

AN ABSTRACT OF THE THESIS OF

Mitchell K. Wang for the degree of Doctor of Philosophy in Health presented on July 9, 1993.

Title: An Exploratory Waste Audit Study of the Oregon Automobile Dealership Industry to Develop a "Model" Toxics Use and Hazardous Waste Reduction Plan

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The move from hazardous waste management to pollution prevention is viewed as a paradigm shift in American industry. Pollution prevention involves source reduction to reduce the amount of hazardous waste that is generated, and recycling of those wastes that cannot be prevented within the production process. The first piece of federal pollution prevention legislation was enacted in 1990. Subsequently, six states have passed similar laws that require industries producing hazardous waste to shift to less polluting practices.

The Oregon Toxics Use Reduction and Hazardous Waste Reduction Act of 1989 requires businesses to develop and implement a hazardous waste reduction plan that reduces not only the amount of hazardous waste generated, but also the type and amount of materials classified as "toxic".

Within the geographical region of Oregon, California, Washington, Alaska, and Idaho, only four studies exist that have researched waste reduction opportunities in the automobile industry.

The purpose of this study was: 1) to determine the number of Small Quantity Hazardous Waste Generators within the Oregon automobile dealership industry, 2) to determine the amount of used radiator coolant and used crankcase oil that is generated by Oregon dealerships (two waste streams that are not being tracked by the regulatory community), 3) to compare the waste disposal practices of urban and rural facilities, and 4) to develop a "Model" Toxics Use Reduction and Hazardous Waste Reduction Plan to be used in regional training sessions.

Based on a 74% rate of return (160 out of 215 dealerships), the results indicated that the gross quantities of the materials investigated (solvents, used oil, and used antifreeze) were greater in urban dealerships. These differences were not significant when quantities of material were standardized to the number of repair orders written.

Urban dealerships generate 0.462 gallons of used oil per repair order written and rural dealerships generate 0.481 gallons. Urban dealerships also generate 0.209 pounds of hazardous waste for each repair order while rural dealerships generate 0.412 pounds.

The data were used to develop a "Model" Toxics Use Reduction and Hazardous Waste Reduction Plan for this industry. The plan, which was published by the Oregon Department of Environmental Quality (DEQ), provides dealerships and the entire automobile repair industry with a step by step guideline to comply with Oregon law in reducing the amount of toxic materials used and hazardous waste generated.

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An Exploratory Waste Audit Study
of the Oregon Automobile Dealership
Industry to Develop a "Model" Toxics Use
and Hazardous Waste Reduction Plan

by

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CHAPTER I

INTRODUCTION

Introduction to the Problem

National, as well as Oregon legislation, has recently been shifted toward the prevention of pollution and away from the current practice of managing hazardous waste. "Zero Generation" and "The Greening of American Business" are phrases that represent the paradigm shift from pollution control to pollution prevention.

Recent Oregon legislation, the Toxics Use Reduction and Hazardous Waste Reduction Act of 1989, requires businesses to develop and implement a plan that reduces not only the amount of hazardous waste generated, but the types and amount of "toxic" materials. (Oregon DEQ, 1990) This landmark piece of legislation takes a proactive, preventive approach to environmental programs. The law requires the Oregon Department of Environmental Quality (DEQ) to: (1) provide technical assistance to affected industries; (2)

monitor the use of toxic substances and the generation of hazardous waste; and (3) require affected industries to engage in comprehensive planning and to develop measurable performance goals.

Educating the facility representatives who are required to complete the reduction plan is but one of the problems facing the environmental regulators. Even though technical assistance is provided, the regulators recognize the difficulties that arise in translating rules and regulations into practical application and making requirements that are accessible to the automobile industry to ensure compliance.

Another problem that arises is that information provided to the regulatory agencies is inadequate. For example, the Oregon DEQ records indicate that there are 106 Small Quantity Hazardous Waste Generators within the automobile dealership industry. (DEQ report dated May 27, 1992) This number represents those dealerships that have reported their status to the DEQ. Regulators, however, report that there are many more facilities that fall under small quantity hazardous waste generator requirements than are listed in state records, and that this type of self-reporting system will never provide the DEQ a complete list of all businesses that qualify for small quantity generator status.

A third problem involves the handling and disposal practices of waste materials that fall into the category of "special waste" materials or are not classified at all by

the Environmental Protection Agency (EPA). For example, both used radiator antifreeze and used crankcase oil are generated in large quantities by the automobile industry, but because they are not classified as "hazardous waste" by either the EPA or the DEQ, few tracking mechanisms are available to determine the quantity and disposal of these materials.

Purpose of the Study

The purpose of this study was two-fold. First, the study provided needed information about the number of Small Quantity Hazardous Waste Generators within the state. Second, the research provided sufficient background information to develop and test a "Model" Toxics Use Reduction and Hazardous Waste Reduction program for the automobile dealership industry.

The objectives of the research were:

- 1) to determine the number of small quantity hazardous waste generators within the Oregon automobile dealership industry;
- 2) to determine the amount generated and disposal strategies for used radiator coolant and used crankcase oil;
- 3) to compare the disposal practices of urban and rural facilities;

- 4) to field test an environmental site auditing program;
- 5) to provide the automobile dealership industry a tool to be used for self regulation;
- 6) to develop a "model" toxics use reduction and hazardous waste reduction plan for use by this industry.

Hypotheses

Three hypotheses were evaluated in this study:

1. There is no significant difference between the number of small quantity and conditionally exempt hazardous waste generators in Oregon's automobile dealership industry.
2. There is no significant difference between "urban" Oregon counties and "rural" Oregon counties with respect to the amount of hazardous waste generated for each repair order written by the dealership.
3. There is no significant difference between rural and urban areas of the state, in the amounts of used crankcase oil and used radiator coolant generated.

Significance of the Study

This study investigated and analyzed the waste practices of the automobile dealership industry focusing on toxic material use and hazardous waste generation. Although there are 250 automobile dealerships within the state, sufficient information was not available concerning the amounts of waste generated, standard industry practices regarding waste management, and waste reduction and toxic material use reduction possibilities.

Within the geographical region of Oregon, Washington, California, Alaska, and Idaho few documents have attempted to characterize the waste reduction practices of this industry: 1) *Reducing Hazardous Waste - Oregon Hazardous Waste Regulations and the Vehicle Maintenance Industry*, published by the Oregon DEQ, 2) *Hazardous Waste Reduction Assessment Handbook - Automotive Repair Shops*, published by the California Department of Health Services (DOHS), 3) *Waste Audit Study*, published by the California DOHS, and 4) *On-Site Consultation Report - Automotive Repair Shop*, published by the Alaska Health Project.

The information provided from this study filled a void in the Oregon Department of Environmental Quality (DEQ) hazardous waste generator database as well as provided Oregon's automobile dealership industry with a much needed assessment of its own operations.

This research concluded development of a "Model" Toxics Use and Hazardous Waste Reduction Plan for use by this industry. A 1989 Oregon law requires that all Small Quantity Hazardous Waste Generators (SQG) complete and actively work on reducing the amount and types of toxic material used in the facility and reducing the amount of hazardous waste generated by the facility operations. The data collected from this study contributed to the development of a workable plan that dealerships in the state can use to cost-effectively reduce their toxics and wastes.

Scope and Limitations

The majority of the data were collected through a mail survey. Although use of the Oregon Automobile Dealers Association added validity to the data collected by the surveys, each individual dealership's response was assumed to be an honest statement of their practices. An on-site evaluation of twenty-four (24) dealerships in the Portland / Salem area was used to verify the accuracy of survey response. Geographical limitations (this study included every facility in Oregon) prevented on-site follow up of all responses.

Of the 160 returned survey questionnaires, 99 (62%) were from what are classified "urban" dealerships. Ideally, the group of dealerships used for validation (dealerships for which an independent survey form was completed by the

researcher) would have been representative of the survey sample. Of the validated dealerships, nineteen of the twenty-four were located in an urban setting (79%) while only five dealerships (21%) were located in a rural setting.

It must also be noted that the validation dealerships utilize outside assistance to maintain facility compliance with OSHA and DEQ regulations. These dealerships, therefore, may not accurately represent the larger number of dealerships that do not have outside assistance.

Definition of Terms

The following terms and acronyms are used in this study:

ACGIH:	American Conference of Governmental Industrial Hygienists
ASA:	Automobile Service Association
Baseline:	Starting point
Berm:	A physical barrier use to ensure any spilled or leaked material does not travel outside the boundary.
CAA:	Clean Air Act
CAS:	Chemical Abstract Service Identification Number
CBO:	Congressional Budget Office
CEG:	Conditionally Exempt Small Quantity Hazardous Waste Generator. One that generates less than 220 pounds of hazardous waste in any calendar month.

CEQ: Council on Environmental Quality

CERCLA: Comprehensive Environmental Response,
Compensation, and Liability Act of 1980 (also
known as Superfund)

CFR: Code of Federal Regulations

CFTC: Consumer Fair Trade Commission

Corrosivity: A material having a pH of less than 2 or
greater than 11.

CWA: Clean Water Act

DEQ: Oregon Department of Environmental Quality

DOHS: California Department of Health Services

EIS: Environmental Impact Statement

EPA: U.S. Environmental Protection Agency

FCC: Federal Communications Commission

FDA: Food and Drug Administration

GAO: Government Accounting Office

HSWA: Hazardous and Solid Waste Amendments

HWI: Hazardous Waste Identification Number

Ignitability: Hazardous waste characteristic associated
with a flash point of less than 140 degrees
Fahrenheit

kg: Kilogram

Leachate: Material that leaks out of a storage system such
as a landfill.

LEL: Lower Explosive Limit

LQG: Large Quantity Hazardous Waste Generator. One that generates over 2,200 pounds of hazardous waste in any calendar month.

MEMA: Motor Equipment Manufacturers Association

MSDS: Material Safety Data Sheet

MSHA: Mine Safety and Health Administration

NAAQS: National Ambient Air Quality Standards

NEPA: National Environmental Policy Act of 1969

Neurotoxin: Affecting the central nervous system

NFPA: National Fire Protection Association

Non Point Sources: Usually moving or intermittent locations that result in the emissions of contaminants

NPL: National Priority List

OADA: Oregon Automobile Dealers Association

ORM: Other Regulated Material

OSHA: Occupational Safety and Health Administration

OTA: Office of Technical Assessment

PEL: Permissible Exposure Limit (OSHA)

Point Sources: Emissions that occur from stationary, quantifiable locations

PPA: Pollution Prevention Act of 1990

ppm: Parts per million

RCRA: Resource Conservation and Recovery Act of 1976

Reactivity: Classification based upon a materials chemical action with another material when mixed

RO: Vehicle Repair Order

SARA: Superfund Amendments and Reauthorization Act
of 1986

Solvents: A class of materials used for cleaning. In this
study, solvents are considered a "Stoddard
Solvent" blend of materials commonly used in
automobile parts washers.

SQG: Small Quantity Hazardous Waste Generator. One
that generates between 220 and 2,200 pounds of
hazardous waste in any one calendar month

Superfund: See CERCLA

SWDA: Solid Waste Disposal Act

TLV: Threshold Limit Value (ACGIH)

TOC: Total Organic Concentration

Toxicity: Sliding scale classification based upon the
materials potential adverse effect upon human
health

Toxics: Definition of a class of chemicals that have been
listed as toxic to human health or the environment

TRI: Toxics Release Inventory Number

TSDF: Treatment, Storage, or Disposal Facility

UEL: Upper Explosive Limit

U.S.C.: United States Code

Used Antifreeze: Also called "Used Coolant". This study
classifies used antifreeze as that material
removed from an automobile radiator and cooling
system.

Used Oil: A waste material that is not classified as "hazardous" by the EPA, but which concern is given. Used oil in this study is that material taken from the automobile lubrication system and discarded.

UST: Underground Storage Tank

VOC's: Volatile Organic Compounds

CHAPTER II

LITERATURE REVIEW

Resource Conservation and Recovery Act (RCRA)

Overview

The Solid Waste Disposal Act (SWDA), enacted in 1965, was the first piece of federal legislation that addressed the nation's waste management problem. The Act was amended by the Resource Conservation and Recovery Act (RCRA) in 1976 and amended once again by the Hazardous and Solid Waste Amendments of 1984 (HSWA). Hazardous waste was first addressed in 1976 under RCRA. These three acts together are commonly referred to as RCRA. The three major programs of RCRA are Subtitles C, D, and I. Subtitle C regulates hazardous waste; Subtitle D regulates solid waste (nonhazardous waste materials), and Subtitle I regulates underground storage tanks that hold petroleum products and hazardous substances (not including wastes).

Subtitle C

Throughout the 1970s air and water pollution control was the main focus of the U.S. environmental improvement efforts. While much was written during that period on the

need to take a "materials balance" approach to environmental policy - that is, to recognize that what goes in must come out- the disposal of solid and liquid wastes on land received relatively little attention. Viewed primarily as a local or regional problem of littering and trash removal, solid waste disposal was seen as secondary to pressing public health and amenity issues associated with air and water pollution.

The year 1978 shifted public attention toward the view of hazardous waste disposal as a national environmental problem. It was then that the nation first learned of Love Canal, a residential area of Niagara Falls, New York, where large quantities of solid and liquid wastes, long buried under ground where a school and adjacent housing tract were later built, had begun to seep into the basements, playrooms, and general environment of area households. Fears of serious adverse health effects began to grow and extended to other parts of the country as similar sites began to receive attention. Today, no other environmental problem is more well-publicized or higher on the public agenda than hazardous wastes; more than 60 percent of the respondents in a recent poll indicated that they view the problem as "very serious." (Roper, 1988)

Hazardous waste is the subset of solid and liquid wastes that is at the center of the current regulatory actions. The definition of the hazardous wastes is not entirely clear. We tend to think of hazardous wastes

as being disposed of on land, although many are not, and we worry about them because of their threats to biological systems. Direct emissions of effluents into the air or water are regulated under the Clean Air and Clean Water acts. Similarly, direct or indirect contamination of drinking water supplies is addressed under the Safe Drinking Water Act. These acts leave for additional regulation the solid or liquid wastes that are disposed of on land, even if they ultimately result in air pollution or the contamination of surface or ground waters.

What is Hazardous Waste?

Hazardous wastes can be defined as a subset of all solid and liquid wastes that are disposed of on land rather than being shunted directly into the air or water and that have the potential to adversely affect human health and the environment. The tendency is to think of hazardous wastes as resulting mainly from industrial activities, but households also play a role in the generation and improper disposal of substances that might be considered hazardous wastes.

Under various statutes and regulations Congress and the EPA have defined hazardous wastes more carefully. Current law defines hazardous wastes as those solid or liquid wastes or combinations thereof that may "cause or contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness" or any

wastes that may "pose a substantial threat to human health" when improperly handled.(42 U.S.C, 1976) The Environmental Protection Agency has refined this definition in its own regulations.(40 CFR Part 261) The EPA has also adopted the convention that a hazardous waste is any solid or liquid waste that has certain harmful effects on the health or the environment.(Farellick, 1985) The legal definition of hazardous wastes is not all inclusive. Under current law and regulations, several categories of potential hazardous wastes are not regulated for political and other reasons, These include mining wastes, cement-kiln dust, household wastes, and agricultural wastes.

The focus on land disposal may not fully capture the nature of the problem. Any effluents not covered under the air and water statutes may be thought of as hazardous wastes whether disposed of on land, directly discharged into the air or water, or placed in oceans or under the ground. The current statutory structure for hazardous waste management covers all of these disposal routes. In the very broadest sense, all pollutants might be considered hazardous waste to the extent that they endanger public health or welfare. Our current regulatory approach to hazardous wastes is not so much predicted on the definition of hazardous wastes as it is on the source of the wastes introduced into the environment.

Current concerns about hazardous wastes focus on the potential for improper storage or disposal to lead to

environmental or human exposure. Wastes placed in plain metal drums can cause corrosion and leak out into the general environment. Wastes held in unlined ponds, lagoons, or landfills over long periods of time may leach into the surrounding soil and nearby water supplies. Concern with hazardous wastes also focuses on two important time dimensions: past disposal practices have resulted in present risks to health and the environment; and some current disposal practices (such as placing wastes in unprotected landfills) may result in unacceptable levels of risk in the future. The distinction between past and present hazardous waste disposal practices is quite important. Programs and incentives directed at current disposal practices can have no effect on past activities. However, the design of programs for cleaning up and allocating the liability for past waste sites may influence, in unexpected directions, those currently generating and disposing of hazardous wastes.

The conditions that led to the creation of particular hazardous waste problems are the same as those that underlie most current environmental concerns. As long as emissions to the air, water, or land are free, little economic incentive exists for firms or households to find alternative, less damaging disposal options. As long as the price of waste disposal is artificially low (through failure to include the social or environmental costs associated with the activity), too many wastes are produced and too few go into safe

disposal facilities. It is not difficult to see why firms and others faced with the costs of incineration to render wastes less harmful (estimated to range from \$300 to \$1000 per ton) or burying the wastes in landfills (perhaps as little as \$50 per ton) would choose the latter.

The scenario is the same for air and water pollution, but other characteristics of hazardous wastes have exacerbated the problem relative to the more conventional pollution problems. First, it has been comparatively easy to hide poor hazardous waste disposal practices from the public much easier than hiding smoke billowing from a stack or liquid effluent spewing from an outfall pipe. Landfills are located in out-of-the-way places and many are on privately held land. There may be few outward signs of disposal, safe or unsafe.

Second, hazardous wastes can affect all environmental media; air, water, and land. Wastes placed in metal barrels may begin over time to leak into the ground and may slowly seep through the soil into underground aquifers or be carried through surface runoff into streams or rivers. Emissions from waste stored above ground may mix with the surrounding air to pose a health threat to those downwind from or near the site. And with hazardous wastes the relevant linkages go between the disposal of wastes and their ultimate effects on health and the environment can be much more numerous and complex than the linkage involved with conventional pollutants. Exposure routes are not often

direct and may involve several different avenues simultaneously.

Third, a hazardous waste site may continue to pollute long after it has ceased accepting new waste. One can stop an industrial facility from polluting the air by shutting down the plant. In similar fashion, one can stop a plant's production of hazardous wastes. However, environmental and health risks may always be associated with a disposal facility even after it has closed. This characteristic has important implications for the design of effective regulatory and enforcement strategies.

While we know little about the actual scope of the hazardous waste problem, what we do know hints at its potential magnitude. According to a recent congressional study, the volume of hazardous wastes generated each year is in the neighborhood of 250 million metric tons. (McCarthy, 1987) These wastes are composed of a diverse mix of substances and from almost every major industrial sector. There are an estimated 650,000 generators of hazardous wastes, but roughly two percent of them contribute over 95 percent of the waste; most generators produce less than 1,000 kilograms per month. From the point of view of policy, it is important to note that, of the quarter of a billion tons of hazardous wastes produced, about 95 percent are stored at the site at which they are generated. (GPO, 1985) The remaining 5 percent are shipped elsewhere for treatment and/or disposal.

Greater uncertainty surrounds the methods by which hazardous wastes are disposed of. Three very different estimates, by the Congressional Budget Office, the EPA, and the Chemical Manufacturer's Association of the ultimate fate of hazardous wastes are shown in Table 2.1.

Table 2.1 Different Hazardous Waste Management Methods

Method	% of Total		
	EPA	CBO	CMA
Surface Impoundment	55	19	<1
Well Injection	13	25	8
Water Discharge	a	22	91
Landfill	1	23	<1
Treatment	20	6	<1
Incineration	<1	5	<1
Storage	9	a	a
Other	<1	a	a

a = Method not included in specific estimates

According to the Congressional Budget Office (CBO), the most common disposal method by volume is deep-well injection, where wastes are pumped into thin, deep shafts and allowed to collect beneath the earth's surface (sometimes in salt domes). In CBO's accounting, deep-well injection accounts for approximately 25 percent of all wastes disposed of off-site, another 23 percent go into sanitary and hazardous waste landfills, and 5 percent are burned in incinerators. The rest are treated or disposed of through a variety of other techniques.

While the EPA and the Chemical Manufacturer's Association (CMA) disagree, perhaps the most important single entry in

Table 2.1 is the large quantity of wastes discharged into surface waters. According to the CMA, this is more difficult to identify and control than contained discharges, and pose a more complicated management problem. Most of these discharges may be subject to anticipated controls under the Clean Water Act.

There is a tendency to assume that of the various disposal options, incineration and treatment, are the safest. Most of the current regulatory attention has therefore been focused on the wastes disposed of in landfills or storage tanks or discharged directly into the environment. These would appear to be the disposal methods having the greatest chance of adversely affecting human health. There are currently operating in the United States about 500 licensed (permitted) commercial treatment, storage, and disposal facilities (TSDFs), 2,500 generator-owned TSDF's are located in the Northeast and Midwest. It is estimated that 10 generator-owned facilities account for more than 60 percent of all hazardous wastes managed (McCarthy, 1987).

There is no accurate estimate of the number of formerly active landfills or other sites at which hazardous wastes were discarded in the past. The EPA currently lists 27,000 abandoned hazardous wastes sites on the inventory it maintains of sites that may require some sort of cleanup. Of these, the EPA estimates that cleanup of at least 2,000 will require some federal action. But the General Accounting

Office (GAO) has estimated that the number of sites may actually be anywhere from 130,000 to 425,000, depending on the definition of a hazardous waste site (GAO, 1987). The Office of Technology Assessment (OTA) takes a broader and more pessimistic view, estimating that there are more than 600,000 active or former solid waste disposal facilities in the United States that could pose threats to health and environment (OTA, 1985). Not all of these would require federal attention to clean them up, but perhaps as many as 10,000 would, according to the OTA. If nothing else, these estimates reflect the range of uncertainty associated with past hazardous waste disposal; they do not hide potential magnitude of the problem. None of the estimates, for example, include closed deep-well injection facilities, because of the difficulty of identifying them. Nor do these estimates include the number of potential hazardous waste sites owned by the federal government. Although federal agencies are beginning to assess the scope of their own problems, one recent study estimates that the number of federal facilities with hazardous waste problems is over 1,000.

The mix of chemicals that typically constitute the hazardous wastes has been associated with a wide range of health and environmental effects, from acute disorders such as skin burns to chronic diseases such as cancer. The chemicals and compounds found commonly in dump sites with which the EPA is concerned, and the types of potential

health risks associated with these chemicals and compounds, are listed in Table 2.2. Because of the wide variety of waste types, disposal sites, exposure conditions, and other important factors that exist, it is impossible to generalize about the health risks associated with an "average" site (GAO, 1987).

Table 2.2 Typical Chemicals Found in Hazardous Waste Sites, and Their Potential Health Risks

Chemical	Number of Sites (out of 546 sites)	Potential Health Risks
Trichloroethylene	179	possible carcinogen
Lead	162	acute toxicity
Toluene	153	carcinogen, possible neurotoxin
Benzene	143	carcinogen
PCBs	121	possible carcinogen, nervous/digestive disorders
Chloroform	111	carcinogen, reproductive toxin

Source: USEPA, "Extent of the Hazardous release Problem and Future Funding Needs - CERCLA Section 301(a)(1)(c) Study." December 1984

While the potential risks to health from exposure to hazardous wastes may be substantial, little is known about the actual risks to the public from past and current disposal practices. Very few studies or formal risk assessments have been conducted in the vicinity of abandoned or currently operating facilities. A recent study of twenty-one hazardous waste disposal sites found that in only one case was there strong evidence of adverse health effects associated with the site (Universities, 1985). The study

acknowledged that the findings were as much a statement on the inadequacy of the data base for making such assessments as they were on the apparent health effects.

