This report is one in a series of volumes published by the U.S. Environmental Protection Agency (EPA) to provide information of general interest regarding environmental issues associated with specific industrial sectors. The documents were developed under contract by Abt Associates (Cambridge, MA), and Booz-Allen & Hamilton, Inc. (McLean, VA). This publication may be **purchased** from the Superintendent of Documents, U.S. Government Printing Office. A listing of available Sector Notebooks and document numbers is included on the following page.

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Electronic versions of all Sector Notebooks are available free of charge at the following web address: **www.epa.gov/oeca/sector**. Direct technical questions to the "Feedback" button at the bottom of the web page.

Cover photograph courtesy of Saturn Motors, Spring Hill, Tennessee. Special thanks to Jennifer Graham for providing photographs.

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EPA Office of Compliance Sector Notebook Project

Profile of the: Motor Vehicle Assembly Industry

September 1995

Office of Compliance
Office of Enforcement and Compliance Assurance
U.S. Environmental Protection Agency
401 M St., SW (MC 2221-A)
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EPA/310-R-95-005.	Iron and Steel Industry	Maria Malave	564-7027
EPA/310-R-95-006.	Lumber and Wood Products Industry	Seth Heminway	564-7017
EPA/310-R-95-007.	Fabricated Metal Products Industry*	Scott Throwe	564-7013
EPA/310-R-95-008.	Metal Mining Industry	Jane Engert	564-5021
EPA/310-R-95-009.	Motor Vehicle Assembly Industry	Anthony Raia	564-6045
EPA/310-R-95-010.	Nonferrous Metals Industry	Jane Engert	564-5021
EPA/310-R-95-011.	Non-Fuel, Non-Metal Mining Industry	Rob Lischinsky	564-2628
EPA/310-R-95-012.	Organic Chemical Industry*	Walter DeRieux	564-7067
EPA/310-R-95-013.	Petroleum Refining Industry	Tom Ripp	564-7003
EPA/310-R-95-014.	Printing Industry	Ginger Gotliffe	564-7072
EPA/310-R-95-015.	Pulp and Paper Industry	Seth Heminway	564-7017
EPA/310-R-95-016.	Rubber and Plastic Industry	Maria Malave	564-7027
EPA/310-R-95-017.	Stone, Clay, Glass, and Concrete Industry	Scott Throwe	564-7013
EPA/310-R-95-018.	Transportation Equipment Cleaning Ind.	Virginia Lathrop	564-7057
EPA/310-R-97-001.	Air Transportation Industry	Virginia Lathrop	564-7057
EPA/310-R-97-002.	Ground Transportation Industry	Virginia Lathrop	564-7057
EPA/310-R-97-003.	Water Transportation Industry	Virginia Lathrop	564-7057
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*Spanish translations available.

MOTOR VEHICLE ASSEMBLY INDUSTRY
(SIC 37)
TABLE OF CONTENTS

MOTOR VEHICLE ASSEMBLY INDUSTRY
(SIC 37)
TABLE OF CONTENTS (CONT'D)

MOTOR VEHICLE ASSEMBLY INDUSTRY (SIC 37) TABLE OF CONTENTS (CONT'D)

MOTOR VEHICLE ASSEMBLY INDUSTRY
(SIC 37)
TABLE OF CONTENTS (CONT'D)

