

Chapter 3

HAZARDOUS MATERIALS IN BERKELEY'S AUTOMOTIVE GARAGES

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Introduction

All automobiles need repair and maintenance to run efficiently. But in this process of repair many products are used that can be very damaging to the environment and in turn detrimental to man. The interests of this paper involve determining the types of hazardous materials used and methods of disposal in automobile garages. This information is used to determine the extent of the problem and the possible need for alternatives.

Past Work

Past investigations and research on hazardous wastes produced by automotive garages are very limited. A study by T.R.W. for the Environmental Protection Agency discusses types of hazardous materials produced by garages as well as treatment and recycling (T.R.W., 1979). The results are based on a few surveys of general auto repair businesses and are not very conclusive. Past work is severely limited in this area, often because of the apprehension of the businesses involved.

Chemical Composition and Environmental and Health Effects

There are a variety of products used and disposed of in automobile repair garages. The chemical composition of these products needs to be determined in order to evaluate their hazards. Chemical components of the hazardous materials were identified at automotive supply stores from product labels which indicate the chemical components and hazardous properties. The following information on hazardous substances commonly found in automotive repair garages is from Hawley (1981) unless otherwise indicated.

Petroleum products - Engine oil and transmission fluid are both products of petroleum. The petroleum hydrocarbons can contaminate marine organisms and are carcinogenic to all organisms at low dosages (Parker, 1980). Petroleum oil is also flammable and toxic if ingested.

Radiator products - Radiator coolant or antifreeze is composed of an organic hydrocarbon which is toxic to the liver and central nervous system upon ingestion and inhalation. Radiator flushing agents are organic hydrocarbons and acids which act to prevent corrosion (Grant, 1969). The combination of these hydrocarbons is very flammable, irritating to the skin and eyes, and toxic

to the liver and renal systems upon inhalation or ingestion.

Carburetor and brake products - Brake fluids and cleaners are products used for the maintenance of a car's brake system. Carburetor cleaner is a flushing agent for carburetors. The primary constituent of brake fluid is an organic hydrocarbon which is toxic to organisms upon ingestion. Brake cleaners and carburetor cleaners are composed of a variety of hydrocarbons and acids. The mixture of these compounds is toxic if inhaled or absorbed through the skin.

Cleaning products - Solvents are used for cleaning different parts of automobiles and as grease cutters. Cleaning solvents are generally composed of chlorinated hydrocarbons and acids. These products are toxic to organisms upon ingestion and an irritant to skin and eyes. Kerosene may also be used as a cleaner and is flammable and toxic if inhaled. Caustic soda or sodium hydroxide is used for steam cleaning engines. This product is corrosive to tissues in the presence of moisture and is very toxic if ingested.

Miscellaneous products - Other hazardous materials discussed in this paper are asbestos, battery acid, and paints and lacquers. Asbestos is a constituent of brake shoes and clutch linings. Dust produced from the asbestos fibers is toxic and an active carcinogen when inhaled. Battery acid (sulfuric acid) is a potential explosive when mixed with water, toxic upon inhalation, and an irritant to tissues. Addition of sulfuric acid to the sewer system may also contaminate water and corrode water pipes. Paints and thinners are composed of inorganic pigments and a hydrocarbon thinner which are flammable and may be toxic if inhaled for long periods of time.

Many of the materials used in automotive repair garages are toxic in one form or another. Adequate precautions need to be used when dealing with these products. Rubber gloves, goggles, and sufficient ventilation should all be required during the use of these dangerous products.

Methodology

The majority of material for this paper was obtained through a survey of automobile repair shops in Berkeley. The survey was constructed from sample questionnaires obtained from the EPA and the Association of Bay Area Governments (Jackson, 1984, pers. comm.). The survey covers questions on general information, business size, hazardous materials used, hazardous wastes, methods of disposal, and future disposal methods (Appendix to Section IV.B.). Businesses were randomly selected from the automotive repair and service section of the Oakland Telephone Directory yellow pages. Telephone surveys were conducted in January, 1984. Some questionnaires were also mailed to consenting businesses.

Additional information was also obtained through a tour of an automotive garage. This interview is not included as part of the survey material. The mechanic of this shop and all the surveyed businesses are anonymous in this report.

Nine businesses were surveyed out of forty-four contacted. The remaining thirty-five refused to participate. All of the businesses are classified under Standard Industrial Code (S.I.C.) 7538, general auto repair (T.R.W., 1979). Three of the participants are also involved in a small amount of automotive painting and are listed under S.I.C. 7535. One business is engaged in body work along with general automotive repair and is listed as S.I.C. 7531.

The nine businesses surveyed are characterized by number of employees, length of time business has been in operation, quantity of cars serviced each month, and annual sales (Table 1). The majority of firms are moderate to large in size. Four of the businesses are associated with larger affiliates. Only three businesses were able to give their total annual sales; the remaining either could not answer or did not know.