Few defensible estimates of risks associated with current disposal practices are available, although the EPA has a number of studies under way. Those that do exist do not concern what is thought of as the biggest problem--land disposal (USEPA, 1985). According to the EPA, emissions into the air of volatile organic compounds from hazardous waste facilities may result in from 1 to 250 cases of cancer annually (USEPA, 1985); similarly, leachate and air emissions from burning, dumping, and disposal of used oil have been estimated to result in 80 annual cases of cancer nationwide (Temple, 1985). Other estimates of health risks from hazardous waste sites are based on models that observers feel may play a useful comparative role in standard-setting, but do not accurately reflect absolute risks. A recent study conducted by the EPA's senior managers placed the risks from hazardous waste sites among the lowest the agency has to address (USEPA, 1987).

This overview suggests several important dimensions of the hazardous waste problem that should be taken into account in any system designed to deal effectively with environmental and health concerns. First, uncertainty over risks suggests uncertainty over regulatory benefits. Second, for hazardous waste disposal--the last "unregulated" form of disposal-- the costs of alternatives to land disposal are

likely to be substantial. Together, these observations highlight the need for control strategy that is flexible and designed to identify and act on the worst problems first. Cost and benefits information in the context of hazardous waste management has a high value. Thus, the incentives imbedded in optimal hazardous waste programs have to serve several purposes; they should encourage the search for and implementation of least-cost solutions to current problems (including disposal, treatment, reduction, or recycling); at the same time, they should encourage the prompt and efficient cleanup of past disposal activities that pose current problems.

An economic-based approach to hazardous waste management would attempt to address these and other elements of the problem. However, the current statutory and regulatory system involves a mixed bag of incentives and constraints that call into question our ability to cope with hazardous wastes in an economically rational manner.

The Current Statutory and Regulatory Framework

The federal government has been concerned with the disposal and treatment of solid wastes since passage of the Solid Waste Disposal Act in 1965. Statutes and regulations concentrating on hazardous wastes are much more recent. It was in 1976 that Congress created a regulatory program to deal with existing disposal practices, and it was in 1980

that it put remediation programs together for abandoned sites.

The 1976 law was entirely rewritten in 1984, and the regulations flowing from it are just beginning to appear and will continue to be issued in the 1990s. The 1980 law concerning abandoned sites was reauthorized and significantly altered in 1986. However, certain basic characteristics of the program have remained unchanged (Dower, 1990).

The basic federal statutory and regulatory framework for addressing current disposal practices and existing disposal sites emerged in 1976 as amendments to the Solid Waste Disposal Act. This set of amendments was called the Resource Conservation and Recovery Act (RCRA). The Act was intended to provide a cradle-to-grave regulatory framework to monitor and control the production, storage, transportation, and eventual disposal of wastes that posed a risk to health and environment. While Congress was clear on that goal, it was vague in spelling out the means to achieve it. Rather, it left the EPA with considerable flexibility and discretion in defining the ultimate approach. Such flexibility would appear to be a particularly appropriate response to a problem as uncertain in breadth and seriousness as that of hazardous waste disposal practices.

The 1976 RCRA had four basic components relating to hazardous wastes. The codified regulatory sections of RCRA are:

- Part 260 Definitions, petitions for rule making changes, and delisting procedures
- Part 261 Hazardous waste identification
- Part 262 Generator standards
- Part 263 Transporter standards
- Part 264 Treatment, storage, and disposal facilities: final operating standards
- Part 265 Treatment, storage, and disposal facilities: interim status standards
- Part 266 Hazardous waste fuel burned for energy recovery, used oil fuel, and process specific regulatory standards
- Part 268 Land disposal restrictions
- Part 270 Permits and operating during interim status
- Part 271 State programs
- Part 280 Underground storage tanks standards

The first step required by the Act was the identification and characterization of hazardous wastes. While the Act contained language concerning the definition of such wastes, it left the specifics to the EPA. The agency responded with a two-prong approach. First, a list was developed of waste materials deemed hazardous on prima facie grounds and thus falling automatically under the regulatory requirements of the Act. The EPA has published a list of over 500 substances, chemical products, and mixtures that are considered hazardous (40 CFR, 1988). Second, to

determine whether any other wastes were to be deemed hazardous. the agency established four criteria- ignitability, corrosivity, reactivity, and toxicity (40 CFR, 1988). Tests have been established for all four criteria. Should a waste prove "positive" on any one of these counts, it falls into RCRA process, regardless of the importance of the products giving rise to the wastes. In that sense, the definitional process is risk-based and involves no balancing. (certain large-volume wastes have been exempted to date, however, including those from oil and natural gas exploration.)

The second major thrust of RCRA (1976) dealt with the generation and transportation of wastes. Under the Act, generators of hazardous wastes were given the responsibility of keeping track of the wastes they generate and where they go. Congress anticipated that the tracking function would include, at a minimum, the use of a system of manifests for following the movement of hazardous wastes from generation to disposal, but provided few additional details on what was expected. All generators, transporters, and disposers of hazardous wastes were required by the EPA to be a part of a system that would identify the quantity, origin, and destination of hazardous wastes being transported, as well as the identity of the transporter. This information was to be contained on a manifest (or form) that would accompany the waste through its travels. Originally the EPA did not propose a nationally uniform system, but allowed states to

develop their own manifests. In response to complaints (primarily from industry) concerning the differing requirements from state to state, the EPA developed a national manifest.

The clear intention of the manifest and recordkeeping requirements was to inhibit the practice of midnight dumping, or illegal disposal, and to firmly fix responsibility for the ultimate disposition of wastes. For example, a transporter cannot accept hazardous wastes unless they are accompanied by a manifest, nor can a treatment facility accept wastes from transporters unless accompanied by that same manifest (Quarles, 1982). This system could be used to develop a data base on the amount and type of wastes being generated in this country. Since the overwhelming percentage of hazardous waste never leaves the point of generation, only a small portion of these wastes fall under the purview of the system. Further, we know very little about the effect of the manifest system on inhibiting illegal disposal of wastes. The incentives for midnight dumping still exist under the manifest system, at least for those finding it cheaper than contracting with a responsible waste transporter and disposal site (GAO, 1985).

The heaviest burden under RCRA fell on those facilities engaged in the treatment, storage, and disposal (TSD) of hazardous wastes. The Act required the EPA to establish performance standards for TSD facilities that are "necessary to protect human health and the environment" (42 U.S.C,

1976). RCRA further required that these standards be applied to, but not limited to: recordkeeping, reporting, monitoring, and inspection; treatment, storage, or disposal methods, techniques and practices; location, design, and construction of facilities; and a host of related matters. Amendments to RCRA adopted in 1980 allowed the EPA to distinguish between new and existing facilities in setting regulatory requirements.

Nine years after RCRA was first passed, the law had not been fully implemented. In fact, the first set of major regulations concerning TSD facilities was not promulgated until 1980 (Dower, 1990). These rules set standards for operation on an interim basis until the final regulations were issued. Many of the requirements for the facilities wishing to continue accepting wastes would already have been met by any reasonably run facility. For example, under the interim rules, TSD facilities were to comply with the manifest requirements, maintain certain records on wastes handled over the life of the facility, and design and implement an inspection program. More economically burdensome were those elements of the interim rules designed to reduce potential long term risks. These elements included the EPA imposed post closure and financial responsibility requirements, liability insurance minimums, and groundwater monitoring activities.

In July, 1982, two years after the promulgation of the interim standards, the EPA issued the final technical

standards to be incorporated in permit applications for disposal facilities. These standards were intended to be the Agency's ultimate interpretation of the law governing the TSD facilities. These requirements formed the basis for the issuance of final permits allowing the operator of a facility to keep it open. The intention of Congress was to have the states carry out the permit process after receiving approval of their hazardous waste management plans from the EPA. These plans could differ from the federal program, but would have to be substantially equivalent (OTA, 1980).

The final technical standards of 1982 are described by the EPA as performance standards, and they are much less specific than the earlier set of proposed rules. They leave substantial discretion to the individual permit writers, and they provide an opportunity for tailoring the requirements to meet site specific needs.

1984 Hazardous & Solid Waste Amendments (HSWA)

In 1983, Congress began to reevaluate the hazardous waste program as it had evolved under RCRA in 1976 and its 1980 amendments. Increasing public concern and conflicts with the Superfund law of 1980 prompted the legislators to pass amendments that can only be described as among the most detailed and most restrictive environmental requirements ever written (42 U.S.C., 1984). The 1984 HSWA amended portions of RCRA. More so than in any previous

environmental law, Congress took on the role of regulator itself and set out specific instructions, rather than general guidance, on the form the hazardous waste programs would take. No major section of the RCRA act went unchanged, and several new major programs were added (Florio, 1986).

Congress had four goals in mind in the 1984 amendments of RCRA. First, it wanted a program that was heavily biased against the land disposal of hazardous wastes, the disposal method most often associated with environmental risk. Second, it wanted the most far reaching of the regulatory exemptions granted under the 1976 program revoked and the universe of control expanded to include more sources and more wastes. Third, it wanted the program to get underway with no further delays. Fourth, it wanted to address the problems that might arise if and when active waste disposal facilities discontinued operation. There was little sympathy given in these amendments to the lessons learned from the fourteen year experience with air and water pollution control. Thus opportunities to reduce the costs of meeting environmental goals were ignored in the interest of quick action (Dower, 1990).

The 1984 Amendments to RCRA made three major changes. First, they closed what had come to be viewed as a loophole in RCRA by bringing under regulation an estimated one-hundred-thirty thousand (130,000) relatively small sources that generate between one-hundred and one-thousand kilograms

(100 - 1,000 kg) of hazardous waste per month. The regulations for small sources (Classified Small Quantity Hazardous Waste Generators - SQG) under the 1984 amendments are allowed to differ from those set forth for larger hazardous waste generators, but they still are "sufficient to protect human health and the environment"(42 U.S.C., 1984). Another major change implemented in 1984 concerned the disposal of certain hazardous wastes on the land. With the public concern mounting over the perceived risk of land disposal (such as the increasing number of abandoned disposal sites) Congress decided to force the EPA to adopt a bias against the disposal of hazardous wastes in landfills (OTA, 1984). Specifically, RCRA was amended to prohibit land disposal of hazardous wastes unless the EPA Administrator determines that "the prohibition of one or more methods of land disposal of such wastes is not required in order to protect human health and the environment for as long as the waste remains hazardous"(42 U.S.C., 1984).

The basis for making such a determination under the 1984 amendments is confusing and complex. The EPA must ban all untreated hazardous wastes from landfills unless it can be demonstrated that the landfilling method will meet certain restrictive conditions (lack of migration being the major concern). The shift from the regulatory presumption of "safe until proven hazardous" to the position of "no land disposal until proven safe" is the most obvious manifestation of congressional desire to do away with land

disposal (Dower, 1990). While an exemption in RCRA for pre-treated or innocuous wastes may offer some relief from the regulatory strictures, the burden of proof is still severe. The eventual impact of this requirement cannot yet be foreseen, but the overall standards of safety under the 1984 amendments are extremely demanding (Environmental, 1987).

A third major change promulgated by the 1984 amendments focused on a number of potential sources of hazardous waste pollution that were not recognized as such under the earlier RCRA program and were thus left unregulated. Among them were underground storage tanks (UST) used to store petroleum, solvents, pesticides, and gasoline. Evidence became available just before passage of the amendments that as many as 100,000 such tanks, containing a wide range of potentially hazardous materials, may have been leaking their contents into the surrounding environment. Congress responded by bringing all USTs into the RCRA system. The EPA is thus required to establish standards for detecting leaks, to remedy the problems that lead to leaks, to determine financial responsibility for tanks that may be taken out of use, and to issue rules regarding the design and construction of any new underground tanks.

Hazardous Waste Identification and Classification

The determination of a waste as a RCRA hazardous waste is perhaps the most important and complex step in

ascertaining one's responsibility under RCRA. Careful attention should be paid to each step in the determination of a waste as hazardous. Many factors can affect the classification of a waste, and they may not necessarily appear in a logical order. This is mainly due to EPA's redefinition of solid waste and because certain hazardous wastes are subject to special considerations under various sections of RCRA (Wagner, 1988). This is mainly due to EPA's redefinition of solid waste and because certain hazardous wastes are subject to special considerations under various sections of RCRA.

The first step is to determine if the waste is considered a solid waste under RCRA. The definition of solid waste is very broad and covers most waste-type items. However, there are two sets of exclusions written by Congress. The second set of exclusions depends on if and how a waste is recycled.

Assuming the waste is a listed hazardous waste; meaning, is the waste or the process that generated the waste specifically listed in Subpart D of part 261? Assuming that it is not, the third and final step is to determine if the waste exhibits a characteristic of hazard waste. The four characteristics are to be applied to each waste stream that does not meet the listing criteria.

Requirements For Conducting A Hazardous Waste Determination

Requirements for conducting a hazardous waste determination in Oregon can be found in OAR 340-102-011. It is the generator's responsibility to determine if the business's waste is considered hazardous under RCRA regulations. All generators of waste material are required by law to identify and evaluate their wastes. This is called a "hazardous waste determination".

Because a hazardous waste determination is the foundation on which proper hazardous waste management is built, failure to conduct a hazardous determination is a very serious violation. Failure to conduct a hazardous waste determination is a Class 1 violation. A civil penalty of up to \$10,000 per day can be assessed for this violation and is one of the most common violations cited by inspectors (DEQ, 1991).

The standard used to determine if a waste is hazardous can be found in RCRA under 40 CFR 261, and OAR 340-101-033, Additional "State Only" Hazardous Wastes. These sections contain listed, characteristic, and "State Only" hazardous wastes. A generator can complete a hazardous waste determination by using either:

1. Knowledge of the waste generation process; and/or
2. Analysis of the waste stream.

A Complete Hazardous Waste Determination Must Answer
The Following Questions:

- * Is the solid waste being generated a hazardous waste?
- * If the waste is hazardous, what is (are) the correct hazardous waste codes(s)?

Knowledge Of Process/ Analysis

In general there are two methods for performing a hazardous waste determination. The first, "knowledge of process", makes the use available information to make the determination. The second, analysis, relies on the testing of the waste to determine the presence of hazardous constituents. Knowledge of process, analytical data and/or a combination of these form the basis by which all hazardous waste determinations are completed.

Knowledge Of Process

The more information that is available concerning the waste stream, the easier a hazardous waste determination will be to complete. Useful sources of information include:

1. Material Safety Data Sheet (MSDS) for product information.
2. The supplier/manufacturer of vendor.
3. Product labels.

Note: Waste streams may differ greatly from original products.

4. Description of the process generating the waste stream. The process will determine if the waste is or is not listed. Compare product information with the listed wastes and hazardous waste characteristics in 40 CFR 261.
5. Trade associations and/or corporate headquarters. Trade Associations can be a good source of information on hazardous waste management practices. They can provide assistance in handling, packaging, and labeling. Some associations publish periodic newsletters which include information on proper hazardous waste management. Someone else in the industry may have already completed the determination.

Maintain all documentation regarding hazardous waste determinations. If there is a completed a hazardous waste determination based on knowledge of process, be sure to document all sources of information used to reach this determination. File this information with hazardous waste determination records. Maintain these records on file for at least three years.

Hazardous Waste Identification

When identifying a hazardous waste, the protocol is to first determine if it is a RCRA-listed hazardous waste. If it is not listed, a generator must then determine if the waste fails any of the characteristics of a hazardous waste: ignitability, corrosiveness, reactivity, and /or toxicity (as determined by the toxicity characteristic leaching procedure test - TCLP). If a listed hazardous waste also exhibits a characteristic, only the listing code and not the characteristic code needs to be recorded.

The RCRA-listed hazardous wastes can be found in 40 CFR Sections of 261.30 through 261.33. The characteristics, of hazardous waste can be found in section 261.20 through 261.24.

The EPA manual, Test Methods for evaluating Solid Waste, Physical/Chemical Methods, is more commonly known as SW-846. This manual provides information on sampling and analyzing procedures for complying with RCRA. However, the general use of SW-846 for testing purposes is not required. One must refer to the regulatory text to determine if a specific test method is required and in some cases, specific tests methods from SW-846 are mandatory (USEPA, 1987).

Notification of Hazardous Waste Activities

Section 3001 of RCRA requires any person generating, transporting, or owning or operating a treatment, storage, or disposal facility involving hazardous waste to notify EPA of the regulated activity using EPA Form 8700-12, "Notification of Hazardous Waste Activity." This procedure requires notification of a facility's location, a general description of the regulated activity, and identification of the types and estimates of the quantities of hazardous wastes. Upon receipt of a completed form, EPA issues an appropriate identification number. The information obtained from these notification forms is entered into EPA's Hazardous Waste Data Management System (HWDMS), which is a data base for RCRA-regulated facilities. A new form is not required if a facility generates or transports hazardous wastes not previously identified on the facility's original form except for waste-as-fuel activities (45 FR 12747). It is important to note that the mere filing of a notification form does not automatically subject a person to RCRA regulation. A facility will become subject to Subtitle C only when that facility generates, transports, or manages a hazardous waste.

Hazardous Waste Generator Classifications

The USEPA and the State of Oregon DEQ place a varying degree of regulatory burden based upon a facilities hazardous waste generator status. There are three classifications of hazardous waste generators: 1) Large Quantity Generators (LQG), 2) Small Quantity Generators (SQG), and 3) Conditionally Exempt Small Quantity Generators (CEG).

A facility is a LQG if in any one calendar month they:

- a. generate 2,200 pounds or more of hazardous waste or,
- b. generate 2,200 pounds or more of spill cleanup debris containing hazardous waste or,
- c. generate more than 2.2 pounds of acutely hazardous waste or,
- d. generate more than 220 pounds of spill cleanup debris containing acutely hazardous waste or,
- e. at any accumulate more than 2.2 pounds of acutely hazardous waste on-site.

A facility is a SQG if in any one calendar month they:

- a. generate more than 220 pounds and less than 2,200 pounds of hazardous waste or,
- b. generate more than 220 pounds and less than 2,200 pounds of spill cleanup debris containing hazardous waste or,
- c. at any time accumulate more than 2,200 pounds of hazardous waste on-site

A facility is CEG if in any one calendar month they:

- a. generate 2.2 pounds or less of acutely hazardous wastes or,
- b. generate 220 pounds or less of hazardous wastes or,

- c. generate 220 pounds or less of spill cleanup debris containing hazardous waste or,
- d. at any time accumulate up to 2,200 pounds of hazardous waste on-site

There are two items that are included in EPA's Notification of Hazardous Waste Activity Form that require clarification. First, the waste code designation D000 is not a valid designation. This number is used solely as a sample TCLP toxicity code designation. Although this number has been used as a catchall category, it has no regulatory significance. Second is the category of infectious wastes. Infectious wastes are associated with hospitals and research laboratories and included such items as laboratory animals, disease-causing agents, and various microbial research wastes. The original notification form included the category of infectious wastes. However, EPA has not yet listed wastes because of their infectious potential, nor has the EPA established characteristics to be used by a generator to identify a waste as infectious.

Non-notification

Non-notification occurs when a facility has been involved in a regulated hazardous waste activity but never notified the EPA of the activity. If a facility involved in regulated activities that failed to notify EPA is discovered, the general procedure is for EPA to issue an

administrative order (an enforcement action order) that requires the facility to obtain interim status, install a ground-water monitoring system (land disposal facilities only), and begin closure of the unit. If the facility utilizes land disposal, it will have to apply for a post-closure permit, which will initiate corrective actions (Wagner, 1988).

Non-notification is probably the most common serious violation. In the majority of cases, a facility manages a waste, generally in a surface impoundment, that they consider nonhazardous. However, EPA subsequently discovers that the waste is in fact a RCRA-regulated hazardous waste. The facility, which would be classified as a hazardous waste management facility, must obtain interim status and begin closure of the hazardous waste management units (Wagner, 1988).

Listed Hazardous Wastes

The EPA has listed hazardous wastes based on the criteria set forth in Section 261.11 of 40 CFR. If a waste meets the listing definition it is presumed to be hazardous regardless of its concentration. However, generators have the opportunity to demonstrate that a listed waste is not hazardous by petitioning to delist a waste at particular generation site based on specified criteria. A more detailed discussion of delisting appears later in this section.

The EPA has listed wastes based on their toxicity, reactivity, corrosivity, and ignitability. For hazardous wastes listed because they meet the criteria of toxicity, EPA's principal focus is in the identity and concentration of the waste's constituents and the nature of the toxicity presented by the constituents. If a waste contains significant concentrations of hazardous waste constituents, the EPA is likely to list the waste as hazardous unless it is evident that the waste constituents are incapable of migrating in significant concentrations even if improperly managed or that the waste constituents are not mobile or persistent should they migrate (USEPA, 1992).

A detailed justification for listing each hazardous waste is contained in EPA's Listing Background Documents. The listing documents are organized into the following sequence: (1) the EPA Administrator's basis for listing the waste or waste stream; (2) a brief description of the industries generating the listed waste stream; (3) a description of the manufacturing process or other activity that generates the waste and identification of waste composition, constituent concentrations, and annual quantity generated; (4) a summary of the adverse health effects of each of the waste constituents of concern; and (5) a summary of damage case histories involving the waste.

The listed hazardous wastes consist of wastes from nonspecific sources (F codes), wastes from specific sources (K codes), and commercial chemical products (U and P codes).

Any waste that is classified as an acutely hazardous waste (H) is subject to reduced weight limits regarding generator categories and more stringent requirements concerning the determination of empty containers. (RCRA Section 3003)

Wastes From Nonspecific Sources

The first category of listed hazardous wastes is generally material-specific wastes generated by a variety of processes. These wastes are further broken down into solvent wastes, electroplating wastes and dioxin wastes (RCRA Section 3003).

Solvent Wastes

Solvent wastes are designated as wastes F001 through F005. For a waste to be classified as a solvent waste, the purpose of the material must have been to mobilize or solubilize a constituent. Thus, if a material was used solely as a reactant or a feedstock, it is not classified as a solvent waste (OSWAR Directive No.9444.08). The mere presence of any of the components listed in F001 through F005 in a waste does not constitute with a sole active ingredient that is listed. It can also meet the listing criteria if it a solvent mixture. A solvent mixture is where a commercial blend that has any of the listed components

under the heading of solvent waste alone or in any combination that equals ten percent or more of the blend will constitute a listed hazardous waste when the material is spent. (Spent means any material that has been used and as a result of contamination can no longer serve the purpose for which it was produced without processing.) It is important to note that if a listed waste is generated, mixed with a nonhazardous waste, and the resultant mixture is less than 10 percent, it is still a hazardous waste because of the hazardous waste mixture rule.

Wastes From Specific Sources

The second category of listed hazardous wastes are not those generated from specific sources. These listings, under the designation of K codes, are hazardous due to what specific industrial process generates the waste rather than what is generated. For example, most hazardous wastes are listed by chemical name, such as benzene, whereas these wastes are listed by the specific industrial process such as untreated process wastewater from the production of toxaphene (K098).

Commercial Chemical Products

The third category of listed hazardous wastes are commercial chemical products, designated by either a U or P

code. The P code wastes are considered acutely hazardous and are subject to further restrictions concerning empty containers and weight limits. For a waste to be categorized as a U or P waste, it must be a commercial chemical product in an unused form. The definition of commercial chemical products includes technical grades, pure forms, off-specification products, or sole active ingredient products. Once a material is spent it does not meet any of the U or P listings, but may meet one of the other listings or exhibit a characteristic (45 FR 78540). If a material contains more than one active ingredient that is a listed U or P code substance, it does not receive the U or P listing and can only be hazardous by another listing or if it exhibits a hazardous characteristic. A commercial chemical product is not considered a hazardous waste until it is intended to be discarded or if it is spilled, in which case the spill cleanup residue attains the appropriate U or P code listing. Thus, it can be stored indefinitely without RCRA restraints if the intent is to use it or to have it recycled. Activities not included in the definition of recycling are if a U or P code product is mixed with used oil or other material and applied to the land as dust suppression or for road treatment, if they are otherwise applied to the land in lieu of their original intended use, if they are contained in products that are applied to the land in lieu of their use, or if they are used as fuel.

