CENTER CODE : PB 234446
AGREEMENT NUMBER : S-800650
SUMMARY OR ABSTRACT : THIS REPORT SUPPLEMENTS THE FINDINGS OF A 1971 STUDY CONDUCTED BY THE MARYLAND ENVIRONMENTAL SERVICE AND THE DEPARTMENT OF HEALTH AND MENTAL HYGIENE, WHICH CONCLUDED THAT THE DISCHARGE OF WASTE OILS TO STATE WATERS PRODUCED A PROBLEM WITHIN THE STATE OF MARYLAND. THE REPORT RECOMMENDED A COMPREHENSIVE PROGRAM OF COLLECTION, STORAGE AND REPROCESSING FOR POLLUTION PREVENTION AND FOR RESOURCE RECOVERY. THE PROGRAM WAS GUIDED BY THE PREMISES THAT ALL CATEGORIES OF WASTE OILS GENERATED WITHIN THE STATE WERE TO BE MANAGED, RECOVERED, OR DISPOSED OF, THAT FUEL OILS WOULD BE THE PRINCIPAL PRODUCTS PRODUCED, AND THAT CURRENT STATE-OF-THE-ART TECHNOLOGY WOULD BE USED IN THE DESIGN OF THE PROGRAM ELEMENTS. JSING QUESTIONNAIRES AND INTERVIEWS IT WAS ESTIMATED THAT 18.5 MILLION GALLONS OF WASTE OILS WERE GENERATED IN MARYLAND IN 1972. MATHEMATICAL MODELS DETERMINED THAT MOST EFFECTIVE COLLECTION SYSTEMS AND ECONOMICS FOR THE WASTE OIL PROGRAM. PRELIMINARY DESIGNS WERE DEVELOPED FOR DIFFERENT SCALES OF

PROCESS PLANTS. HEAVY EMPHASIS WAS PLACED ON PROTECTING THE ENVIRONMENT. PLANT COSTS VARIED BETWEEN $3 MILLION FOR A 7.3 MILLION GALLON PER YEAR (MGY) PLANT, TO $7.5 MILLION FOR A 30 MGY PLANT. MANAGEMENT, LEGISLATIVE AND REGULATORY APPROACHES TO THE WASTE OIL PROBLEM WERE ALSO DELINEATED. A WASTE OIL RECOVERY AND REUSE PROGRAM CAN BE INITIATED IMMEDIATELY USING EXISTING TECHNOLOGY, COLLECTION AND STORAGE RESOURCES. BECAUSE OF A NEED TO CONSIDER ALL SOURCES OF WASTE OILS, THE PROGRAM REQUIRES SUBSIDIZATION AT LOWER PLANT THROUGHPUTS. AT THE 30 MGY CAPCAITY, THE PROGRAM ECONOMICS CAN BE SELF-SUSTAINING. /EPA/