Page

MOTOR VEHICLE ASSEMBLY INDUSTRY
(SIC 37)
EXHIBITS INDEX

MOTOR VEHICLE ASSEMBLY INDUSTRY (SIC 37) LIST OF ACRONYMS

AFS -	AIRS Facility Subsystem (CAA database)
AIRS -	Aerometric Information Retrieval System (CAA database)
BIFs -	Boilers and Industrial Furnaces (RCRA)
BOD -	Biochemical Oxygen Demand
CAA -	Clean Air Act
CAAA -	Clean Air Act Amendments of 1990
CERCLA -	Comprehensive Environmental Response, Compensation and Liability Act
CERCLIS -	CERCLA Information System
CFCs -	Chlorofluorocarbons
CO -	Carbon Monoxide
COD -	Chemical Oxygen Demand
CSI -	Common Sense Initiative
CWA -	Clean Water Act
D&B -	Dun and Bradstreet Marketing Index
ELP -	Environmental Leadership Program
EPA -	United States Environmental Protection Agency
EPCRA -	Emergency Planning and Community Right-to-Know Act
FIFRA -	Federal Insecticide, Fungicide, and Rodenticide Act
FINDS -	Facility Indexing System
HAPs -	Hazardous Air Pollutants (CAA)
HSDB -	Hazardous Substances Data Bank
IDEA -	Integrated Data for Enforcement Analysis
LDR -	Land Disposal Restrictions (RCRA)
LEPCs -	Local Emergency Planning Committees
MACT -	Maximum Achievable Control Technology (CAA)
MCLGs -	Maximum Contaminant Level Goals
MCLs -	Maximum Contaminant Levels
MEK -	Methyl Ethyl Ketone
MSDSs -	Material Safety Data Sheets
NAAQS -	National Ambient Air Quality Standards (CAA)
NAFTA -	North American Free Trade Agreement
NCDB -	National Compliance Database (for TSCA, FIFRA, EPCRA)
NCP -	National Oil and Hazardous Substances Pollution Contingency Plan
NEIC -	National Enforcement Investigation Center
NESHAP -	National Emission Standards for Hazardous Air Pollutants
NO_2 -	Nitrogen Dioxide
NOV -	Notice of Violation
NO_X -	Nitrogen Oxide
NPDES -	National Pollution Discharge Elimination System (CWA)

MOTOR VEHICLE ASSEMBLY INDUSTRY
(SIC 37)
LIST OF ACRONYMS (CONT'D)

NPL -	National Priorities List
NRC -	National Response Center
NSPS -	New Source Performance Standards (CAA)
OAR -	Office of Air and Radiation
OECA -	Office of Enforcement of Compliance Assurance
OPA -	Oil Pollution Act
OPPTS -	Office of Prevention, Pesticides, and Toxic Substances
OSHA -	Occupational Safety and Health Administration
OSW -	Office of Solid Waste
OSWER -	Office of Solid Waste and Emergency Response
OW -	Office of Water
P2 -	Pollution Prevention
PCS -	Permit Compliance System (CWA Database)
POTW -	Publicly Owned Treatments Works
RCRA -	Resource Conservation and Recovery Act
RCRIS -	RCRA Information System
SARA -	Superfund Amendments and Reauthorization Act
SDWA -	Safe Drinking Water Act
SEPs -	Supplementary Environmental Projects
SERCs -	State Emergency Response Commissions
SIC -	Standard Industrial Classification
SO_2 -	Sulfur Dioxide
TOC -	Total Organic Carbon
TRI -	Toxic Release Inventory
TRIS -	Toxic Release Inventory System
TCRIS -	Toxic Chemical Release Inventory System
TSCA -	Toxic Substances Control Act
TSS -	Total Suspended Solids
UIC -	Underground Injection Control (SDWA)
UST -	Underground Storage Tanks (RCRA)
VOCs -	Volatile Organic Compounds

MOTOR VEHICLE ASSEMBLY INDUSTRY (SIC 37)

I. INTRODUCTION TO THE SECTOR NOTEBOOK PROJECT

I.A. Summary of the Sector Notebook Project

Environmental policies based upon comprehensive analysis of air, water, and land pollution are an inevitable and logical supplement to traditional single-media approaches to environmental protection. Environmental regulatory agencies are beginning to embrace comprehensive, multi-statute solutions to facility permitting, enforcement and compliance assurance, education/outreach, research, and regulatory development issues. The central concepts driving the new policy direction are that pollutant releases to each environmental medium (air, water, and land) affect each other, and that environmental strategies must actively identify and address these inter-relationships by designing policies for the "whole" facility. One way to achieve a whole facility focus is to design environmental policies for similar industrial facilities. By doing so, environmental concerns that are common to the manufacturing of similar products can be addressed in a comprehensive manner. Recognition of the need to develop the industrial "sector-based" approach within the EPA Office of Compliance led to the creation of this document.