Characteristic Hazardous Waste

Section 3001 of RCRA requires EPA to develop and promulgate criteria for identifying characteristics of hazardous waste that are separate from the listed wastes. The primary responsibility for determining whether a waste exhibits a characteristic rests with the generator. Characteristics were selected that were measurable by standard available testing protocols. Thus, EPA established that ignitability, corrosiveness, reactivity, and extraction procedure toxicity (collectively known as ICRE) are the characteristics of a hazardous waste (RCRA Section 3001).

Ignitability (D001)

A waste is an ignitable waste if it meets any of the following conditions:

1. A liquid that has a flash point of less than 140 degrees F as determined by either a Pensky-Martens or a Setaflash closed-cup test.

Liquids are determined by using the paint filter test (PFT), EPA test method No. 9095. A sample of the waste is placed onto a paint filter (400 micron or No. 60 mesh). If any liquid seeps through the filter within five minutes, it is considered a liquid.

There is an exclusion from the ignitable characteristic for aqueous solutions that fail the flash point test and contain less than 24 percent alcohol. Originally this exclusion was intended for alcoholic beverages such as wine (450 FR 33108). However, the regulatory language is ambiguous regarding the extent of this exclusion. OWSER Directive No. 9443.02 states, " while the Agency's intent was that this exemption apply to potable beverages only, because the term alcohol was used instead of ethanol, all aqueous wastes which are ignitable only because they contain alcohols (here using the term alcohol to mean any chemical containing the hydroxyl [-OH] functional group) are excluded from regulation." The directives also defines the term "aqueous solution" by stating, "With respect to what constitutes an aqueous solution, such a solution is one in which water is the primary component. This means that water constitutes at least 50 percent by weight of the sample."

2. It is an ignitable compressed gas as defined by the Department of transportation (DOT).(49 CFR 173.300)

An ignitable compressed gas must first meet the definition of a compressed gas, which is "any material or mixture having in the container an absolute pressure exceeding 40 p.s.i. at 70 degrees F or, regardless of the pressure at 70 degrees F, having absolute pressure exceeding

104 p.s.i. at 130 degrees F; or any liquid flammable mixture having a vapor pressure exceeding 40 p.s.i. absolute at 100 degrees F." A material meeting the definition of a compressed gas is ignitable if it is either a mixture of 13 percent or less (by volume) with air, forms a flammable mixture, or the flammable range with air is wider than 12 percent regardless of the lower limit; the flame projects more than 18 inches beyond the ignition source with valve opened fully, or the flame flashes back and burns at the valve with any degree of valve opening; or there is any significant propagation of flame away from the ignition source.

3. It is an oxidizer as defined by DOT in 49 CFR 173.151.

An oxidizer is a substance that yields oxygen readily when involved in a fire, thereby accelerating and intensifying the combustion of organic material. There is no prescribed test for determining this classification. DOT does give examples of oxidizers such as chlorate, permanganate, inorganic peroxide, or a nitrate.

Corrosivity (D002)

A waste is a corrosive waste if it meets any of the following criteria:

1. It is aqueous and has a pH of 2 or less or 12.5 or more

2. It is a liquid and corrodes steel at a rate of 6.35 mm or more per year as determined by the National Association of Corrosion Engineers (NACE).

Waste in a solid phase, as determined by the paint filter test, are not considered corrosive wastes (45 FR 33108).

Reactivity (D003)

The reactivity characteristic requires a determination based more on judgment than a standardized quantitative determination except for explosives (Class A or B) and toxic (sulfide and cyanide) gas generation.

If a material can cause the generation of harmful vapors or fumes that can present a danger to human health or the environment, reacts violently with water, or has the ability to explode without detonation, it is considered a reactive hazardous waste.

Toxicity (D004-17)

The EPA has determined that one of the most significant dangers by hazardous waste stems from the leaching of toxic constituents of land-disposed wastes into ground water (Wagner, 1988). Consequently, the toxicity characteristic is designed to identify wastes that are likely to leach

hazardous constituents into the ground water under improper management conditions. EPA established a testing procedure that extracts constituents from solid waste in a manner which simulates the leaching action that can occur in a landfill. The EPA has made the assumption that industrial wastes would be co-disposed of with nonindustrial wastes in an actively decomposing municipal landfill situated over an aquifer. It is important to note that for the purpose of determining whether a waste is hazardous using the toxicity test, it is irrelevant that a person does not, in fact, co-dispose of their hazardous waste in a municipal landfill or in any type of landfill.

Toxicity Characteristics Leaching Procedure (TCLP)

The TCLP has taken the place of the EP toxicity test. The TCLP adds 38 organic constituents to the current list for a total of 52. The test procedure, EPA test method No.1310, has revised the extraction procedure for easier and more consistent results. The TCLP was finalized on November 7, 1986 (51 FR 40572), solely for the purpose of the land disposal ban. The test became final in the winter of 1988 for the purpose of hazardous waste determination.

Pollution Prevention Act

Overview

Another important regulation, the Pollution Prevention Act of 1990, seeks to encourage industry to reduce quantities of hazardous waste generated during the manufacturing process. This act was introduced on March 15, 1989 and was initiated by both a U.S. Senator and on the same day by a U.S. Representative. After much debate, the bill was attached to the budget reconciliation bill where it was passed and signed by President Bush (Revenue Reconciliation Act, 1990).

The Pollution Prevention Act of 1990 can be found in Section 6601 of the Revenue Reconciliation Act of 1990. The Act enumerates five Congressional findings: 1) Congress believes that there are significant opportunities for industry to reduce or prevent pollution at the source through cost effective changes in production, operation, and raw materials use. Such changes offer industry substantial savings in reduced amounts or raw material needed, decreased liability costs associated with waste generation, and will help protect the environment as well as reduce risks to worker health and safety; 2) Congress believes that opportunities for source reduction are often not realized because existing regulations, and the industrial resources they use for compliance focus primarily upon treatment and

proper disposal of generated wastes; 3) Further, Congress believes that existing regulations do not advocate multimedia management of wastes and that industry needs information and technical assistance to overcome institutional barriers to the adoption of source reduction techniques, and; 4) Congress believes source reduction is fundamentally different and more desirable than waste management and pollution control. The EPA needs to address the historical lack of attention to source reduction and; 5) Congress specifically declared it to be the national policy of the United States that "Pollution should be prevented or reduced at the source whenever feasible; pollution that cannot be prevented should be recycled in an environmentally safe manner, whenever feasible; pollution that cannot be prevented or recycled should be treated in an environmentally safe manner whenever feasible; and disposal or other release into the environment should be employed only as a last resort...". In so declaring it national policy, Congress identified pollution prevention as the means of choice and land, water, or air disposal as a last resort (Revenue Reconciliation Act, 1990).

The Act substantially increases reporting requirements under the Emergency Planning and Community Right-to-Know Section 313 Form R. Section 313 requires manufacturing facilities, with more than ten employees and that meet the use or generation levels established for one or more of the three hundred or so listed chemicals, to report information

on toxic emissions to each environmental media (land, air, water) on an annual basis. EPA's Form R must be completed and submitted by July 1 of each year. Prior to passage of the ACT, the EPA Form R contained sixty (60) data points. Presently, the number of data points has been expanded to one-hundred-thirteen (113). The revised Form R report must include:

- 1) The quantity of the chemical entering any waste stream (or otherwise released into the environment) prior to recycling, treatment, or disposal during the calendar year for which the report is filed. This quantity must also be reported as a percentage of change from the previous year;
- 2) The amount of the chemical that is recycled (at the facility or at an off site location) during the calendar year as well as the percentage change from the previous year. The recycling process used must also be reported;
- 3) The source reduction practices used with respect to that chemical within the facility;
- 4) The amount expected to be reported under provisions 1 and 2 above for the two calendar years immediately following the year for which the report is filed;
- 5) A ratio of production from the reporting year in comparison to the previous year;

- 6) The techniques used to identify source reduction opportunities;
- 7) The amount of any toxic chemical released into the environment that resulted from a catastrophic event, remedial action, or other one-time event and is not associated with production processes during the reporting year; and
- 8) The amount of the chemical from the facility that is treated (at the facility or at an off site location) during the calendar year. This quantity must also be reported as a percent change from the previous year.

These changes were mandated to address what Congress believed to be too much flexibility in report requirements under the existing Form R. Companies subject to SARA Section 313 reporting requirements will in the future be required to report in precise detail what each is doing to achieve waste reduction. These changes will make it easier for third parties, reviewing this publicly available information, to determine whether meaningful waste reduction is being achieved.

For example, under the revised Form R, interested parties will be able to review historic production levels and generated waste quantities. If a facility appears to have achieved substantial waste reduction, that fact can be confirmed or disallowed if production levels remain static or in fact decrease.

The Act created a pollution prevention office within the EPA to implement strategies promoting source reduction. The EPA is required to establish standard methods for measurement of source reduction, review regulations to determine their effect on source reduction, coordinate source reduction strategies, assure public access to the data and, establish a clearinghouse to disseminate information.

Under the Act, the EPA must make matching grants to states for programs to promote the use of source reduction techniques by industry. In issuing a grant, the EPA must consider whether the proposed state program makes specific technical assistance available to businesses seeking information about source reduction opportunities, targets assistance to businesses for whom lack of information is an impediment to source reduction, and provides training in source reduction techniques.

Potential Impact

The Act has several far reaching implications. First, the increased emphasis on the expanded utility of the SARA Section 313 Form R will continue to inspire EPA enforcement activity and the initiation of citizen suits (Bergeson, 1991). Second, the law will hasten the need for businesses to treat the idea of source reduction and pollution prevention with greater respect. Historically, the waste

minimization certifications required under the Hazardous and Solid Waste Amendments of 1984 (RCRA) have not been thought to be meaningful (Hirshhorn, 1990). The generator certifications on hazardous waste manifests and on annual and/or biennial reports have evolved into a simple statement of a "for recycle" notation without a clear guide as to what recycling process was used, or what the final determination of the waste product was. For example, to the best of my knowledge, no enforcement action has ever been brought against a facility or a person for improperly certifying that a company has a waste minimization program in place.

The expanded Form R will change that. Businesses subject to SARA Section 313 reporting will be required to report in greater detail their production ratios and the amount of waste entering the waste stream. It will be that much more difficult to finesse responding to questions about the levels of waste reductions actually realized at the source. Third, the Act provides for even more hard data for community groups to ask even tougher questions about what exactly facilities are doing to reduce and/or eliminate emissions of toxics into the environment.

Oregon's Toxics Use & Hazardous Waste Reduction Act of 1989

Oregon's Toxics Use and Hazardous Waste Reduction Act (ORS 465-003 through 037) is intended to reduce, avoid, or eliminate the use of toxic substances and the generation of hazardous wastes. It became law when it was signed by the Governor on July 24, 1989. The law and the administrative rules (OAR Chapter 340, Division 135), which explain the law in more detail and provides the steps required to fully administer the reduction requirements set forth by the Oregon Legislature (DEQ, 1990).

Reduction is any change or modification that avoids, reduces, or eliminates the use of toxic substances or the generation of hazardous waste. Oregon's first reduction priority, toxics use reduction, involves changes in chemical usage and production processes before waste is generated. The next priority, waste reduction, can take place only after waste is generated. Recycling is the most common waste reduction technique.

For the purposes of the law, reduction does not include reduction in air emissions, wastewater discharges, or solid waste, although each business facility is encouraged to consider a wide range of environmental issues while preparing a reduction plan (DEQ, 1990).

Oregon's law covers chemical use from start to finish - from toxics use to hazardous waste. The law reflects the Legislature's determination that the best ways to reduce the

adverse effects of chemicals in the workplace and in the environment are to:

1. Provide businesses with technical assistance concerning the reduction of toxic substances and hazardous waste;
2. Require businesses and industries to develop measurable performance goals and to make long-term plans to reduce their use of toxic substances and their generation of hazardous wastes; and
3. Monitor their use of toxic substances and the generation of hazardous waste.

Carrying out these key requirements should decrease costs and liabilities to businesses at the same time as benefits accrue in the areas of public health, safety, and the environment. With this law, the legislature affirmed that reducing toxic substances and hazardous wastes is good for business, employees, and the public (DEQ, 1990).

Who is Affected?

The law requires three groups to develop plans: large toxics users, large quantity hazardous waste generators, and small quantity hazardous waste generators. These three groups are called "toxics users" (DEQ, 1990). Conditionally exempt small quantity hazardous waste generators are not

required to develop reduction plans, although they may wish to develop plans for their own benefit and, like other affected businesses, they are also eligible for technical assistance.

What is Required?

Affected businesses in Oregon are required to develop plans to reduce toxics substances used and hazardous wastes generated (OAR 340-135-050). The focus of the planning efforts will be on toxic substances and hazardous wastes for which performance goals are required. These plans must contain the following seven items (OAR 340-135-050):

1. A written policy of management commitment
2. A written statement of goals, scope, and objectives
3. Measurable performance goals
4. Identification and evaluation of toxic substances and hazardous wastes and associated costs
5. Identification of reduction options and an implementation plan
6. An employee training program
7. An ongoing reduction program

Each affected business is also required to prepare an annual progress report (OAR 340-135-070). The purpose of the annual report is to evaluate progress, if any, in

achieving performance goals. This reporting requirement provides an opportunity for an annual reevaluation of each businesses reduction program, options that could be considered for implementation, and an assessment of progress. These reports may include amendments to a firm's original reduction plan along with explanations for these changes (DEQ, 1990).

Automobile Dealership Process Description

The automobile dealerships are full service facilities that can perform repair work from the "front of the vehicle to the rear bumper". They service all types if cars and light to medium duty trucks. Processes performed by the repair shop can be grouped into the following broad categories (Toy, 1987):

- a. Axle overhauls
- b. Brake jobs
- c. Computer diagnostic tests
- d. Electrical repair
- e. Emissions testing/exhaust work
- f. Engine overhaul
- g. Mechanical related work
- h. Suspension/drive train repair
- i. Tune-ups
- j. Transmission work

In general, the flow of work in the automotive shop begins in the front office area. A customer enters the shop and requests specific repairs on his vehicle. The job is then "written up" and a mechanic is assigned to perform the repair work. Each mechanic is assigned a work area or "stall" to complete the repair noted on the work order (Toy, 1987).

Specific tasks involved during the performance of the various work operations described above can include:

Parts Disassembly and Reassembly

This process generally involves physical rather than chemical activity. Mechanics will disassemble, inspect and then reassemble various vehicle components. Aerosol cleaning solvents and lubricants are used during this process.

Parts Cleaning

Most auto repair work involves some type of degreasing process or parts cleaning. In general, degreasing is the removal of surface grime, oil, and grease from the metal auto part that needs inspection and repair. Common forms of parts cleaning include cold degreasing, and vapor phase (hot) degreasing.

The automobile dealerships described in this study employ several parts cleaning processes. Typically, more

than one process is used to clean a single part. The various cleaning processes are described below.

Aerosol Spray Cleaning:

Twelve to sixteen ounce aerosol spray cleaners are used to clean and lubricate small engine parts. These cleaners are hand held by the mechanics and sprayed directly on the part to be inspected and repaired. This process is typically used during vehicle tune-up operations and brake jobs. Aerosol spray cleaners are also used to eliminate the residual solvent and grime remaining on parts cleaned in cold degreasing tank.

Cold Degreasing Tank:

This type of cleaning process is commonly used in small shops and garages. The process is used for major vehicle repair work such as engine overhauls, transmission repair, and work performed on vehicle suspension and the drive train.

The process involves placing the vehicle part into the degreasing tank. The part is cleaned through a soaking process. Shop mechanics will also physically brush the part to enhance the cleaning process.

Cleaning solvents used during this process will vary. Stoddard solvent is commonly used. The auto repair shop

described in this audit has switched from Stoddard solvent cleaning bath to diesel/kerosene cleaning mixture primarily to eliminate the Stoddard solvent waste stream.

High Pressure Water Wash

The auto repair shop also uses a high pressure water washer to clean engine parts. The totally enclosed system operates at 400 psi and uses water/soap mixture, heated to 140-160 F., to clean parts. The water/soap mixture is contained in a 5 gallon container and is passed through the system at a rate of 2-gallons per minute and is recycled through the system. To facilitate the cleaning process parts are first soaked in the cold degreasing tank to loosen up grime and grease on the engine part. The cleaning process takes approximately 5 to 10 minutes (Alaska, 1987).

Carburetor Cleaning Drum:

A five gallon cleaning tank (drum) is used to clean carburetors in the shop. The cleaning solvent used is a methylene chloride, (a chlorinated solvent) cresylic acid mixture. The solvent cleaning drum is water sealed to prevent excessive evaporation of the solvent.

The process involves placing the part into a wire mesh basket which is then placed into the drum. The part is allowed to sit in the drum for 30 minutes to 24 hours. Once

cleaned, the basket with part is hung on the lip of the drum suspended above the cleaning solvent for approximately ten minutes allowing residual solvent to drip back into the drum. The part is then washed with a water wash from a hose to rinse off residual solvent and blown dry making the part ready to use. The water is squeegeed into a nearby drain connected to an oil/water separator (California, 1988).

Oil/Fluids Change:

Tune-ups and other forms of automobile repair work involve replenishing and replacing oils, lubricants and other fluids needed to maintain the operating efficiency of the vehicle. The process involves draining the fluid from the fluid reservoir on the automobile into a collection container.

The dealership identifies the type of oil/fluid being handled according to the fuel used by the vehicle, such as unleaded, or leaded gasoline. Once the oils or fluids are collected, mechanics will transfer the oil according to suspected type into one of three larger storage containers. Customers can also provide the shop with their own waste oil container and accept responsibility for oil disposal.

Products Used

Raw materials used by the automobile repair shop described in this study include:

1. Oils, lubricants, and other fluids.
2. Kerosene/Diesel Fuel.
3. Aerosol Cleaning Sprays/ Lubricants.
4. Pressure Washer Soap.
5. Stoddard Solvents.
6. Carburetor Cleaner.
7. Brake Cleaners (either chlorinated or non chlorinated)

Waste Generation

Parts Disassembly, Assembly & Cleaning

a. Aerosol Spray Cleaning:

The aerosol spray cleaning materials contain petroleum distillates, toluene, and other chlorinated solvents.

Primary material loss occurs through the spray application, overspray and evaporation of cleaning solvent into the shop environment.

b. Cold Degreasing Tank

Typically degreasing tank sludge contain heavy metals and spent solvent materials. The cold tank also generates approximately 12-16 gallons of waste kerosene/diesel "solvent" mixture per at a rate of 6 to 8 gallons per cleaning. Additional solvent is lost through evaporation, absorption onto rags and operator clothing, mixed with sludge, drag-out, and miscellaneous spills (California, 1988).

c. Carburetor Cleaning Drum

The waste contains primarily methylene chloride in addition to xylene and cresylic acid.

This process also generates approximately 40 gallons of wastewater per month. Wastewater is generated when residual solvent is washed off carburetors, the final step in the cleaning process (Alaska, 1987).

d. Pressure Washer:

Approximately 4 gallons of wastewater are generated by this process per cleaning. It is cleaned approximately 4 times per month depending on the volume of work. Approximately 16 gallons of wastewater per month (Alaska, 1987).

2. Oil/Fluid Changes

- A. "Suspected" off-spec used oil (leaded oil). The source of the leaded oils are leaded gasoline vehicles serviced in the shop.
- B. Hazardous waste contaminated oil. The sources of contamination include cold tank wastes, any waste carburetor cleaner and other cleaning solvents. Volume varies depending on the contamination of on-spec oil.
- C. On-spec used oil (non-hazardous waste oil). The sources of non-hazardous waste oil include oils for vehicles using unleaded fuels, transmission fluids, axle lubricants, transfer case lubricants.
- D. Anti-freeze (ethylene glycol) is generated from the removal and replacement of this fluid during radiator system work.

3. Other Waste Sources

Other waste sources generated by the automobile repair shop include the following:

- A. "Sludge" material is generated when the oil/water separator screen connected to the floor drain is cleaned.
- B. Used lead acid batteries
- C. Industrial wastewater

Vehicle maintenance is a varied industry, and generates a variety of wastes. Solvents used for parts cleaning make up a large portion of these wastes, some of which are chlorinated solvents such as methylene chloride (toxic, persistent) and trichloroethane. Solvents are often designated as ignitable. Lead-acid batteries, which are often replaced in vehicle maintenance shops, contain sulfuric acid which is designated corrosive. However, as long as the sulfuric acid is kept in the battery and the battery is recycled, the acid (and battery) does not have to be managed as a hazardous waste (Toy, 1987).

An Oregon law passed in 1989 prohibits disposal of lead acid batteries by any method other than recycling. Battery retailers and wholesalers are required to take back used batteries for recycling. Automotive paint and body work shops have waste streams dominated by paint and thinner wastes. Methyl ethyl ketone is designated toxic as well as ignitable. Acids and potash used for oil and grease removal. Thinners are usually ignitable, but designations and waste codes vary with constituents of thinners.

Used Oil and waste antifreeze may or may not be hazardous depending on characteristics. Table 2.3 provides hazardous wastes codes. The correct DOT shipping name for a specific waste should be verified with the transporter or regional offices of the federal Department of Transportation (DOT) or the state offices of the Public Utility Commission (PUC) prior to completion of the hazardous waste manifest.

Items listed are examples only, and other DOT descriptions and identification codes may be applicable in some circumstances.

Table 2.3 Waste Materials Generated as a Result of Various Vehicle Maintenance Operations(California, 1988)

WASTE TYPE	WASTE CODE
* Wastes from oil and grease removal	
-acids	D002
-potash	D002
-caustic soda	D002
-carburetor cleaners	F002 or F004
-chlorinated solvents	F001
-ignitable degreaser	D001
-mineral spirit solvents	D001
-petroleum naphtha	D001
-petroleum distillates	D001
-1,1,1,-trichloroethane	F001
* Wastes from paint preparation	
-white spirit, varsol	D001
-alcohols	D001
-enamel reducers	D001
-methyl ethyl ketone (MEK)	F005
-mineral spirits	D001
-petroleum distillates	D001
-still bottoms from solvents recycling	F001, F002 F003, F004 or F005
* Paint wastes	
-acrylic and alkyd paint	D001
-enamels and epoxy paint	D001
-lacquers	D001
-still bottoms from solvent recycling	F001, F002 F003, F004 or F005
* Auto painting equipment cleaning, paint removal, stripping	
-acetone	F003
-alcohols	D001
-enamel reducers	D001
-methyl ethyl ketone (MEK)	F005
-mineral spirits	D001
-petroleum distillates	D001
-VM&P naphtha	D001
-toluene	F005
-xylene	F003
-Still bottoms from solvent recycling	F001, F002 F003, F004 or F005

Generators of waste should be careful not to pour liquid hazardous waste down the drain or dispose of solid hazardous waste in the dumpster.

Used Oil

Used oils that are recycled are not currently considered a hazardous waste in Oregon, nor are they an EPA listed hazardous waste, unless they are mixed with other wastes that is designated as hazardous under state or federal laws, or if they exhibit a hazardous characteristic. However, some regulations regarding used oils exist, and they should be managed properly (DEQ, 1990).