ITEM 7

ACCESSION NUMBER : 98533
TITLE : VEHICLE NOISE CONTROL PROGRAM OF THE NEW JERSEY AUTHORITY
PUBLICATION NAME : TRANSPORTATION RESEARCH BOARD SPECIAL REPORTS
PUBLISHER/CORPORATE AUTHOR : TRANSPORTATION RESEARCH BOARD
DOCUMENT IDENTIFICATION : HUD-381-PDR
PUBLICATION DATE : 741200
DOCUMENT DATA : 17 PP FIGS. PHOTS. REFS.
AUTHOR : KUNNA, JG
DOCUMENT CENTER/AVAILABILITY : GOVERNMENT PRINTING OFFICE
DOCUMENT CENTER CODE : 023-000-00284-1
SUMMARY OR ABSTRACT : THIS PUBLICATION DESCRIBES THE CONCEPT OF TOTAL ENERGY SYSTEMS AS A SOLUTION TO WASTING THE HEAT RESULTING FROM FUEL CONSUMPTION IN HEATING AND COOLING SYSTEMS. AS OPPOSED TO LETTING UNUSED ENERGY DISSIPATE IN THE SURROUNDING AIR OR WATER, TOTAL ENERGY SYSTEMS MAKE USE OF THIS ENERGY AND UTILIZE IT IN OPERATING PLANTS CLOSE TO CONSUMERS, THEREBY ELIMINATING FURTHER LOSS OF ENERGY THROUG TRANSPORTING. THIS TECHNIQUE IS CALLED >ONSITE GENERATION WITH WASTE-HEAT RECOVERY>. DESPITE THE TECHNOLOGICAL EXPERTISE THAT IS IMPLIED BY THIS TERM, THE PRACTICE OF TOTAL ENERGY DOES NOT REQUIRE SPECIAL EQUIPMENT OR KNOWLEDGE. A DIAGRAM DEPICTS THE EFFICIENCY OF TOTAL ENERGY SYSTEM AT WORK≠ A SINGLE ENGINE FOR A WHOLE BUILDING PROVIDING SPACE HEATING, AIR COOLING, AND HOT WATER. THE TOTAL ENERG CONCEPT IS NOT NEW, BUT THE RECOVERY OF WASTE HEAT IS. TODAY ALMOST 500 TOTAL ENERGY SYSTEMS ARE IN OPERATION THROUGHOUT THE COUNTRY. WHAT MUST RECEIVE CONTINUING DEVELOPMENT IN THE FUTURE IS THE APPLICATION OF THESE SYSTEMS TO RESIDENTIAL COMMUNITIES AND THEIR RELATED FACILITIES. IN ORDER TO RESEARCH THIS ASPECT, HUD≠S OFFICE O POLICY DEVELOPMENT AND RESEARCH HAS SET UP A TEST FACILITY AT AN APARTMENT COMPLEX IN JERSEY CITY, OPERATED ON DIESEL OIL. THIS FACILITY HAS PROVEN THE SUITABILITY OF THE SYSTEM TO A RESIDENTIAL UNIT. ALTHOUGH THE ENERGY SAVING AND LOW POLLUTION BENEFITS ARE RECOGNIZED, THE COSTS OF OPERATING A SYSTEM LIKE THIS ARE NOT WELL DEFINED. THE NATIONAL BUREAU OF STANDARDS IS CURRENTLY OBTAINING ALL THE OPERATIONAL DATA NECESSARY AND A DATA BASE WILL BE AVAILABLE AFTE ONE YEAR OF OPERATION. EXPANSION OF THE TOTAL ENERGY SYSTEM WILL RESULT IN MIUS - THE MODULAR INTEGRATED UTILITY SYSTEM. BY THIS CONCEPT, THE WASTE DISPOSAL PROBLEM WILL BE SOLVED BY EXTRACTING THERMAL ENERGY FROM SOLID WASTE, RECLAIMING LIQUID WASTE FOR PROCESS FLUID, AND PURIFICATION OF WATER FOR DRINKING PURPOSES. THE COST OF THESE SYSTEMS WILL VARY FOR DIFFERENT GEOGRAPHICAL AREAS. THE LONG-RUN ECONOMIC VALUE WILL OF COURSE DEPEND UPON THE ECONOMIC LIFE OF THE SYSTEM. THESE CONCEPTS ARE NOT NEW: COMBINING THEM TO PRODUCE AN ALMOST SELF SUFFICIENT COMMUNITY IS THE NOVELTY. HUD IS

DEMONSTRATING WHAT CAN BE ACCOMPLISHED THROUGH EXISTING TECHNOLOGY AND THE EFFORTS OF CONSUMERS.
SUPPLEMENTARY NOTE : PRESENTED AT A WORKSHOP ON MOTOR VEHICLE NOISE CONTROL, WASHINGTON, D.C., 10-11 DECEMBER 1974.

