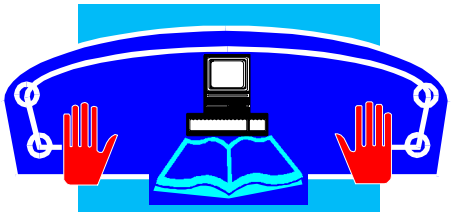

Report On Update Summary Of Waste Lubricating Oil Furnaces For Use In The Northwest Territories

Type of Study: Analysis/review
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REPORT ON

UPDATE SUMMARY OF WASTE LUBRICATING OIL FURNACES FOR USE IN THE NORTHWEST TERRITORIES

APRIL, 1993

Northwest Territories Renewable Resources
Pollution Control Division

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TABLE OF CONTENTS

* NOT AVAILABLE IN STANDARD PRINTED VERSION + SEPARATE VOLUME

SUMMARY

This report reviews and assesses waste oil furnaces, suitable for community operations in the Northwest Territories. The study focuses on the furnaces certified or undergoing certification for use in Canada, but also reviews furnaces certified in the United States. Also contained in this report are all the manufacturers that are certified by the Canadian Standards Association, Underwriters Laboratories of Canada or Underwriters Laboratories. In addition, all of the furnace manufacturers certified by the Energy Testing Laboratories of Maine that could be contacted are reviewed.

This report is an update of a 1988 study on waste oil furnaces for the Northwest Territories by Boreal Consulting Services Ltd. The changes to the companies and furnace models that were available in 1988, as well as new models that are currently available, are discussed in the present study.

Contact was made with a total of 13 companies that either supply or manufacture atomizing, vaporizing or boiler type waste oil furnaces. Of these, 11 produce atomizing type heaters and boilers, while two produce vaporizing type heaters. There are presently four waste oil heaters certified for use in Canada. Three are the atomizing models and one is a vaporizing unit. Another atomizing model is currently undergoing certification procedures at Underwriters Laboratories of Canada.

1.0 INTRODUCTION

The problem of disposing of waste lubricating oils such as crankcase oils, lube oils and automatic transmission fluids (ATF) is not a simple matter for the isolated communities of the Northwest Territories. Due to the remoteness of this area, practical and economical means of disposing of waste oils are usually not available. Re-refining the waste oils requires accessible transportation by road, rail or water, all of which are not economically viable in the Northwest Territories. One solution to waste oil disposal that has been of particular interest to the Government of the Northwest Territories, is to use this product in waste oil furnaces to provide heat. This solution not only offers a method of eliminating the waste problem, but has the added advantage of turning the waste oil into usable fuel. This is an attractive alternative to other methods of disposal, given the high demand for heat generation in this area.

The use of waste oil furnaces by communities in the Northwest Territories can be beneficial in many ways. Using the waste oil at its source of generation, the problems of storage, transportation and disposal of the waste product, not to mention the risk of accidental spills, are reduced. A suitable system for this application will be one that makes efficient use of the waste oil , is easy to install, operate and maintain, and, at the same time, meets established safety and environmental standards. Given the remoteness of the area, it is imperative that the equipment be reliable and easily serviced. Parts must be readily available, preferably in Canada.

Air emissions data has been requested from all the manufacturers and to date, all available information has been incorporated into this report. Some data was uncovered in a literature search which provides general emissions data from small furnaces and boilers using waste oil. This data was obtained in the mid-80s and a report produced in 1989. More recent data from tests in 1991 in Whitehorse, YK was also uncovered. Excerpts and tables from these reports, showing emissions data, can be found in Appendix 1. Potential pollutants in waste oils are also discussed further in section 5.0.

In order for a waste oil furnace to be used in Canada, Underwriters Laboratories of Canada (ULC) or Canadian Standards Association (CSA) certification must be obtained. This can be done in advance on a specific line of models or by on-site inspections of individual furnaces. CSA does not require that emissions testing, other than the smoke number, and levels of carbon dioxide and carbon

monoxide, be done on heaters to obtain certification. Similarly, to become ULC certified, the CSA requirements are done along with two additional tests of their own, neither of which address the level of atmospheric emissions. Complete test procedures for CSA and the Energy Testing Laboratories of Maine (ETLM) maybe found in Appendix 4.0. CSA indicated that any possible emissions testing could be done at Environment Canada, although no such data is needed for certification.

Section 2.0 of this report presents the methods used in this study. Section 3.0 gives a general review of waste oil burners, and section 4.0 discusses certification agencies. Section 5.0 highlights levels of contaminants in waste oil. Section 6.0 presents the specifications and a brief summary for each of the different units.

2.0 METHODS

Currently available waste oil furnaces and relevant technologies were investigated by conducting a computerized literature search and a survey of manufacturers. The manufacturer's survey focused on equipment available and certified in Canada, but also included those available in other jurisdictions, particularly in Alaska.

2.1 LITERATURE SEARCH

A computerized literature search was conducted using the facilities of the Canadian Institute for Scientific and Technical Information (CISTI). The six databases searched are listed below in Table 1 with the appropriate time frame for each.

TABLE 1

Computer Databases Searched

DATABASE	SPAN OF COVERAGE
Engineering Index (EI, EIM and EIPlus)	1970-present
NTIs	1964-present
ELIAS	1976-present
Energy Science and Technology	1974-present
Environmental Resources Technology Database (ERTH)	1965-present
CISTIMON	1978-present

In addition to the CISTI search a manual search of the Environmental Emergencies Technology Division (EETD) library at Environment Canada and the S.L. Ross library was conducted.

A small database was designed using DBASE IV (Ashton Tate Corp.), to organize the 209 references found and to facilitate future document selection. DBASE IV was chosen for its compatibility with industry standards, the ease with which a database can be constructed and modified, and its ability

to perform complex searches on the created database.

A bibliographic list of the references is given in Appendix 1. The bulk of these references may be found in the S.L. Ross and Environment Canada, EETD libraries.

2.2 MANUFACTURER'S SURVEY

In order to discover what types of waste oil furnaces were currently available, a survey was faxed to over 50 potential manufacturers, distributors or suppliers of waste oil furnaces and other related equipment in North America. The list and a sample of the fax sent may be found in Appendix 3. Of the companies contacted, roughly a dozen produced or supplied heating units suitable for using waste oil as fuel. Six of these companies contacted had been surveyed during the previous heater assessment in 1988. Some of their products have remained relatively unchanged since then, while others have undergone some modifications or received further certification. These companies have been included in this update in order to reflect the changes and to update information on availability and pricing of their products. Companies listed in the 1988 waste oil furnace report were contacted to confirm if they continued to manufacture or supply the models described in that report.

2.3 OTHER JURISDICTIONS

Contact was made with the Department of Environmental Conservation in Alaska. They advised that the use of waste oil furnaces in Alaska was governed by the same EPA legislation as in the "lower 48" states. As such, there is nothing unique in what is permitted for use in Alaska.

2.4 DATA ANALYSIS

The assessment of the potential waste oil furnaces uncovered by the surveys included the following factors:

- type of furnace (i.e. atomizing, vaporizing and boiler);

- ability to be thermostatically controlled and ducted;
- capacity, heating output and efficiency;
- current stage of certification, approvals, safety features;
- quality of emissions/feedstock;
- ease of cleaning, maintenance and inspection;
- cost.

3.0 WASTE OIL HEATER REVIEW

There exist two types of heating units, characterized by their method of firing: atomizing and vaporizing. The two most common heating applications of these units are the hot air furnace and the hot water boiler. The following is a brief description of each type of furnace.

The atomizing type furnace is by far the most popular type of heater, accounting for roughly 95 % of the domestic fuel oil furnaces in operation. In this type of burner, the oil is preheated to lower its viscosity, thus improving its flow and atomization characteristics. The oil is then sprayed through a nozzle, simultaneous y injecting compressed air into the oil stream. This results in the production of a mist of oil. The oil/air mixture is then ignited, usually by an electric spark. Most of the fuel is burned and discharged out the flue, leaving almost no bum residue *or* ash in the unit. This makes the atomizing type furnace relatively simple to clean, and requires little maintenance. Nozzles should be cleaned monthly, while a thorough cleaning is normally required yearly. While this type of burner leaves virtually no bum residue in the unit, metals and other inorganic entrained in the oil are expelled into the atmosphere.

The vaporizing type burners heat the oil in a small pot to its boiling point. Air is provided, mixed with the vapour, and the oil/air mixture ignited by means of an electric spark or a manual pilot. Because only the lower boiling-point components of the oil are vaporized, unburned residue remains in the pan. It is usually necessary to remove this residue and clean the pot on a daily basis. The heater must be re-ignited each time. This procedure requires about 15 minutes daily. Due to the concentrating of inerts in the bum residue in the bottom of the burner pan, the vaporizing type furnace has lower air emissions than the atomizing type furnace; however, the residue to be disposed of may be hazardous.

There are two main advantages that the atomizing type burner has over the vaporizing kind. First, they can be thermostatically controlled, and second, some models are ductable. These features greatly enhance the usability and versatility of a waste oil heater. The main disadvantage of an atomizing type furnace is that its emission-pollution levels are greater than those from the vaporizing type. However, many atomizing burners have managed to obtain certification from CSA or ULC etc., and hence meet some environmental requirements, as discussed further in section 4.0.

4.0 CERTIFICATION AGENCIES

There are four major agencies that certify waste oil furnaces, two in Canada and two in the United States. These are: the Canadian Standards Association (CSA), Underwriters' Laboratories of Canada (ULC), Underwriters Laboratories (UL) and Energy Testing Laboratories of Maine (ETLM). Only the furnaces certified by CSA or ULC are approved for use in Canada, including the Northwest Territories. In addition, the Office of The Fire Marshal stated that ULC listed furnaces are acceptable for use in the Northwest Territories, but that UL listed appliances are not.

4.1 DEFINITIONS

The following definitions are frequently encountered in the waste oil furnace industry

- **unit (or space) heater:** A device that is being used to heat an area without using ductwork.
- **central furnace:** A unit that allows heated air to be distributed through a ducting network.
- **used** oil: " A petroleum-based oil that has been used primarily for lubrication purposes in combustion engines, turbines, transmission gear boxes and other areas of industry. It may have been subjected to the breakdown of the primary components, or the depletion of additives, or the build-up of undesirable elements, compounds or other impurities, or any combination thereof. This does not include 'synthetic lubricants' or any oil known to contain materials such as chlorinated hydrocarbons. " (CSA, 1992)
- **ulti-oil furnace:** A furnace designed for use with a range of distilled fuel oil types (e.g. #2, #3, #4 and #5). The density of used 10W3O crankcase oil tested by Environment Canada (Whiticar et al. 1993) was 0.89 g/ml at 15°C; its viscosity was 500 cSt at 0°C and 200 cSt at 15°C. In comparison the density range for #2-#5 fuel oils (Whiticar et al. 1993) is 0.855 {#2) - 0.948 (#5) g/ml at 15°C; the viscosity range is 1.8 (#2) -473 (#5) cSt at O"C and 2.5 (#2) -313 (#5) cST at 15 'C. The energy content of used oil ranges from 15,000-20,000 BTU/lb (Mueller Associates, 1989); the energy content of #2-#5 fuel oil ranges from 19,000 (#5) BTU/lb to 20,000 (#2) BTU/lb (Perry et al. 1984).

4.2 CANADIAN STANDARDS ASSOCIATION

CSA is responsible, among other duties, for ensuring the safety of waste oil furnaces in Canada. The certified furnaces are not intended for residential use. There are two different test procedures; one for each type of furnace (atomizing or vaporizing). Their complete testing procedures can be found in

Appendix 4. CSA conducts safety testing to ensure smooth operation, such as verifying stable combustion, acceptable temperature limits, continuous operation, etc. However, none of their tests assesses the level of emissions from the furnace, except for smoke number, carbon dioxide and carbon monoxide concentrations. They use three types of fuel to test the furnaces, which are listed below. They also verify that it will operate safely using #l and #2 fuel oil. The fuels used are:

- mixture of used oil from 3 different sources
- used oil with 20 % winter grade of regular leaded gasoline
- automobile transmission fluid

4.3 UNDERWRITERS LABORATORIES OF CANADA

ULC performs the CSA tests along with two additional procedures of their own. The models are certified as unit heaters only, and are solely meant for industrial use. Again, none of their tests addresses the level of emissions, other than smoke number and levels of CO_2 and CO. The additional tests are:

- burn a mixture of automobile sump oil with 209% by volume gasoline for eight hours
- burn automatic automotive transmission fluid for eight hours

4.4 UNDERWRITERS LABORATORIES

The UL standard for oil burning appliances is UL 296A. This certifies waste oil furnaces intended to burn waste crankcase oil as fuel. The furnaces are intended for use in commercial and industrial occupancies. They do not test for air pollutants other than smoke density. UL certifies units as either central furnaces (ducted in and out), or as ductable and non-ductable unit heaters.