Recycling of used oil is a service provided by collectors of used oil. Most used oil recycling services currently charge the generator a fee to pick up the oil due to the low price of oil and the cost of recycling. However, even with the charge, recycling of used oil can be an economically and environmentally sound way to dispose of waste oils. Generators using this type of service should determine from the service what the final disposal of the oil will be and verify that the oil will be handled in an environmentally safe and legal manner.

Used oil generated by a business may be burned on-site in a commercial space heater. Used oil may not be collected from other generators, unless the used oil is generated as a household waste (i.e., do-it-yourself oil changes), or

unless the person delivering the oil is a registered used oil marketer and has certified that the oil meets certain quality specifications.

If used oil does not meet quality specifications, it is known as "off spec" oil. A generator may burn off spec oil if the heater is designed to have a maximum capacity of 500,000 BTU and is vented to the outside. A generator may not burn off-spec oil collected from other generators unless it is received from do-it-yourself oil changers who generate used oil as household waste. Because used oil frequently contains high amounts of water, sludge and ash-forming components, it should be burned only in specially designed boilers (EPA, 1992).

The RCRA regulations have established concentration limits for specific constituents in the waste oil. Used oil concentration limits for specific constituents in the waste oil. Used oil is off-specification if any of these concentration limits are exceeded (EPA, 1992):

* Arsenic	5 parts per million (ppm) maximum
* Cadmium	2 ppm maximum
* Chromium	10 ppm maximum
* Lead	100 ppm maximum
* Flash Point	100 F minimum
* Total Halogens	4000 ppm maximum

If used oil is mixed with a listed or characteristic hazardous waste, it may result in the entire mixture being regulated as a hazardous waste. This may mean that the generator of the used oil is no longer a small generator, and thus would be subject to the requirements of large generators, and the fuel burning requirements of large generators, and the fuel burning requirements for hazardous waste incinerators (EPA, 1992).

CHAPTER III

Research Design and Methodology

This chapter on research design and methodology describes the research materials and procedures followed in the selection of the sample population, development and delivery of the survey instrument, collection of qualitative and quantitative data, and data analysis.

Selection of the Sample Population

The sample population for this study included new car automobile dealerships in the State of Oregon. A new car dealership is defined as a "franchise" for one or more of the new car automobile manufacturers (Ford, General Motors, Toyota, etc.). An independent dealership will consist primarily of used car lots, automobile wholesalers, and automobile brokers that are not directly tied into any of the manufacturers. Because independent dealerships rarely conduct maintenance services on automobiles, these businesses were not included in the sample population.

There are approximately 250 new car automobile dealerships in the State of Oregon. Although this fluctuates from year to year, this is the average over the last decade.

Of the roughly 250 dealerships, 234 belong the Oregon Automobile Dealers Association (OADA). This represents ninety-four percent (94%) of the total. Each county in Oregon is represented by at least one automobile dealer, and each county has at least one automobile dealer that is a member of the OADA. Table 3.1 shows the number of OADA members in each Oregon County.

TABLE 3.1 : County Representation in OADA (Number of Members)

<u>County</u>	<u>Number</u>		<u>County</u>	<u>Number</u>	
	<u>1992</u>	<u>1993</u>		<u>1992</u>	<u>1993</u>
Clatsop	4	3	Yamhill	7	5
Columbia	2	1	Marion	17	18
Tillamook	4	3	Polk	2	2
Benton	5	5	Lincoln	5	5
Linn	8	7	Lane	22	20
Coos	7	8	Curry	8	7
Jackson	13	11	Josephine	6	6
Klamath	5	4	Lake	1	0
Crook	1	1	Deschutes	7	5
Harney	2	2	Jefferson	2	2
Wheeler	1	1	Baker	3	3
Malheur	5	5	Union	3	3
Wallowa	2	2	Hood River	3	2
Umatilla	8	6	Wasco	3	3
Multnomah	34	33	Washington	26	26
Clackamas	18	16			
			TOTAL	234	215

To ensure the best representation of both urban and rural dealerships, every member of the OADA was selected as the sample population for this study.

Survey Development

Development of an appropriate instrument was necessary because a questionnaire that was appropriate for the purpose of this exploratory study was not available.

Included in the survey were questions designed to collect information currently unavailable from the literature or from regulatory agencies, such as information about "regulated wastes", which are not classified as hazardous (listed or characteristic wastes) by the EPA and/or the Oregon DEQ. Examples of these "regulated wastes" are: used motor oil and used antifreeze. These materials are regulated with regard to safe handling and disposal practices, and by local agencies (public works agencies, municipal sewer districts, etc.). No formal tracking system exists for these regulated materials.

In addition, the following steps were taken in the development of the instrument.

1. The questionnaire included provisions to improve validity. Respondents were asked to provide exact amounts of solvents used which could be cross checked with DEQ records if the facility was classified as a small quantity generator.

2. Open ended questions were used to encourage respondents to search their facility records to provide accurate information.
3. Industry specific jargon was used to increase response rate. All jargon used in the instrument is widely accepted vernacular within automobile dealerships.
4. The researcher received assistance from the Survey Research Center at Oregon State University to organize the material in a format that could best be administered.
5. The researcher then consulted the OADA to identify any question(s) that appeared to be proprietary in nature. The researcher was concerned that if the dealership thought the answer to one or more questions could be potentially damaging, chances of receiving a completed instrument would decrease.
6. The survey was pretested on fifteen (15) automobile dealerships; ten in a metropolitan area (population of greater than 100,000) and five in a rural area (population of less than 40,000).

7. Following the pretest, revisions to the instrument were made to reword several questions for added clarity, and to add opinion questions made by the survey pretest respondents.

8. Each individual survey form was number coded in order to ensure confidentiality of the respondents. Although the form asked for a contact person's name and telephone number, the name of the dealership was not requested. The researcher personally numbered each questionnaire form using the Oregon Automobile Dealers Association (OADA) mailing list. One copy of the mailing list was coded with the same corresponding numbers and remained in the possession of the researcher.

Data Collection

Quantitative and qualitative information was gathered from Oregon automobile dealerships using the following: (1) survey data, (2) state agency data, and (3) on-site observations.

Collected Survey Instruments

The finalized survey instrument was mailed from the offices of the Oregon Automobile Dealers Association (OADA) to 234 Oregon automobile dealers. The surveys were addressed to the dealership Owner or General Manager along with a cover letter describing the purpose of the questionnaire and its importance (a copy of the survey questionnaire is included as Appendix A). Each package included a self addressed stamped envelope for the return of the completed survey form. The completed surveys were to be sent to the OADA offices. It was believed that a much greater return would be achieved if; return postage was included, and the dealerships returned the form to the OADA instead of a third party address. Thirty days following the initial mailing of the questionnaire, the OADA included a questionnaire copy in the Association's monthly newsletter. Also included in the newsletter was a brief article encouraging dealers to complete the survey.

State Agency Data

Data collected from several State of Oregon regulatory agencies were used to validate survey responses. Data such as DEQ Annual Reports (which characterize and account for all listed and characteristic hazardous waste shipments in the state from Small or Large Quantity Generators), State

Fire Marshal chemical inventory data (which is Oregon's approach to the Title III requirements of the Superfund Amendments and Reauthorization Act [SARA]), and DEQ notification listings that indicate hazardous waste generator classifications were available and utilized as one method of cross checking information gathered from returned questionnaire forms.

On-Site Observations

The researcher personally inspected twenty-four dealerships in order to verify questionnaire data and to make determinations as to the types and depth of information required to develop a workable reduction plan for this industry. The main objective was to determine if the respondent was accurate or made a guess or estimate.

Chapter IV

RESULTS

Characteristics of the Study Sample

A total of 160 questionnaires (68%) were returned to the OADA offices during the summer of 1992. The initial questionnaire mailing resulted in 101 returned forms (44%). The second mailing resulted in an additional 59 returned forms.

The overall return represents a 68% of the original number of forms delivered. However, the data contained in Table 4.1 indicate that there was a decrease in the number of active OADA members during this time frame. Several of these dealerships were contacted on the telephone and by other means to determine the reason for not returning the forms. A number of the dealers were in the process of closing their business, others were selling their dealerships, and a few were proceeding to consolidate under one roof. For these reasons, the total number of questionnaires delivered to prospective respondents should be adjusted to 215 dealerships. With this adjustment, the total percentage of returned questionnaires equals seventy-four percent (74%).

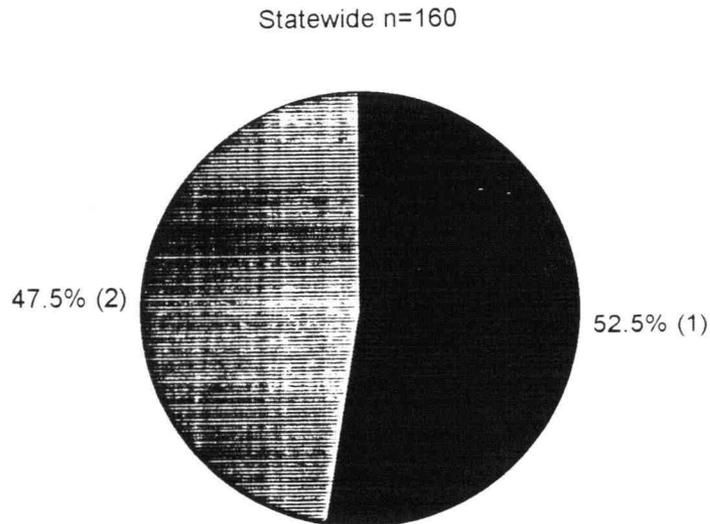
Table 4.1 : County Representation of Returned Surveys
(Number of OADA Members)

County Members				County Members			
	<u>1992</u>	<u>1993</u>	Surveys		<u>1992</u>	<u>1993</u>	Surveys
			Received				Received
Baker	1	1	1	Clackamas	18	16	13
Clatsop	4	3	1	Yamhill	7	5	3
Columbia	2	1	1	Marion	17	18	14
Tillamook	4	3	3	Polk	2	2	1
Benton	5	5	4	Lincoln	5	5	4
Linn	8	7	5	Lane	22	20	12
Coos	7	8	4	Curry	8	7	4
Jackson	13	11	10	Josephine	6	6	5
Klamath	5	4	2	Lake	1	0	0
Crook	1	1	1	Deschutes	7	5	4
Harney	2	2	1	Jefferson	2	2	1
Wheeler	1	1	1	Malheur	5	5	4
Union	3	3	2	Wallowa	2	2	1
Hood River	3	2	0	Umatilla	8	6	6
Wasco	3	3	2	Multnomah	34	33	27
Washington	26	26	22				
				TOTAL	234	215	160

Large quantity generators must comply with every applicable EPA and DEQ regulation. Small generators are given exemptions for certain requirements, and conditionally exempt generators have the least amount of regulatory burden. The major differences between the requirements of the SQG and the CEG involve record keeping, reporting, and the quantity of hazardous waste material generated by each.

The Oregon DEQ records (facilities notifying as a SQG as of 6-26-1992) indicate that there are 104 small quantity generators (SQG) within the dealership industry . This number represents 41.6 percent of the facilities statewide (there are 250 dealerships in Oregon). The number of conditionally exempt generators listed with the DEQ is not recorded because these generators are not required to file a notification form with the state. According to the research data, 52.5 % of Oregon dealerships fall under the requirements of small quantity hazardous waste generators while 47.5 % are conditionally exempt. Figure 4.1 shows the breakdown in generator status for the state of Oregon.

Figure 4.1 Generator Status of Oregon Dealerships



(2) = Conditionally Exempt (CEG)
(1) = Small Quantity (SQG)

The percentage of conditionally exempt generators (CEG) is 47.5%, while the percentage of small quantity generators (SQG) is shown as 52.5%.

County specific data was also included to differentiate between urban and rural facilities. Figure 4.2 represents a county by county depiction of generator status.

The greatest number of SQGs are located in the more populated counties. Of the total number of SQGs statewide; 16.6 % are in Washington County, 22.6 % are in Multnomah County, and 17.9 % are located in Lane or Jackson County; 57.1 % of the state's SQGs are in four Oregon counties.

Dealerships were also categorized as urban or rural. Urban dealerships were located in counties with a metropolitan population of 100,000 or greater and included Multnomah, Washington, Clackamas, Marion, Lane, and Jackson counties.

The remainder of Oregon counties were designated rural.

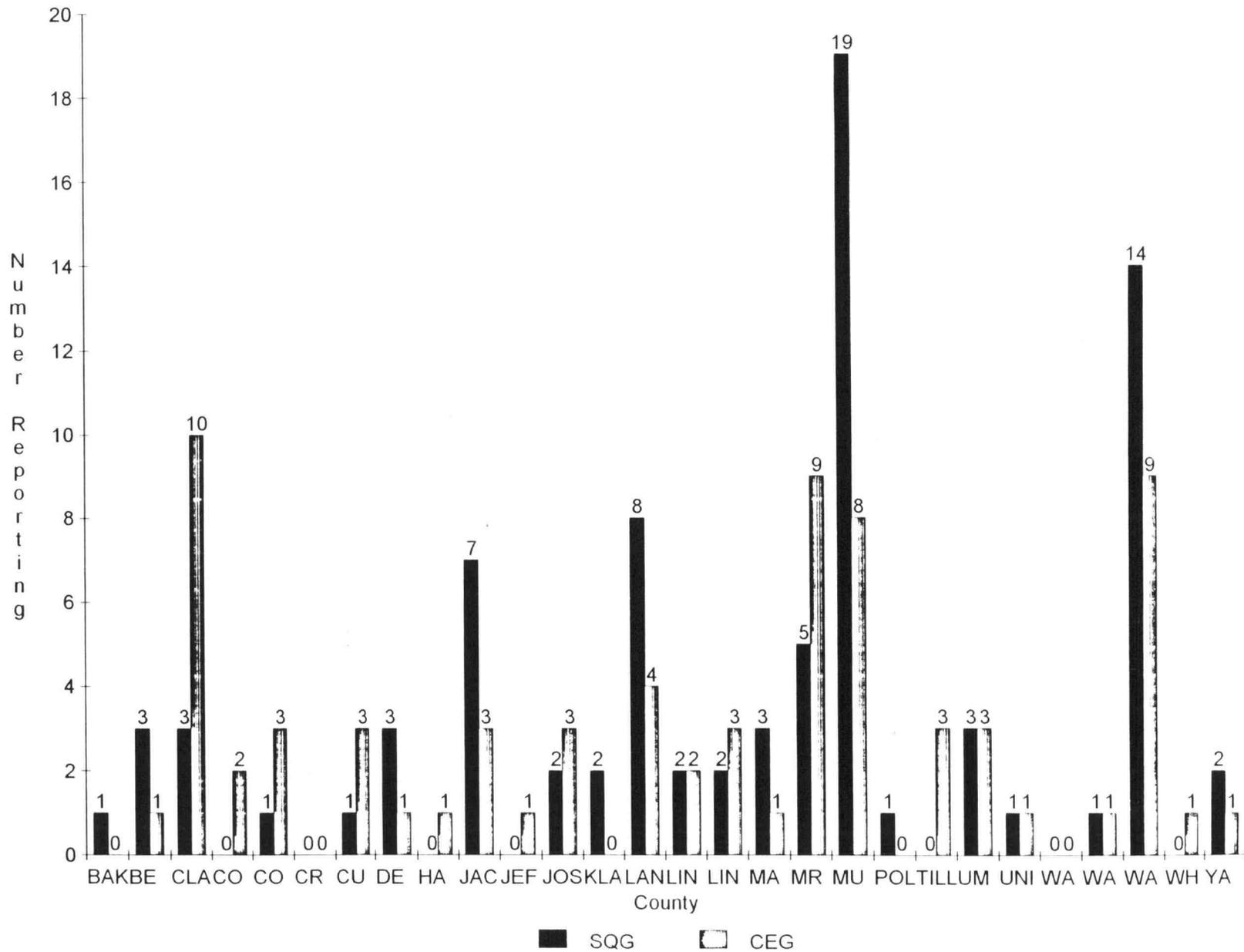
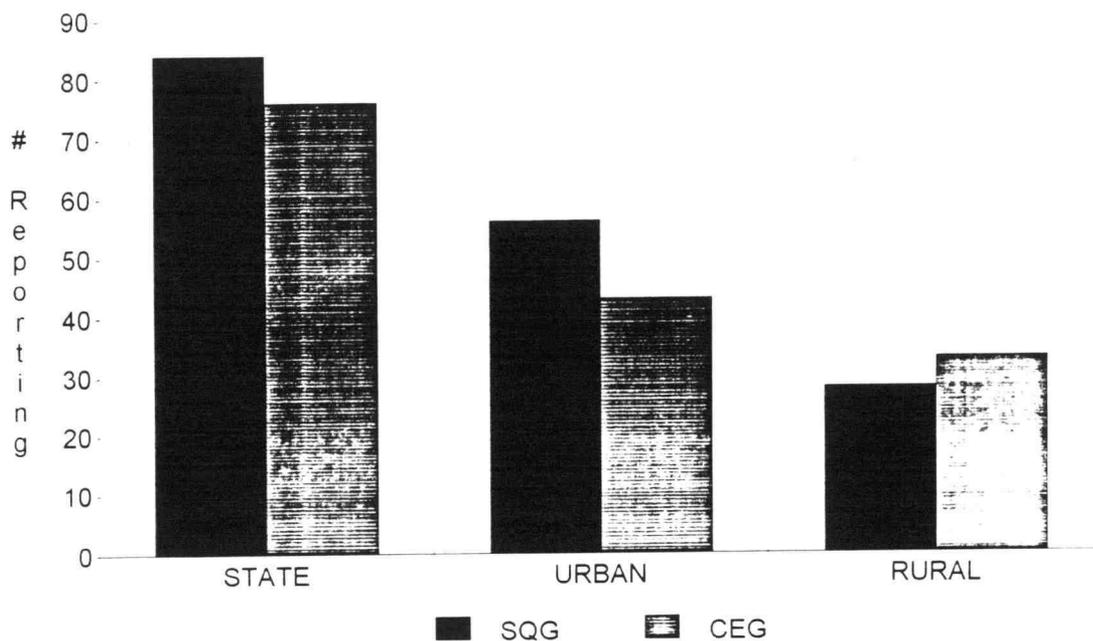


Figure 4.2 Generator Status by County

The data show that 66.7 % of the State's SQGs were urban dealerships. Those that were classified as CEG in urban counties represent 56.6 % of the total. This is depicted in Figure 4.3

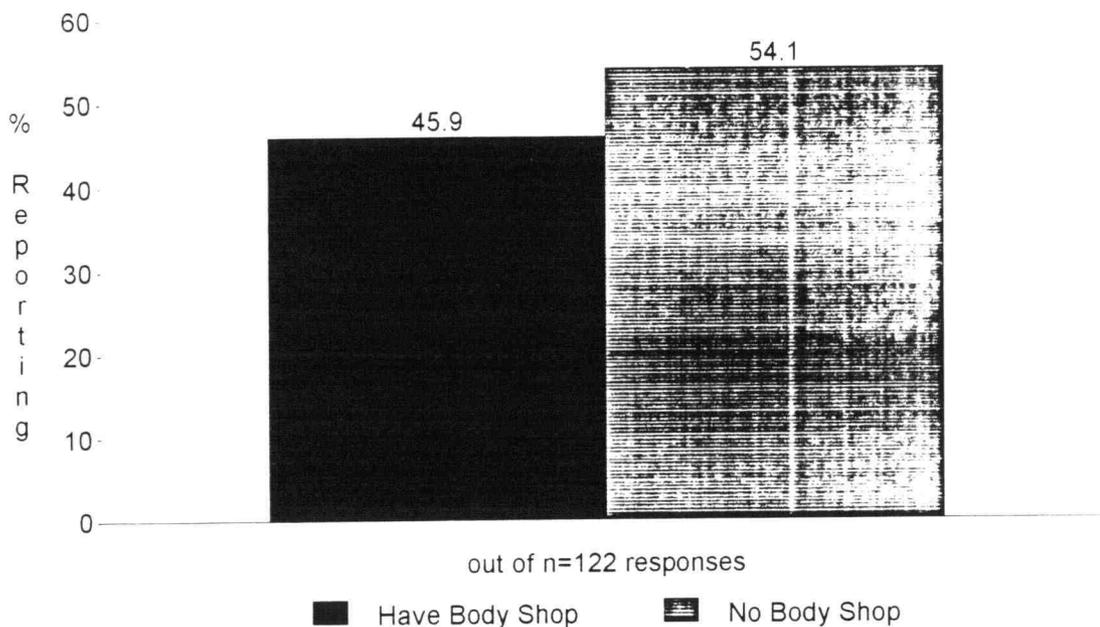
Figure 4.3 Generator Classifications, Urban vs Rural



Within the automobile dealership industry, one of the major contributors to the generator classification of the facility is the presence or absence of a paint and body repair shop. Each paint and body repair facility generates some quantity of hazardous waste, primarily waste lacquer thinner which is an EPA "listed" waste. This listed waste must be managed independently from other "characteristic" waste streams. The number and percentage of dealerships that have paint and body repair facilities could have a

direct impact on the generator classification. Figure 4.4 shows that 45.9% of dealerships in Oregon utilize a paint and body shop facility.

Figure 4.4 Percentage of Dealerships That Have Body Shops



Every paint and body shop will generate some quantity of hazardous waste material, especially waste lacquer thinner. The dealership's generator classification becomes important when considering waste materials from these shops. If the dealership is a SQG, there are a cadre of regulations that must be followed, and exemptions that cannot be taken. The data show that of the dealerships reporting to have body shops, 70% are SQG. Of these, 61.5% have their hazardous waste lacquer thinner removed by a waste hauler, 10.3% do not have their waste lacquer thinner removed but rather

recycle the material at their facility, and 28.2% did not reply.

If the dealership is a CEG, fewer regulations must be followed for the management of characteristic wastes. But in the case of waste lacquer thinner, which is an EPA listed hazardous waste, all regulations must be followed.

According to the survey data, 30% of those dealerships that operate body shops are CEG. Of these, 41.2% of the dealerships have their waste lacquer thinner removed by a waste hauler, and 11.7% did not reply. Of the 47.1% of the dealerships that do not have their waste lacquer thinner removed, 75% recycle the material on site and 25% manage it in another, unspecified, way.

The companies used to remove waste lacquer thinner include: 1) Envirotech, 45.2%, 2) Safety Kleen Corp., 41.9%, 3) Safco, 6.5%, 4) Sol-Pro, 3.2%, 5) Waste Management, Inc., 3.2%.