ITEM 8

ACCESSION NUMBER : 98667
TITLE : SYNTHETIC GASOLINE FROM THE CARBON OF LIMESTONE
PUBLICATION NAME : LIME STONE
PUBLISHER/CORPORATE AUTHOR : NATIONAL LIMESTONE INSTITUTE, INCORPORATED
DOCUMENT IDENTIFICATION : V12 N44
PUBLICATION DATE : 750600
DOCUMENT DATA : 6 PP PHOTS.
AUTHOR : TAMERS, MA
SUMMARY OR ABSTRACT : ENERGY FROM FOSSIL CARBON SOURCES ARE BRIEFLY REVIEWED AND THE POSSIBILITIES ARE DETAILED OF UTILIZING LIMESTONE TO PRODUCE A SYNTHETIC LIQUID HYDROCARBON. THE BERGINS AND FISCHER-TROPSCH PROCESSES OF COAL LIQUEFICATION ARE OUTLINED. AN EFFORT IS NOW UNDERWAY TOWARDS INITIATING THE LARGE SCALE PRODUCTION OF SYNTHETIC BENZENE AND OTHER AROMATICS THAT CAN BE MADE FROM IT. THE METHODS UTILIZED IN THIS METHOD MAY BE SUMMARIZED≠ THE LIMESTONE OR OTHER CARBONATE OR CARBONIZED MATERIAL (SUCH AS CHARCOAL, AGRICULTURAL WASTES, FORESTRY MATERIALS ETC.) IS CONVERTED TO LIME AND THE CARBON DIOXIDE COLLECTED. THE GAS IS THEN PURIFIED AND REACTED WITH MOLTEN LITHIUM METAL AT APPROXIMATELY 1300 DEG. F. AN ALTERNATIVE IS OUTLINED WHEREBY THE LIMESTONE IS REACTED UNDER VACUUM AND AT 1300 DEG. F, DIRECTLY WITH MOLTEN LITHIUM. IN THIS CASE, THE LIME IS REMOVED FROM THE SOLUTION RESULTING FROM THE CARBIDE HYDROLYSIS AND THE LITHIUM RECOVERED FOR RECYCLING. THE CHEMICAL YIELDS IN THE ACETYLENE-PRODUCING STEPS ARE BETTER THAN 90 PERCENT. THE LITHIUM CARBIDE HYDROLYSIS GENERATES ACETYLENE THAT IS PURIFIED IN VARIOUS WAYS BEFORE BEING SUBMITTED TO A CATALYST (VANADIUM OR CHROMIUM ACTIVATED BEADS) FOR CYCLIZATION TO BENZENE. CATALYST ACTIVITY IS DISCUSSED. THE USE OF SYNTHETIC BENZENE AND DERIVATIVES AS EXTENDERS FOR PETROLEUM FUELS IS REVIEWED. THE ADVANTAGES ARE DESCRIBED OF A SYNTHETIC BENZENE CONTENT OF 10 TO 20 PERCENT OF REGULAR GASOLINE. ENVIRONMENTAL CONSIDERATIONS IN THE PRODUCTION OF SYNTHETIC BENZENE ARE OUTLINED≠ THE RECYCLING OF INTERMEDIATES IN THE PROCESS OF BENEZENE PRODUCTION; REACTIVATION OF THE CATALYST; AND THE USE OF A WASTE PRODUCT AS THE RAW MATERIAL IN THE PRODUCTION (OF BENZENE) ITSELF. SOME ADVANTAGES IN THE SYNTHESIZED BENEZENE INTERNAL CONBUSTION FUEL CONSTITUENT ARE LISTED. THE MOST IMPORTANT AMONG THESE ARE THE REDUCTION OF U.S. DEPENDENCE ON IMPORTED OIL.

ITEM 9

ACCESSION NUMBER : 136466
REPORTING ORGANIZATION/SOURCE : NATIONAL TECHNICAL INFORMATION SERVICE
TITLE : A TECHNICAL AND ECONOMIC STUDY OF WASTE OIL RECOVERY. PART IV. ENERGY CONSUMPTION IN WASTE OIL RECOVERY. PART V. A FIELD TEST OF THE QUALITY OF RE-REFINED LUBE OILS. PART VI. A REVIEW OF RE-REFINING ECONOMICS
NON-ENGLISH TITLE/TITLE NOTE : FINAL REPT
PUBLISHER/CORPORATE AUTHOR : TEKNEKRON, INC., BERKELEY, CALIF.*ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. OFFICE OF: SOLID WASTE MANAGEMENT PROGRAMS.*INSTITUTE OF; PUBLIC ADMINISTRATION, BERKELEY, CALIF.