4.5 ENERGY TESTING LABORATORIES OF MAINE

The standard used for testing is ETLM 83-1, and can be found in Appendix 4. ETLM performs UL 296A as well as ETLM 83-1. The furnaces become listed for burning #1 and #2 fuel oil, waste crankcase oil up to No. 50 SAE viscosity and automatic transmission fluid. Again, no emissions testing,

other than smoke density, is required to obtain ETLM certification.

4.6 US ENVIRONMENTAL PROTECTION AGENCY

Some of the manufacturer's literature indicates EPA approval. The EPA permits the burning of used oil provided that the furnace's maximum capacity is less than 500,000 BTU/h, its combustion gases are vented to outside air and that the heater burns used oil obtained by the owner or operator, or from do-it-yourself changers who generate used oil as household wastes. In addition, the EPA does not require on-site oil tests to ensure quality of the oil being used. All the furnaces listed in this report, when operated properly, meet this requirement and do not need to be tested by the EPA in order to claim to meet EPA standards.

5.0 POLLUTION POTENTIAL OF WASTE OIL FURNACES

Because leaded gasoline is no longer available, the amount of lead entering the crankcase oil is considerably less than in the previous decade when most studies of waste oil burning were done. The problem with standardized testing for pollutants, such as heavy metals in the stack stream of waste oil furnaces, is that the amount emitted is mostly a function of the contaminants in the fuel and not a function of the individual heaters, among a given class of furnaces (e.g. atomizing or vaporizing). For example, if the same atomizing furnace is operated on a "clean" used oil and then a "dirty" used oil, the "clean" oil will give "the better results. If different oils were used with two different atomizing heaters, one could seem to indicate good results and the other would not, hence the testing of various furnaces this way is inconclusive and should only be done with used oil of identical pollutant concentrations. Alternatively, it is possible to analyze the oil first, and then the emissions, but emissions testing is costly. For this reason, a common method of determining the maximum amount of pollutants in the stack gas is simply to analyze the used oil and assume 100% of the contaminants enter the atmosphere.

A comparison between metals in used and unused lube oils can be seen in Table 2. The most abundant metal found in used oil in the 1980s was lead. The high lead concentration is due to piston blowby in engines using leaded gasoline. Small amounts may be due to antiwear or extreme pressure additives. Today's gasoline contains no lead additives, and as a result, the lead content in today's used oil will be significantly lower than indicated by Table 2. It is estimated that "unleaded" gasoline contains approximately 0.75 ppm lead and according to the EPA, only 8 % of lead in gasoline enters the oil. This means that the concentration is less than 0.1 ppm lead in most used oils.

TABLE 2: AVERAGE CHEMICAL ANALYSIS OF USED AND VIRGIN LUBE OIL[1]

PROPERTY	USED OIL	VIRGIN LUBE OIL
Sulfur, wt%	0.42	0.32
Lead, ppm	7,535[2]	0
Calcium, ppm	1,468	1,210
Zinc, ppm	1,097	1,664
Phosphorus, ppm	931	1,397
Magnesium, ppm	309	675
Barium, ppm	297	37
Iron, ppm	205	3
Sodium, ppm	118	4
Potassium, ppm	31	<1
Copper, ppm	29	0
Silicon, ppm	24	4
Chromium, ppm	15	0
Tin, ppm	13	0
Manganese, ppm	4	0

1. data from 1980

2. using leaded gasoline

source: Mueller, 1989

Mueller (1989) indicates that there are five major chlorinated solvents found in used oil (see Appendix 1). These solvents are derived from either the breakdown of additives in the gasoline, or due to the addition of chlorine or bromine to leaded gasoline to act as a scavenger. Because leaded gasoline is no longer used, the concentration of chlorine and bromine additives will decrease. Mueller also points out that the total chlorine concentration range is very large. This indicates the presence of metalworking oils or mixing of used oil with chlorinated solvents. Since metalworking oils only account for a small segment of the industrial market, little used oil is expected to contain levels of total chlorine above 1000 ppm.

Used oil also contains carcinogenic organic compounds. It is assumed that the amounts of these substances would be identical in used or unused oils, and Mueller indeed confirms this. Another aspect to be considered is the amount of emitted carcinogens due to combustion in the furnace; however, many furnaces operate at very high temperatures, and any carcinogenic compounds would be completely combusted.

6.0 UPDATE SUMMARY OF WASTE LUBRICATING OIL FURNACES

This study involved the review of the existing 1988 report (Boreal 1988) on waste oil furnaces for the GNWT, and an update on the currently available waste oil furnaces. Since the previous waste oil furnace assessment was conducted, several new furnaces have come on the market. As well, many of the previously reported furnace models have been modified, expanded upon or in some cases, discontinued. It was also discovered that some of the manufacturers reported in the 1988 study have changed owners, changed names or are no longer in existence. The current assessment will deal with the new furnaces available today, as well as with some of those discussed in the 1988 report to which changes have been made.

In total, there were thirteen waste oil furnace companies uncovered by this study, of which eleven produced atomizing type furnaces and two manufactured vaporizing type furnaces. T'he products surveyed are listed alphabetically according to the manufacturer's trade rime. The pertinent information for each burner is given in tabular form for quick, easy, reference and comparison between models. A brief description of the available units follows. Distributor/manufacturer brochures and product literature can be found in Appendix 8. A list of installation references can be found in Appendix 6.

Many of the models now available feature waste oil storage tanks as workbenches with the actual furnace mounted several feet above the work area. Some of the atomizing type furnaces also include an integrated air compressor, eliminating the need for shop air and thus reducing necessary peripheral equipment purchases.

Heater and furnace manufacturers normally have their products tested by one Or several of the following approval agencies:

- Canadian Standards Association (CSA) (416) 747-4000
- Underwriters' Laboratories of Canada (ULC) (416) 757-3611
- Underwriters' Laboratories Inc., U.S. A. (UL) (312) 272-8800
- Energy Testing of Laboratories of Maine (ETLM) (207) 767-9500

Most of the waste oil heaters on the market are UL listed. Two have obtained ULC listing, two are CSA certified, and *one* is presently undergoing ULC testing. Only the furnaces with CSA and ULC certification are approved for use in Canada, and in particular, the Northwest Territories. The only Canadian certified vaporizing burner for used oil is the Alternative GV 200X furnace, which has obtained CSA approval. Reznor is the only atomizing furnace to obtain CSA certification for their burner with used oil. ULC listed burners, all of which are atomizing, include the Clean Bum CB 2000 and CB 4000, the Enviro-care "ARTIC" line and the "Black Gold" by Black Gold Inc., which is currently undergoing certification proceedings.

The units of measure used in this furnace assessment are English and not metric due to the standard usage of these units in the waste oil furnace business. It has been assumed that when American manufacturers use the unit "gallons per hour" or GPH, that USGPH is implied, while the Canadian manufacturers' use of GPH implies imperial units.

Procedures for calculating costs and benefits for a particular waste oil furnace application may be found in Appendix 5. Example calculations are also given for three installations.

6.1 "Alternative" by Teledyne Metal Products

460 Industrial Ave., Woodstock, ON N4S 7X6

Dist.: Alternate Energy Resources (A. E. R.)
46 Leaf Willoway, Willowdale, ON M2J 2B4
Tel: (416) 756-4789 Fax: (416) 756-7706

MODEL	GV 200X
DISBURSEMENT RANGE (Btu/h)	200,000
CONSUMPTION RATE (imp.GPH)	1.01
LINE VOLTAGE	115
ELECTRIC DR4W (A)	6
DIMENSIONS (in.) H/W/L	571~f19~4 1
WEIGHT (lbs)	498
FREE AIR (cfm)	2800
FLUE SIZE (in.)	8
DUCTABLE	NO
THERMOSTATIC CONTROL	NO
TYPE	VAPORIZING
COST (CAD)	≈ 5 OOO+INSTALLATION
CERTIFICATION	CSA

The GV 200X is a floor mounted heater. This burner has received CSA certification. This unit is designed to bum #1 and #2 fuel oils as well as used automotive oil. It has two chambers; the lower one where the oil is introduced, and the upper chamber where the oil vapours are burned. The heavy metals remain in the lower chamber for easy removal and disposal. A computerized, fully automated, control system monitors and controls the heater providing safe and efficient combustion. The unit burns without smoke or odour. Adjustable louvres allow for maximum free-flow of air. Teledyne also manufactures another model, the HV lOOX, but is made only on demand.

6.2 **"ARTIC"** by **Enviro-Care** Manufacturing Ltd.

685 Rupert St, Waterloo, ON N2V 1N7
Tel: (519) 725-9285 Fax: (519) 725-9288

MODEL	ARTIC 250	ARTIC 350	ARTIC 500
FIRING RATE (BTU)	250,000	350,000	495.000
CONSUMPTION RATE (GPH)	0.6-1.3	1.7-2.0	2.3-2.8
LINE VOLTAGE	220	220	220
AMPS FULL LOAD	16.5	17.5	17.5
DIMENSIONS (in.) WXHXL	26x28x123	32x59x77	32x59x100
SHIPPING WEIGHT (lbs)	625	825	1100
FAN OUTPUT (cfm)	2500	3500	5000
FLUE SIZE (in., OD)	7	8	10
DUCTABLE	YES	YES	YES
THERMOSTATIC CONTROL	YES	YES	YES
TYPE	ATOMIZING	ATOMIZING	ATOMIZING
COST CAN$	6000	8150	9950
CERTIFICATION	ULC,UL	ULC,UL	ULC,UL

The Enviro-Care "ARTIC" multi-oil furnace is available in three sizes, all of which are ductable. The smallest, with a firing rate of 250,000 BTU is designed to be hung from the ceiling or supported on a stand. The two larger models, the ARTIC 350 and ARTIC 500 are stand alone floor models. This line of burners is UL listed for waste oils as well as fuel oils. It is also UL listed with or without ducting. They are ULC listed for #2 - #5 fuel oil, crankcase and differential used oil and ATF. The swing open burners allow for easy access the nozzle, electrodes and combustion chamber. Thermostatic control is full y automatic. This furnace is manufactured and distributed in Canada.

6.3 "Balcrank Waste Oil Furnace", by Balcrank Products Inc.

One, Balcrank Way, Weaverville, NC 28787
Tel: 1-800-742-5300 Fax: 1-800-763-0840

MODEL	BF250	BF250D	BF350	BF350D
INPUT Btu/h	250,000	250,000	350,000	350,000
OUTPUT Btu/h	200,000	200,000	300,000	300,000
CONSUMPTION RATE (USGPH)	1.75	1.75	2.40	2.40
LINE VOLTAGE	115	115	115	115
AMPS FULL LOAD	13	13	13	13
DIMENSIONS (ii.)	41x29%x28%	41x29%x28%	54x29 %x28 ½	54x29 ½x28 ½
WEIGHT (lbs.)	340	345	370	375
FAN OUTPUT (cfm)	4500	3950	3000	2680
FLUE SIZE (in.)	8	8	8	8
DUCTABLE	NO	YES	NO	YES
THERMOSTATIC CONTROL	YEs	YES	YES	YEs
TYPE	ATOMIZING	ATOMIZING	ATOMIZING	ATOMIZING
COST (USD)	8988	9,291	9,926	10,136
COST (USD) (C/W tank)	11,410	11,661	10,136	13,501
COST (USD)(double wall trek)	13,044	13,224	13,044	14,073
CERTIFICATION	UL	UL	UL	UL

The Balcrank units are available in two sizes, with outputs of 200,000 and 300,000 Btu/h and with efficiencies (output/input) of 80 and 85% respectively. A non-ductable and a ductable version is available in each size and all are thermostatically controllable. The Balcrank Waste Oil Furnaces can therefore be used as area heaters or connected to an existing ducting system, and are UL approved for either application. A swing-out burner door enables easy burner and nozzle cleaning. The units also contain an integrated air compressor. The complete furnace system with support mounts, hardware and a 240 gallon capacity tank is also available in both the ductable and non-ductable furnaces. The parts can also be sold separately. The double walled 240 gal. tank is UL listed. A single wall non-UL listed tank is also available. These furnace models come with a 10 year limited warranty. These models appear to be identical to the "Omni" burners discussed later in this report.

6.4 "Black Gold" by Black Gold Inc.