The Sector Notebook Project was initiated by the Office of Compliance within the Office of Enforcement and Compliance Assurance (OECA) to provide its staff and managers with summary information for eighteen specific industrial sectors. As other EPA offices, States, the regulated community, environmental groups, and the public became interested in this project, the scope of the original project was expanded. The ability to design comprehensive, common sense environmental protection measures for specific industries is dependent on knowledge of several inter-related topics. For the purposes of this project, the key elements chosen for inclusion are: general industry information (economic and geographic); a description of industrial processes; pollution outputs; pollution prevention opportunities; Federal statutory and regulatory framework; compliance history; and a description of partnerships that have been formed between regulatory agencies, the regulated community, and the public.

For any given industry, each topic listed above could alone be the subject of a lengthy volume. However, in order to produce a manageable document, this project focuses on providing summary information for each topic. This format provides the reader with a synopsis of each issue, and references where more in-depth information is available. Text within each profile was researched from a variety of sources, and was usually condensed from more detailed sources pertaining to specific topics. This approach allows for a wide coverage of activities that can be further explored based upon the citations and references listed at the end of this profile. As a check on the information included, each notebook went through an external review process. The Office of Compliance appreciates the efforts of all those that participated in this process and enabled us to develop more complete, accurate, and up-to-date summaries. Many of those who reviewed this notebook are listed as contacts in Section IX and may be sources of additional information. The individuals and groups on this list do not necessarily concur with all statements within this notebook.

I.B. Additional Information

Providing Comments

OECA's Office of Compliance plans to periodically review and update the notebooks and will make these updates available both in hard copy and electronically. If you have any comments on the existing notebook, or if you would like to provide additional information, please send a hard copy and computer disk to the EPA Office of Compliance, Sector Notebook Project, 401 M St., SW (2223-A), Washington, DC 20460. Comments can also be uploaded to the Enviroene Bulletin Board or the Enviroene World Wide Web for general access to all users of the system. Follow instructions in Appendix A for accessing these data systems. Once you have logged in, procedures for uploading text are available from the on-line Enviroene Help System.

Adapting Notebooks to Particular Needs

The scope of the existing notebooks reflect an approximation of the relative national occurrence of facility types that occur within each sector. In many instances, industries within specific geographic regions or States may have unique characteristics that are not fully captured in these profiles. For this reason, the Office of Compliance encourages State and local environmental agencies and other groups to supplement or re-package the information included in this notebook to include more specific industrial and regulatory information that may be available. Additionally, interested States may want to supplement the "Summary of Applicable Federal Statutes and Regulations" section with State and local requirements. Compliance or technical assistance providers may also want to develop the "Pollution Prevention" section in more detail. Please contact the appropriate specialist listed on the opening page of this notebook if your office is interested in assisting us in the further development of the information or policies addressed within this volume.

If you are interested in assisting in the development of new notebooks for sectors not covered in the original eighteen, please contact the Office of Compliance at 202-564-2395.

II. INTRODUCTION TO THE MOTOR VEHICLES AND MOTOR VEHICLE EQUIPMENT INDUSTRY

This section provides background information on the size, geographic distribution, employment, production, sales, and economic condition of the Motor Vehicle Equipment industry. The type of facilities described within the document are also described in terms of their Standard Industrial Classification (SIC) codes. Additionally, this section contains a list of the largest companies in terms of sales.

II.A. Introduction, Background, and Scope of the Notebook

This industry notebook is designed to provide an overview of the motor vehicles and motor vehicle equipment industry as listed under the Standard Industrial Classification (SIC) code 37. Establishments listed under this code are engaged primarily in the manufacture and assembly of equipment for the transportation of passengers and cargo by land, air, and water.