DOCUMENT IDENTIFICATION : EPA/530/SW-90C.4
PUBLICATION DATE : 751000
DOCUMENT DATA : 141P
AUTHOR : CUKOR, PM; HALL, T
DOCUMENT CENTER/AVAILABILITY : NATIONAL TECHNICAL INFORMATION SERVICE
DOCUMENT CENTER CODE : PB-251716/7ST
AGREEMENT NUMBER : EPA-68-01-2904
SUMMARY OR ABSTRACT : THIS REPORT CONTAINS THE FOLLOWING STUDIES: AN ENERGY BALANCE OF WASTE OIL RECYCLING AS LUBE OIL AND WASTE OIL RECOERY AS FUEL OIL; A DESCRIPTION OF A POTENTIAL FIELD TEST RE-REFINED LUBE OIL USING MOTOR VEHICLES ON A FEDERAL FACILITY; AN UPDATE OF RE-REFINING ECONOMIES REFLECTING INCREASED PRICES OF PETROLEUM PRODUCTS (1974-75)
SUPPLEMENTARY NOTE : SEE ALSO PB-237 620. PREPARED IN COOPERATION WITH INSTITUTE OF PUBLIC ADMINISTRATION, BERKELEY, CALIF.

ITEM 10

ACCESSION NUMBER : 142287
REPORTING ORGANIZATION/SOURCE : ENGINEERING INDEX
TITLE : EVALUATING A WASTE-OIL RECLAMATION SYSTEM
PUBLICATION NAME : PLANT ENGINEERING
PUBLISHER/CORPORATE AUTHOR : TECHNICAL PUBLISHING COMPANY
DOCUMENT IDENTIFICATION : V30 N9
PUBLICATION DATE : 760429
DOCUMENT DATA : PP 255-257
AUTHOR : ALLEN, JL
DOCUMENT CENTER/AVAILABILITY : ENGINEERING SOCIETIES LIBRARY
SUMMARY OR ABSTRACT : CURRENTLY, ONLY A SMALL PORTION OF INDUSTRIAL OILS (INDUSTRY ESTIMATES RANGE FROM 2 TO 5 PERCENT) IS BEING RECYCLED, THE REST WINDS UP BEING SPREAD ON DIRT ROADS, BURNED AS FUEL OIL, OR JUST DUMPED SOMEWHERE. MOST PLANT ENGINEERS REALIZE THAT RECYCLING IS PROBABLY THE ONLY REALISTIC SOLUTION TO THE PROBLEM TODAY, BUT THE QUESTION IS: ≠HOW↓≠ IF SOLID PARTICLES WERE THE ONLY CONTAMINANTS IN USED PLANT LUBRICANTS, A SIMPLE FILTRATION SETUP WOULD PROVIDE THE ANSWER. UNFORTUNATELY, THAT IS NOT THE CASE, BUT MODERN LUBRICANT-RECYCLING SYSTEMS CAN BE DESIGNED TO HANDLE ALMOST ANY CONTAMINANT PROBLEM. THE ARTICLE DISCUSSES IMPORTANT FACTORS TO BE CONSIDERED IN EVALUATING OIL RECLAMATION SYSTEMS, INCLUDING TYPE OF OIL, CONTAMINANTS, QUANTITIES, FILTERS AND COSTS.

ITEM 11

ACCESSION NUMBER : 146071
REPORTING ORGANIZATION/SOURCE : NATIONAL TECHNICAL INFORMATION SERVICE
TITLE : WASTE OIL STUDY. REPORT TO THE CONGRESS
PUBLISHER/CORPORATE AUTHOR : ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C
DOCUMENT IDENTIFICATION : 18
PUBLICATION DATE : 740400
DOCUMENT DATA : 414P
DOCUMENT CENTER/AVAILABILITY : NATIONAL TECHNICAL INFORMATION SERVICE
DOCUMENT CENTER CODE : PB-257693/2ST
SUMMARY OR ABSTRACT : THIS REPORT PRESENTS THE RESULTS OF STUDIES UNDERTAKEN TO DETERMINE THE EXTENT OF THE PROBLEM RESULTING FROM THE DISPOSAL OF WASTE OILS AND THE EFFECT OF VARIOUS DISPOSAL TECHNIQUES ON THE ENVIRONMENT. THE REPORT IS SUBMITTED IN FULFILLMENT OF SECTION 104 (M (2) OF THE WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972. WASTE