Hazardous Waste Manifesting

The primary method to track the movements of hazardous waste throughout the country is the use of the Uniform Hazardous Waste Manifest. This document (EPA Form 8700) is the one mechanism the regulatory agencies have to ensure that all shipments of hazardous waste are accounted for (since the generator is responsible for the material from the cradle to the grave). A copy of each manifest used is

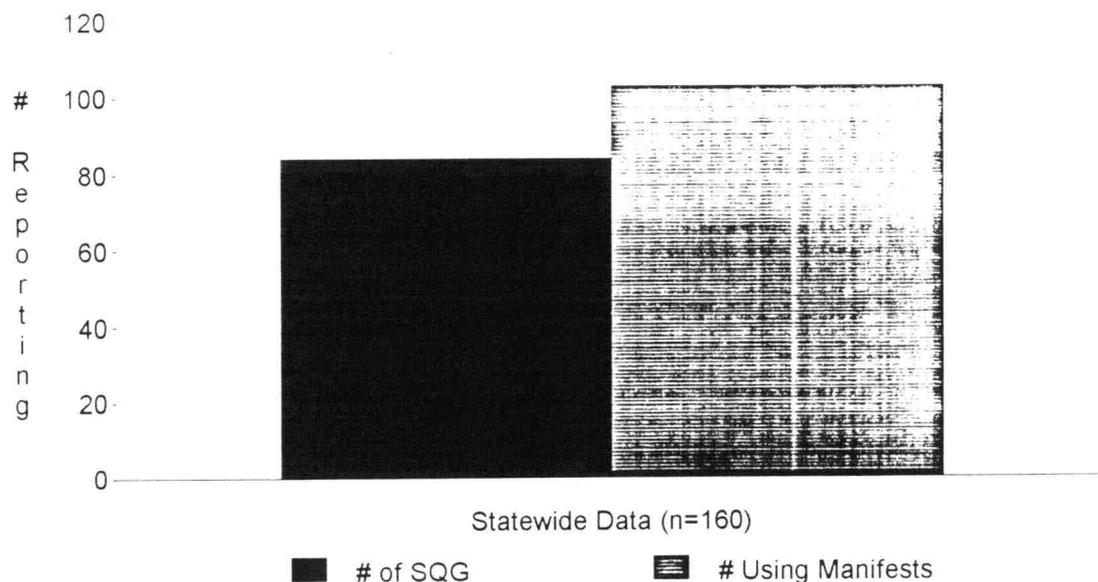
forwarded to the DEQ, and each hazardous waste hauler, and each hazardous waste generator, must account for every manifest at the end of the calendar year.

Every facility that is a SQG must complete a hazardous waste manifest for each shipment of waste that leaves the facility. A CEG facility is exempt from the manifesting requirements unless the hazardous waste transporter requires its use.

The data indicate 64.4 % of all dealerships utilized the hazardous waste manifesting procedure for their solvent hazardous waste. In comparison, 62.7% of the dealerships with body shops utilized hazardous waste manifests for their waste lacquer thinner.

The comparison of statewide data, for the use of the Hazardous Waste Manifest forms (for waste solvent), shows the number of dealerships presently using this tracking system outnumber the dealerships that are required by RCRA to use the system. Out of the 160 returned questionnaires, 84 stated that they are SQG which are required by RCRA to utilize the Hazardous Waste Manifest system. However, 103 dealerships indicated that they used the manifesting procedures when their hazardous waste was delivered to a transporter. In Figure 4.5 the number of Oregon dealerships required by RCRA to use the manifest tracking system is compared to the number of dealerships that indicate they are presently using the system.

Figure 4.5 Number of SQGs compared to the Number of Dealerships that use Manifest Forms



Hazardous Waste Components

The dealership industry as a whole generates two primary hazardous waste streams: 1) a stoddard solvent type solution used in parts washer devices, and 2) waste lacquer thinner that is residual from the application of primers and topcoats to the exterior surfaces of automobiles.

Out of the 160 dealerships responding to the questionnaire, 134 or 83.8 % stated that the solvent used in the parts washer devices was manufactured and distributed by Safety Kleen Corporation. Other parts washer companies listed (and the number of dealerships using their services) are: Wesco (5), Larry Freepons (10), and Washington Chemical

(3). Thirteen dealerships (8%) responded to this question by stating their parts washer solvent was administered by the dealership itself. This means that the dealership purchases an appropriate solvent from a chemical distributor and manipulates the solvent, including waste disposal.

The most common procedure for the handling and manipulation of the parts washer solvents is for the dealership to enter into an agreement (usually for a twelve month period of time) with a company like Safety Kleen Corporation whereby Safety Kleen Corporation periodically (usually every 4-6 weeks) exchanges fresh solvent for old solvent at the dealership. This method limits the amount of handling required by dealership employees and limits the amount of hazardous waste solvent that is potentially mishandled or illegally disposed.

The solvent manufactured by Safety Kleen Corporation (Parts Washer Solvent 105) is a mixture of various petroleum based hydrocarbons. The primary hazard of this material is its flash point of 105 degrees Fahrenheit, hence its name - Solvent 105. The flash point of this material is also the hazardous waste determination factor. According to the EPA requirements, this solvent, after it loses its usefulness as a product, carries the hazardous waste characteristic code of D001 - Ignitable. Since this waste material is designated a hazardous waste, the hazardous waste manifesting system applies for SQG facilities.

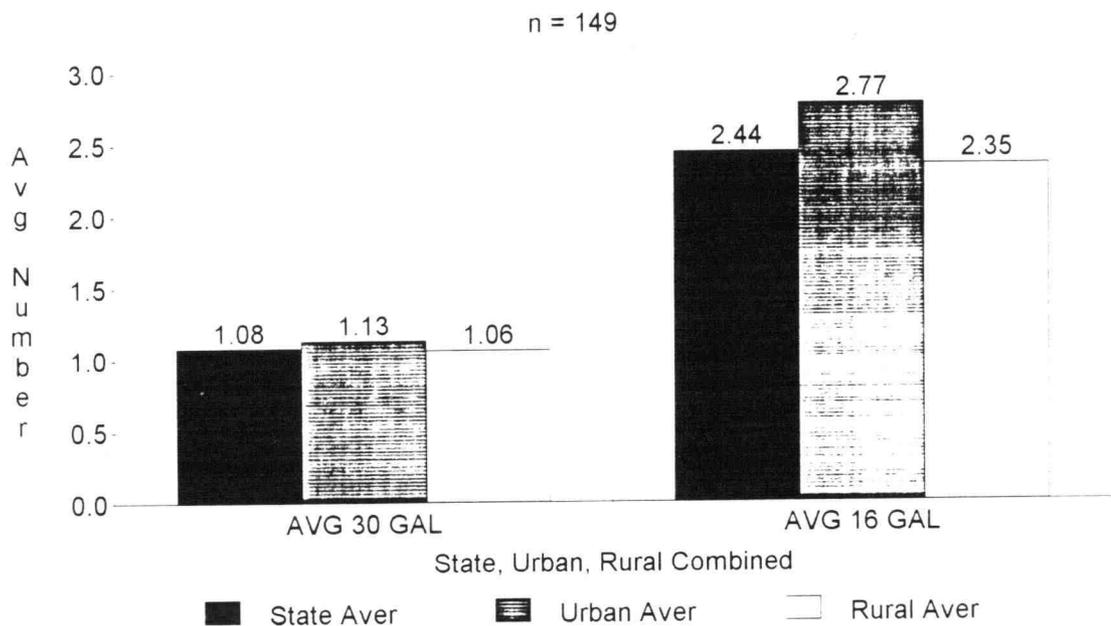
Safety Kleen (as well as all others) provides the solvent material in either sixteen gallon or thirty gallon drums. The amount of hazardous waste generated from this operation is dependent upon: 1) the number of each size solvent tank (the sixteen gallon solvent tanks generate forty-five pounds of hazardous waste each and the thirty gallon solvent tanks generate eighty-five pounds of hazardous waste each) located in the dealership, and 2) the frequency of solvent collection and replacement. The number of weeks interval between services was not made available to the researcher in sufficient numbers to warrant inclusion in the data; however, total numbers of parts washers used and total annual quantities were given. This information is sufficient to categorize the parts washer solvent waste stream.

The average number of sixteen gallon parts washers is over twice that of thirty gallon parts washers. The average dealership statewide will utilize 1.08 thirty gallon and 2.44 sixteen gallon parts washer devices in their facility.

Given that each sixteen gallon parts washer weighs forty-five pounds and each thirty gallon parts washer weighs eighty-five pounds, the average amount of hazardous waste from this waste stream would equal two-hundred-two (202) pounds for each Oregon dealership at any point in time. If these averages were used, every dealership in Oregon would be close to being classified as SQG just based upon this one hazardous waste stream.

These results led to the question that urban dealerships might have been excessively contributing to an inflated statewide average. Figure 4.6 compares urban, rural, and statewide averages, for the number of parts washers utilized by the industry.

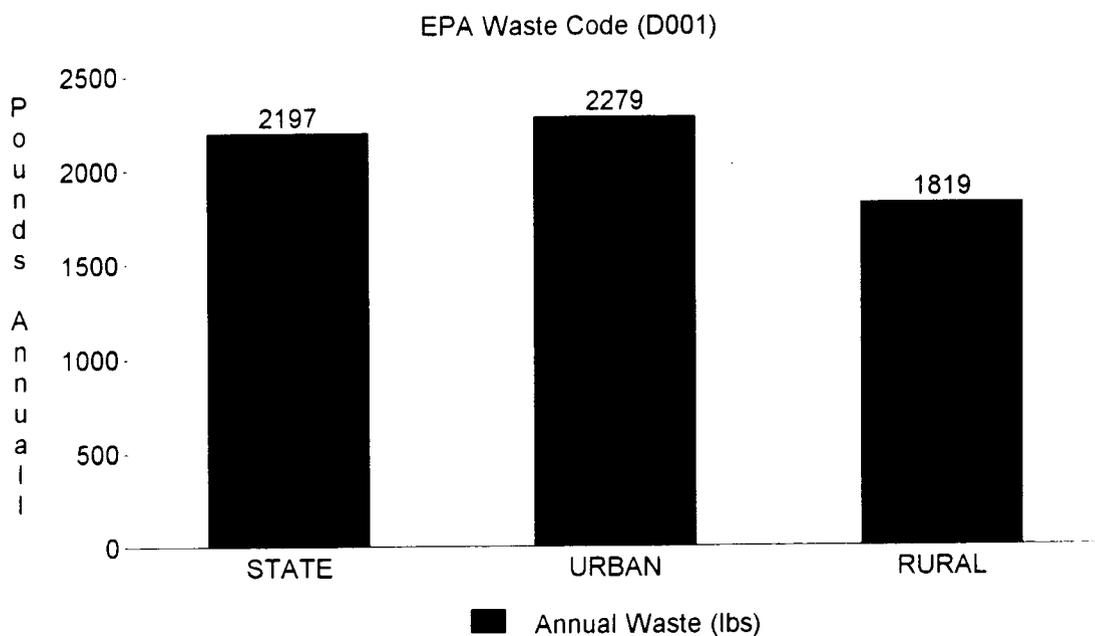
Figure 4.6 Average Number of Parts Washers Used: State, Urban, and Rural Comparisons



The data indicate that the number of thirty gallon parts washers in use are equal in urban and rural dealerships while urban dealerships use fifteen percent (15%) more sixteen gallon parts washers than rural dealerships. The total number of parts washers reported in use by the 160 respondents equals 159 thirty gallon and 453 sixteen gallon devices.

Additional comparisons were sought to determine if the totals of parts washer solvent waste, produced on a yearly basis, differed between urban and rural dealerships. Figure 4.7 shows the annual averages of parts washer waste produced by urban and rural dealerships as compared to statewide averages.

Figure 4.7 Average Amount of Parts Washer Hazardous Waste Generated Annually



The data in Figure 4.7 indicate that there is a difference in the total amount of parts washer solvent waste produced by urban and rural dealerships. The statewide average production of solvent waste totals 2,197 pounds per year. Solvent waste from urban dealerships average 2,279 pounds per year while rural dealerships account for an average of 1,819 pounds per year.

Testing of the Hypotheses and Statistical Analysis

Hypothesis testing procedures were dependent on the type of data to be analyzed. Categorical data were analyzed through the use of cross tabulations (tables) and χ^2 statistics to determine if the variables were significantly different from one another. One way ANOVA and t-testing were also used where applicable. For all testing, a significance level of $p < .05$ was used.

Hypothesis One

There is no significant difference between the percentage of small quantity and conditionally exempt hazardous waste generators in the Oregon dealership industry.

The data gathered by State of Oregon agencies were acquired from "Notification" reports made to the DEQ by individual dealerships. As of June 1992, 104 dealerships notified the state of their SQG status. This number represents 41.6% of the total dealership population. The data gathered in this study, however, show that 52.5% of Oregon dealerships are SQG. This difference indicates that a self reporting mechanism, such as the "Notification" reports made to the DEQ, may not be accurate.

Hypothesis number one states that the number of SQG and

CEG facilities will be equal. The research data showed that 52.5% of the dealerships reported to be SQG while 47.5% reported as CEG. T-tests were conducted to determine if there were significant differences between the percentage of SQG and CEG.

The p-value was calculated to be 0.264. Therefore, the researcher failed to reject the null hypothesis that there is no significant difference between the number of SQG and CEG facilities.

Hypothesis Two

There will be no significant difference between "urban" Oregon counties and "rural" Oregon counties in the amount of hazardous waste (parts washer waste) generated for each repair order written by the dealership.

The statistical analysis of population differences (urban & rural) was handled as an analysis of a two sample location problem using the sample means (t-test). Table 4.2 lists the comparisons between urban and rural averages for the number of devices and amounts of parts washer waste.

Table 4.2 Urban and Rural Averages: A Comparison of
Parts Washer Wastes

Parts Washer Factors	Urban Annual Averages	Rural Annual Averages	p-value
Number of 30 gal.....	1.13.....	1.06.....	0.729
Number of 16 gal.....	2.77.....	2.35.....	0.422
Waste per Repair			
Order (lbs).....	0.209.....	0.412.....	0.138
Annual Waste (lbs)....	2279.....	1819.....	0.001*

*Significantly different at $p < .05$			

The p-value was calculated to be 0.138, therefore the researcher failed to reject the null hypothesis of no difference between urban and rural dealership amounts of hazardous waste generated for each repair order.

Hypothesis Three

There is no significant difference, in the amounts of used crankcase oil and used radiator coolant generated, between rural and urban areas of the state.

The third hypothesis was investigated in terms of the handling practices of these two materials: 1) transporting from the facility, 2) burning of the used oil as an energy source, and 3) use of other disposal options.

One of the primary objectives of this research was to determine the use of hazardous materials and the disposition of several waste products that are not classified as hazardous by the regulatory agencies. Of specific interest are: 1) used crankcase oil and 2) used radiator coolant.

Both of these materials are classified as special wastes (requiring the generator to perform a waste determination in order to handle as a non hazardous waste) and in some instances are exempted from regulation as long as proper handling and disposal methods are carried out.

Used Oil

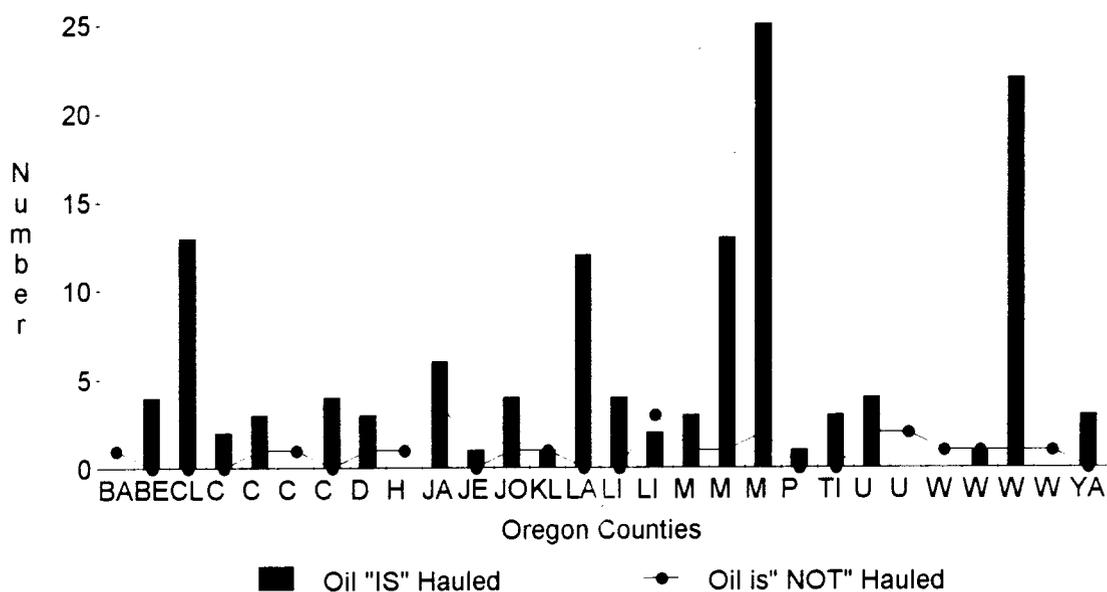
On an aggregate volume basis, used crankcase oil is the largest waste stream generated by the dealership industry. The statewide average annual amount of used oil from a typical dealership amounts to 3,752 gallons, which would qualify every automobile dealership in the state as a SQG or perhaps even a Large Quantity Hazardous Waste Generator (LQG) if used oil were classified as a hazardous waste.

Used oil is considered a "regulated" waste and because it is not a hazardous waste, manifesting procedures do not apply to this waste stream. Recordkeeping is performed by:

1) the dealerships themselves and 2) business records from companies that remove used oil.

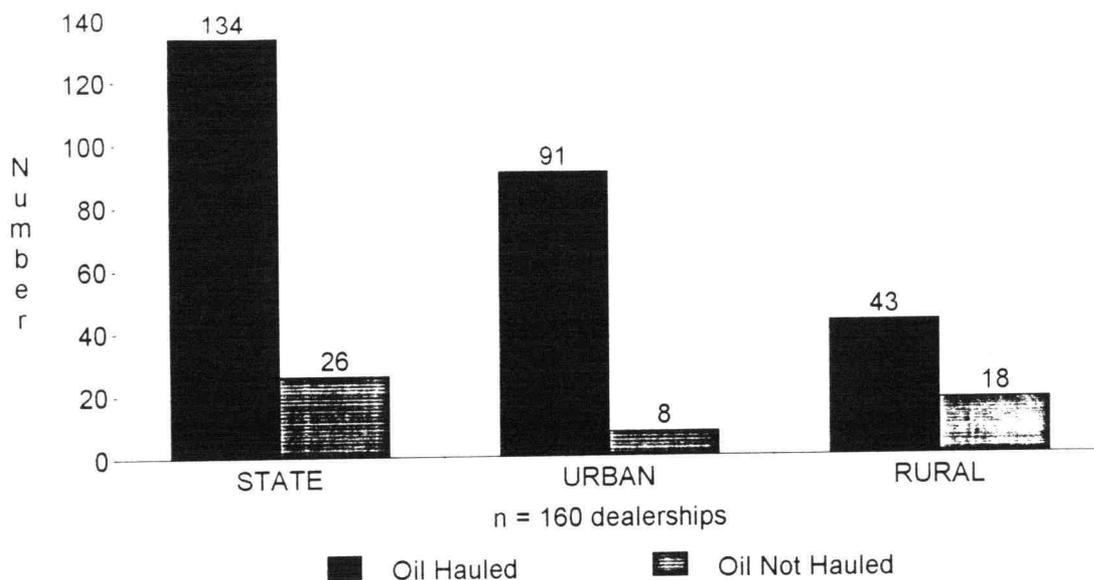
Figure 4.8 compares the number of facilities that have used oil hauled away to the number of facilities that do not haul used oil away.

Figure 4.8 Comparison of Dealerships That Have Used Oil Hauled to the Number That do not Have Used Oil Hauled; By County



In Figure 4.8 it is indicated that a majority of the dealerships have used crankcase oil transported from the facility. Statewide figures show that 132 of the 160 questionnaire respondents (82.5%) state that their oil is transported while only 28 (17.5%) manage their used oil in another way. Figure 4.9 depicts, in a general way, the number of dealerships that transport used oil.

Figure 4.9 Comparison of Dealerships That Have Used Oil Hauled Compared to the Number that do not



A chi-squared distribution test was used to determine if there are differences between urban and rural dealerships. In this case, X^2 (df=1) = 3.13, which is not significant at $p < .05$

Based on the analysis, the researcher failed to reject the null hypothesis that there are no differences in the disposition of used oil between urban and rural dealerships. Although both urban and rural dealerships transport used oil away from facilities, 91.9% of the urban shops transport oil, whereas only 70.5% of the rural dealerships transport used oil. All dealerships participating in the on site visit reported that their used oil was removed by a transporting company.

The questionnaire asked the respondents to indicate how they disposed of used crankcase oil if the oil was not removed from the facility. Thirty-six dealerships reported that their used oil was burned on site in a space heater. Of the 36 burners of used oil, fifteen (41.7%) were urban while twenty-one (58.3%) were rural dealerships. Of the 36 used oil burners, 15 also have their oil hauled away. These businesses transport their excess oil during the summer months when space heaters are not needed. Of the 36 dealerships that both burn and haul used oil, ten are urban and five are rural. Of the 21 dealerships that only burn their used oil, five are urban and sixteen are rural.

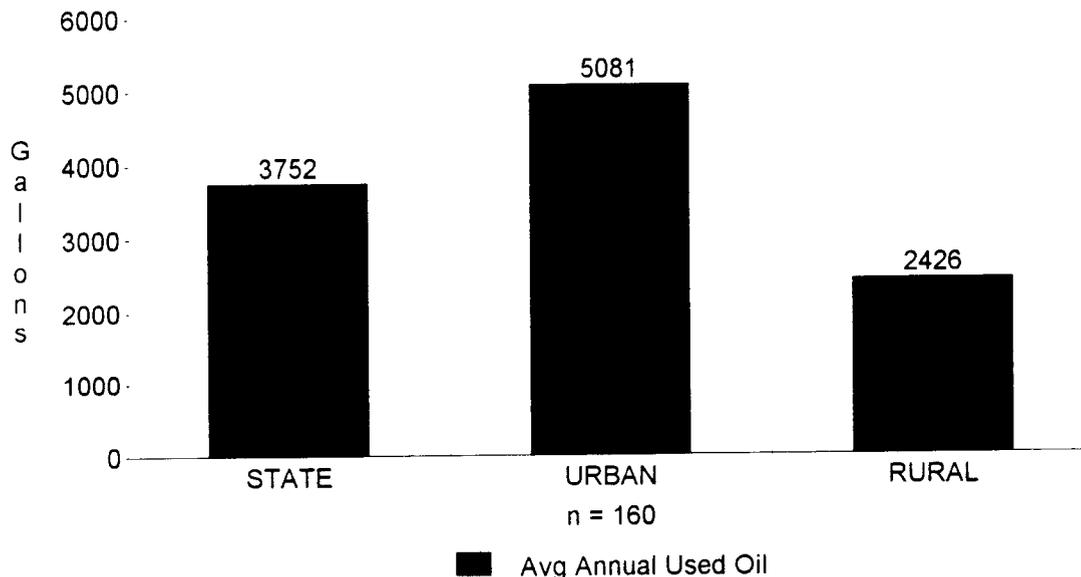
The option of both burning and transporting the used crankcase oil was not accounted for in the design of the data analysis phase of this research. It is unlikely that the 28 dealerships indicating they do not transport used oil will be completely accounted for with respect to their used oil management scheme.

Another categorical analysis of this waste stream involves: 1) average annual used oil quantities and 2) comparisons of average annual used oil quantities to average annual new oil purchases. The data received for these analyses were the least complete sets of data within the survey questionnaire. Because detailed tracking and recordkeeping are not required (manifests are not needed in Oregon for used oil transport), dealerships may not be

attentive to this waste stream or may be relying on waste haulers to manage it for them.

Figure 4.10 portrays the average annual amount of used oil generated. The average amount statewide is 3,752 gallons per year per dealership. The average amount for an urban dealership is 5,081 gallons while the average for a rural dealership is 2,426 gallons. A two sided t-test was performed to determine if there is a significant difference between urban and rural dealerships in the amount of used oil generated per year. The resulting p-value of 0.002 indicated a significant difference.

Figure 4.10 Average Annual Used Oil Quantity; State, Urban, and Rural Comparisons



An additional test was performed to determine if the annual amount of used oil generated, as a function of the number of repair orders written, is equal for urban and

rural dealerships. Table 4.3 compares annual amounts of used oil generated and also standardizes these amounts as a function of repair orders written. The analysis resulted in a p-value = 0.242. The researcher failed to reject the null hypothesis of no difference. The data indicate that the amounts of used oil generated for each repair order is statistically equal between urban and rural dealerships.