240 Great Circle Road #344, Nashville, TN 37228
Tel: (615) 251-0680 or 1-800-351-0643
Fax: (615) 251-0682

MODEL	BLACK GOLD
INPUT (Btu/h)	200000
CONSUMPTION RATE (USGPH)	1.4
LINE VOLTAGE	115
AMPS FULL LOAD	20
DIMENSIONS (in.) L/W/H	18x18x109
WEIGHT (lbs)	650
FAN OUTPUT (cfm)	2000
FLUE SIZE (in. OD)	8
DUCTABLE	YES
THERMOSTATIC CONTROL	YEs
TYPE	ATOMIZING
COST (USD)	5796-WITH STORAGE TANK 4998 W/O STORAGE TANK
CERTIFICATION	UL

The Black Gold furnace is designed to bum waste crankcase oil, lube oil, and ATF; No. 1 and No.2 fuel oil. This furnace, currently undergoing ULC testing, meets UL requirements for waste oil furnaces, both as a unit heater and central furnace, and has received the Massachusetts State Fire Marshal's approval. In addition to this, it was tested at an EPA vehicle emissions test centre (Nashville and Davidson County, TN) and was found to have zero hydrocarbon and zero carbon monoxide emissions (see Appendix 7). Black Gold also claims that the average lead emissions from their heater is less than that of an automobile, when they are both operated using unleaded gasoline. Maximum efficiency of this unit is 80%. The furnace has a swing-away burner for easy access and cleaning. One attractive feature of this burner is its built-in air compressor, eliminating the need for a shop compressor for fuel atomization. It also has a metering pump to handle fuels of viscosity ranging from diesel to crankcase fuel, without adjustment. The Black Gold also offers such options as a water heater for year round use, a through-the-wall flue to cut venting costs and an energy recovery unit for enhanced heating efficiency. This unit is ductable and can be thermostatically controlled. The waste oil storage tank also serves as a work bench.

6.5 "Clean Burn Multi-oil **Furnace" by Clean Burn Inc.**

83 South Groffdale Road, Leola, PA 17540
Tel:1-800-331-01 83 Fax: 717-656-0952

Dist.: DE-ON SUPPLY, INC.
R.R. #1, Waterloo, ON, N2J 4G8
Tel: (519) 664-3586 Fax: (519) 664-2897

MODEL	CB-2000	CB-4000	CB-90-C	CB-90-D
MAX BTU/H	185,000	280,000	350,000	500,000
CONSUMPTION RATE (GPH)	1.3	2.0	2.5	3.6
LINE VOLTAGE	115	115	230	230
AMPS FULL LOAD	15	15		
DIMENSIONS (in.) L/W/H	50x42x28	63x48x33	68x30x73	75x38x84
WEIGHT	400	600	900	1300
FAN OUTPUT (cfm)	2200	4100	3500	5900
STACK SIZE (in.)	8	8	8	10
DUCTABLE	YEs	YEs	YEs	YEs
THERMOSTATIC CONTROL	YEs	YEs	YEs	YEs
TYPE	ATOM.	ATOM.	ATOM.	ATOM.
COST (CAD)	4995	6095		
CERTIFICATION	UL,ULC	UL,ULC	ETLM	ETLM

Clean Bum produces furnace models capable of burning a range of petroleum products including crankcase and ATF, as well as fuels oils No. 2, 4 and 5, with no smoke or odour. The CB-2000 and CB-4000 are fully automatic, ductable furnaces, both UL and ULC listed for fuel oils #2, #4, and #5, as well as used oil. These furnaces can be ceiling hung or a blower kit may be attached for ductable applications. Two larger floor models with enhanced cabinet and expanded shrouding offers more CFM and heat output. Air compressors are required to operate these burners! Clean Bum also features a three-pass heat exchanger for greater efficiency which comes with a six year warranty. Analysis of different waste oils as well as emissions data for the CB-2000 can be found in Appendix 7.

Clean Bum also makes a line of multi-oil boilers, available in three sizes, which are capable of burning No. 2 fuel oil, automatic transmission oil and used crankcase oil up to 50 SAE (viscosity of 16 to 23 cStokes @ 99°F). The standard boilers systems include cast iron boiler, hi/lo controls, cast iron foundation, burner, oil supply pump, check valve and screen, in-line *canister* filter, barometric damper, wall thermostat, and oil and air pressure regulators.

MODEL	CSS-5	CSS-6	CSS-7
MAX. INPUT (Btu/h)	240,000	300,000	360,000
# OF SECTIONS	5	6	7
CONSUMPTION RATE(GPH)	1.7	2.2	2.6
BOILER WATER VOLUME (GAL)	52	61	70
HOT WATER COIL (@100 °F,GPM)	5	6	7
FLUE SIZE (ii.)	10	10	10
DIMENSIONS (ii.) L/W/H	32x29x59	38x29x59	44x29x59
LENGTH w/BURNER & SMOKEHOOD (in.)	53	59	65
WEIGHT (lbs.)	1900	2200	2500
VOLTAGE (V)	115	115	115
AMP DRAW	15	15	15
COST	11,300	12,300	13,300
CERTIFICATION	ETLM	ETLM	ETLM

6.6 **"CompuHeat" by CompuHeat** Inc.

7589 Race Road, N. **Ridgeville,** OH 44039
Tel: (216).35&0650 Fax: (219) 327-1047

MODEL	AUO 125	AUO 230
INPUT **Btu/h**	126,000	230,000
OUTPUT **Btu/h**	100,000	184,000
CONSUMPTION **RATE (GPH)**	0.9	1.65
LINE VOLTAGE **(V)**	115	115
WEIGHT	185	320
FLUE SIZE (in.)	7	8
DUCTABLE	NO	NO
THERMOSTATIC CONTROL	YES	YES
TYPE	ATOMIZING	ATOMIZING
COST **(USD)**	2453	2603
CERTIFICATION	NONE*	NONE*

*NOT ON UL,ULC,CSA,ETLM LIST.

These burners can operate at 80% **efficiency** and are capable of burning waste oil and No. 2 fuel oil. These units are designed for overhead suspension, and are not **ductable.** They are thermostatically controlled. **CompuHeat** also manufactures a number of attachments for existing air or water heating equipment of which the components are UL listed. The units are claimed to have, "smokeless, **odourless** operation" although no test data was provided to support this conclusion. Conversion kits are available for all oil **fired,** and some gas fired heaters and boilers for burning waste oil. Three firing rates are available: **80,000-160,000 BTU, 100,000-190,000** BTU and 130,000-250,000 BTU.

6.7 **"FX230" by Fornax** Inc.

P.O. BOX 65, SANDFORD, ME 04073
Tel: (207) 324-0790 or 1-800-639-2077 Fax: (207)490-2510

MODEL	FX230
BTUH INPUT	230,000
CONSUMPTION RATE (GPH)	1.65
LINE VOLTAGE (V)	115
AMPS FULL LOAD	30
DIMENSIONS (in.)	26x26x108
WEIGHT	375
FAN OUTPUT (cfm)	2600 @FREE AIR
STACK SIZE (in.)	7
DUCTABLE	YEs
THERMOSTATIC CONTROL	YEs
TYPE	ATOMIZING
COST $US	4295
CERTIFICATION	ETLM

The FX230 is designed to burn waste crankcase and lube oils, ATF, and #1 & #2 heating oils. It has a built in air compressor and a swing away burner for easy cleaning of the combustion chamber. It comes with a one year warranty. Also included is a 290 gallon work bench tank. The model can be cleaned twice a year, with each cleaning requiring 15 minutes. The FX230 is ETLM tested and listed to 83-1 and UL 296, 727, and 731 standards .

6.8 **"LANAIR** TURBO-Z", **by LENAN Corp.**

312-T Barberry Drive, **Janesville,** Wise 53545
Tel: (608) 752-1601 Fax: (608) 757-7878

Dist: Mag Tool Inc.
16204-116 Ave. Edmonton, AB T5M 3V4
Tel: 1-800-661-9983 Fax: (403) 447-2056

MODEL	CA 120	CA 200	CA 260	MF 150
OUTPUT (Btu/h)	120,000	190,000	260,000	150,000
CONSUMPTION RATE (gph)	0.95	1.28	1.83	1.07
LINE VOLTAGE	120	120	120	120
AMPS FULL LOAD	14	14	14.8	14
DIMENSIONS (in.)	40X30X46	40X30X46	40x30x65	58x25x53
WEIGHT (lbs)	280	340	415	650
FAN OUTPUT, cfm	2800	2800	2800	1450
FLUE SIZE (in.)	6	8	8	8
DUCTABLE	NO	NO	NO	YES
THERMOSTATIC CONTROL	YEs	YEs	YEs	YES
TYPE	ATOM.	ATOM.	ATOM.	ATOM.
COST (CAD)	4492	5542	6442	
CERTIFICATION	UL	UL	UL	UL

Lanair offers a range of waste oil furnaces. The CA series, used for free air applications, is a ceiling hung, fully automatic, thermostatically controlled model available in three sizes. These waste oil heaters are listed to bum waste automotive oil (used crankcase oil and used automatic transmission fluid) as well as #1 and #2 fuel oil. Models are compatible with all **Lanair** accessories and can be installed as individual heating units or with a used oil workbench/tank. **Lanair** also make a multi fuelled central furnace, the **MF** 150, which is capable of burning wood, coal, used oil and fuel oil. This is a self-contained unit which can be installed in a furnace room and connected to existing ductwork. Standard accessories supplied with all **Lanair** products include a fuel supply pump and filters. An auxiliary supply tank is also provided with the MF 150 model. (Note: **Lanair** no longer makes the LV-110 vaporizing heaters described in the 1988 report).

6.9 **"OMNI" by Omni Heat, Inc. and Econo-Heat, Inc.**

N. 1419 Thiermar Road, Spokane, WN 99212
Tel: (509) 534-10 2 Fax: (509) 534-1183

MODEL	OWH-250	OWH-250D	OWH-350	OWH-350D
INPUT Btu/h	250,000	250,000	350,000	350,000
OUTPUT Btu/h	200,000	200,000	300,000	300,000
CONSUMPTION RATE(GPH)	1.75	1.75	2.40	2.40
LINE VOLTAGE (V)	115	115	115	115
AMPS FULL LOAD	13	13	13	13
CABINET DIM. (in.) L/H/D	41x29%x28%	41x29%x28%	54x29 %x28%	54x29 ½x28½
WEIGHT fibs.)	340	345	370	375
FAN OUTPUT (cfm)	4500	3950	3000	2680
FLUE SIZE (in.)	8	8	8	8
DUCTABLE	NO	YEs	NO	YEs
THERMOSTATIC CONTROL	YEs	YEs	YEs	YES
TYPE	ATOMIZING	ATOMIZING	ATOMIZING	ATOMIZING
COST (USD)	4395	4495	4895	4995
CERTIFICATION	UL	UL	UL	UL

The OMNI by Econo-Heat, formerly manufactured by Omni Heat, features a swing-out burner door for access to flame cone and nozzle and is available in two sizes; 250,000 Btu/h and 350,000 Btu/h input capacity with 80 and 85% efficiencies respectively. Standard features include an integrated air compressor, a fuel transfer pump and thermostat to name a few, and a ductable model is available in both furnace sizes. This furnace is UL listed as a unit heater and Econo-Heat offers a ten year limited warranty on their waste oil heating units. Some emissions data for this burner can be found in Appendix 7.

6.10 "Original CTB-87" BY: KUTRIEB

430 PHILLIP STREET, CHETAK, WI 54728
Tel: (715) 924-4871 or 1-800-826-6710 Fax: (715) 924-2436

MODEL	CTB-87
FIRING RATE (BTUH)	87,000
CONSUMPTION RATE (GPH)	0.63
LINE VOLTAGE (V)	115
DIMENSIONS (in.) H/W/D	38x26½x30½
WEIGHT (lbs)	170
FAN OUTPUT (cfm)	N/A
FLUE SIZE (in.)	6
DUCTABLE	NO
THERMOSTATIC CONTROL	YEs
TYPE	VAPORIZING
COST $US	1150
CERTIFICATION	NONE*

*NOT ON UL,ULC,CSA,ETLM LIST.

The Kutrieb CTB-87 is a vaporizing waste oil heater. It comes with a self contained 6 gallon tank and does not require compressed air or electric pre-heating. It bums fuels ranging from ATF to heavy diesel as well as clean fuels. The CTB-87 also has a residue removal system that allows the heater to operate continuously for up to 60 hours. Information concerning emissions was requested and has not been received to date.

6.11 "Reznor" by Reznor Group

McKinlay Ave., Mercer PA 16137

Dist.: Mckerlie-Millen Autoparts
2400 Sheffield Road, Ottawa, ON K1B 5P6
Tel: (613) 749-5220 Fax: (613) 749-1244

MODEL	RA 110	RAD 110	RA 140C	RAD 140C	RA 235	RA 235C	RAD 235	RAD 235C
INPUT (Btu/h)	11 0,000		140,000		235,000		235,000	
OUTPUT (Btu/h)	88,000		112,000		188,000		188,000	
CONSUMPTION RATE gp	0.8		1.0		1.7		1.7	
VOLTAGE (V)	115		115		115		115	
AMPERAGE (A)	14	18	14	22	15		22	
DIMENSIONS (in.)								
WEIGHT (lbs)	290	352	290	352	343		410	
FAN OUTPUT (cfm)	2000		2000		3200		3200	
FLUE SIZE (in.)	7		8		8		8	
DUCTABLE	NO	YEs	NO	YEs	NO		YEs	
THERMOSTAT CONTROL	YEs		YEs		YES		YEs	
TYPE	ATOMIZING		ATOMIZING		ATOMIZING		ATOMIZING	
COST								
CERTIFICATION	UL		CSA		UL	CSA	UL	CSA

The Reznor heaters are designed to bum waste oil with viscosities ranging from #2 fuel oil to 50 weight oil (defined as having a viscosity of 16 to 23 cStokes @ 99 "C). The Reznor features a remote flow control pump which constantly adjusts for viscosity differences by adjusting temperature and pressure, thereby delivering a relatively constant volume of oil. This is achieved by means of warming assembly - a large aluminum cylinder located outside the burner. The built-in air compressor eliminates the need for shop air. All the Reznor heaters are UL listed. Those with model numbers ending with -C have met CSA standards for the burning of No. 2 fuel oil as well as used oil. Emissions data concerning metals and volatile and semi-volatile compounds can be found in Appendix 7.