LUBRICATING OILS CONTAIN A MYRIAD OF CONTAMINANTS DEPENDING UPON THE USAGE. IN GENERAL, THEY CONTAIN OXIDATION PRODUCTS, SEDIMENT, WATER AND METALLIC PARTICLES RESULTING FROM MACHINERY WEAR. THE COLLECTION OF WASTE OILS FROM INDUSTRIAL OPERATIONS AND AUTOMOTIVE SERVICE FACILITIES IS THE WEAKEST LINK IN THE OVERALL WASTE OIL RECYCLING/DISPOSAL SCHEME. DISPOSAL METHODS CURRENTLY USED INCLUDE RE-REFINING, USE AS A FUEL FOR INDUSTRIAL AND UTILITY APPLICATIONS, USE IN ROAD OILS, ASPHALTS AND AS A DUST PALLIATIVE, DISPOSAL IN SANITARY LANDFILLS, AND SURREPTITIOUS DUMPING ON LAND OR IN WATER. THE RE-REFINING INDUSTRY IN THE UNITED STATES IS DISCUSSED. RESULTS OF THE BIOLOGICAL STUDIES TO DATE ARE PRESENTED.
SUPPLEMENTARY NOTE : SEE ALSO REPORT DATED APR 73, PB-253 332.

ITEM 12

ACCESSION NUMBER : 164615
REPORTING ORGANIZATION/SOURCE : ROADS AND TRANSPORTATION ASSOCIATION OF CANADA
TITLE : PATTERNS OF MOTOR OIL USE AND PUBLIC ATTITUDES TO THE USE OF RE-REFINED MOTOR OIL
PERFORMING AGENCY : ONTARIO MINISTRY OF TRANSPORTATION & COMMUNIC, CAN
INVESTIGATOR : ADAMS, M; SHARRATT, K
FUNDING AGENCY/RESP. ORGAN. : ONTARIO MINISTRY OF TRANSPORTATION & COMMUNIC CAN
ACTIVITY STATUS : COMPLETED
SUMMARY OR ABSTRACT : THIS STUDY, CARRIED OUT BY ENVIRONICS RESEARCH, WAS UNDERTAKEN AS ONE COMPONENT OF A COMPREHENSIVE ENERGY CONSERVATION STUDY OF THE FEASIBILITY OF RECYCLING USED MOTOR OIL. A FIFTEEN MINUTE TELEPHONE INTERVIEW WAS CONDUCTED IN DECEMBER/75 AMONGST 700 RANDOMLY SELECTED CAR OWNING HOUSEHOLDS FROM TORONTO AND FIVE OTHER URBAN AREAS OF SOUTHERN ONTARIO. THE REPORT EXPLORES THE AMOUNT OF OIL THAT IS CONSUMED, THE MANNER IN WHICH IT IS CHANGED, THE BRAND NORMALLY PURCHASED AND THE REASON FOR DOING SO AND THE ATTITUDE TOWARDS A RE-REFINED OIL. ATTENTION WAS GIVEN TO VARIATION IN THESE PATTERNS BY CAR AGE, MILES DRIVEN, SEX, ETC. THE STUDY REVEALED THAT 30% OF DRIVERS WERE SELF CHANGES, HOWEVER, THEY ACCCOUNTED FOR ONLY 19% OF THE OIL CONSUMED. ABOUT 9% OF ALL OIL WAS DISPOSED IN AN ENVIRONMENTALLY DETRIMENTAL MANNER. JUST OVER ONE HALF OF CAR OWNERS EXPRESSED THEIR WILLINGNESS TO PURCHASE A RE-REFINED PRODUCT. THE REPORT CONCLUDES THAT THE IDEA OF A RE-REFINED OIL WILL ENJOY STRONG SUPPORT FROM THE CAR OWNER IF AN APPEAL IS MADE TO HIS POCKET BOOK OR CONSCIENCE. /RTAC/