Table 4.3 Annual Used Oil Amounts per Repair Order:
Urban and Rural Dealership Comparisons

Type	Mean	Std.Dev.	Variance	p-value
Urban	0.462	0.098	-	-
Rural	0.481	0.179	-	-
Pooled	0.464	0.062	0.161	0.242

New Oil Purchased

The amount of new oil a particular dealership purchases during the year should be an indicator of the amount of used oil generated. A direct comparison of the two is depicted in Figure 4.11.

Figure 4.11 Comparison of New vs Used Oil Annual Amounts;
State, Urban, and Rural Comparisons

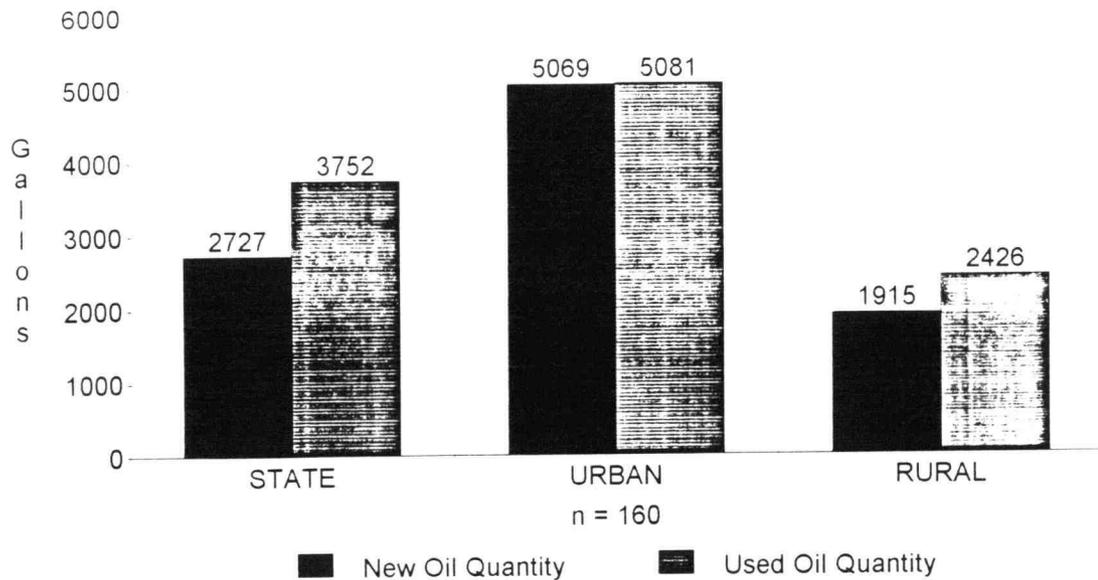


Table 4.4 lists the amount of new oil purchased per repair order written.

Table 4.4 Amount of New Oil Purchased / Repair Order

Group	Mean	Std.Dev.	Variance	p-value
Urban	0.462	0.0039	-	-
Rural	0.465	0.0522	-	-
Pooled	0.464	0.0132	0.20	0.313

The researcher fails to reject the null hypothesis that there are no significant differences between urban and rural dealerships for the amount of new oil purchased as a function of the number of repair orders written.

Used Antifreeze

Used antifreeze (radiator coolant) is the second largest waste stream generated by this industry, and perhaps has the most diverse composition. The components of this waste stream are completely dependent upon the material that is added to the radiator before the vehicle enters the dealership facility.

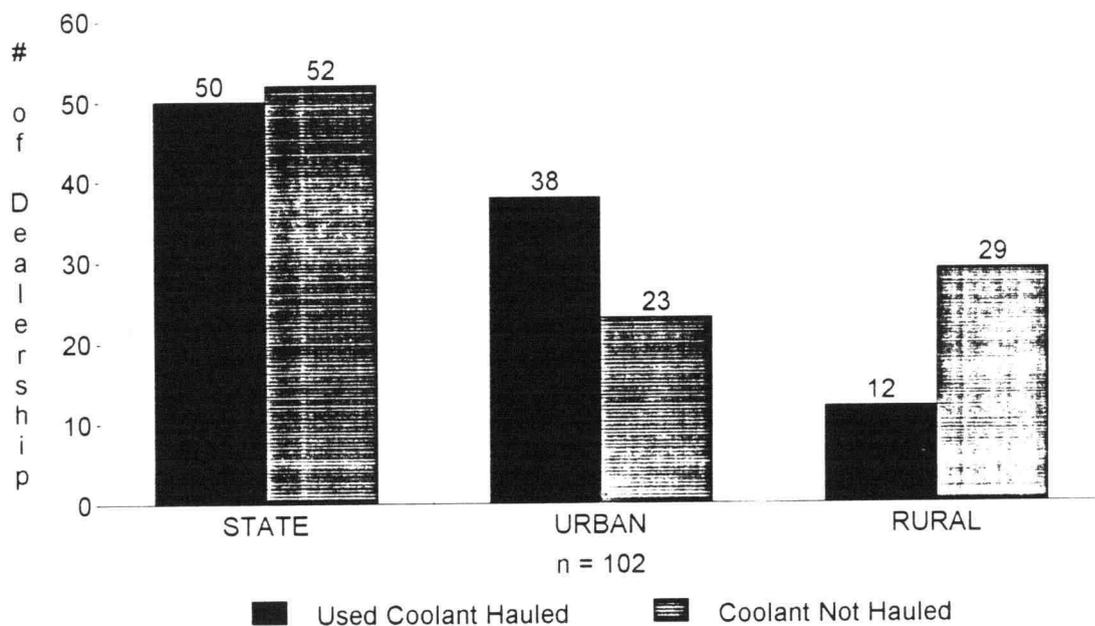
Used coolant is considered a "regulated" waste in Oregon. Although the DEQ gives general guidelines on the handling and disposal, most areas of the state are left to the local jurisdiction to regulate this material. For example, used antifreeze may not be dumped into a storm sewer system that outfalls at surface waters, but, the used coolant may be disposed into the sanitary sewer system if the local treatment facility accepts it.

The respondents were asked if used antifreeze was transported away from the facility. This is an important question because, if the material is transported (given a licensed and reliable waste hauler) from the facility, there is less chance of accidental discharge into the environment.

The data indicate an almost even number of dealerships that do transport and those that do not. Based on a response of $n = 102$, forty-nine percent (49%) of Oregon's dealerships have their used radiator coolant transported from the facility while fifty-one percent (51%) do not. On site visits produced the following data: 1) 42% have their

used coolant hauled away while 58% do not; and 2) of those that do not have the used coolant removed, 50% utilize the sanitary sewer system and 50% recycle the material on-site. Figure 4.12 compares urban and rural dealerships as to the frequency of transporting used radiator coolant.

Figure 4.12 Comparison of State, Urban, and Rural Dealerships; Number that Have Used Coolant Hauled vs the Number that do not



Analysis concerning the disposal of used coolant was performed using a chi-squared distribution test. In this case, X^2 (df=1) = 2.81, which is not significant at $p < .05$. The researcher failed to reject the null hypothesis of no difference in the disposition of used coolant between urban and rural dealerships.

An additional test was performed to determine if the annual amount of used coolant generated, as a function of the number of repair orders written, is equal for urban and rural dealerships. Table 4.5 compares annual amounts of used coolant generated and also standardizes these amounts as a function of repair orders written. The analysis resulted in a p-value = 0.166. The researcher failed to reject the null hypothesis of no difference.

Table 4.5 Annual Used Coolant Amounts per Repair Order; Comparisons of Urban and Rural Dealerships

Type	Mean	Std.Dev.	Variance	p-value
Urban	0.108	0.287	-	-
Rural	0.066	0.068	-	-
Pooled	0.077	0.118	0.528	0.166

What became apparent in the analysis was that there was a 100% completion rate for the questions concerning used oil, but only a 64% completion rate for the used coolant questions. Whether this difference means that a percentage of the respondents wish not to divulge their used coolant handling practices is unclear. When the researcher attempted follow up to gain answers to these questions, many respondents were unwilling to answer.

Because over half of the dealerships do not have their used radiator coolant removed by a waste hauler, other questions inquired about the disposal of used coolant.

Survey respondents were asked to list (from a set of options) which method(s) they utilize to handle and dispose of their used radiator coolant. Seventy-three percent (73%) of the respondents indicated sanitary sewer disposal as their means of waste management, 11.5% indicated they recycle the material at the facility, and 15.5% use the storm sewer system for disposal. Of the 15.5% that utilize the storm sewer system, 75% are classified as urban dealerships. Urban dealerships may be violating DEQ regulations that strictly prohibit storm sewer usage for coolant disposal. Whether these facilities are on combination systems (both sanitary sewer and storm drain systems flow into the waste water treatment plant) is unknown from the data.

An indicator of the amount of used coolant generated is the amount of new antifreeze purchased. Table 4.6 describes the averages and statistical testing performed on the amount of new antifreeze purchased.

Table 4.6 Amount of New Antifreeze Purchased / Repair
Order

Group	Avg. Mean	Std. Dev.	Variance	t-statistic	p-value
Urban	0.082	0.032	-	-	-
Rural	0.083	0.285	-	-	-
Pooled	-	0.072	0.4789		0.84

The researcher failed to reject the null hypothesis in the case of this material. The data indicate that there is no significant difference between urban and rural dealerships in the amount of new antifreeze purchased, as a function of the number of repair orders written.

Chapter V

DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

Discussion

The data received indicate there are little or no differences between urban and rural dealerships with regard to wastes generated once the numbers are standardized. As a function of the number of repair orders written, both urban and rural dealerships are statistically equivalent in the amounts of waste material generated.

From the data gathered, using 160 dealerships as a population base, it is possible to profile this industry's waste management practice. A description of a typical Oregon urban automobile dealership includes one that will: Write 11,000 repair orders in the coming year; be either a SQG or a CEG; utilize 1.13 thirty gallon parts washers; utilize 2.77 sixteen gallon parts washers; manifest its hazardous waste shipments; have its used oil hauled from the facility; have its used coolant hauled from the facility; not utilize a used oil space heater; store new oil in an aboveground tank; generate 2,280 pounds of parts washer hazardous waste; generate 5,080 gallons of used oil; generate 1,160 gallons of used coolant; purchase 5,070 gallons of new oil; purchase 1,000 gallons of new

antifreeze; generate 0.462 gallons of used oil for every repair order written; generate 0.108 gallons of used coolant for every repair order written and; have a production index of 1.01 (indicating a one percent increase in the number of repair orders written)

A description of a typical rural Oregon dealership includes one that will: write 5,050 repair orders per year; be either a SQG or a CEG; utilize 1.06 thirty gallon parts washers; utilize 2.35 sixteen gallon parts washers; manifest its hazardous waste shipments; have its used oil hauled from the facility; not have its used coolant hauled from the facility; not utilize a used oil space heater; store new oil in an aboveground tank; generate 1,820 pounds of parts washer hazardous waste; generate 2,425 gallons of used oil; generate 260 gallons of used coolant; purchase 1,900 gallons of new oil; purchase 350 gallons of new antifreeze; generate 0.481 gallons of used oil for every repair order written; generate 0.066 gallons of used coolant for every repair order written and; have a production index of 0.93 (indicating a seven percent decrease in the number of repair orders written)

Conclusions

Seventy four percent of the dealerships responded to the survey which may allow inferences to be made for the statewide industry.

The study found that over fifty percent of the Oregon automobile dealerships are Small Quantity Hazardous Waste Generators. Based on monthly hazardous waste generation quantities associated with Small Quantity Generators, this means that the industry generates approximately 50,000 pounds of hazardous wastes every calendar month.

Urban dealerships tend to be classified as Small Quantity Hazardous Waste Generators. Rural dealerships tend to be classified as Conditionally Exempt Small Quantity Hazardous Waste Generators.

Although the number of parts washer devices in use are equal in urban and rural dealerships, the annual amounts of hazardous waste generated are significantly greater for urban dealerships. This may be in direct relation to the number of repair orders written. Since twice as many repairs are being performed in urban dealerships, the solvent become spent faster thus generating more hazardous waste.

Based on the data received in this study, it may be possible to extrapolate annual amounts of hazardous waste generated, used oil generated, and used coolant generated based solely on a dealership's production index. In order

for regulators, or the dealerships themselves, to determine the amount of waste generated at any particular time, they simply need the number of repair orders written to date.

The primary objective of this research was to gather information for the development of a "Model" Toxics Use and Hazardous Waste Reduction Plan. The final plan, which was published by the Oregon DEQ is included as Appendix B.

Recommendations

The first recommendation recognizes the limitations of an exploratory study. This study did not attempt to control for certain variables while testing for differences. The results must be evaluated accordingly. Further research should be conducted to examine different variables while controlling for others. For example, analysis of those variables of interest (e.g., used oil quantities, used coolant quantities) by requiring transporters to document shipments could provide an additional reference by which the regulators could base technical assistance priorities.

Another recommendation is for the Oregon DEQ to implement an evaluation procedure for individual reduction plans. Present procedures, including annual progress reports, do not have an effective evaluation element. Facilities required to develop and implement an initial reduction plan need only send the DEQ a notice that the plan is in place. The DEQ evaluation of the plan's effectiveness

comes about during a site inspection only. Perhaps requiring businesses to forward completed reduction plans for DEQ evaluation and approval would ensure that the regulations are being met.

Further recommendations involve intrinsic compliance strategies. It was the researchers opinion that a "law" does not necessarily generate compliance. Sound technical assistance programs, full utilization of trade associations, increased enforcement activities, and the creation of public awareness and involvement may generate a higher rate of compliance with DEQ regulations. Most facility owners and operators are more than willing to comply with environmental regulations if they only the technical assistance to ensure that what they were doing was correct.

The researcher recommends to the OADA that the Association become the enforcement and technical assistance center for the automobile dealerships in the state. Self regulation may be the ultimate form of enforcement for this industry.

Bibliography

- 29 CFR Part 1910.1200, July, 1988
- 29 CFR Part 1910.1000, July 1988
- 29 CFR, 1910, Subpart Z, GPO
- 40 CFR Part 261
- 40 CFR, 260-268, 280, GPO
- 42 U.S.C. Section 1004 (5) 6903, 1976
- 47 GSI, *Two States Approve Waste Reduction Laws (Massachusetts and Oregon)*, JEH, v52 p154, November 1989
- 49 CFR Part 172, October 1988
- Abelson, P., *Incorporation of New Science Into Risk Assessment*, Science, vol 250, Dec 1990, pp 250
- Achterman, G., *Strategies for Minimizing Hazardous Wastes*, Salem, Oregon, June 1988
- Alaska Health Project, *Waste Reduction Assistance Program (WRAP) On-Site Consultation Audit Report Automotive Repair Shop*, Alaska Health Project, July 1987
- Alm, A., *Waste Reduction*, ES&T, Vol. 23, No. 3, 1989
- Anderson, C., *Public Health: Hazards for Risk Assessment (Costs of Regulations)*, Nature, vol 351, May 1991, pp 170
- Anderson, P., *Emissions management Program Plays Major Role in Pollution Prevention*, Pulp & Paper, September 1991, pp 129-131
- Arthur D. Little, Inc., *A Plan for Development of Hazardous Waste Management Facilities in the New England Region*, New England Regional Commission, Sept. 1979
- Baldwin, M., *Law and the Environment*, Walker, 1970
- Bardach, E., *Going by the Book: The Problem of Regulatory Unreasonableness*, Temple University Press, Philadelphia, PA, 1982
- Barnthouse, L., *Case Studies in Ecological Risk Assessment*, ES&T, vol28, Feb 1991, pp230

- Blair, L., *Scientific and Technical Needs for Hazardous Waste Management*, Office of Science and Technology Policy, Washington D.C., 1979
- Breyer, S., *Regulation and its Reform*, Harvard University Press, Cambridge, MA, 1982
- Brown, S.M., "Health Aspects of Hazardous Waste Disposal", *Environment*, Vol. 28, 1986, pp 38-41
- Brown, S.M., *Inspection-Based Enforcement: In a Successful Program, "The Emphasis is on Prevention"*, *JEH*, Vol. 51, 1988, pp 86-88
- Brown, M.S., *A Pilot Outreach Program for Small Quantity Generators of Hazardous Waste*, *AJPH*, v78 p1343-6, October 1988
- Burke, D., *The Best Route to Waste Reduction*, *Chemical Week*, Nov 12, 1986, p. 3
- California DHS, *Hazardous Waste Reduction Assessment Handbook - Automotive Repair Shops*, October 1988
- California DHS, *Hazardous Waste Reduction Checklist*, October 1988
- Caldart, C., *Waste Generation Reduction: A First Step Toward Developing a Regulatory Policy to Encourage Hazardous Substance Management through Production Process Change*, *Hazardous Waste and Hazardous Materials*, vol 2, No.3, 1985, pp 309-331
- Campbell, M., *Profit From Pollution Prevention, A Guide to Industrial Waste Reduction and Recycling*, Pollution Probe Foundation, Ontario, Canada, 1982
- Cannon, J., *A Clear View: Guide to Industrial Pollution Control*, Rondale Press, 1976
- Cardinal, C., *Risky Business; Communicating Risk for the Government*, *ES&T*, vol 25, Dec 1991, pp1382
- Center for Hazardous Materials Research, *Hazardous Waste Minimization Manual for Small Quantity Generators*, 1987
- Chemical Manufacturers Association, *A System for Management of Hazardous Waste by Degree of Hazard Under Subtitle C of RCRA*, 1979
- Chemical Waste Management, Inc., *Generators RCRA Audit Form*, Feb 1989

- Chem-Security Systems, Inc., *Manifest Requirements*,
Portland, OR, Publication Date Unknown
- Chess, C., et al., *Risk Communication Activities of State
Health Agencies*, *AJPH*, vol 81, Apr 1991, pp 403
- Clarke, L.B., "Acceptable Risk? : Making Decisions in a
Toxic Environment", *New Scientist*, Vol. 123, 1989, pp
57-58
- Comella, P., *Waste Minimization/Pollution Prevention*,
Pollution Engineering, April 1990, pp 71-74
- Commoner, B., *A Reporter at Large: The Environment*, *New
Yorker*, June 15, 1987, p46-47
- Congressional Budget Office, *Hazardous Waste Management:
Recent Changes and Policy Alternatives*, USGPO,
Washington D.C., 1987
- Covello, V.T., "Environmental Impact Assessment, Technology
Assessment, and Risk Analysis", *Harvard Press*, 1987
- Cowan, M., *Toxic Substances*, *Toxic Substances Journal*, Vol.
5, 1983, pp 1-2
- CRC Press, *Handbook of Chemistry & Physics*, 62nd Ed., 1982
- Dandoy, S., "Risk Communication and Public Confidence in
Health Departments", *AJPH*, Vol. 80, Nov 1990,
pp 1299-1300
- Davis, C., *Dimensions of Hazardous Waste Politics and
Policy*, *Greenwood Press*, 1988
- DeFina, R., *The Cost of Federal Regulation of Economic
Activity*, USGPO, Washington D.C., 1978
- Deisler, P.F., *The Risk Management - Risk Assessment
Interface*, *ES&T*, vol 22, No. 1, 1988, pp 15-19
- DeLand, M.R., *An Ounce of Prevention...After 20 Years of
Cure*, *ES&T*, vol.25, No.4, 1991
- Deroche, A.G., *The Principles of Auto Body Repairing and
Painting*, 3rd Ed., *Prentice-Hall*, NJ, 1971
- Dower, R., *Hazardous Wastes, Public Policies for
Environmental Protection*, *Resources for the Future*,
Washington D.C., 1990
- Enloe, C., *The Politics of Pollution in a Comparative
Perspective*, *McKay Publishing*, 1975

- Environmental and Energy Studies Institute, *The National Hazardous Waste Land Disposal Restrictions: Better Data, Clearer Policy Needed to Make it Work*, Washington D.C., 1987
- ERM Group, *Oregon Hazardous Waste Regulations and the Vehicle Maintenance Industry*, 1989
- Farellick, B., *When is a Waste Not a Waste*, Environmental Forum, vol. 4, No. 5, Sept. 1985, pp. 26-32
- Florio, J., *Congress as Reluctant Regulator: Hazardous Waste Policy of the 1980s*, Yale Journal on Regulation, vol. 3 no. 2, 1986, pp 251-382
- Freeman, Harry M., *"Hazardous Waste Minimization"*, McGraw/Hill, 1990
- Fromm, C., *Succeeding at Waste Minimization*, Chemical Engineering, Sept. 14, 1987, pp 91-94
- Fromm, C., *Waste Reduction Audit Procedure, A Methodology for Identification, Assessment and Screening of Waste Minimization Options*, Jacobs Engineering Group, March 1986
- GAO, *Illegal Disposal of Hazardous Wastes: Difficult to Detect or Deter*, GAO/RCED-85-2, 1985
- GAO, *Superfund: Extent of Nation's Potential Hazardous Waste Problem Still Unknown*, Washington D.C., Dec. 1987
- Government Institutes, Inc., *Hazardous and Solid Waste Minimization*, Washington D.C., May, 1986
- Greeno, J.L., et al, *Environmental Auditing*, John Wiley & Sons, New York 1985
- Greeno, J.L., Hedstrom, G.S., DiBerto, M., *Environmental Auditing*, John Wiley & Sons, New York 1985
- Hansen, F., *Pollution Prevention Planning, A New Mandate for Oregon's Environment*, The Environmental Forum, Sept/Oct 1989, pp 30-34
- Harris, R., *Business Firms Under the New Social Regulation*, Duke University Press, Durham, NC, 1985
- Helbrecht, L., *Personal Communication*, Washington DOE, May 1992
- Higgins, Thomas, *"Hazardous Waste Minimization Handbook"*, Lewis Publishers, 1989

- Higgins, T.E., *Hazardous Waste Minimization Handbook*, Lewis Publishers, 1989
- Hirschhorn, J., *Taking Seriously the Reduction of Hazardous Waste*, *Pollution Engineering*, Jan 1987, pp 50-51
- Hirschhorn, J., *The NEW Environmental Protection: Technology Exists to Prevent Pollution*, *Pollution Engineering*, Nov 1987, pp 62-64
- Hirschhorn, J., *Cutting Production of Hazardous Waste*, *Technology Review*, April 1988, p52-61
- Hirschhorn, J., *Hazardous Waste Reduction, Management of Hazardous Materials and Wastes: Treatment, Minimization and Environmental Impacts*, Pennsylvania Academy of Science, 1989
- Hodge, D., *Personal Communication*, Alexander Chrysler-Plymouth, Portland, OR June 1992
- Jacobs Engineering Group, *Overview of Waste Minimization Issues, Approaches & Technologies*, Air Pollution Control Association, Dec. 10-12, 1986
- Kendall Hunt Publishing, *The Environment at Risk; National Issue Forums*, Dayton, OH, 1989
- Kimbrough, R.D., "Environmental Protection: Theory and Practice", *ES&T*, Vol. 24, 1990, pp 1442-1445
- Knechtgas, P., *Risk Assessment For Local Risk Managers*, *JEH*, vol 54, Jul/Aug 1991, pp 13
- Kohl, J., *Management and Minimization of Hazardous Waste Under RCRA*, NCSU, Raleigh, NC, Sept 1990
- Landeau, N., *The Environmental Law Handbook*, Ballantine Press, NY, 1971
- Lapp, S., *A Risk Evaluation System*, *Chemtech*, vol 21, Nov 1991, pp 700
- Latin, H., *Ideal versus Real Regulatory Efficiency: Implementation of Uniform Standards and Fine-Tuning Regulatory Reforms*, *Stanford Law Review*, May 1985, p1267
- Laumann, S., *Toxics Use Reduction: From Pollution Control to Pollution Prevention*, *OSPIRG*, Jan 1988
- Lazarus, G., *Development of a State Hazardous Waste management System: Planning, Ownership Options, Liability and Management Technologies*, NCSL, Feb 1980