6.12 "SHENANDOAH" by Shenandoah Manufacturing Co.

P.O. Box *839*, Harrisonburg, VA 22801
Tel: 1-800-4[illegible]-7436 or *(703) 434-3838* Fax: *(703) 434-3068*

MODEL	WO-F75	WO-F150*	WO-F200*	WO-F300*
INPUT (Btu/h)	89,000	175,000	235,200	350,000
OUTPUT (Btu/h)	75,000	150,000	200,000	300,000
CONSUMPTION RATE (gph)	0.63	1.25	1.68	2.5
LINE VOLTAGE (V)	115	115	115	115
AMPS FULL LOAD	30	30	30	30
DIMENSIONS (ii.) L/W/H	48x43x17	40x45x36	40x51x36	62x57x33
DIMENSIONS (with ductable kit)		51x45x36	51x51x36	73x57x33
WEIGHT (lbs)	335	387	452	662
WEIGHT (lbs) (with ductable kit)		490	550	760
BLOWER (cfm)	1400	2500	2900	4700
BLOWER (cfm) (with ductable kit)		$2420_{@.25"SP}$	$2420_{@.5"SP}$	$4800_{@.75"SP}$
FLUE SIZE (in.)	6	8	8	8
DUCTABLE	YES	WITH KIT	WITH KIT	WITH KIT
THERMOSTATIC CONTROL	YEs	YES	YEs	YEs
TYPE	ATOM.	ATOM.	ATOM.	ATOM.
COST (USD)/ UL listed	29951 N. A.	3850/4100	4350/4595	5510/5755
COST (USD), (with ductable kit)	N.A.	*4385*	*4930*	*6330*
CERTIFICATION	ETLM	UL, ETLM	UL, ETLM	UL, ETLM

* Ductable models ETLM listed only, SP = Static pressure (inches of water)

These unit heaters and ductable furnaces have efficiencies in the 85 % range. They are designed to burn #l and #2 fuel oil, crankcase oil, transmission and hydraulic fluids and other petroleum-based lubricants, with any weight combination up to SAE #50 (viscosity of 16 to 23 cStokes @ 99 "C). The unit heaters are available in four sizes and can be ceiling hung or mounted above a workbench tank. The ductable furnaces are available in three sizes; however it is only UL certified as a unit heater . All units are thermostatically controlled. These units come with a six-year limited warranty on the fire chamber and heat exchanger. Ductable kits and workbench tank are available separately. Some emissions data for this burner can be found in Appendix 7.

6.13 "SUNFIRE", by Advanced Metal Tech

194 Speedvale Ave. W, Guelph, ON
Tel: (519) 824-7653 Fax: (519) 822-9485

Dist.: ECOSOLVE CORP.
425 Conestogo Road, Waterloo, ON N2L 4C9
Tel: (519) 725-3222 Fax: (519) 725-2084

MODEL	FT 165	FT 245*	FT 245B	FLA 250"	FLA 350	FLA 495
FIRING RATE (BTU)	90 to 165,000	185 to 245,000	185 to 245,000	185 to 250,000	300 to 350,000	425 to 495,000
CONSUMPTION RATE (USGPH)	0.6-1.1	0.7-1.6	0.7-1.6	0.-1.7	2-2.4	2.8-3.4
LINE VOLTAGE (V)	220	220	220	220	220	220
AMPS FULL LOAD	15.5	15.5	16.5	16.5	17.5	17.5
DIMENSIONS (in.) W/H	22x24	26x28	26x28	32x34	32x59	32x59
LENGTH (in.)	94	116	123	81	77	100
WEIGHT (lbs)	550	575	625	625	825	1100
FAN OUTPUT (cfm)	2000	2500	2500	2500	3500	5000
FLUE SIZE (in.)	7	7	7	7	10	10
DUCTABLE	NO	NO	YES	YES	YES	YES
THERMOSTATIC CONTROL	YES	YES	YES	YES	YES	YES
TYPE	ATOM.	ATOM.	ATOM.	ATOM.	ATOM.	ATOM.
COST (USD)	2995		3995		5995	7995
CERTIFICATION	UL	UL	UL	UL	UL	UL

* by special order only

Sunfire furnaces can bum all used motor oil and used transmission fluid as well as No.2 fuel oil and offers a complete line of UL listed products. Safety features include an automatic shut off of oil flow should the flame extinguish, and a "HIGH LIMIT" switch to shut off the burner, should the furnace overheat. Parts are warranted for one year. Ceiling hung and floor models are available. Emissions data concerning CO, SO_2 and NO_x can be found in Appendix 7.

7.0 REFERENCES

A. Lafranco & Associates Inc. 1992. Emission Survey Monitoring Report (March 1992 Survey)., report to the Yukon Government. Whitehorse, Yukon.

Boreal Consulting Services Ltd. 1988. Review and Evaluation of Equipment for Utilizing Waste Oil as a Fuel for Heating in the N. W. T., report to the Northwest Territories Renewable Resources Pollution Control Division, March 1988.

Canadian Standards Association, 1992

Mueller Associates, Inc. 1989. Waste Oil Reclaiming Technology Utilization and Disposal, Noyes Data Corporation, Park Ridge, New Jersey, U.S.A.

Perry, R. H., D.W. Green and J.O. Maloney (eds.). 1984. Perry's Chemical Engineers' Handbook. McGraw-Hill. Toronto

Whiticar, S., M. Bobra, M. Fingas, P. Jokuty, P. Liuzzo, S. Callaghan, F. Ackerman and J. Cao. 1993. A Catalogue of Crude Oil and Oil Product Properties. Environment Canada - ESD, Report EE-144, Ottawa

APPENDIX 4

Certification Testing Procedures

- **CSA Testing Procedures**
- **US EPA Regulations**
- **ETLM Test Procedures**

Date: October 28, 1992

FUEL BURNING EQUIPMENT NOTICE NO. 72

To: Manufacturers of Appliances Burning Used Oil; Members of the CSA Advisory Council on *Fire* Safety; and Others Interested

Subject: Requirements for Appliances Burning Used Oil in an. Atomizing Burner

The Canadian Standards Association is pleased to announce the publication of requirements for appliances burning used oil.

Background and Rationale

In response to a request from Industry, the Certification and Testing Division of the Canadian Standards Association has developed and issued Technical Information Letter (T.I.L.) No. R-1 (Copy attached).

This T.I.L. contains requirements which apply to appliances burning used oil in an atomizing burner, for installation in commercial and industrial premises. The requirements will be used for Interim Certification of such appliances pending the acceptance of the T.I.L. by the Technical Committee on CSA Standard CAN/CSA-B140.0-M87 - General Requirements for Oil Burning Equipment.

Effective Date: Immediately.

Direction

Manufacturers wishing to obtain CSA Certification of appliances burning used oil in an atomizing burner may make an application at any time.

Applications may be made by contacting CSA's Applications Section, Customer Services Group, Rexdale, (416) 747-4251 or any CSA Region Office. Upon receipt of an enquiry or application, customers will be advised of the quantity and types of samples that should be submitted.

This direction is applicable to products Certified under the following CSA Product Classification:

6421 01 - FUEL BURNING EQUIPMENT (OIL) - UNITS - COMMERCIAL/INDUSTRIAL

TILBB/92-059/1/dw

CSA Can Help

If you wish to make an application or require additional information regarding this Certification Notice, or T.I.L. No. R-1, please contact one of our Offices or Overseas Agencies listed below.

Rexdale Office				
(Information) -	Telephone:	(416) 747-4244,	Telefax:	(416) 747-2475
(Standards Sales) -	Telephone:	(416) 747-4044,	Telefax:	(416) 747-2475
Moncton Office -	Telephone:	(506) 858-9300,	Telefax:	(506) 858-9302
Montreal Office -	Telephone:	(514) 694-8110,	Telefax:	(514) 694-5001
Vancouver Office -	Telephone:	(604) 273-4581,	Telefax:	(604) 273-5815
Winnipeg Office -	Telephone:	(204) 632-6633,	Telefax:	(204) 632-1796
Edmonton Office -	Telephone:	(403) 450-2111,	Telefax:	(403) 461-5322
Brussels Office -	Telephone:	(32) 2-512-3854,	Telefax:	(32) 2-502-4867
Hong Kong Office -	Telephone:	(852) 664-2872,	Telefax:	(852) 664-5033
Japan Office '-	Telephone:	(81-3) 3234-3553	Telefax:	(81-3) 3234-8678
Taiwan Office -	Telephone:	(886) 2-299-5023,	Telefax:	(886) 2-299-5022
IMQ/CSA Agency -	Telephone:	(39) 2-507-3220,	Telefax:	(39) 2-507-3271
JMI/CSA Agency -	Telephone:	(81-3) 416-0111,	Telefax:	(81-3) 416-9691
N.V.KEMA/CSA Agency -	Telephone:	(31-85) 569-111,	Telefax:	(31-85) 514-922
SEMKO AB/CSA Agency -	Telephone:	(46) 8-750-0350,	Telefax:	(46) 8-750-6030
VDE-PZI/CSA Agency -	Telephone:	(49) 69 830-6229	Telefax:	(49) 69830-6666
BSI/CSA Testing Lab	Telephone:	(44) 442-230442,	Telefax:	(44) 442-231442
LCIE/CSA Testing Lab	Telephone:	(33) 1-4095-6230,	Telefax:	(33) 1-4095-6003

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TILBB/92-059/2/dw

TECHNICAL INFORMATION LETTER NO. R-1
Certification and Testing Division

Produce Group: Fuel Burning

Date: October 28, 1992

Issued By: Jim Frangakis/Tony Ogborn

EQUIPKENT: Appliances Burning Used Oil in an Atomizing Burner

ITEM : Interim Certification Requirements

The attached requirements have been submitted to the Technical Committee on CSA Standard B140.0-M87, General Requirements for Oil Burning Equipment.

These requirements are now currently in effect.

TILBB/92-059/3/dw

CANADIAN STANDARDS ASSOCIATION

Requirements for Appliances Burning Used Oil in an Atomizing Burner

1. SCOPE

1.1 These requirements apply to vented appliances burning used oil in an atomizing-type burner and such devices as may be required to control the supply of fuel.

1.2 These requirements apply to appliances for installation only in commercial or industrial premises.

1.3 These requirements apply to appliances burning used oil generated on the premises of the owner; or under certain conditions permitted by the regulatory authority, used oil generated outside of the premises of the owner, and subject to additional monitoring or extra controls as to contents and additives.

1.4 These requirements apply to appliances with a fuel input rate of 2.0 Canadian gallons per hour or less.

1.5 The requirements given herein apply to appliances when installed in accordance with the instructions supplied by the manufacturer.

1.6 Appliances having a burning rate greater than 2.0 Canadian gallons per hour, may be examined and tested in accordance with the intent of these requirements.

2. DEFINITIONS

2.1 The following definitions apply in these requirements:

Burner means that portion of the appliance within which the fuel is vaporized and mixed with the combustion air;

Burner assembly means a unit comprising a vaporizing burner and such devices as may be required to control the supply of fuel of the burner.

Atomizing type oil burner means an oil burner in which the fuel oil is broken into droplets prior to vaporization and combustion.

Used oil, for the purpose of these requirements is a petroleum-based oil that has been used primarily for lubrication purposes in combustion engines, turbines, transmission gear boxes and other areas of industry. It may have been subjected to the breakdown of the primary components, or the depletion of additives, or the build-up of undesirable elements, compounds or other impurities, or any combination thereof.

This definition does not include the so-called "synthetic lubricants", transformer oil, capacitor oil, hydraulic oil, brake fluids or any oil known to contain materials such as chlorinated hydrocarbons.

3. GENERAL REQUIREMENTS

3.1 Reference Publications: These requirements make reference to the following publications:

CAN/CSA - B139-M91	Installation Code for Oil Burning Equipment.
CAN/CSA - B140.0-M87	General Requirements for Oil Burning Equipment.
CAN/CSA - B140.2.1-M90	Oil Burners; Atomizing-Type.
CAN/CSA - C22.1-1990	Canadian Electrical Code, Part I.
CSA C22.2 No 3-X1988	Electrical Features of Fuel-Burning Equipment.