Due to the broad scope of the industries listed under SIC 37, this notebook will focus on the three-digit SIC 371 which is limited to motor vehicles and motor vehicle equipment (also known as the automotive industry). The primary focus within SIC 371 are numbers 3711 - motor vehicles and passenger car bodies, 3713 - truck and bus bodies, and 3714 - motor vehicle parts and accessories.

Industry groups not covered by this profile include: SIC 372 - Aircraft and Parts; 373 - Ship and Boat Building and Repairing; 374 - Railroad Equipment; 375 - Motorcycles, Bicycles, and Parts; 376 - Guided Missiles and Space Vehicles and Parts; and 379 - Miscellaneous Transportation Equipment. The following automotive products are also not covered in this profile: diesel engines, tires, automobile stampings, vehicular lighting equipment, carburetors, pistons, ignition systems, and cabs for off-highway construction trucks.

II.B. Characterization of Motor Vehicle and Motor Vehicle Equipment Industry

The U.S. motor vehicle and motor vehicle equipment industry is a diverse and technically dynamic industry which plays a vital role in the U.S. economy. The massive size of the automotive industry and the diverse nature of parts required to produce a car requires the support of many other major U.S. industries such as the plastics and rubber industry and the electronic components industry.

Facilities involved with the manufacturing of automobiles are located across the U.S. and are organized based on the types of products produced. Businesses involved in the manufacturing of these products range from the large “Big Three” automakers, General Motors Corporation (GM), Ford Motor Company., and Chrysler Corporation, to smaller, independent automotive parts suppliers such as Dana Corporation, Allied Signal, and Borg Warner. Other facilities involved in the manufacture of automobiles include Toyota, Honda, Nissan, Subaru, Isuzu, Auto Alliance, BMW, and Mitsubishi.

II.B.1. Industry Size and Geographic Distribution

The motor vehicle and motor vehicle equipment industry is a key component in the U.S. economy, accounting for a substantial percentage of direct and indirect employment as well as overall industrial output. The vast size and scope of the industry is best understood by examining the quantity and distribution of automotive facilities located around the U.S and the number of individuals employed by these facilities.

The U.S. Industrial Outlook 1994 states that an estimated 6.7 million persons were employed directly and in allied automotive industries in 1991. According to the Department of Commerce’s *U.S. Global Trade Outlook, 1995-2000*, in 1992 the total direct employment for SIC 3711, industries manufacturing just motor vehicles and passenger car bodies alone, was 314,000. This figure is down from a peak high in 1985 of 408,000. The U.S. Bureau of Labor Statistics estimates that an additional six percent employment loss will occur by 2005 in the motor vehicles manufacturing industry. This loss in jobs will most likely result from a decrease in the number of individuals needed to manufacture a car.

Most individuals employed by the motor vehicle and motor vehicle equipment industry work at facilities employing between 20 and 49 individuals (See Exhibit 1). These facilities, as well as the larger and smaller operations, are located throughout the United States. The vast majority of production is concentrated in the Great Lakes Region. According to 1991 data in the *AAMA Motor Vehicle Facts and Figures ‘94*, the Great Lakes Region contains over 1,700 motor vehicle and equipment manufacturers. This figure represents 39 percent of the 4,467 facilities in the United States. California, Missouri, and Texas also post a large number of automotive industries. The number of establishments manufacturing motor vehicles and motor vehicle equipment increased for all size facilities from 1982 to 1987. The value of shipments also increased during the same five year period.