ITEM 13

ACCESSION NUMBER : 168786
REPORTING ORGANIZATION/SOURCE : NATIONAL TECHNICAL INFORMATION SERVICE
TITLE : MEASUREMENTS AND STANDARDS FOR RECYCLED OIL
PUBLISHER/CORPORATE AUTHOR : NATIONAL BUREAU OF STANDARDS
DOCUMENT IDENTIFICATION : NBS-SP-488 FINAL RPT.
PUBLICATION DATE : 770800
DOCUMENT DATA : 145 PP
AUTHOR : BECKER, DA
DOCUMENT CENTER/AVAILABILITY : NATIONAL TECHNICAL INFORMATION SERVICE
DOCUMENT CENTER CODE : PB-271562/1ST
SUMMARY OR ABSTRACT : CONTENTS: THE NBS WORKSHOP OBJECTIVES AND THE NBS RECYCLED OIL PROGRAM; BURNING USED OIL AT A MILITARY INSTALLATION;

FUEL OIL AND THE DEFENSE SUPPLY AGENCY; FUEL OIL SPECIFICATIONS; AUTOMOTIVE CRANKCASE DRAININGS USED FOR FUEL; ASTM TEST METHODS FOR INDUSTRIAL OILS; INDUSTRIAL OIL RECYCLING AT CHRYSLER; INDUSTRIAL OILS-DESCRIPTIONS, ADDITIVES, AND TEST METHODS; THE USE OF RECYCLED INDUSTRIAL AND HYDRAULIC OILS AT FORD; INDUSTRIAL LUBRICANTS, RECLAIMED OILS, AND TEST METHODS; DOD EXPERIENCES IN TESTING LUBE OILS; WASTE OIL RECYCLING--AN IDEA WHOSE TIME HAS COME; COMMENTS ON ADDITIVE RESPONSE TO DIFFERENT BASE OILS; ACTIVITIES OF THE ASTM USED OIL TASK FORCE; ACTIVITIES OF THE API USED OIL TASK FORCE; CHEVRON RESEARCH'S EXPERIENCES WITH RE-REFINED OILS; ENGINE SEQUENCE TESTS FO DETERMINATION OF LUBE OIL QUALITY; SCREENING TESTS ON LUBE OILS; LABORATORY TESTING ON RE-REFINED MOTOR OIL; DIESEL LUBE OIL TEST METHODS; RECENT USED OIL LEGISLATION; THE LEAD PROBLEM ASSOCIATED WIT RECYCLED OIL; FACTORS AFFECTING USED OIL RECOVERY/UTILIZATION AND EFFECTS OF PROPOSED POLICY ALTERNATIVES; ENERGY CONSERVATION ASPECTS OF RE-REFINED OIL; MARKETING BARRIERS FOR RECYCLED OIL.

SUPPLEMENTARY NOTE : LIBRARY OF CONGRESS CATALOG CARD NO. LCCCN-77-600032.