	* business & SIC code(s)	# of employees full-time	part-time	length of time business in operation	quantity of cars serviced per month	annual sales (\$)
Business #1	auto repair 7538	1	1	8 months	20	do not know
Business #2	auto repair body shop 7538,7531, 7535	9	9	18 years	220	no answer
Business #3	auto repair 7538	13	0	20 years	600-650	cannot answer
Business #4	auto repair 7538	4	0	10 years	800	\$250,000
Business #5	auto repair paint shop 7538, 7535	18	0	31 years	700	1.7 million
Business #6	auto repair 7538	5	0	2.5 years	600	cannot answer
Business #7	auto repair 7538	6	0	12 years	175-210	\$375,000
Business #8	auto repair paint shop 7538,7535	45-50	0	17 years	500-600	no answer
Business #9	auto repair 7538	14	0	22 years	98	\$460,000

Table 1. Size of Business.

Source: Information obtained from T.R.W., 1979.

	engine oil	transm. fluid	anti-freeze	brake fluid	carb.	brake	CLEANERS solv.	kerosene	paints & thinner	caustic soda
Business #1	20	-	5-10	-	-	-	-	-	-	-
Business #2	50	150	20	2	-	-	55	-	2	-
Business #3	150	150	very little	-	very little	-	30	-	-	-
Business #4	220	150	25	10	5	5	55	10	-	-
Business #5	400	50	100	2	15 ^a	15 ^a	20 ^a	-	13	-
Business #6	150	5	250	2	12 ^b	15-20 ^a	15	-	-	-
Business #7	120	10	10	6	20 ^a	6	55	-	-	-
Business #8	100	2-3	50-100	very little	very little	-	50-75	-	80	280
Business #9	55	5	10	1	-	-	-	-	-	-

Table 2. Quantities of Hazardous Materials Used in Surveyed Businesses.

a = data in 12-ounce cans/month
 b = data in 6-ounce cans/month
 c = all other data in gallons/month

Hazardous Materials Used

Automobile repair shops use a variety of hazardous materials, such as engine oil, transmission fluid, antifreeze, brake fluid, carburetor cleaner, solvents, kerosene, and caustic soda. The quantity of these substances used by each business surveyed is given in Table 2. Paints and paint thinners are used only by businesses that engage in auto painting. Data on Business #1 are very limited because it is too small and new to have adequate records on many of the substances. It is included because of its unique method of disposing of antifreeze (see below).

Some of the hazardous materials are originally contained in drums or aerosol cans which are still contaminated with the residue of the product when empty. The empty drums are returned to the product manufacturer and the empty aerosol cans are thrown away in the community trash. Table 3 gives the size and number of containers used each month.

Hazardous Wastes and Recycling Techniques

Automobile repair shops generate a variety of hazardous wastes and use different methods of disposal for these by-products. Table 4 lists the different type and quantity of wastes generated

by the businesses surveyed. The waste produced in the largest quantity by all the businesses surveyed is used engine oil. A comparison of Tables 1 and 4 shows that very little correlation exists between the size of the business and the quantity of waste generated.

Disposal of waste engine oil and transmission fluid is fairly uniform in all businesses surveyed. All the waste engine oil and transmission fluid is mixed and stored in an underground storage tank until a commercial recycling hauler transports the material to a recycling center for reclaiming. The incentive behind this program is that the recycling center pays the repair shop for the used oil. Excess oil contained in used oil filters is also drained into the underground storage tank, and the oil filter itself is picked up with the community local trash.

Waste antifreeze created from the flushing of automobile radiators is disposed of to the community sewer. One business commented that very little antifreeze is actually drained at the time the automobile is being repaired. Most of the fluid leaks out onto the street before the car even gets to the garage. Generally the antifreeze is highly diluted in the radiator and is diluted further when poured into the sewer. The only exception to sewer disposal is by one business which evaporates antifreeze and water in a holding tank. This seems to be due to the small amount of waste antifreeze this firm creates.

Evaporation is used in two businesses

for disposal of waste effluent from cleaning solvents and grease cutters. Kerosene is used at one business as a cleaner and is readily evaporated in appropriate holding tanks. Spare parts may contain residues of hazardous substances and should be disposed of with proper methods. Most parts are rebuilt on- or off-site in all businesses except one where the parts are sent to a landfill. An exception to the rebuilding process is gasoline tanks. Gasoline tanks are drained and then redeemed by the manufacturer because of explosive properties.