3.2 General:

3.2.1: The equipment shall meet the general provisions of CSA Standard B140.0, General Requirements for Oil Burning Equipment applicable to all oil burning equipment. Other references herein to that Standard are abbreviated to CSA Standard B140.0. Many of the terms used herein are defined in the CSA manual of Definitions Recommended for Use in CSA Standards for Fuel-Burning Appliances and Equipment.

Note: Throughout these requirements, reference is made to certain other Standards which should be consulted.

?.2.2: Each appliance shall be provided with suitable safety controls as required in CSA Standard B140.0.

3.3 Threads:

3.3.1 Pipe Threads: All pipe threads shall be in accordance with American Standard B2.1-1960, Pipe Threads (Except Dryseal), for tapered pipe threads.

3.3.2 Screw Threads: Screws and screw holes used for mounting components or parts which may be removed for servicing, shall be threaded in accordance with CSA Standard B1.1-1949, Unified and American Screw Threads.

3.4 Electrical Features:

3.4.1: The electrical features shall meet the applicable requirements of the pertinent CSA Standards.

Note: The general requirements for the electrical features are given in CSA Standard C22.2 No 3, Electrical Features of Fuel-Burning Equipment (Gas and oil). The requirements for specific electrical component parts are given in the applicable Standards of the Canadian Electrical Code, Part II.

3.4.2: For the purpose of these requirements the equipment shall be considered as stationary apparatus, and shall be provided with a terminal or connection box, or some suitable equivalent, for conduit connection to the source of supply.

3.4.3: All motors shall comply with the applicable requirements of CSA Standards *C22.2 No* 3, Electrical Features of Fuel-Burning Equipment (Gas and Oil) and C22.2 No 100, Motors and Generators.

3.5: Methods of Assembly and Shipment. The methods of assembly and shipment of the equipment shall comply with the applicable requirements of CSA Standard B140.0.

4. CONSTRUCTION

4.1 General:

4.1.1: The materials and workmanship and the construction of the equipment shall comply with the applicable requirements of CSA Standard B140.0.

4.1.2: The design and construction of the equipment shall comply with the requirements of the following Standards, as applicable:

CAN-/ CSA	B140.2.1-M90	-	Oil Burners; Atomizing-Type.
CAN/CSA	B140.4-1974	-	Oil-Fired Warm Air Furnaces.
CAN/CSA	B140-.7.2-1967	-	Oil-Fired *Steam* and Hot Water Boilers for Commercial and Industrial Use.

5. MARKING

5.1 General: The markings shall comply with the applicable requirements of CSA Standard B140.0.

5.2 Details Required: The equipment shall be plainly marked in a permanent manner, in English and French, with the following details:

(a) The manufacturer's name, tradename, or other recognized symbol of identification.

(b) The model or type designation.

(c) The type of fuel oil to be used.

(d) The maximum input in suitable units, i.e., gallons per hour.

(e) The electrical rating, when applicable, as specified by CSA Standard C22.2 N03, Electrical Features of Fuel-Burning Equipment.

(f) The words "CSA CERTIFIED TO ELECTRICAL AND FUEL BURNING REQUIREMENTS ONLY".

(g) Installation clearances, including height above floor in garages, service stations, etc.

(h) The stack height and separation distance requirements described in Table 1, Clause 6.2 (c).

(i) Maintenance and operating instructions, including the following:

i. Complete ignition and shut-down procedures.

ii. Instructions for monthly and annual maintenance and cleaning.

iii. The procedure to be followed *to* ensure correct combustion (e.g., flame appearance or CO_2 readings).

iv. Instructions for the removal of excess oil from the combustion chamber when such has accumulated.

(j) Cautions, including the following:

i. "NOT FOR RESIDENTIAL USE".

ii. "ONLY USED OIL GENERATED ON THE PREMISES OF THE OWNER MAY BE USED IN THIS EQUIPMENT, UNLESS WRITTEN AUTHORIZATION IS OBTAINED FROM THE REGULATORY AUTHORITY".

iii. "EVERY MONTH, THE FIRE SIDE OF THE HEAT EXCHANGER AND FLUE PIPING MUST BE CLEANED".

iv. "EVERYMONTH, THE OIL-FEED RESERVOIR MUST BE CLEANED".

v. "EVERY YEAR. THE EXHAUST STACK MUST BE CLEANED".

vi. "WHENEVER ANY CLEANING, INCLUDING THAT OF THE FLUE PIPING AND EXHAUST STACK, IS DONE, PROPER PROTECTIVE CLOTHING INCLUDING GLOVES AND A FACE MASK OR RESPIRATOR MUST BE WORN".

vii. "DO NOT ATTEMPT TO LIGHT A HOT APPLIANCE".

viii. "DO NOT ATTEMPT TO START THE BURNER WHEN EXCESS OIL HAS ACCUMULATED" .

ix. "DO NOT TAMPER WITH CONTROLS, CALL YOUR SERVICEMAN".

x. "DO NOT ADD ANY CLEANING FLUIDS OR OIL ADDITIVES TO THE USED OIL BURNED IN THIS APPLIANCE".

xi. "KEEP THE FUEL VALVE NEAREST TO THE SUPPLY TANK SHUT OFF WHEN THE BURNER IS SHUT OFF FOR EXTENDED PERIODS".

xii . "REFER TO OPERATING MANUAL FOR FURTHER INFORMATION".

6. INSTRUCTIONS

6.1 General:

6.1.1: The instructions shall comply *with* the applicable requirements of CSA Standard B140.0.

6.1.2: The manufacturer shall provide Installation Operating and Service Instructions. These shall accompany each appliance. These may be combined into one publication.

6.2 Installation instructions: The installation instructions shall include the following information where applicable:

(a) A complete list of all sub-assemblies or components packed separately.

(b) That the installation shall be in accordance with the regulations of regulatory authorities covering environmental quality, fuel, fire and electrical safety.

Notes:

1. Installation, operating and maintenance permits from each of the above authorities may be required. Municipal permits may also be required.

2. Reference should be made to CSA Standard B139, Installation Code for oil Burning Equipment.

(c) That, in addition, the installation shall be in accordance with Table 1:

TABLE 1

Stack Height and Separation Distance Requirements

For Furnace With Heat Input BTU/Hour	Min Height of Stack Above Roof At Point of Exit (ft)	Distance. From Edge of Building To Nearest Property Line (ft)
Up to 100,000	12	17
100,000 to *350,000*	18	*17*

The structure in which the used oil appliance is housed shall be no less than 15 ft high at the point where the appliance is situated and have a min length and width of 20 ft, and a min floor area of 400 sq ft.

(d) Data for proper installation of all sub-assemblies and components.

Note: Cross-sectional drawings and/or illustrative descriptions of step-by-step methods of installing the equipment.

(e) A wiring diagram for the electrical equipment.

Note: All wiring shall be done in accordance with CSA Standard C22.2, Canadian Electrical Code, Part I.

(f) Data with regard to the installation of the fuel tank including the minimum clearance between the fuel tank and the appliance.

(g) installation clearances, including height above floor in garages, service stations, etc.

(h) With emphasis, clear direction that a permanent service platform, including stairs and railings, must be provided at an elevation to facilitate regular maintenance.

(i) The recommended draft.

(j) Instructions for installation of the flue pipe including minimum clearance to combustible material.

(l) Information relative to the supply of air for satisfactory combustion into the room in which the equipment is located.

A705/Attach/9/gl

6.3 Service Instructions: The service instructions shall include the following information where applicable.

(a) An indicated space for the name, address and telephone number of the serviceman.

(b) Information with respect to the regular general maintenance and care to be given the appliance, including mention of necessary care to be taken and as noted in Clause 5.

(c) Instructions to be followed in cleaning the fuel strainer or filter and the burner.

(d) Information relative to checking the installation.

(e) Recommendations for cleaning and replacing the flue pipe.

(f) Information regarding adjusting and operating electrical controls'.

(g) Instructions for adjusting the draft regulator if one is supplied.

(h) The appearance of the flame for proper combustion, at high and low fire.

(i) Instructions for the removal of excess oil from the combustion chamber when such has accumulated.

6.4 Operating Instructions: Operating Instructions shall contain the following information where applicable:

(a) A caution to read and save these instructions for reference.

(b) The type of fuel oil to be used.

(c) The maximum input in suitable units, i.e., gallons per hour.

(d) All maintenance and operating instructions included in 5.2 (h) above.

(e) All cautions included in 5.2 (i).

(f) The following additional caution: Words to the effect that: "USED OILS CONTAIN HEAVY METALLIC COMPOUNDS AND FOREIGN MATERIALS, WHEN BURNED, THESE COMPOUNDS ARE EMITTED FROM OR DEPOSITED WITHIN THIS HEATING APPLIANCE AND THEREFORE CARE SHOULD BE TAKEN WHEN USING, CLEANING AND MAINTAINING THIS EQUIPMENT".

(g) "KEEP THE FUEL VALVE NEAREST TO THE SUPPLY TANK SHUT OFF WHEN THE BURNER IS SHUT OFF FOR EXTENDED PERIODS".

7. TESTS, NORMAL OPERATION

7.1 General:

7.1.1: The appliance shall perform safely when installed and operating in accordance with the instructions supplied by the manufacturer.

7.1.1: The operation of the appliance or any component thereof shall not be hazardous to life or property, when tested under such abnormal conditions as are likely to occur in service.

7.1.3: The instrumentation and methods of testing shall be in accordance with the procedures in CSA Standard B140.0.

Note: Local regulations may require additional on-site tests.

7.1.4: If defects begin to become evident, additional tests shall be performed to determine whether such defects would result in unsafe conditions in normal operation.

7.1.5: The burner assembly shall be installed in accordance with the manufacturer's instructions.

7.1.6: The heating surfaces of the appliance and vent pipe shall be clean at the beginning of the test.

7.1.7: For test purposes the voltage to be used shall be as listed in Table 2 and unless otherwise stated in rated voltage.

7.1.8: In general, performance shall comply with the applicable requirements of the following standards:

B140.2.1-M90	-	Oil Burners; Atomizing Type.
B140.4-1974	-	Oil-Fired Warm Air Furnaces.
B140.7.2-1967	-	Oil-Fired Steam and Hot Water Boilers for Commercial and Industrial Use.

TABLE 2

VOLTAGES

Nominal	Tested Voltage		
	Rated	Percent of Rated	
		75	110
110-120	120	90	132
220-240	240	180	264
440-480	480	360	528
550-600	600	450	660

7.2 Combustion:

7.2.1: Requirements.

7.2.1.1: Combustion shall be stable and complete at all firing rates in the operating range of the burner under normal operating conditions.

7.2.1.2: The density of the smoke in the flue gases shall not exceed that corresponding to a No 1 **Shell-Bacharach** smoke-spot, at any firing rate at which the burner can be operated.

7.2.2 Procedures:

7.2.2.1: The start-up shall be according to manufacturer's instructions. The firing rate shall be adjusted to that specified by the manufacturer, plus or minus 2 percent, using used oil, Types A, B and C in sequence. The oil types are specified in Clause 9.

7.2.2.2: Where applicable, the combustion air supply shall be adjusted to establish the air fuel ratio recommended by the manufacturer.

Note: For the purpose of these tests, the percent of carbon dioxide in the flue gases may be specified and used in establishing the air fuel ratio.

7.2.2.3: For natural draft installations, the chimney draft shall be the minimum draft recommended by the manufacturer, but shall not exceed 0.06 in water column.

7.2.2.4: For mechanical draft installations, the over fire draft shall be the minimum draft recommended by the manufacturer.

7.2.2.5: The combustion characteristics shall be determined after steady-state operating conditions have been established and after eight (8) hours of continuous operation.

7.3 Ignition: Ignition shall be evaluated using used oil B. Ignition, if it occurs, shall be safe, smooth and reliable under each of the conditions specified in Clause 7.3 of CSA Standard B140.2.1-M90.

The performance of the combustion safety control shall comply with Clause 7.10 of CSA Standard B140.2.1-M90.

7.4 Temperature:

7.4.1: The temperature limits for any component or material shall be as specified in CSA Standard B140.0 when the test ambient is corrected to 77F.

7.4.2: For continuous operation, the maximum temperature of any component or material shall not exceed the limits specified for normal operation.

7.4.3: The flue gas temperature shall not exceed 750F.

7.5 Continuity of Operation:

7.5.1: Each heater equipped for the attachment of a duct or ducts shall be subjected to the Continuity of Operation Test and the Temperature Test, Clause 7.4 shall be run in conjunction with it.

7.5.2: The outlet temperature at which the safety limit control, when adjusted to its maximum setting, functions to shut off or reduce the flow of fuel to the burner shall be determined by gradually reducing the air flow through the heater by reducing both the inlet and outlet openings simultaneously.

7.5.3: The limit control and operating control shall function to limit the temperature at the air outlet to a maximum of 250F.

7.5.4: The limit control and operating control shall be by-passed and the heater shall be operated at its rated maximum fuel input.