Lounsbury, J., *Heading Off Waste Before It Starts*, EPA Journal, March 1988

Magat, W, editor, *Reform of Environmental Regulation*, Ballinger Publishing Company, 1982

Material Safety Data Sheets (MSDS) from the following manufacturers: Chrysler, Valvoline, General Motors, Wurth USA, Mitsubishi, Kent Industries, 3M, Cyclo Automotive, Ford, Tech Chemical, Nissan, Cam 2, IPC, Radiator Specialty, B & B Auto Supply, Honda, CRC Chemicals, BG Products, Justice Brothers, Siloo, Premier Industrial, Wesco, Safety Kleen, Bowman, Zep Manufacturing, and Christenson Oil

McCann, P., *Waste Minimization & Recycling Options*, Hazardous Materials & Waste Management, May-June, 1987, pp 11-15

McCarthy, J., *Hazardous Waste Fact Book*, Congressional Research Service, Washington D.C., 1987

McClelland, A., *Risk Assessment: How Do We Irrational Humans Really Do It?*, Chemtech, vol 21, June 1991, pp 340

Meddaugh, J., *An Opinion: Hazardous Waste Reduction and Management for Small Businesses*, Earthwatch Oregon, Winter, 1987

Meek, W., *Environmental Analysis - A Guide to Federal Environmental Concerns*, Rocky Mountain Foundation, Boulder, CO, 1974

Minnesota Mining and Manufacturing, *Low- or Non-Pollution Technology Through Pollution Prevention*, 3M Company, St. Paul, MN, 1988

Muir, W., *Promoting Hazardous Waste Reduction: Six Steps States Can Take*, Inform, Inc, NY, NY, 1987

Nagel, S., *Environmental Politics*, Praeger, 1974

NCASI, *Special Technical Session*, Portland, Oregon, April 5, 1991

Nichols, T.A., Pollock, C.G., *Methodology for Performing an Effective Environmental Site Assessment*, Air & Waste Management Association 82nd Annual Meeting, 1989, section 89-17.6

NIOSH, "*Pocket guide to Chemical Hazards*", U.S. Department of Health and Human Services, September 1985

- North, W., "Risk Assessment: What it is, How it Works", EPA Journal, Vol. 13, 1987, pp 13-15
- North Carolina Pollution Prevention Pays Program, *Accomplishments of North Carolina Industries*, NC Department of Natural Resources and Community Development, Raleigh, NC, January 1986
- OAR Chapter 437 Division 155, *Hazard Communication*
- OAR Chapter 340. Division 135, 1990
- OAR Chapter 340 Division 100, *Hazardous Waste Management*, March 1991
- OAR Chapter 340. Division 135, Appendix A
- Oldenburg, K., *Waste Reduction: from Policy to Commitment*, Hazardous Waste & Hazardous Materials, Vol. 4, No. 1, 1987
- Oldenburg, K., *Waste Reduction*, Environment, Vol. 29, No. 2, March 1987, pp 16-45
- OMB, *Regulatory Program of the United States Government*, April 1, 1986 - March 31, 1987
- OMB, *Regulatory Program of the United States Government*, April 1, 1985 - March 31, 1986
- OMB, *Regulatory Program of the United States Government*, April 1, 1987 - March 31, 1988
- Oregon DEQ, *Hazardous Waste Management in Oregon Fact Sheet*, May 1990
- Oregon DEQ, *DEQ Hazardous Waste Fact Sheet for Oregon Generators*, 1988
- Oregon DEQ, *Seven Steps for Identifying Hazardous Wastes, Oregon's Hazardous Waste Program*, February 1989
- Oregon DEQ, *Oregon's Toxic Use Reduction and Hazardous Waste Reduction Fact Sheet*, August 1989
- Oregon DEQ, *Benefitting from Toxic Substance and Hazardous Waste Reduction*, October 1990
- Oregon DEQ, *Guidelines for Waste Reduction and Recycling - Solvents*, August 1989
- Oregon DEQ, *How to Reduce, Identify, Store and Dispose of Hazardous Waste in Oregon*, November 1991

- Oregon DEQ, *Small Businesses and Hazardous Waste: What You Should Know*, Sept 1992
- Oregon DEQ, *Vehicle Maintenance and Repair Fact Sheet*, Sept 1988
- Oregon DEQ, *HB 3305: Lead-Acid Battery Recycling in Oregon*, Fact Sheet, Jan 1990
- Oregon DEQ, *A Waste Reduction Handbook*, Oct 1991
- Oregon DEQ, *Managing Used Antifreeze Fact Sheet*, Aug 1990
- Oregon DEQ, *What is the Department of Environmental Quality?*, Spring 1983
- Oregon DEQ, *Hazardous Waste Technical Bulletin, Used Oil Filters*, Aug 1991 Revision
- Oregon DEQ, *Waste Reduction and Recycling Fact Sheet*, Jun 1992
- ORS Chapter 465, 1989
- OTA, *Technologies and Management Strategies for Hazardous Waste Control*, GPO, Washington D.C., 1983
- OTA, *Serious Reduction of Hazardous Waste*, Washington D.C., September, 1986
- OTA, *Superfund Strategy*, USGPO, Washington D.C., 1985
- Overcash, M., *Techniques For Industrial Pollution Prevention, A Compendium for Hazardous Waste and Nonhazardous Waste Minimization*, Lewis Publishers, Chelsea, MI, 1986
- Peer Consultants, *User's Guide for SWAMI: Strategic Waste Minimization Initiative version 2.0*, USEPA, Cincinnati, OH, 1992
- Portier, C.J., "Quantitative Risk Assessment", *Chemtech*, Vol. 20, 1990, pp 484-487
- Portney, P., *Reforming Environmental Regulation: Three Modest Proposals*, *Columbia Journal of Environmental Law*, vol 13, 1988, pp 501-515
- Quarles, J., *Federal Regulation of Hazardous Waste: A Guide to RCRA*, Environmental Law Institute, Washington D.C., 1982

- Randall, P., *Prototype Evaluation Initiatives in a New Jersey Vehicle Maintenance and Repair Facility*, USEPA International Conference Report, Washington D.C., June 1990
- Reagan, M., *Regulation: The Politics of Policy*, Little, Brown & Co., Boston, MA, 1987
- Revenue Reconciliation Act of 1990, Section 6601, Signed by the President on October 27, 1990
- Roper Organization, *Independent Polling*, 1987, 1988
- Russel, M., "Risk Assessment in Environmental Policy Making", *Science*, Vol. 236, 1987, pp 286-290
- San Bernardino County DEHS, *Hazardous Materials and Waste Management Handbook*, April 1988
- Sarokin, D., *Cutting Chemical Wastes*, INFORM, NY, 1985
- Savage, D., *The Economics of Environmental Improvement*, Houghton-Mifflin, 1974
- Schneider, C., *Hazardous Waste: The Bottom Line is Prevention*, *Issues : Science and Technology*, Summer 1988, pp 75-80
- SCS Engineers, *Waste Audit Study - Automotive Paint Shops*, January 1987
- Seneca, J., *Environmental Economics*, Prentice-Hall, 1974
- Slatten, T., *Personal Communication*, Washington ASA, May 1992
- Sloan, I., *Environment and the Law*, Oceana Publications, Dobs Ferry, NY, 1974
- Small Business Center for Education, *Handling Hazardous Waste: A Resource Guide for Automotive Repair Shops*, 1990
- So, F., *The Practice of Local Government Planning*, International City Management Association, 1988, p191
- Stavins, R., *Clean Profits: Using Economic Incentives to Protect the Environment*, *Policy Review*, Spring 1989, p58
- Steeler, J., *Overview of the Final USEPA Hazardous Waste Generator and Transporter Regulations*, NCSL, Denver, CO, 1980

- Stern, B.S., "Education and Training of Environmental Health Personnel in Health Risk Assessment and Management of Hazardous Waste", JEH, Vol. 50, 1988, pp 352-354
- Temple, Baker, and Sloan, Inc., *Regulatory Impact Analysis: Proposed Standards for the Management of Used Oil*, EPA, Washington D.C., July, 1985
- TESLA Enterprises, *A Tool Box Guide to Hazardous Waste Management*, Unknown Publication Date
- Thompson, F., *Technical Assistance for Hazardous Waste Reduction*, ES&T, Vol. 21, No. 12, 1987
- Toy, Wesley M., *Waste Audit Study on Automotive Repairs*, May 1987
- Universities Associated for Research and Education in Pathology, *Health Aspects of the Disposal of Waste Chemicals*, Bethesda, Md. 1985
- USDOJ, *A Series of Fact Sheets: Pollution Prevention Handbook*, Washington D.C., Aug 1992
- USEPA, *Hazardous Waste Management System; General; Identification and Listing of Hazardous Waste; Used Oil; Final Rule*, May 20, 1992
- USEPA, *The Hazardous Waste System*, Washington D.C., June 1987
- USEPA, *Waste Minimization Opportunity Assessment Manual*, 1988
- USEPA, *Unfinished Business: A Comparative Assessment of Environmental Problems*, Office of Policy Analysis, Feb., 1987
- USEPA, *Summary of the 1990 Budget*, Jan, 1989
- USEPA, *Preliminary Benefit-Cost Analysis for Regulating VOC Emissions from Treatment, Storage, and Disposal Facilities Managing RCRA Waste*, Office of Air Quality Planning and Standards, Washington D.C., July, 1985
- USEPA, *Hazardous Waste Facts*, (SW-737), 1980
- USEPA, *Everybody's Problem: Hazardous Waste*, (SW-826), 1980
- USEPA, *State Decision Makers Guide for Hazardous Waste Management*, (SW-612) 1977

USEPA, *Attack on Hazardous Waste: The Challenge of the 1980's*, (SW-845), 1980

USEPA, *Report to Congress: Minimization of Hazardous Waste*, Washington D.C., 1986

USGPO, "Chemical Hazard Response Information System", Superintendent of Documents, U.S. Government Printing Office, 14 November, 1984

Veschueren, K., *Handbook of Environmental Data on Organic Chemicals*, Van Nostrand Reinhold Co., 1977

Washington DOE, *Waste Reduction for Vehicle Maintenance Shops*, March 1992

Weast, Robert C., *Handbook of Chemistry and Physics*, CRC Press Inc., 1988

Wigglesworth, D., *Profiting from Waste Reduction in Your Small Business*, 1988

Wirth, T., *Project 88. Harnessing Market Forces to Protect Our Environment*, Harvard University Press, October 1988, p18

Wise, D., *Management of Hazardous Substances: A Survey of State Laws*, NCSL, Washington D.C., 1980

APPENDICES

Appendix A

Survey Instrument

**OREGON AUTOMOBILE INDUSTRY
TOXICS USE & WASTE QUESTIONNAIRE**

(format has been altered to facilitate readability)

A. GENERAL INFORMATION

1. Contact Person Name: _____ Phone: _____
2. Number of RO's Written in 1991 (**Retail, Internal, Wholesale**): _____
3. Number of RO's written January - April 1992: _____
4. Is Your Dealership **Domestic:**____ **Import:**____ **Combination:**____
5. How is your Dealership classified by the DEQ?
 - Large Generator:** _____
 - Small Generator:** _____
 - Conditionally Exempt:** _____

B. PARTS WASHER INFORMATION

If you do not operate Parts Washers, proceed to next section.

6. How many Parts Washers do your operate?
 - 30 gallon:** _____
 - 16 gallon:** _____
7. What company services these machines: _____
8. Do you receive hazardous waste manifests? **Yes:** _____ **No:** _____
9. If yes, what was the total quantity in 1991? _____ pounds
10. If no, how many times were these machines serviced in 1991?
 - _____ times

C. USED OIL INFORMATION

11. Is your used oil hauled away? Yes: _____ No: _____

12. If yes, by whom?

13. How often is it collected? every _____ weeks

14. If no, what happens to it? **Oil burner:** _____

(check all that apply) **Recycled on site:** _____

Other (specify) :

15. Total quantity in 1991: _____ gallons

16. How do you store used oil? (check all that apply)

Underground tank: _____

Aboveground tank: _____

Drum: _____

Other: _____

D. USED RADIATOR COOLANT INFORMATION

If you do not generate used coolant,

proceed to next section

17. Is your used radiator coolant hauled away? Yes: _____ No: _____

18. If yes, by whom? _____

19. How often is it collected? Every _____ weeks

20. If no, what happens to it? (check all that apply)

Sewer disposal: _____

Storm drain disposal: _____

Recycled on site: _____

Other (specify): _____

21. Total quantity in 1991? _____ gallons

22. How do you store used coolant? (check all that apply)

Underground tank: _____

Aboveground tank: _____

Drum: _____

Other: _____

E. BODY SHOP INFORMATION

23. Do you operate a Body Shop? Yes: _____ No: _____

If no, proceed to next section

24. Do you have your waste thinner hauled away? Yes: _____ No: _____

25. If yes, by whom?

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26. If no, how is it managed?

Recycled on site: _____

Other

(specify): _____

27. Do you receive manifests for your waste thinner? Yes: ____ No: ____

28. Total quantity in 1991: _____ gallons

29. Total amount of thinner purchased in 1991: _____ gallons

30. Total amount of paint product purchased in 1991: _____ gallons

F. CHEMICALS PURCHASED INFORMATION

31. Total amount of new oil purchased in 1991: _____ gallons

32. How do you store new oil? (check all that apply)

Underground tank: _____

Aboveground tank: _____

Drum: _____

Gallon: _____

Quart: _____

33. Total amount of new coolant purchased in 1991: _____
gallons

34. How do you store new coolant? (check all that apply)

Underground tank: _____

Aboveground tank: _____

Drum: _____

Gallon: _____

35. Total amount of brake cleaner purchased in 1991: ___ cases ___ drums

36. List manufacturers names: _____

37. Manufacturers name your preferred brake cleaner:

38. Total amount of carb cleaner purchased in 1991: ___ cases ___ drums

39. List manufacturers names: _____

40. Manufacturers name your preferred carb cleaner:

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G. REGULATIONS

41. Describe your feeling about DEQ regulations: **Very Good** _____

Good _____ **Adequate** _____ **Needs Improvement** _____

Poor _____

42. Describe your ability to understand DEQ regulations:

Full Understanding _____

Enough to keep me in compliance _____

Usually need help _____ **Always need help** _____

43. Where do you go to get help with DEQ? (check all that apply)

DEQ _____ **OADA** _____ **NADA** _____ **Colleagues** _____

Consultants _____ **Other** _____

44. Where do you think assistance should come from? **DEQ**_____

OADA_____ **NADA**_____ **Colleagues**_____

Consultants_____ **Other**_____

45. What is the best way to ensure DEQ and OR-OSHA compliance?
 (train a staff person, attend seminars, hire a consultant, etc.)

46. Time per month does your dealership spends on **DEQ & OSHA?**
 _____ hours

46. Is this: **Too much**_____ **Adequate**_____

Not enough_____

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GROUPS OR AGENCIES PROHIBITED

Appendix B

Model Toxics Use & Hazardous Waste Reduction Plan

Abstract

This document represents a technical assistance program for the Oregon automobile industry. It contains background information, compliance strategies, and a "Model" toxics use and hazardous waste reduction plan designed specifically for this industry. Many automobile repair facilities are classified by the DEQ as small quantity generators. And as such, these Shop Owners/Managers are required by Oregon law to develop and implement a five year to ten year plan which effectively reduces the toxic materials used and the hazardous wastes generated at the facility. This "Model" plan is part one of a two-part technical assistance program. Part two consists of the delivery of six (6) training seminars at various locations in Oregon. These seminars were scheduled for the weeks of July 27 and August 3.

Disclaimer

This document is offered for educational and informational purposes. When using this document and making any decisions concerning waste management, especially waste reduction, it is recommended that the facts and circumstances be reviewed by appropriately trained professionals and consultants. It is the generators responsibility to comply with state rules and regulations. This document is intended to provide assistance, but does not replace these laws, nor does compliance in accordance with this document ensure regulatory compliance according to the law.

The mention of commercial products, their source, or their use in connection with material reported herein is not to be construed as either an actual or implied endorsement of such products. Any mention of a particular product's chemical constituency is based upon an available Material Safety Data Sheet (MSDS) document created by the product manufacturer. It is assumed that the most current MSDS was made available for use, since it is the responsibility of the product manufacturer to forward any MSDS revisions in a timely manner. All MSDS documents used for this research were either solicited directly from the product manufacturer or copied from a current file at an automobile dealership where the product was in use.

1. Introduction

This document provides you, the Oregon Automobile Dealer, with information and a model that will help you; 1) reduce the amount of hazardous waste generated, 2) reduce the amount of toxic material your dealership uses, and 3) fully comply with the DEQ regulation - "Toxics Use Reduction and Hazardous Waste Reduction Plan." This booklet should provide you with all the information you need in order to meet the September 1, 1992 planning deadline.

Regulations Overview

Oregon's Toxics Use Reduction and Hazardous Waste Reduction Act (ORS 465-003 through 037) is intended to reduce, avoid, or eliminate the use of toxic substances and the generation of hazardous wastes. It became law when it was signed by the governor on July 24, 1989. The Administrative Rules for this legislation may be found in OAR 340.135.

Reduction is any change or modification to your maintenance operation that avoids, reduces, or eliminates the use of toxic substances or the generation of hazardous waste. Oregon's first reduction priority, toxics use reduction, involves changes in chemical usage and business processes before waste is generated. The next priority, waste reduction, can take place only after waste is

generated. Recycling is the most common waste reduction technique. For the purposes of the law, reduction does not include reduction in air emissions, wastewater discharges, or solid waste, although you are encouraged to consider a wide range of environmental issues while preparing your reduction plan.

The law requires three groups to develop waste reduction plans: large toxics users, large quantity hazardous waste generators, and small quantity hazardous waste generators. These affected businesses in Oregon are required to develop plans to reduce toxic substances used and hazardous wastes generated (OAR 340-135-050). The reduction plan will focus on toxic substances and hazardous wastes for which performance goals are required.

The Toxics Use Reduction & Hazardous Waste Reduction plan must contain:

- * A written policy of management commitment
- * A written statement of goals, scope, and objective
- * Measurable performance goals
- * Identification and evaluation of toxic substances and hazardous wastes
and associated costs
- * Identification of reduction options and an implementation plan
- * An employee training program
- * An ongoing reduction program

Each affected business is also required to prepare an annual progress report (OAR 340-135-070). The purpose of the annual report is to evaluate progress, if any, in achieving performance goals. This reporting requirement provides an opportunity for an annual re-evaluation of your company's reduction program, options that could be considered for implementation, and an assessment of your progress.

Generally, concentrating effort at the beginning means that progressively fewer wastes remain for clean-up or disposal at the end. This front end approach offers numerous benefits including reductions in worker exposure, liability, and disposal costs. The most valuable toxics use reduction options are:

*** Good operating practices**

- improved housekeeping
- purchasing and inventory control
- materials management
- process control
- leak and spill prevention

*** Technology changes**

- process changes
- equipment changes

*** Raw material changes (input substitution)**

*** Product reformulation**

Waste reduction is the number two priority of this program. Waste reduction is defined as any recycling or other activity applied after hazardous waste is generated that is consistent with the general goal of reducing present and future threats to public health, safety, and the environment. The most common waste reduction options are recycling / reclamation and materials exchange.

Minimizing the production of hazardous wastes in the vehicle maintenance industry makes sense because it helps you to:

- * Reduce operating costs by using less raw materials
- * Avoid expensive hazardous waste transportation and disposal costs
- * Reduce your regulatory requirements, saving time and money
- * Improve workplace health and safety
- * Reduce the liabilities associated with transportation, treatment, and disposal of hazardous waste, and
- * Reduce potential damage to the environment

Do You Use Toxic Materials ?

Most automobile repair facilities use several types of toxic material. Some common examples are:

- * Aerosol cleaners and lubricants
- * Parts washer solvents
- * Paint and paint products
- * Carburetor and brake cleaners
- * Antifreeze
- * Lead acid batteries
- * etc.

In general, a material is toxic if it exhibits properties that are harmful to humans. For the purposes of the DEQ reduction plan, those chemicals outlined in the Superfund Amendments and Reauthorization Act (SARA) Section 313 are of concern. A listing of these chemicals is included.

Do You Generate hazardous Waste ?

Most shops generate some type and amount of hazardous waste. Typical examples include:

- * Contaminated crankcase oil
- * Waste gasoline
- * Spent solvents
- * Spent caustic cleaners
- * Sump sludge
- * Used lead acid batteries
- * Waste lacquer thinner

- * Hot tank sludge
- * etc.

In general, a waste is hazardous if it is toxic, corrosive, ignitable, or reactive. The criteria for determining hazardous properties are complex. You can find these criteria in OAR Chapter 340 Division 100 and/or in the Code of Federal Regulations (CFR) 40 CFR Part 261. For the purposes of the DEQ reduction plan, a hazardous waste is one in which a "Uniform Hazardous Waste Manifest" is required for transportation purposes.

2. Determining Your Regulatory Status

The greater the amount of hazardous waste produced by a repair shop, the more regulatory requirements must be met. Each shop must comply with the requirements set for its generator category.

YOU ARE A LARGE QUANTITY GENERATOR IF..

In one calendar month you...

- generate 2,200 pounds or more of hazardous waste
- or
- generate 2,200 pounds or more of spill cleanup debris containing hazardous waste or
- generate more than 2.2 pounds of acutely

hazardous waste or

- generate more than 220 pounds of spill cleanup debris containing an acutely hazardous waste or

At any time you...

- accumulate more than 2.2 pounds of acutely hazardous waste on-site

YOU ARE A SMALL QUANTITY GENERATOR IF..

In one calendar month you...

- generate more than 220 pounds but less than 2,200 pounds of hazardous waste or
- generate more than 220 pounds but less than 2,200 pounds of spill cleanup debris containing hazardous waste or

At any one time you...

- accumulate more than 2,200 pounds of hazardous waste on-site

YOU ARE A CONDITIONALLY EXEMPT GENERATOR IF..

In one calendar month you...

- generate 2.2 pounds or less of an acutely hazardous waste or

- generate 220 pounds or less of hazardous waste
or
- generate 220 pounds or less of spill cleanup
debris containing hazardous waste or

At any time you...

- accumulate up to 2,200 pounds of hazardous waste
on-site

3. Who is Required to Complete the Plan ?

WHO	DEADLINE
Large Toxics Users and Large Quantity Generators	September 1, 1991
Small Quantity Generators	September 1, 1992
Conditionally Exempt Generators	Not Required

4. Principles of Toxics Use & Waste Reduction

Reducing the amount of materials you use and wastes you generate can help you comply with hazardous waste regulations. You can also save money by reducing your waste disposal costs. Waste reduction can also lower your

liability since it reduces the likelihood that your waste will be improperly disposed to the environment and require cleanup. Finally, reducing your toxic materials and wastes will help protect your employees' health and safety because it will limit exposure to hazardous substances, especially when you include employee training and material substitution in your reduction plan. See Appendix 1 - Hazardous Materials & Alternates.

To be successful, your reduction plan must be organized. It is not hard to organize toxics use and waste reduction (if you follow the "Model Plan" outline contained in this booklet), but you will need to spend some time in the beginning to get started. Organizing your waste reduction team is as easy as utilizing your already established Safety Committee. You and your Safety Committee working together to implement reduction options and priorities will ensure that the options are weighed from all aspects. As you work through reducing toxics and wastes, keep in mind the following eight principles:

1. Dealers and Managers must be committed to reduction for your plan to succeed.
2. You need to know the types of hazardous materials

you use and the types of hazardous waste you generate.