ITEM 14

ACCESSION NUMBER : 217297
TITLE : ECONOMICS ARE BUGABOO IN SCRAP TIRE RECYCLING
PUBLICATION NAME : CHEMICAL & ENGINEERING NEWS
PUBLICATION DATE : 720800
DOCUMENT DATA : PP 8-10 4 PHOT
AUTHOR : ANDERSON, EV
SUMMARY OR ABSTRACT : IN MOST CITIES BURNING AS A MEANS OF TIRE DISPOSAL IS FORBIDDEN, AND MANY LANDFILLS NO LONGER ACCEPT TIRES. THE RECLAIMED-RUBBER INDUSTRY IS DECLINING IN COMPETITION WITH INEXPENSIV VIRGIN SYNTHETIC RUBBERS. IN MOST CASES THE TECHNOLOGY FOR RECYCLING SCRAP TIRES HAS BEEN PROVED, BUT TYPICAL COSTS RANGE FROM $9 TO $20 PER TON. ON THE OTHER HAND, BOTH INDUSTRY AND RESEARCH INSTITUTIONS ARE OPTIMISTIC ABOUT THE SUCCESS OF THE RECYCLING PROCESS AND POTENTIAL APPLICATIONS. FOR EXAMPLE, THE FIRESTONE CO. HAS IDENTIFIED AS MANY AS 50 DIFFERENT CHEMICALS IN THE PRODUCTS DRIVEN OFF AND CONDENSED IN ITS AKRON PILOT PLANT, ALL THEM HAVING A PRACTICAL USE. THE RECOVERED OILS CAN BE USED TO MANUFACTURE RUBBER, PREPARE CARBON BLACK FOR RECYCLING, OR USE AS A PETROCHEMICALS FEEDSTOCK. RECOVERED GASES CAN FUEL THE RECOVERED REACTOR. WIRE CAN BE RECLAIMED FOR USE. CHAR CAN BE USED AS A PARTICULATE IN CONCRETE OR AS A FILTERING MEDIU IN SEWAGE TREATMENT. IT IS GENERALLY THOUGHT THAT THE ECONOMICS OF TH PROCESS WILL STAND OR FALL ON CARBON BLACK. RESEARCH AGENCIES ARE INVESTIGATING THE USE OF RECYCLED TIRES AS A SOIL CONDITIONER, AN ABSORBER FOR CLEANING UP OIL SPILLS, AN ADDITIVE TO ASPHALT FOR ROAD PAVING, A MATERIAL FOR RUNNING TRACKS, ARTIFICIAL REEFS, AND BARRIERS AGAINST VEHICLE COLLISIONS WITH FIXED OBJECTS. THIS LAST APPLICATION IS BEING EXPLORED BY THE TEXAS TRANSPORTATION INSTITUTE UNDER A CONTRACT WITH NCHRP.
INFO SERVICE ACCESSION NUMBER : 1P34228680

ITEM 15

ACCESSION NUMBER : 233313
TITLE : THE NEW LOOK OF PLOWSHARE
PUBLICATION NAME : MILITARY ENGINEER
DOCUMENT IDENTIFICATION : V64 N420