7.5.5: The duct or ducts shall be restricted to produce a static pressure in the duct(s) equal to the maximum operating static pressure marked on the heater.

7.6 Flue Gas Analysis: The composition of the flue gases shall be determined periodically during the test in accordance with the procedures in CSA Standard B140.0.

The quantity of carbon monoxide shall not exceed 400 ppm by volume on an air-free basis.

8. TESTS, ABNORMAL OPERATION

The burner assembly and heating unit shall comply with the requirements of Clause 7.5 of CSA Standard B140.2.1-M90.

9. TEST OIL

Type A: A mix of approximately equal quantities of lubricating oil drainings from three different sources such as automotive service stations, with care that the samples include representative amounts of heavy ends, sludge, etc., as drained from automobile engines.

Type B: Four volumes of Type A oil mixed with one volume of winter grade of regular leaded gasoline.

Type C: Conventional fluid as drained from automobile automatic transmissions.

APPENDIX

From CSA Code B139-M91, Installation Code for Oil Burning Equipment:

(Note: The following is a direct quote and should not be interpreted to imply that used oil appliances are acceptable in residential service).

"7.3 Appliance Installation in Garages:

7.3.1: An appliance may be installed In a commercial storage or residential garage if the appliance is located at least 460mm (18 in) above floor level and protected against physical damage. Air duct systems serving garages shall not be connected with other parts of the building.

7.3.2: An appliance may be installed in a repair garage if the appliance is located at least 1.4m (4.5 ft) above floor level, and is protected against physical damage.

Note: When headroom for vehicles is required underneath the appliance, the bottom of the appliance should be located no lower than the top of the highest vehicle-admitting door."

A705/Attach/16/gl

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 260, 261, 266, 271 and 279

[FRL-4153-6]

RIN: 2050-AC17

Hazardous Waste Management System; Identification and Listing of Hazardous Waste; Recycled Used Oil Management Standards

AGENCY: U.S. Environmental Protection Agency.

ACTION: Final rule.

SUMMARY: The Agency is promulgating a final listing decision for used oils that are recycled and is simultaneously promulgating standards for the management of used oil under RCRA section 3014. EPA has made a final listing decision for used oils that are recycled based upon the technical criteria provided in sections 1004 and 3001 of RCRA. EPA determined that recycled used oil does not have *to be* listed as a hazardous waste since the used oil management standards issued in this rulemaking are adequately protective of human health and the environment. These standards cover used oil generators, transporters, processors and re-refiners, burners, and marketers These standards are promulgated under the authority of section 3014 of RCRA and will be codified in a new part 279 of chapter 40 of the Code of Federal Regulations. When these *management* standards go into effect, service station dealers who collect used oil from do-it-yourself (DIY) generators and who are in compliance with the standards promulgated, may be eligible for the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) section 114(c) liability exemption. EPA is continuing to evaluate the potential hazards associated with management of used oil When this analysis is completed, the Agency will publish Notice(s) of Data Availability in the Federal Register over the next several months, as necessary. EPA will also, at that time, solicit " opinion from the public on what, if any, additional steps may be necessary regarding used oil management

EFFECTIVE DATE: March 8, 1993.

ADDRESSES The regulatory docket for this rulemaking is available for public inspection at *room* 2427, U.S. Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460 from 9 a.m. to 4 p.m., Monday through Friday, except for Federal holidays. The docket *number is* F-92-UOZF-FFFFF. The . . , public must make an appointment to review docket materials by calling (202) 260-9327. The public may copy a maximum of 100 pages from any regulatory document at no cost. Additional copies cost $0.20 per page.

FOR FURTHER INFORMATION - -

For general information contact the RCRA Hotline, Office of Solid Waste, U.S. Environmental Protection Agency, 401 M Street, SW, Washington, DC 20460; Telephone (800) 424-9346 (toll free) or, in the Washington, DC, metropolitan area at (703) 920-9810.

For information on specific aspects of this role, contact Ms. Rajani D. Joglekar, telephone (202) 260-3516, or Ms. Eydie Pines, telephone (202) 260-3509, U.S. EPA 401 M Street SW., Washington, DC 20460.

SUPPLEMENTARY INFORMATION: The contents of today's preamble are listed in the following outline:

'L Authority

This regulatory decision and the regulations promulgated today are issued under the authority of sections 1004, 1006, 2002, 3001, 3014, and 7004 of the Solid Waste Disposal Act, M amended by the Resource Conservation and Recovery Act, and as amended by the Used Oil Recycling Act, as amended 42 U.S.C. 6901, 6905, 6912(a), 6921 through 6927, 6930, 5934.0935.6937 through 6939 and 0974.

E Background

A. *Authorities and Regulations Covering Used Oil Management*

1. Statutory Authority

Section 3014 of RCRA requires EPA 10 establish standards applicable to recycled used oif that will protect public health and the environment and, to the extent possible within that context, not discourage used oil recycling. Section 3014 was added to the RCRA statute by the Used Oil Recycling Act (UORA) of 1980. The UORA required the Agency to establish performance standards and other requirements "as may be

approach minimizes complexity by placing ail used oil generators under uniform regulatory requirements: it eliminates the need far measuring quantnes of used oils collected and stored each month: it stliminates the concerns that generators could k bumped into •more stringent regulatory category if the collect DIY-generated used oils: and above all. It allows for a system whereby all used oil is collected. recycled. and managed in an ● nvmn.mentally sound manner. thus reducing hazards to human health and the environment. Another major advantage. as discussed earlier in section V.D.1.h..is that approximately 30.000 used oil generators who meet the CERCLA section 114(c) "service station" definition qualify for the liability exemption if they accept DIY-generated used oil and comply with the used oil management standards. including corrective action (*i.e.*. used oil spill response and clean up requirements).

EPA decided against providing a small quantity generator exemption for the following reasons:

- The generator standards established today are basic and minimal good housekeeping practices that include maintaining ● ll tanks ● nd containers in good condition. labeling tanks and containers. and cleaning up spills ● nd releases of used oil. They are substantially less than those proposed in 1985 sod 1991.
- Large generators who use tanks that ● *xced* the capacity limits ● nd other prerequisites established under the SPCC and UST programs ● m subject to the containment ● nd corrective action requirements in those programs. These programs provide ● *ddition*d protection necessary at used oil generator sites appropriately beyond the basic standards contained in today's ride.
- The collecnon of DIY-generated used oil would be discouraged due to the inherent concern for generators of being bumped into a *higher* category [e.g.. if an exemption was set at 100 kg/me. generators would be unwilling to accept DIY-generated used oils because of the concern that the ● dditional quantities of used oil would require them to comply with the management standards).
- Generators may have to keep records of used *oil* generation activities to demonstrate that they qualify from an exemption. It is probable that some generators may dump used oil to show that they only generate a quantity of used oil that is less than the quantity limit for defining a small quantity used oil generator.
- An extensive education and outreach program would be necessary to explain the interface between the used oil generator exemption and the CERCLA liability exemption.
- Existing mismanagement practices at certain generator sites would continue. resulting in ongoing risks to human health and the environment.
- As discussed in Section X of this preamble. the costs of compliance are . relatively small on ● per facility basis. even though total costs to generators may be 39 to 66 percent of the total costs to the regulated community.

b. *Used 011 generated on ships.* In the case of used oils generated by ships or vessels (aa defined in 40 CFR 280.10), these used oils are not subject to the used oil management standards until the used oiia are transported ashore. When used oils are removed from a ship or vessel and taken ashore. the owner or operator of the snip or vessel and the person or persons removing or accepting the used oil from the vessel are co-generators of the used oil and hods parties are responsible for managing the used oil in accordance with the used oil generator standards in subpart C *of* part 279. The co-generators may decide which party will fulfill the requirements of subpart C. Bilge water that contains used oil but does not contain listed hazardous waste when brought ashore must be managed in compliance with the generator standards in today's rule prior to subjecting it to separation atepa that use oil/water separators. Bilge water containing listed hazardous waste is subject to RCRA subtitle C regulations *once* brought ashore. EPA believes that large quantities of bilge water are not generally Stored for an extended period but are processed soon after their arrival on the shore. After separation the used oil portion *of the* bilge water must *be* maintained in compliance with the used oil generator standards. The remaining wastewater separated from bilge water must be managed in accordance with the applicable RCRA regulations and any discharged is subject to applicable Clean Water Act regulations. (See J4279.101e)[3) and 279.20(a)(2).)

c. *Management of Materials Contaminated with Used Oil.* As discussed above. used oil that is mixed with a hazardous waste must be managed as a hazardous waste in accordance with all applicable RCRA requirements. Persons wbo generate mixtures of used oil and other materials or solid wastes (e.g.. used oil filters, rags. sorptive minerals. sorbent materials scrap metals) are subject to part 279. Used oil removed from mixtures *must* be managed in accordance with the requirements *of* part 279 and either sent off-site for recycling or reused on-site. If the used. oil removed from the mixture cannot be recycled. the generator must comply with the requirements of subpart I of part 279 for disposal of the used oil. Mixture of used oil and solid waste (e.g., natural or synthetic sorbent materials) from which *used oil* can not be separated when burned far energy recovery is subject to used oil specification fuel requirements.

After separating used oils from other materials or solid wastes. the remaining material or solid waste must be managed in accordance with any and all applicable RCRA requirements. The generator must determine whether or not the materials that previously contained used oii exhibit ● characteristic of hazardous waste (with the exception of non-terne-plated used oil filters: see 57 FR 21534), and if so. manage them in accordance with existing RCRA controls. If the material does not exhibit a hazardous characteristic (and is not mixed with a listed hazardous waste) then the material can be managed as a solid waste.

d. *On-Site Management of Used Oil.* As discussed above, generators who blend used oil with diesel fuel for use in their own vehicles need *not manage* the used oil/diesel fuel mixture in accordance with the generator requirements of part 279. EPA believes that used oil/diesel fuel mixtures should be stoned properly to ensure against possible spills. fire. and explosion hazards. Prior to mixing with diesel fuel. these used oils are subject to the part 279 generator standards. Generators may use such a mixture in their own vehicles.

Used oil generators who dispose of used oil on-site must test the used oil or apply their knowledge to determine whether *or not the* used aii exhibits a hazardous waste characteristic. If the used oil exhibits a characteristic of hazardous waste. the used oil must> disposed in accordance with all applicable RCRA requirements. When disposing used oil that cannot be recycled, the generator must comply with subpart I of part 279. relating to proper management and disposal of used oils. Used oil *generators* processing used oil on site are subject to standards for used oil processors/re-refiners promulgated today.

e. *On-Site Storage. Used oil* generators are required to store used oil in tanks or containers and must maintain all tanks and containers in good operating condition In maintaining all tanks and containers in goad condition generators must ensure that ● ll tanks and containers are free of any visible spills or leaks. as well as structural damage or deterioration.

Generators storing used oil in aboveground tanks and containers must clearly label all tanks and containers with the term "used oil." Generators who store used oil in underground tanks must label all fill pipes with the words

controlling (containing) used oil spills or releases that may occur during the operation of used oil processing and re-refining facilities and (b) requiring the removal of contaminated soils in the vicinity of or beneath the aboveground used oil storage and processing units at closure.

m. *Other applicable requirements.* In addition to complying with the requirements of subpart F, owners and operators of used oil processing and re-refining facilities who also transport used oil off-site must comply with the requirements for used oil transporters in subpart E. Owners and operators of used oil processing and re-refining facilities who market used oil fuels must comply with the requirements of subpart H: owners and operators who burn used oil fuels must comply with the requirements of subpart G. Disposal of used oil must be performed in compliance with the requirements specified in part 279, subpart L. Similarly, management of used oil processing and re-refining residuals must be performed in compliance with the existing RCRA requirements. In addition, used oil generators who recycle used oil on-site in a manner other than burning for energy recovery must comply with the standards promulgated today for used oil processors and re-refiners.

5. Standards for Burners of Off-Specification Used Oil Fuel

a. *Applicability.* 40 CFR part 279, subpart G applies to owners and operators of facilities where off-specification used oil fuel is burned for energy recovery in any boiler or industrial furnace and hazardous waste incinerator subject to regulation under 40 CFR part 264 or 265, subpart O. The requirements are shown in Table VI.5. The requirements of 40 CFR part 279, subpart G are applicable to: (1) Owners and operators of facilities that burn used oil fuel for energy recovery where the fuel does not meet the specification levels for the constituents listed in 5279.11 (previously 40 CFR 266.41); (2) transporters or marketers who burn used oil fuels that do not meet the specification for used oil fuels (used oil transporters are also subject to 40 CFR part 279. subpart E and marketers are also subject to 40 CFR part 279 subpart H): and (3] used oil processing and re-refining facilities that also burn off-specification used oil fuels (used oil processing and re-refining facilities also are subject to 40 CFR part 279. subpart F). Used oil fuel. or used oil sent off-site to be burned for energy recovery, . includes any fuel produced from used oil through processing, blending, or other treatment. The requirements of subpart G are merely the existing requirements of the former part 266, subpart E, with minor modifications. EPA summarizes these requirements below.