3. You should know how your hazardous waste is managed and how much your present waste management costs.
4. "Good Housekeeping" reduces spills and other waste.
5. Store different waste types in different containers. Make sure your containers are leak-proof and kept covered. Avoid spillage when filling containers.
6. Train all of your employees in hazardous waste handling and your waste reduction methods.
7. Be aware of the hazardous materials regulations that apply to you. Assign an employee to keep track of environmental requirements. You can utilize the OADA, or one of its private consultants to keep yourself informed.
8. Keep up-to-date on new waste reduction technologies. The DEQ, trade magazines, or product vendors are a good source of information.

5. Benefits For Reduction

Reducing toxics use and hazardous waste generation may show an immediate economic benefit for your shop (see example on page 8 and Chapter V -Success Stories). However, there are other benefits that are not so easily seen.

Some things do not lend themselves to technical assessment or to dollars-and-cents measurement. Some choices are seen as more acceptable by employees, customers, and the community. Employees increasingly expect, and respond favorably to, a hazard free workplace. Public opinion polls show that the American public expects more environmental protection and is willing to pay for it.

The implications of these expectations and opinions cannot be measured with accuracy. Nonetheless, it is important to account for these expectations and opinions whenever major changes are contemplated.

You should note the intangible benefits that are associated with a successful toxics use and waste reduction program:

- * Reduced regulatory burden
- * Reduced liability
- * Improved employee health & safety
- * Improved employee relations
- * Improved customer / community relations

Information provided in Appendix 2 - Chemical Components of Commercial Products (Brake Cleaners) and Appendix 3 -Chemical Components of Commercial Products (Carburetor Cleaners) should start you on the track toward thorough product evaluation. Other useful information regarding product evaluation is available through the OADA &

ASA and will be presented in the training seminars held July 28 - August 10.

II. "MODEL PLAN"

Toxics Use Reduction and
Hazardous Waste Reduction Plan

Period covered : _____ to _____

1. POLICY STATEMENT

At _____,
protecting the _____ (Dealership Name)
environment as well as the health and safety of our
employees is a high priority. We are committed to reducing
the amount of toxic materials used at this facility as well
as reducing the amount of hazardous waste generated. This
plan describes our efforts to reduce wherever technically,
economically practicable, and consistent with sound
environmental management. When the generation of hazardous
waste cannot be avoided, we are committed to recycling,
treatment, and disposal of that waste in ways that minimize
undesirable effects on air, water, land, and human life.

Standard Industrial Classification (SIC) code(s):

_____ #1 _____ #2 _____ #3 _____ #4

EPA Hazardous Waste Identification Number:

ORD _____
(EPA number)

Company Official Signature

2. PREFACE

a. SCOPE AND OBJECTIVES

In full compliance with the Oregon Toxics Use Reduction and Hazardous Waste Reduction Act of 1989 (ORS 465.003 - 465.037) _____ plans to

(Dealership Name)

achieve substantial environmental benefits and reduced risk to the environment, the community, our employees, and the company through a meaningful process to identify, evaluate, and implement technically and economically feasible alternatives to the use of toxic materials and the generation of hazardous wastes.

Our reduction efforts will be prioritized by first, concentrating on the reduction of toxic materials used in this facility, and second, by reducing the amounts of hazardous waste we generate. Through the process of annual updates and reduction plan amendments, a full range of alternatives will be phased in over the next five years. The first year we will address the largest quantities of toxic substances used and the largest hazardous waste streams generated.

This shop uses many materials in the process of automobile repair. We will continue to meet the high quality standards that our customers have come to know and expect. The specific toxics use and hazardous waste reduction options implemented will be limited to those that maintain our competitive and quality position in the automobile repair market.

b. GENERAL PROCEDURE

We will evaluate technologies, procedures, and personnel training programs to ensure unnecessary toxic materials are not used and unnecessary hazardous wastes are not generated. This will be accomplished by:

1. Evaluate the different types and amounts of toxic materials used.
2. Evaluate the types and amounts of hazardous waste generated.
3. Determine where and why these toxic materials are used.
4. Determine where and why the wastes are generated.
5. Identify and evaluate different technologies, substitute products, and further recycling opportunities.
6. Utilize a cost accounting scheme for each toxic material and hazardous waste.
7. Set performance goals when possible
8. Establish a feasibility analysis
9. Develop an implementation schedule for those reduction options that are technically and economically feasible.

c. PRIOR REDUCTION EFFORTS

The baseline year for this plan is 1991. All reduction strategies are based on 1991 figures. However, during and prior to 1991 _____

(Dealership Name)

implemented the following toxics use and hazardous waste reduction:

(Use the space on the following page to describe any and all reduction efforts you have made)

Example:

During 1991, Shop A reduced the number of parts washers from five (2 - 30 gallon and 3 - 16 gallon) to two (1 - 30 gallon and 1 - 16 gallon). These parts washers were on a 4-week maintenance schedule. The amount of toxics used was reduced from one-hundred-eight gallons (108 gal) to forty-six gallons (46 gal) every four weeks. The amount of hazardous waste generated was reduced from three-hundred-seven pounds (307 lbs) every four weeks to one-hundred-thirty-one pounds (131 lbs). This represents a forty-three percent (43%) reduction in hazardous waste generated as well as a greater than fifty percent (50%) reduction in service cost.

d. IMPEDIMENTS TO REDUCTION

There is a growing concern nationwide to eliminate toxics, VOC's, and reduce hazardous waste. Most chemical manufacturers understand this concern and are striving to reduce the hazards associated with their products. These products can be reformulated in many cases, but if they do not work to the standards of the end user he/she will not purchase the product and in many cases will end up using an even more harmful substitute to fulfill the job.

A major impediment we are facing is effectiveness of any substitute, less toxic, material. Other impediments to reduction include; capital reserves for the purchase of equipment, management and employee training in the area of toxics use and hazardous waste reduction, lack of sufficient technology, lack of manpower, and changes in the makeup of the automobile parts. These listed impediments make us realize that we must analyze our vehicle maintenance process to see how we can do things differently. There are many different ways to reduce waste generation that does not

SARA SECTION 313

CHEMICAL	CAS NUMBER	PRODUCT NAME
Acetone	67-64-1	Parts Washer Solvents
Ammonia	7664-41-7	Antifreeze
Asbestos	1332-21-4	Brake Cleaners
t-Butyl Alcohol	75-65-0	Carburetor Cleaners
Chlorine	7782-50-5	Contaminated Oil
Dichloromethane	75-09-2	Lacquer Thinner
1,4-Dioxane	123-91-1	Silicone Sprays
2-Ethoxyethanol	110-80-5	Aerosol Lubricants
Ethylene Glycol	107-21-1	Paint Products
Hydrochloric Acid	7647-01-0	Hot Tanks
Isopropyl Alcohol	67-63-0	Enamel Reducers
Lead	7439-92-1	Caustic Cleaners
Methanol	67-56-1	Used Oil Filters
MEK	78-93-3	CFC's
MIBK	108-10-1	
Methyl Isocyanate	624-83-9	
Naphthalene	91-20-3	
Sulfuric Acid	7664-93-9	
Tetrachloroethylene	127-18-4	
Toluene	108-88-3	
Toluene-2,4-diisocyan	584-84-9	
1,1,1-Trichloroethane	71-55-6	
Tetrachloroethylene	79-01-6	
Lead Compounds	-	
Hazardous Waste	Listed	
Hazardous Waste	Characteristic	

**THE FOLLOWING PAGES REPRESENT A "MODEL" FOR THE MAJOR PROCESSES
AND CHEMICAL COMPOUNDS USED IN THE SHOP.**

USE THESE PAGES AS WORKSHEETS TO BE INCLUDED IN YOUR SPECIFIC PLAN.

WASTE GENERATION POTENTIAL:

This material is designed to become a waste. The sellers of the solvent schedule regular replacement intervals by which a drum of new solvent is exchanged for a drum of spent solvent. The spent is classified as a characteristic waste with an EPA code of D001.

OPTIONS FOR REPLACEMENT OR CURTAILED USE:

1. Decrease the number of parts washers in the facility.
2. Alter the pick-up schedule of the material. Waste reduction of 30% is accomplished if the pick-up schedule is changed from 4-weeks to 6-weeks.
3. Replace parts washers with hot water washers.
4. A combination of 1 - 3 above.
5. Install a solvent reclamation device on the parts washers.
6. Replace the parts washers with aerosol cleaners.
7. Replace the parts washers with bulk cleaners.
8. Replace the parts washers with steam cleaners.
9. Substitute a solvent that has a flash point greater than 140 degrees F.
10. Install a solvent filtration unit.
11. Recycle the solvent on site.

JUSTIFICATION FOR OPTIONS DEEMED UNACCEPTABLE:

(Defend your reasons why any/all options are unacceptable)

(Example: Replacement with aerosol cleaners is both technically and economically non-feasible. Aerosols would require the use of several cans to perform the same job, costs would more than double, employee health would be placed in greater risk, and more material would be released into the atmosphere)

OPTIONS REQUIRING FURTHER STUDY:

(To be completed by the dealership)

(Example: To date, a substitute solvent with a flash point greater than 140 degrees does not perform well enough to meet our standards. We will continue to investigate this product substitution.)

TIME FRAME FOR IMPLEMENTATION:

(Describe what options will be taken and when)

COST ACCOUNTING FOR 1991:

1. Cost of material used	\$
2. Cost of waste disposal	\$
3. Cost of storage	\$
4. Cost of treatment	\$
5. Cost of liability	\$
6. Cost of compliance	\$
7. Cost of conversion to another material	\$
8. Capitol costs to make the change:	
- Equipment	\$
- Construction	\$
- Utility connections	\$
- Engineering / Permitting	\$
- Contracting	\$
- Training	\$
- Start up	\$
Total	\$

PERFORMANCE GOAL:

(Example: This dealership will reduce the amount of parts washer solvent waste 25% by 1993 and further reduce toward our goal of 100%)

4. MATERIAL SPECIFIC OBJECTIVE**b. ANTIFREEZE****CHEMICALS:** Ethylene Glycol**CAS #:** 107-21-1**POINT OF USE:**

Product is added to an automobile radiator following cooling system service.

REASON FOR USE:

The only technically and economically feasible option for this operation.

FATE IN THE PROCESS:

New material is completely contained in the automobile cooling system.

WASTE GENERATION POTENTIAL:

Used antifreeze taken from the automobile radiator is a potential hazardous waste. All automobile cooling system repair work has the potential of hazardous waste generation.

OPTIONS FOR REPLACEMENT OR CURTAILED USE:

1. Collect the coolant prior to repair and replace the collected coolant back into the radiator.
2. Purchase and use a coolant recycling machine.
3. Contract with a coolant recycling company to recycle and sell back to us the collected antifreeze.
4. A combination of 1 - 3 above.
5. Cease all cooling system repair work.
6. Have the customer transport his own used coolant away from the facility.
7. Substitute a Propylene Glycol mixture for Ethylene Glycol.

JUSTIFICATION FOR OPTIONS DEEMED UNACCEPTABLE:

(Defend your reasons why any/all options are unacceptable)

OPTIONS REQUIRING FURTHER STUDY:

(To be completed by the dealership)

TIME FRAME FOR IMPLEMENTATION:

(Describe what options will be taken and when)

COST ACCOUNTING FOR 1991:

1. Cost of material used	\$
2. Cost of waste disposal	\$
3. Cost of storage	\$
4. Cost of treatment	\$
5. Cost of liability	\$
6. Cost of compliance	\$
7. Cost of conversion to another material	\$
8. Capitol costs to make the change:	
- Equipment	\$
- Construction	\$
- Utility connections	\$
- Engineering / Permitting	\$
- Contracting	\$
- Training	\$
- Start up	\$
Total	\$

PERFORMANCE GOAL:

WASTE GENERATION POTENTIAL:

Portions of the material are lost to the atmosphere due to the propellants and due to evaporation. The collected material has the potential of hazardous wastes generation by contaminating a non-hazardous waste such as used crankcase oil. If this material is collected as a liquid (which is usually the case) and placed with used oil, hazardous waste generation potential is high.

OPTIONS FOR REPLACEMENT OR CURTAILED USE:

1. Substitute a non-chlorinated material.
2. Use bulk liquids instead of aerosol containers.
3. Use water as a brake cleaner.
4. Do not clean the parts during repair.
5. Install strict inventory controls.
6. Segregate the waste material.

JUSTIFICATION FOR OPTIONS DEEMED UNACCEPTABLE:

(Defend your reasons why any/all options are unacceptable)

OPTIONS REQUIRING FURTHER STUDY:

(To be completed by the dealership)

TIME FRAME FOR IMPLEMENTATION:

(Describe what options will be taken and when)

COST ACCOUNTING FOR 1991:

1. Cost of material used	\$
2. Cost of waste disposal	\$
3. Cost of storage	\$
4. Cost of treatment	\$
5. Cost of liability	\$
6. Cost of compliance	\$
7. Cost of conversion to another material	\$
8. Capitol costs to make the change:	
- Equipment	\$
- Construction	\$
- Utility connections	\$
- Engineering / Permitting	\$
- Contracting	\$
- Training	\$
- Start up	\$
Total	\$

PERFORMANCE GOAL:

4. MATERIAL SPECIFIC OBJECTIVE

d. CARBURETOR CLEANERS

CHEMICALS: Methanol	CAS #:	67-56-1
Toluene		108-88-3
Acetone		67-64-1
Xylene		1330-20-7
EGMBE		111-76-2

POINT OF USE:

REASON FOR USE:

FATE IN THE PROCESS:

WASTE GENERATION POTENTIAL:

OPTIONS FOR REPLACEMENT OR CURTAILED USE:

1. Utilize cold dip carb cleaners only.
2. Train employees to restrict usage.
3. Purchase less toxic materials.
4. Purchase material in non-aerosol form.
- 5.
- 6.
- 7.

JUSTIFICATION FOR OPTIONS DEEMED UNACCEPTABLE:

(Defend your reasons why any/all options are unacceptable)

OPTIONS REQUIRING FURTHER STUDY:

(To be completed by the dealership)

TIME FRAME FOR IMPLEMENTATION:

(Describe what options will be taken and when)

COST ACCOUNTING FOR 1991:

1. Cost of material used	\$
2. Cost of waste disposal	\$
3. Cost of storage	\$
4. Cost of treatment	\$
5. Cost of liability	\$
6. Cost of compliance	\$
7. Cost of conversion to another material	\$
8. Capitol costs to make the change:	
- Equipment	\$
- Construction	\$
- Utility connections	\$
- Engineering / Permitting	\$
- Contracting	\$
- Training	\$
- Start up	\$
Total	\$

PERFORMANCE GOAL:

4. MATERIAL SPECIFIC OBJECTIVE**e. CONTAMINATED OIL****CHEMICALS:** Various**CAS #:****POINT OF USE:**

Used crankcase oil is generated during most automotive repair work, especially internal engine operations. Customers regularly have the lubricating fluids in their automobile changed at this dealership. This material is not a useful product, but rather a spent material that we must properly manage.

REASON FOR USE:

To properly maintain automobile functions, crankcase oil and other liquid lubricants must be regularly changed.

FATE IN THE PROCESS:

Used crankcase oil is stored for regular removal by a fully regulated used oil hauler who takes the material to a recycler, or the material is burned on-site (waste to energy recycling) in an oil burning heating system.

WASTE GENERATION POTENTIAL:

Used crankcase oil that is not contaminated is not a hazardous waste in Oregon. The potential for used oil becoming a hazardous waste is dependent upon the types and amounts of "other" material that is mixed with the used oil. Common examples of contamination is the addition of chlorinated materials to the oil (brake cleaners), or the addition of low flash point liquids (waste gasoline or solvent).

OPTIONS FOR REPLACEMENT OR CURTAILED USE:

1. Employee training to eliminate "other" material being added to the used oil.
2. Eliminate all "other" products that could potentially contaminate the used oil.
3. Cease oil changes.
4. Use an oil burner exclusively.
5. Purchase and use a oil recycling machine.
6. Have the customer haul away his own used oil.

JUSTIFICATION FOR OPTIONS DEEMED UNACCEPTABLE:

(Defend your reasons why any/all options are unacceptable)

OPTIONS REQUIRING FURTHER STUDY:

(To be completed by the dealership)

TIME FRAME FOR IMPLEMENTATION:

(Describe what options will be taken and when)

COST ACCOUNTING FOR 1991:

1. Cost of material used	\$
2. Cost of waste disposal	\$
3. Cost of storage	\$
4. Cost of treatment	\$
5. Cost of liability	\$
6. Cost of compliance	\$
7. Cost of conversion to another material	\$
8. Capitol costs to make the change:	
- Equipment	\$
- Construction	\$
- Utility connections	\$
- Engineering / Permitting	\$
- Contracting	\$
- Training	\$
- Start up	\$
Total	\$

PERFORMANCE GOAL:

4. MATERIAL SPECIFIC OBJECTIVE**f. LACQUER THINNER****CHEMICALS:** _____**CAS #:****POINT OF USE:****REASON FOR USE:****FATE IN THE PROCESS:****WASTE GENERATION POTENTIAL:****OPTIONS FOR REPLACEMENT OR CURTAILED USE:**

1. Employee training to reduce the amount of material used.
2. Purchase and use of a recycling machine.
3. Purchase and use of a gun washing machine.
4. A combination of 1 - 3 above.
5. Install strict inventory controls to reduce the amount of material in inventory.
6. Replace the thinner with a water based system.

JUSTIFICATION FOR OPTIONS DEEMED UNACCEPTABLE:

(Defend your reasons why any options are unacceptable)

OPTIONS REQUIRING FURTHER STUDY:

(To be completed by the dealership)

TIME FRAME FOR IMPLEMENTATION:

(Describe what options will be taken and when)

COST ACCOUNTING FOR 1991:

1. Cost of material used	\$
2. Cost of waste disposal	\$
3. Cost of storage	\$
4. Cost of treatment	\$
5. Cost of liability	\$
6. Cost of compliance	\$
7. Cost of conversion to another material	\$
8. Capitol costs to make the change:	
- Equipment	\$
- Construction	\$
- Utility connections	\$
- Engineering / Permitting	\$
- Contracting	\$
- Training	\$
- Start up	\$
Total	\$

PERFORMANCE GOAL:

4. MATERIAL SPECIFIC OBJECTIVE

The following are examples of other material specific plans that your shop may wish to develop. Each of these materials has the potential of creating hazardous waste, and each material is a toxic substance.

g. SILICONE SPRAYS

h. AEROSOL LUBRICANTS

i. PAINT PRODUCTS

j. HOT TANKS

k. ENAMEL REDUCERS

l. CAUSTIC CLEANERS

m. USED OIL FILTERS

n. CFC's

III. EMPLOYEE AWARENESS AND TRAINING

Employee training is an important part of your reduction program. The personnel responsible for operating equipment, loading and unloading hazardous materials, storing, transferring and using hazardous materials need to be trained in safe operating procedures. Employees should be trained before they start working with hazardous materials and when new procedures are implemented and/or when new materials are introduced into the shop. This training can be accomplished by annual Hazard Communication (Employee Right-to-Know) programs.

Employees need to be involved in your waste reduction program. Without their cooperation and training, any new procedure to reduce waste or use of substitute products is likely to fail. Encourage your employees to offer suggestions, either to the Safety Committee or to the persons you designate to implement your reduction plan.

Training should also be given on spill prevention, such as how to detect leaks in any vehicle maintenance system. Techniques for minimizing the potential for a spill or release should be emphasized. Leaks and spills are costly and dangerous to human health and the environment. Leak and spill prevention training can save money in both product and cleanup costs. Train to reduce leaks and spills by:

- * Use storage tanks and vessels only for their intended purposes
- * Install leak detection equipment for storage tanks
- * Install spill containment and train employees to use it
- * Wipe up spills, do not hose down the area
- * Maintain the integrity of tanks and containers
- * Control the loading, unloading and transfer of all materials
- * Install secondary containment around tanks and storage areas

Good housekeeping practices should be taught and enforced; (1) routinely inspect and maintain equipment, (2) perform preventative maintenance, (3) repair leaks as they occur, (4) cover containers when not in use, (5) use tight fitting rings and bungs on containers to minimize evaporation and spillage, and (6) use spigots or pumps to prevent spills.

PLEASE DESCRIBE YOUR EMPLOYEE TRAINING PROGRAM HERE: State who will be trained, by whom, how often, and an outline of the topics covered.

IV. NOTICE OF PLAN COMPLETION

INSTRUCTIONS: Copy this form. Type and print all responses. If the requested information does not apply to you, please note "not applicable." The completed form should reach DEQ by September 1, 1992 if you are a small quantity generator, or by September 1 of the year following the year you become a large or small quantity generator.

Send the completed notice to: Oregon DEQ, Hazardous and Solid Waste Division, 811 SW Sixth Ave., Portland, OR 97204

BASIC INFORMATION

Company Name: _____

Location of Facility: _____

Mailing Address: _____

Telephone: _____

Standard Industrial Classification (SIC) Code(s): _____

EPA Hazardous Waste Identification (HWI) Number: ORD _____

EPA Toxic Release Inventory (TRI) Number: _____

Period covered by the plan (not less than 5 nor more than 10 years): _____

OPTIONAL INFORMATION

(NOTE: You may want to send DEQ a summary of your progress in reducing toxic substances and hazardous wastes prior to the year when your plan was completed. If submitted, such information will be kept confidential and not become part of the public record.)

I am _____ am not _____ submitting a separate document describing this firm's reduction in toxic substances and hazardous wastes prior to this calendar year.

ACKNOWLEDGMENT OF COMPLETION

The business identified on this form has completed a plan for reducing toxic substances and/or hazardous wastes as required by Oregon law. As further specified by law, this plan is being retained at our business location.

Name of Person completing this form:

Name and Title or Owner or Senior Manager:

Signature of Owner or Senior Manager:

Date:

V. SUCCESS STORIES

1. John Pusieski, Parts and Service Director at Link Pontiac-Mazda-GMC Truck in Oregon City recently purchased a water jet parts washer to replace most of his solvent washers. Link Pontiac reduced the number of solvent washers from six (6) to two (2) while showing an increase in Technician efficiency.

John states, "Other benefits are that the water washer allows my Technicians to load it and return to work while the parts are cleaned automatically. This equates to greater productivity and substantially reduces my employees exposure to hazardous materials."

Before the water washer, Link Pontiac was generating three-hundred-fifty pounds (350 lbs) of hazardous waste every four weeks. Now they are generating only ninety pounds (90 lbs) during the same time. That is a seventy-five percent (75%) reduction.

Link Pontiac is now in the conditionally exempt generator classification which affords them reduced record keeping and other requirements.

2. Mike Jacobson, Operations Manager at DeLon Downtown Auto Center in Salem implemented a similar waste reduction strategy. His Service Departments now contain only one (1) solvent washer each. The

Technicians at DeLon were quick to appreciate the installation of their water jet washer.

Mike has also begun a strict inventory control and vendor control program for the dealership. Instead of utilizing several vendor products that perform the same function, the Parts Department determines which are the best all around products and stocks only those materials.

The DeLon dealerships are now conditionally exempt generators.

3. Dave Hodge, Master Technician from Alexander Chrysler Plymouth in Portland, has been working toward zero waste generation for several years at his dealership. Dave has implemented major toxics use and hazardous waste reduction programs ranging from a detailed product evaluation matrix, to a precision based on-site paint mixing scheme, to a cascade re-use system for solvent parts washers. The cascade re-use system has across the board application for Oregon dealerships and has shown to decrease the amount of hazardous up to seventy-five percent (75%).