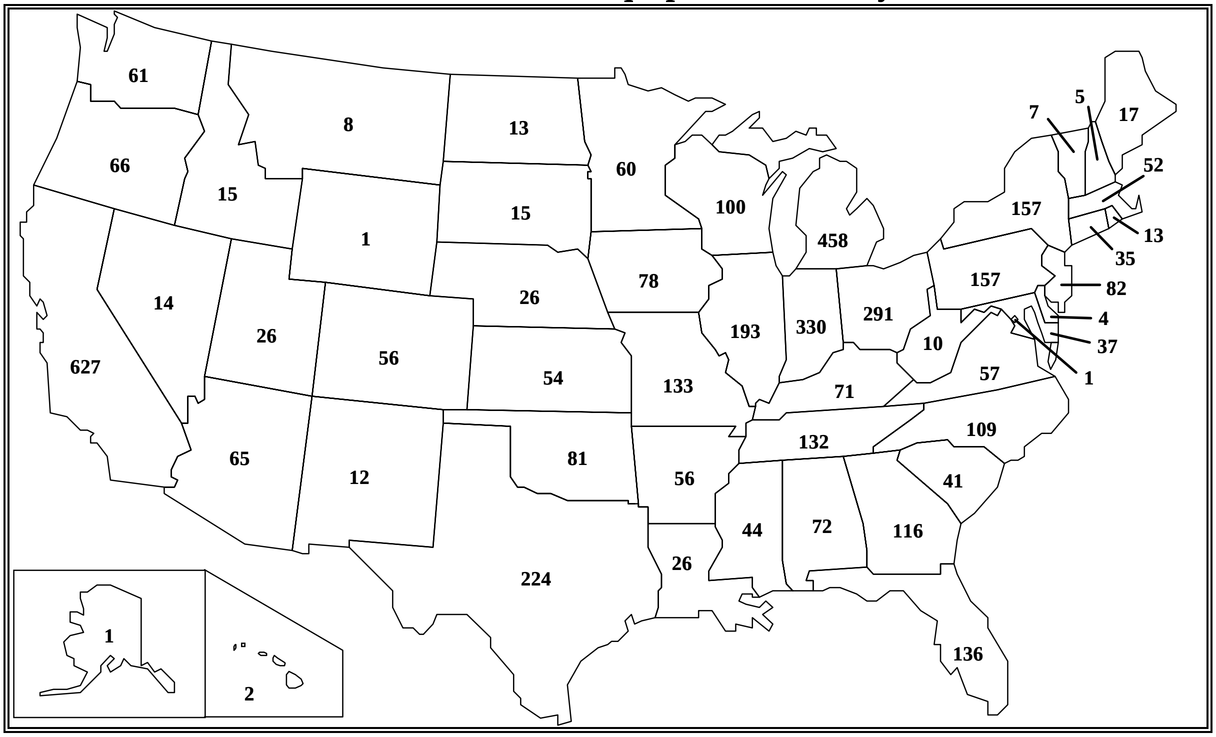
Exhibit 1
Size Distribution of Motor Vehicle and Motor Vehicle Equipment Manufacturing Establishments

	1982		1987	
Number of Employees	**Number of Establishments**	**Value of Shipments (millions of dollars)**	**Number of Establishments**	**Value of Shipments (millions of dollars)**
1-4	851	127.5	918	197.7
5-9	502	246.5	549	407.3
10-19	562	567.5	647	895.9
20-49	579	1,306.9	650	2,132.4
50-99	320	1,897.5	382	2,919.8
100-249	295	4,062.0	362	6,761.1
250-499	148	4,739.9	202	9,475.3
•500	218	96,580.0	226	177,151.5
Totals	**3,475**	**128,057.4**	**3,936**	**199,941.0**

Source: Census of Manufacturers: 1982, 1987, Bureau of the Census, U.S. Department of Commerce.

States in the Great Lakes Region are home to the majority of automotive assembly plants. As International companies have moved facilities to the U.S., additional States, including Tennessee, California, and Kentucky have become the site of automotive plants. The geographic distribution of manufacturing plants will further increase with the completion of a BMW plant in Spartansburg, SC in 1995 and start of production at the Mercedes Benz plant in January 1997 in Tuscaloosa, AL. Exhibit 2 shows the geographic distribution of industries listed under SIC 37 producing motor vehicles and motor vehicle equipment.