TABLE VI.5.—STANDARDS FOR BURNERS OF OFF-SPECIFICATION USED OIL

Requirement	New or Existing	Regulatory citation
Burners who perform other management activities.	New	§ 279.60(b)
Restrictions on burning.	Existing	§ 279.61
Notification and EPA identification number.	Existing	§ 279.62
Rebuttable presumption for used oil.	Existing	§ 279.83(a), (b), and (c)
Exceptions from rebuttable presumption for CFC and metalworking oils.	New	§ 279.63(c)(1) and (2)
Record retention for rebuttable presumption.	New	§ 279.63(d)
Type of storage units.	New	§ 279.64(a)
Condition of tanks and containers.	New	§ 279.64(b)
Secondary containment for containers and existing and new above ground tanks.	New	§ 279.64(c), (d) and (e)
Labelling of containers and tanks.	New	279.64(f)
Responses to releases.	New	§ 279.64(g)
Tracing—acceptance and recordkeeping.	Existing	§ 279.65
Certification	Existing	§ 279.66
Management of residues.	New	§ 279.67
SPCC requirements, including spill prevention and control.	Existing (applicable independently).	40 CFR Part 112
UST requirements, including corrective action and financial responsibility.	Existing (applicable independently).	40 CFR Part 280
Inspections	N.A.	None
Closure	N.A.	None

The requirements under part 279, subpart G are not applicable to persons burning used oil fuel that meets the used oil fuel specifications of 40 CFR 279.11.[22] provided the marketer or burner of such fuel complies with the requirements of that section. , . .

Used oils that are hazardous wastes may be burned for energy recovery in compliance with subpart G of part 279, instead of 40 CFR part 266, subpart H (standards for burning hazardous waste in boilers and industrial furnaces), provided the used oil fuel is hazardous solely because it exhibits a characteristic of hazardous waste by its own nature or was mixed with hazardous waste generated by a conditionally exempt small quantity generator regulated under 40 CFR 261.5.

Burners who treat off-specification fuel by processing, blending, or other treatment to meet the specification levels contained in 40 CFR 279.11, must comply with the processing and re-refining facility standards of 40 CFR part 279, subpart F and the used oil marketer standards of subpart H of part 279.

b. *Restrictions.* Used oil fuel that is ofl-specification *(i.e.,* used oil fuel exceeding any *of* the specifications of 40 CFR 279.11) may be burned only in industrial furnaces or boilers (defined in 40 CFR 2SLI.1O) that meet the *following* criteria: (I) Are located on the site as part of a manufacturing process (e.g., cement kilns, asphalt plants) where materials are transformed into new products, including the component parts of products, by mechanical or chemical processes: (z) are utility boilers that generate electric power, steam, heated or cooled air, or other gases or fluids for sale for energy purposes: (3) are used oil-fired space heaters, provided that the burner complies with 40 CFR 279.23; or (4) are incinerator in compliance with parts 264/265, subpart O. (See § 279.61 for the specific restrictions.]

c. *On-site Burning in Space Heaters.* Used oil may be burned in a used oil-fired space beater, provided that the space heater bums only used oil that the owner or operator generates sod/or used oil obtained from household DIY oil changers. The space heater must have a maximum capacity of not more than 0.5 million MU per hour and the combustion gases from the burner unit must be vented to the ambient air.

d. *Notification Requirements.* Burners , of off-specification used oil fuel must notify the appropriate EPA Regional Administrator using EPA Form 8700–12 *or* by submitting a letter, stating the location and general description of used oil burning activities, unless the owner *or* operator of the facility haa previously notified the Agency *of* their used oil burning activities. Upon receipt of this notification EPA will issue an EPA identification number to the burner. This requirement does not apply to: (1)

[22] The specification levels are: arsenic = 5 ppm, maximum; cadmium .2 ppm, maximum; chromium = 10 ppm, maximum; lead = 100 ppm, maximum; flash point = 100°F, minimum; total halogens = 4,000 ppm maximum.

release is located. a generator must perform the following cleanup steps:

(1) Stop the release:

(2) Contain the released used oil:

(3) Clean up and manage properly the released used oil and other materials: and

(4) If necessary to prevent future releases, repair or replace any leaking used oil storage containers or tanks prior to returning them to service.

§ 279.23 On-site burning in space heaters.

(a) Generators may burn used oil in used oil-fired space beaten provided that:

(1) The heater burns only used oil that the owner or operator generates or used oil received from household do-it. yourself used oil generators:

(2) The heater is designed to have a " maximum capacity of not more than 0.5 million Btu per hour: end

(3 I The combustion gases from the heater are vented to the ambient air.

(b) (Reserved)

§ 279.24 Off-site shipments.

Except as provided in paragraphs (a) through (c) of this section. generators must ensure that their used oil is transport only by transporters who have obtained EPA identification numbers.

(a) *Self-transportation of small amounts to approval collection centers.* Generators may transport. without an EPA identification number. used oil that is generated at the generator's site and used oil collected from household do-it-yourselfers to a used oil collection center provided that:

[1] The generator transports the used oil in a vehicle owned by the generator or owned by an employee of the " generator:

(2) The generator transports no more than 55 gallons of used oil at any time: and

(3) The generator transports the used oil to a used oil collection center that is registered. licensed. permitted or recognized by a state/county/municipal government to manage used oil

(b) *Self-transportation of small amounts to aggregation points owned by the generator.* Generators may transport without an EPA identification number, used oil that is generated at the generator's site to an aggregation point provided that:

(1) The generator transports the used oil in a vehicle owned by the generator or owned by an employee of the generator:

(2) The generator transports no more than S5 gallons of used oil at any time: . and

(3) The generator transports the used oil to an aggregation point that is owned and/or operated by the same generator.

(c) *Toiling arrangements.* Used oil generators may arrange for used oil to be transported by a transponder without an EPA identification number: f the used oil is reclaimed under a contractual agreement pursuant to which reclaimed oil is returned by the processor/ - refiner to the generator for use as a lubricant. cutting oil. *or* coolant. The contract (known as a "tolling arrangement") must indicate

(1) The type of used oil and the frequency of shipments:

(2) That the vehicle used to transport the used oil to the processing/re-refining facility and to deliver recycled used oil back to the generator is owned and operated by the used oil processor/re-refiner: and

(3) That reclaimed oil will be returned to the generator.

Subpart D-Standards for Used Oil Collection Centers and *Aggregation* Points

§ 279.30 Do-it-yourselfer Used oil collection centers.

(a) *Applicability. This section* applies to owners or operators *of* all do-it-yourselfer (DIY) used oil collection centers. *A* DIY used oil collection center is any site or facility that accepts/ aggregates and stores used oil collected only from household do-it-y ourselfers.

(b) *DIY used oil collection center requirements. Owners* or operators of ail DIY used oil collection canters must comply with the generator standards in subpart C of this part.

§ 279.31 used oil collection a n t -

(a] *Applicability. This section* applies to owners or operators *of* used oil collection centers. A used oil collection center is any site or facility that accepts/aggregates and stems used oil collected from used oil generators regulated under subpart C *of this* part who bring used oil to the collection center in shipments of no more than 55 gallons under the provisions of § 279.24(a). Used oil collection centers may also accept used oil from household do-it-yourselfers.

(b) *Used oil collection center requirements.* Owners or operators of all used oil collection centers muse

(1) Comply with the generator " standards in subpart C of this part: and

(2) Be registered/licensed/permitted/ recognized by a state/county/municipal . government to manage used oil. - , -

§ 279.32 Used oil aggregation points owned by the generator.

(a) *Applicability.* This section applies to owners or operators of ail used oil aggregation points. A wed oil aggregation point is any site or facility that accepts. aggregates. end/or stores used oil collected only from other used oil generation sites owned or operated by the owner or operator of the aggregation point. from which used oil is transposed to the aggregation point in shipments of no more than 55 gallons under the provisions of § 279.24(b). Used oil aggregation points may also accept used oil from household do-it-yourselfers.

(b) Used *oil aggregation point requirements.* Owners or operators of ail used oil aggregation points must compiy with the generator standards in subpart C of this part.

Subpart E—Standards for Used Oil Transporter *and* Transfer Facilities

5279.40 **Applicability.**

(a) *General.* Except as provide-din paragraph (a)(1) through (a)(4) of this section. this subpart applies to all used oil transported. Used oil transporters are persons who transport used oil persons who collect used oil from more than one generator and transport the collected oil, and owners and operators of used oil transfer facilities.

(1) This subpart does not apply to on-site transportation

(z) This subpart does not apply to generators who transport shipments of used oil totalling 55 gallons or less from the generator to a used oil collection center as specified in § 279.24(a).

[3] This subpart does not apply to. generators who transport shipments *of* used oii totalling 55 gallons or less from the generator to a used oil aggregation point owned or operated by the same generator as specified in § 279.24(b).

(4) This subpart does not apply to transporta *tion* of used oil generated by household do-it-yourselfers from the initial generator to a regulated used oil generator, collection center. aggregation point, processor/re-refiner. or burner subject to the requirements of this part. Except as provided in paragraphs (a)(1), through (a)(3) of this section. this subpart does. however. apply to transportation of collected household do-it-y ourselfer used oil from regulated used oil generators. collection centers. aggregation points. or other facilities where household do-it-y ourselfer used oil is collected.

(b) *Imports and exports.* Transporters who import used oil from abroad or export used oil outside of the United

whom the used oil was sent for processing/re-refining;

(3) The EPA identification number of the transporter who delivered the used oil to the processor/re-refiner;

(4) The EPA identification number (if applicable) of the generator or processor/re-refiner from whom the used oil was sent for processing/re-refining;

(5) The quantity of used oil accepted; and

(6) The date of acceptance.

(b) *Delivery.* Used oil processor/re-refiners must keep a record of each shipment of used oil that is shipped to a used oil burner, processor/re-refiner, or disposal facility. These records may take the form of a log, invoice, manifest, bill of lading or other shipping documents. Record for each shipment must include the following information:

(1) The name and address *of the* transporter who delivers the used ail to the burner, processor/re-refiner or disposal facility;

(2) The name and address of the burner, processor/re-refiner or disposal facility who will receive the used oil;

(3) The EPA identification number of the transporter who delivers the used oil to the burner, processor/re-refiner or disposal facility;

(4) The EPA identification number *of the* burner, processor/re-refiner, or disposal facility who will receive the Used oil;

(5) The quantity of used oil shipped; and

(6) The date *of* shipment.

(c) *Record* retention The records described in paragraphs (a) and (b) *of* this section must be maintained for at least three years.

§ 279.57 Operating record and reporting.

(a) *Operating record.* (1) The owner or operator must keep a written operating record at the facility.

(2) The following information must be recorded, as it becomes available, and maintained in the operating record until closure of the facility;

(i) Records and results of used oil analyses performed as described in the analysis plan required under § 279.55; and

(ii) Summary reports and details of all incidents that require implementation of the contingency plan an specified in § 279.s2(%).

(b) *Reporting.* A used ail processor/re-refiner must report to the Regional Administrator, in the form of ● letter, on a biennial basis (by March 1 of each ● ven numbered year), the following information concerning uaad oil activities during the previous calendar year;

(1) The EPA identification number, name, and address of the processor/re-refiner;

(2) The calendar year covered by the report; and

(3) The quantities of used oil accepted for processing/re-refining and the manner in which the used oil is processed/re-refined, including the specific processes employed.

§ 279.58 Off-site shipments of used oil.

Used oil processors/re-refiners who initiate shipments of used oil off-site must ship the used oil using a used oil transporter who has obtained an EPA identification number.

§ 279.59 Management of residues.

Owners and operators who generate residues from the storage, processing, or R-fining of used ail must manage the residues as specified in § 279.10(e).

Subpart G—Standards for Used Oil Burners Who Burn Off-Specification Used Oil for Energy Recovery

§ 279.60 Applicability.

(a) *General.* The requirements of this subpart apply to used ail burners except as specified in paragraphs (a)(1) and (a)(2) of this section. A used ad burner is a facility where used ail not meeting the specification requirements in § 279.11 is burned for energy recovery in devices identified in § 279.61(a). Facilities burning used oil for energy recovery under tbe following conditions am not subject to this Subpart:

(1) The used oil is burned by the generator in an an-site space healer under the provisiona of § 279.23; or

(2) The used oil is burned *by* a processor/re-refiner for purposes of *processing* used oil. which is considered burning incidentally to used oil processing.

(b) *Other applicable previsions* Used oil burners who conduct the following activities are also subject to the requirements of other applicable provisions of&a part as indicated below.

(1) Burners who generate used oil must also comply this subpart C *of this* part;

(2) Burners who transport used oil must also comply with subpart E of this part;

(3) Except as provided in § 279.61(b), burners who process or re-refine used oil must also comply with subpart *F* of this part;

(4) Burners who direct shipments *of* off-specification used oil from *their* facility to a used oil burner or first claim that used oil that is to be burned for energy recovery meets the used oil fuel specifications set forth & § 279.11 must also comply with subpart H of this part; and

(5) Burners who dispose of used oil, including the use of used oil as a dust suppressant, must comply with subpart I of this part.