PUBLICATION DATE : 720700
DOCUMENT DATA : PP 233-6 5 FIG
AUTHOR : GREEN, J8
SUMMARY OR ABSTRACT : FORMALLY ESTABLISHED BY THE U.S. ATOMIC ENERGY COMMISSION IN 1957 TO INVESTIGATE POTENTIAL INDUSTRIAL AND CIVIL APPLICATIONS OF NUCLEAR EXPLOSIVES, THE PLOWSHARE PROGRAM≠S MAIN THRUST WAS TOWARD DEVELOPMENT OF EXCAVATION TECHNOLOGY. THE LIMITED TEST BAN TREATY HAS PUT A VIRTUAL HALT TO EXCAVATION RESEARCH, AND PROGRAM IS BEING REORIENTED TOWARD MEASURING AND PREDICTING EXPLOSI E EFFECTS AND DEVELOPING SUITABLE EXPLOSIVES. OPERATIONS HAVE NOW SHIFTED FROM EXCAVATION TO UNDERGROUND ENGINEERING APPLICATIONS, WH CH CAN BE GROUPED INTO THREE MAJOR CATEGORIES≠ ENERGY RESOURCES DEVELOPMENT, MINERAL RESOURCES DEVELOPMENT, AND WASTE MANAGEMENT. IN ALL APPLICATIONS THE NUCLEAR EXPLOSIONS ARE COMPLETELY CONTAINED. THE >CAVITY-- CHIMNEY> FORMATION PROCESS OF THESE EXPLOSIONS IS DESCRIB D. PLOWSHARE HAS BECOME OF SPECIAL IMPORTANC E IN STIMULATING LOW-PERMEABILITY GAS RESERVOIRS, AS THE ENVIRONMENTAL MOVEMENT HAS EXERTED PRESSURE FOR A SHIFT FROM COAL OR FUEL OIL TO NATURAL GAS A TIME WHEN SUPPLIERS ARE OPERATING AT OR ABOVE 100 PERCENT OF THEIR PROJECTED DELIVERY CAPACITY. THE BUREAU OF MINES ESTIMATES THAT NUCLEAR METHODS CAN PRODUCE 317 TRILLION CUBIC FEET OF NATURAL GAS, COMPARED WITH 275 TCF BY CONVENTIONAL MEANS. TECHNIQUES AND NEW PROJECTS ARE DESCRIBED. THE SAME METHODS CAN BE APPLIED TO STIMULATIO OF PETROLEUM APPLIED TO STIMULATION OF PETROLEUM RESERVOIRS. NORMAL PRODUCTION METHODS WOULD REQUIRE 30 YEARS TO RECOVER WHAT NUCLEAR EXPLOSIVES CAN RECOVER IN 10. SECONDARY RECOVERY HAS BEEN SUCCESSFULL ATTEMPTED IN THE SOVIET UNION. NUCLEAR EXPLOSIVES CAN ALSO OBVIATE PEAK-DEMAND PIPELINE FACILITIES BY CREATING STORAGE IN A VERY TIGHT UNFRACTURED, IMPERMEABLE FORMATION. FEASIBILITY STUDIES OF SUCH STORAGE ARE ENCOURAGING. NATURAL GEOTHERMAL ENERGY IS ANOTHER APPLICATION IN THE ENERGY RESOURCES CATEGORY. WITH RESPECT TO MINER RESOURCES, CONTAINED UNDERGROUND NUCLEAR EXPLOSIONS CAN CREATE A CHIMNEY AND FRACTURE ZONE IN THE ORE DEPOSIT BELOW THE WATER TABLE, PERMITTING IN SITU LEACHING WITH AN ACID SOLUTION. THE TECHNOLOGY IS DISCUSSED BRIEFLY. IN THE CASE OF NUCLEAR WASTE DISPOSAL, RADIOACTI E WASTE FROM FUEL-REPROCESSING PLANTS WOULD BE STORED IN ONE OR MORE NUCLEAR CHIMNEYS AT THE SITE AND ALLOWED TO SELF-BOIL. WHEN IT HAD SERVED ITS PURPOSE THE CHIMNEY WOULD BE BOILED DRY AND CEMENTED SHU , THE HEAT GENERATED BY THE WASTE WOULD THEN MELT THE ROCK, WHICH WOULD DISSOLVE THE WASTE MATERIAL. WHEN THE MOLTEN MATERIAL COOLED, THE RADIOACTIVITY WOULD BE PERMANENTLY INSOLUBLY INCORPORATED INTO THE ROCK. THE CLOSE-LOOP OPERATIONAL CYCLE WOULD ENSURE NO RELEASE OF CONTAMINATION TO THE ENVIRONMENT DURING THE DISPOSAL OPERATIONS.
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ITEM 16

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SUMMARY OR ABSTRACT : WASTE AUTOMOTIVE AND INDUSTRIAL OIL ARE EXAMINED AS PROSPECTIVE CANDIDATES FOR GREATER RECYCLING AND RECLAMATION. ALTHOUG LUBRICATING OILS REPRESENT ONLY 1% OF THE TOTAL DOMESTIC PETROLEUM PRODUCTION, CONSERVATION CAN RESULT IN SIGNIFICANT GAINS. TO PRODUCE THIS OIL FROM NEW CRUDE RESERVES WOULD TAKE AN INVESTMENT OF PERHAPS $80 MILLION IN REFINERY CAPACITY AND AN EXPLORATION, DEVELOPMENT, AND PRODUCTION INVESTMENT EXCEEDING $3 BILLION. THE PRESENT PRIMARY END USES OF WASTE OIL AND THE TECHNIQUES REQUIRED TO RECLAIM WASTE OIL AR DESCRIBED. THE MAJOR IMPEDIMENTS TO GREATER WASTE OIL USAGE ARE ANALYZED, INCLUDING THE FOLLOWING FACTORS≠ ECONOMICS, TECHNOLOGY, WASTE OIL COLLECTION, GOVERNMENT ACTIONS, AND ENVIRONMENT QUALITY PROBLEMS. FEDERAL POLICY PROPOSALS ARE PRESENTED TO ENCOURAGE MORE WIDESPREAD RECLAMATION OF WASTE OIL.

SUPPLEMENTARY NOTE : PRESENTED AT THE NATIONAL COMBINED FARM, CONSTRUCTION AN INDUSTRIAL MACHINERY AND POWERPLANT MEETINGS, MILWAUKEE, WIS., 9-12 SEP 1974.

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