Disposal of paint thinner and lacquer is restricted to the three businesses dealing with automotive

	containers	size	# per month
Business #1	-	-	-
Business #2	drums	55 gal.	1-5
Business #3	-	-	-
Business #4	drums	55 gal.	1
Business #5	drums aerosol cans	55 gal. 12 oz.	25 gal./3mos. 50
Business #6	aerosol cans	6 & 12 oz.	27
Business #7	drums aerosol cans	20 gal. 12 oz.	2/yr. 20
Business #8	-	-	-
Business #9	-	-	-

Table 3. Empty Hazardous Containers Produced.
 "-" information not available.

	engine oil	oil filters *	transm. fluid	anti- freeze	solv.	kerosene	paints & thinners	spare parts
Business #1	500	100	-	5	-	-	-	rebuilt off-site
Business #2	50	100	-	20	550	-	2	rebuilt on-site
Business #3	150	-	150	20	30	-	-	taken to landfill
Business #4	150	400	30	50	-	18.3	-	rebuilt on-site
Business #5	200	200	50	100	-	-	13	rebuilt on & off-site
Business #6	150	300	5	250	-	-	-	rebuilt off-site
Business #7	120	120	10	10	-	-	-	rebuilt off-site
Business #8	100	200	2-3	50	-	-	80	rebuilt on-site
Business #9	55	12	5	10	-	-	-	-

Table 4. Type and Quantity of Hazardous Wastes Generated by Businesses Surveyed.

A few of the waste materials are larger than their corresponding products, because of added water and other substances and possibly incorrect information from businesses.

* = data in #/month; all other wastes in gallons/month.

painting. The disposal of thinners and lacquers is usually costly for the business. One business reported paying \$200 per 55-gallon drum for adequate transportation and disposal at a hazardous waste facility.

On-Site Treatment and Off-Site Transportation

On-site recycling and treatment of wastes are economically convenient methods. But the small automotive repair business is not equipped for any form of recycling except rebuilding of spare parts. None of the businesses surveyed do any other form of on-site recycling. Five of the businesses treat their hazardous wastes in some way: one evaporates antifreeze, two evaporate solvents and kerosene, and two report removing asbestos dust (used in brake shoes and clutch linings) from water with a carbon filter before disposing in the sewer.

A large quantity of wastes is transported off-site from the automotive repair garages. A tank-truck is used to transport oil and transmission fluid from the storage tanks to recycling centers. Its driver is informed before hand, without a written manifest, of the contents of the

waste being hauled. Public waste collection trucks pick up used oil filters and spare parts with the garbage for disposal in landfills. The transporter has no knowledge of the contents of the garbage. Private waste collection trucks contracted by the automobile repair company are used to transport paint thinners and lacquers to hazardous waste facilities. The transporter is given a written manifest on the contents of the waste that is being hauled.

Alternatives

Based on the material gathered in the surveys, alternative disposal methods do not seem necessary. Most of the wastes produced in automotive repair businesses is either recycled or is in small enough quantities to have few environmental effects. Four of the nine businesses are satisfied with the present methods of disposal and are not interested in any alternative methods.

Alternative methods for disposal of these hazardous substances are dump day(s), waste exchange programs, and recycling for a fee. An acceptable option for one of the surveyed businesses is a community "Dump Day" where hazardous wastes are taken to certain locations on a specific day for adequate disposal. One of the businesses is willing to participate in a hazardous waste exchange program where two or more firms circulate their wastes for use as products. All of the businesses are involved in a recycling program for oil and transmission fluid with a monetary gain. But three of the businesses are also willing to work with recycling companies for a fee.

Discussion

The automobile repair industry deals with a large quantity of hazardous substances. This fact is very apparent from the surveys. The danger is not as obvious to the automobile mechanics dealing with these materials on a daily basis. All of the businesses contacted had to be convinced the substances they are dealing with are hazardous. I believe this is because of the lack of knowledge of the hazards these materials create. Most of the businesses are also misinformed about the current laws on the handling of hazardous materials and are unwilling to reveal their lack of information. All automobile repair garages need to be supplied with information on the products they are using, adequate disposal methods, and laws dealing with these hazardous materials.

The results of the surveys show adequate disposal of engine oil and transmission fluid wastes. The majority of the cleaning materials are also disposed of properly. More investigation is needed in the areas of waste oil filters and antifreeze. These materials are not being removed efficiently from the environment. Investigation is also needed regarding more economic incentives for proper disposal of automotive painting wastes. One business reported a loss in disposing of paint thinners and lacquers. This particular business is fairly large and is capable of absorbing this loss. But many smaller automobile paint shops are unable to deal with this loss and may resort to illegal methods of disposal.

A larger problem may exist with employee health, both with hazardous substances and in-shop ventilation. Many of the smaller businesses surveyed do not have adequate ventilation for safe use of most of the hazardous substances. Carbon monoxide build-up from car exhaust is also a serious health threat without ventilation. Long-range effects of insufficient ventilation are not a major topic of this paper. However, additional information on the effects of inadequate ventilation and hazardous materials should be pursued.

The surveys reveal only a limited problem in disposal of hazardous wastes. If all of Berkeley's automotive repair garages are disposing of wastes in similar or otherwise adequate ways, there is not a large problem in this city. Because so few businesses were willing to contribute to the survey and those that did were often very reluctant to give answers, I believe the disposal problem in auto garages could be larger than the surveys revealed.

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