(c) *Specification fuel.* This ● *u&Mm* does not apply to persons burning used oil that meets the used oil fuel specification of § 279.11, provided that the burner complies with the requirements of subpart H Of this part.

§ 279.61 Restrictions on burning.

(a) Off-specification used oil fuel may be burned for energy recovery in only the following devices:

(1) Industrial furnaces identified in § 260.10 of this chapter;

(Z] Boilers, as defined in § 260.10 of this chapter. that are identified as follows:

(i) Industrial boilers located on the site *of* a facility engaged in a manufacturing process where substances are transformed into new products, including the component parts of products, by mechanical or chemical processes;

(ii) Utility boilers used to produce ● iedc prover. steam, heated or wokd air, or ether gases or fluids for sale; or

(iii) Used oil-fired space heatera provided that the burner meets the provisions of § 279.23; or

(3) Hazardous waste incinerators subject to regulation under subpart O of parts 2$4 or 265 of this chapter.

('b)(l) With the following exception used oil burners may not *process* used oil unless they also comply with the requirements of subpart *F* of this part.

(2] Used oil burners may aggregate off-specifica *tion* used oil with virgin oil or on-specifica tion used oil for purposes of burning, but may not aggregate for purposes of *producing* on-specification used oil.

§ 279.62 Notification

(a] *Identification numbers.* Used oil burners who have not previously complied with the notifica tion requirements of RCRA section 30t0 must comply with these requirements and obtain an EPA identification number,

(b) *Mechanics of notification.* A used oil burner who haa not received an EPA identification number may obtain one by notifying the Regional Administrator of their uaad oil activity by submitting either:

(1) A completed EPA Form 8700–12 (To obtain EPA Form 8700–12 call RCRA/Superfund Hotline at 1–800–424–9346 or 703–920–9810); or

APPENDIX 5

Cost/Benefit Analysis and Payback Work Sheets

Cost/Benefit Analysis and Payback Work Sheet

One strong reason for installing a waste oil furnace in a facility is the possibility that the operator could save some money on conventional heating bills. This appendix contains a simplified, step-by-step process whereby potential cost savings can be estimated as well as the time required to pay back the capital investment in the unit. The simplified analysis given below contains the following basic assumptions:

1) The facility is heated by a conventional furnace fired by a fuel oil

2) The heat generated per litre of waste oil in the waste oil furnace is the same as the heat generated per litre of fuel oil in the conventional oil furnace

3) The cost of electricity to operate the waste oil furnace is the same as for the conventional furnace

4) Interest rates over the payback period are ignored.

COSTS

It is strongly recommended that users of the selected product be contacted to ascertain realistic operating costs. Most manufacturers will provide the names of these users to prospective customers. Some of these are provided in Appendix 6.

Fixed Costs

1) Purchase cost of furnace $_____

2) Freight/delivery costs $_____

3) Installation costs (including electrical plumbing and ductwork, if any) $_____

4) Purchase cost of waste oil storage unit (if not included with unit) $_____

5) Freight/delivery costs of waste oil storage unit $_____

6) Installation cost for waste oil storage unit (if separate from furnace installation costs) $_____

Total of 1) to 6) = A = $_____

Variable Costs

7) Estimated annual used oil transportation or preparation costs $_____/yr

8) Estimated annual maintenance costs, including cleaning" at 15 minutes per day for vaporizing ; 10 hours per year for atomizing $_____/yr

9) Estimated spare parts costs $_____/yr

Total of 7) to 9) = **B** = $_____/yr

* *N.* B. This number varies widely with each unit; check with a user given as a reference by the manufacturer

BENEFITS

Variable Benefits

10) Estimated volume of waste oil to be burned annually cannot exceed firing rate of furnace or generation rate of used oil if no stockpile of waste oil exists. $_____L/yr

11) Cost of fuel $_____IL

12) Annual fuel oil savings =10) X 11)= $_____/yr

13) Estimated annual waste oil storage and/or disposal cost savings $_____/yr

Total annual benefits = 12) +13) = **C** = $_____/yr

PAYBACK

If C is greater than B, the waste oil furnace will eventually pay for itself. The estimated time for this to occur is:

Payback time (yr) = A/(C-B) =_____

The first example calculation taken from the 1988 Report (Boreal, 1988) follows:

From "Case Study Number One" in Appendix A

COSTS

Fixed Costs

1) +2) +3) Purchase cost + freight + installation for furnace $20,000

4) +5) +6) Purchase cost + freight + installation for waste oil storage tank. $8,000

A = $28,000

Variable Costs

7) Oil transport or preparation	$ 0
8) Annual maintenance or cleaning; 5 min per week changing filters; 30 rnin every 2 mo. cleaning fire box; 30 min every 3 mo. cleaning nozzle; 5 hr every year cleaning tank- assumed labour cost @ $15/hr; 7 month heating season.	$ 156
9) Annual spare parts cost (2 filters per week @ $12 each, for 7 months)	$ 728

B = $ 884

BENEFITS

Variable Benefits

10) Volume of waste oil burned annually	20.400 L/vr
11) Cost of fuel oil	$ 0.35 /L
12) Annual fuel oil savings 10) x 11)	$ 7,140
13) Annual waste oil disposal savings	unknown

c = $7,140

PAYBACK

Payback time = $28,000/($7140-$884) = **4.5 years**

This would be considerably reduced if the waste oil disposal cost were accounted for, estimated at a minimum of $1 .50/L or $30,600 annually, for disposal at a certified hazardous waste facility.

The second example involves the installation of a "demonstration project" 200,000 BTU/hr waste oil furnace at a government garage in Iqaluit.

COSTS

Fixed Costs

1) +2) +3) Purchase cost + freight + installation for furnace
$8996 + $1500 + $500 = $ 10,996

4) +5) +6) Purchase cost + freight + installation for waste oil storage tank. $ 0 (included with unit)

A = $10,996

Variable Costs

7) Oil transport or preparation $ 0

8) Annual maintenance or cleaning; 5 hrs per month cleaning & maintenance - high due to high ash and bacteria content of waste oil: assumed labour cost @ $20/hr; 10 month heating season. $ 1,000

9) Annual-spare parts cost ($25 for nozzles; cleanable filters therefore no filter cost) $ - 2 5

B = **$1,025**

BENEFITS

Variable Benefits

10) Volume of waste oil burned annually (10 drums per month)	20,500 L/yr
11) Cost of fuel oil	$ 0.39/L
12) Annual fuel oil savings 10) x 11)	$ 7,995
13) Annual waste oil disposal savings (based on $14,000 to ship 60 drums to Montreal for disposal)	$23,000

c = $30,995

PAYBACK

Payback time = $10,996/($30,995 - $1,025) = 0.37 years = 4.5 months

Without the oil disposal savings the payback would still only be 1.6 years.

The last example calculation relates to a recent installation of a 235,000 BTU/hr space heater in a large construction garage in Iqaluit.

COSTS

Fixed Costs

1) +2) +3) Purchase cost + freight + installation for furnace
$6800 + $854 + $500 = $ 8,154

4) +5) +6) Purchase cost + freight + installation for waste oil storage tank. $ 0 (included above)

A = $8.154

Variable Costs

7) Oil transport or preparation $ 0

8) Annual maintenance or cleaning; 9 hours per year cleaning filters; assumed 1 a hour cost @ $20/hr. $ 180

9) Annual spare parts cost (cleanable filters, no extra nozzles required yet) $ 0

B = $ 180

BENEFITS

Variable Benefits

10) Volume of waste oil burned annually (average of 25-39 drums per month)	65,600 L/yr
11) Cost of fuel oil	$ 0.39 /L
12) Annual fuel oil savings 10) x 11)	$ 25,584
13) Annual waste oil disposal savings (oil stockpiled previously)	0

C = $25,584

PAYBACK

Payback time = $8,154/($25,584 - $180) = 0.32 years = 4 months

Even with increased maintenance and other costs, this application appears to be highly cost effective.

APPENDIX 6

Manufacturer's References

- **Econo-Heat**
- **Alternate Energy Resources**
- **Clean Burn**
- **Black Gold**
- **Fornax**

MANUFACTURER'S REFERENCES

ECONO-HEAT Inc.

Alaska Pulp
Wrangell, Alaska

Blue Crick Auto Sales
1-509-244-3852

Echo Bay Mines
Edmonton, AB
George or Norm Maradyn
1-403-459-8417

Hendrix Motor Co.
1947 NW Overton
Portland, Oregon
1-503-241-5495

Jim's Pacific Garage
506 S.main
Pasco, WA 99301
1-509-547-7770

Loren Smith Farms
1-503-753-4928 or
1-503-753-4620

Mammoth Disposal Co.
1-619-934-2201

Mark Woods Trucking
1-209-897-1035

Marlin Hutterian Brethren
Rte 1 Box 6E
Reardan WA
1-509-299-5400

Ross Island Sand & Gravel
Ken English
1-503-239-5504

Valley Transmission
1-509-924-6600

Wilson Tractor
1-509-397-4329

Wrangel Forest Products
Herb Murphy
1-907-874-3371

Washington State Dept. of Transportation
Ron Smith or Jim Shaw
1-206-768-5706 or
1-206-768-5710

ALTERNATE ENERGY RESOURCES

Gertzen Equipment
Dave or Sndy
1-416-670-7321

Milton Chrysler Dodge
Carl Bodeker
1-416-878-8877

Sheridan Equipment
Ken Fitzsimons
1-416-670-5100

Skelton Trucking
Ron Skelton
1-416-297-5468

Tandet Truck Leasing
John Tilley (or sons)
1-416-827-0501

Toronto Freight Liner Ltd.
Chris Ritchie
1-416-420-6500

Trt Sand and Gravel
Joe Locke
1-416-686-3903

CLEAN BURN

Agro- Drain Systems	CB2000	1-613-826-2388
Arstein Industrial Equipment	CB2000	1-705-472-8500
Bumstead Motors	CB 90C	1-519-538-3260
G.L. Robbins Construction	CB4000	1-519-867-5270
Halman Chevrolet	CB4000	1-519-364-3340
Jerry's General Repair	CB2000	1-519-443-5751
Land Mercury Sales	CB2000	1-519-326-8607
Moose Creek Cement	CB2000	1-613-538-2381
Osgoode Sand & Gravel	CB2000	1-613-822-1603
Sharp Bus Lines	CB4000	1-519-448-1331
Villeneuve Construction	CB4000	1-705-372-1838

SUNFIRE

Bob Anderson Ford
Kevin
Missourri Valley, IA
1-712-642-2728

Croft Ford
Ron Bleiler
Athens, PA
1-717-888-2366

Burtis Motor Company
Dale Cook
Garden City, KS
1-316-275-6171

BLACK GOLD

Anchorage Chrysler
Norm Spencer
Grounds Maintenance Man
Anchorage, Alaska
1-907-264-2220

State of Alaska
Dept. of Transportation
Bob Hess
Anchorage, Alaska
1-907-269-7980

Nome Checkered Cab
Gary Hart, Owner
Nome, Alaska
1-907-443-5 136/2132

State of Alaska
Dept. of Transport
Jeff Prehiem
Palmer Highway Shop
Palmer, Alaska
1-907-745-3117

FORNAX

Barringer VW
Rochester, NH
Bob Barrenger
1-603-332-6242

Fishery Products Inc.
Boston, MA
Joe Bowen
1-617-542-7300

City of Dover
Dover, NH
Dave Allen, Dir.
Waste Management
1-603-743-6070

Frazier Pontiac
Amesbury, MA
Scott Dolloff
1-508-388-2500

FORNAX CONT'D

City of Rochester
Rochester, NH
Bert George, Public Works
I-603-332-4096

Diesel Don's Truck Semite
Weare, NH
Don Boisvert
1-603-529-1777

Dreher-Holloway
Exeter, NH
Michael Baillargeon
1-603-772-4787

Newman Ford
Salem, NH
Steve Newman
1-603-898-9766

Port City Nissan
Portsmouth, NH
Rick Fecteau
1-603-431-6500

Tire Loft
Portsmouth, NH
Alan Watson
1-603-43 1-1234

Town of Billerica
Billerica, MA
Dave McLaughlin, Public Works
1-617-671-0952

H & D Truck Service
Bow, NH
Wendell Dicey
1-603-224-5440

Hervey's Tire
Rochester, NH
Steve Hervey
1-603-332-5420

Mass. Turnpike Authority
Weston, MA
Chuck St. Pierre
1-617-431-5161

Town of Middleton
Middleton, MA
Dennis Roy
I-508-777-0407

Town of Wilmington
Wilmington, MA
Roger Lessard, Public Works
1-508-658-3017

Wall Lincoln-Mercury
Methuen, MA
Dick Kuhn
I-508-687-31OO