Exhibit 2
Geographic Distribution of the Motor Vehicles and Motor Vehicle Equipment Industry



Source: AAMA Motor Vehicle Facts & Figures '94, compiled from 1991 U.S. Department of Commerce, Bureau of the Census data.

Motor Vehicle Equipment

In 1992, the largest number of automotive parts producers, including approximately 450 relatively small aftermarket part manufacturers, were located in California, while approximately 315 original equipment parts manufacturers were located in Michigan. Indiana and Ohio were the sites of 228 and 205 equipment parts manufacturers respectively. In order to minimize transportation costs and maximize responsiveness to automakers, producers of original equipment parts are located in close proximity to auto assembly facilities; most are located in Michigan, Indiana, Illinois, and Ohio. Conversely, aftermarket suppliers have little incentive to locate near automotive plants and are thus located across the country. A concentration of aftermarket suppliers are located in California, Texas, and Florida.

The U.S. automotive industry is the largest manufacturing industry in North America, accounting for approximately four percent of the gross national product (GNP). The U.S. automotive industry contains the number one and two manufacturers of automobiles in the world, GM and Ford (see Exhibit 3). According to 1993 data from the American

Automobile Manufacturers Association (AAMA), the U.S. was the third largest producer of cars in the world, behind Europe and Asia respectively, dominating 30.3 percent of the market.

Exhibit 3
Top 10 Motor Vehicle Manufacturers
Ranked by World Production-1994

Manufacturer	Country	Passenger Cars	Commercial Vehicles	Total
General Motors	United States	4,989,938	875,890	6,865,828
Ford	United States	3,685,415	2,058,877	5,744,294
Toyota	Japan	3,649,640	838,251	4,487,891
Volkswagen	Germany	3,119,997	165,699	3,285,696
Nissan	Japan	2,222,985	675,200	2,898,185
PSA	France	2,252,121	185,605	2,437,726
Renault	France	1,929,858	334,473	2,264,331
Chrysler	United States	727,928	1,254,748	1,982,676
Fiat	Italy	1,557,556	242,844	1,800,400
Honda	Japan	1,629,666	132,531	1,762,19

Source: AAMA Motor Vehicle Facts & Figures '94.

II.B.2. Product Characterization

The motor vehicles and motor vehicle equipment industry produces a wide range of diverse products from ambulances and automobiles to the cylinder heads, ball joints, and horns that go in these vehicles. The Bureau of the Census' SIC code categorizes the automotive industry based on the type of products manufactured. The following is a list of the four-digit SIC codes found under Industry Group Number 371:

SIC 3711 - Motor Vehicle and Passenger Car Bodies
SIC 3713 - Truck and Bus Bodies
SIC 3714 - Motor Vehicle Parts and Accessories
SIC 3715 - Truck Trailers - (not covered in this profile)
SIC 3716 - Motor Homes - (not covered in this profile)

The motor vehicle and motor vehicle equipment industry is organized into four primary areas based on the types of product produced. These areas are: (1) passenger cars and light trucks; (2) medium and heavy duty trucks; (3) truck trailers; (4) and automotive parts and accessories. The automotive parts industry is further broken down into two sectors, original equipment suppliers and aftermarket suppliers. Original equipment suppliers provide parts directly to automakers while aftermarket suppliers provide parts exclusively to the replacement parts market. The original equipment market accounts for approximately 80 percent of all motor vehicle parts and accessories consumed in the U.S., with the remaining 20 percent accounted for by the aftermarket.

II.B.3. Economic Trends

Economic Health

Motor Vehicles

According to the Department of Commerce's *U.S. Global Trade Outlook, 1995-2000*, worldwide sales volume of cars, trucks, and buses have grown 1.2 percent annually during the past ten years. Slow growth in the industry can be attributed to the saturation of the market in developed nations. In order to adjust to the long-term changes in demand, the motor vehicle industry is currently undergoing a global reorganization. Within the next ten years, as companies consolidate and restructure, perhaps as few as ten mega-manufacturing alliances will dominate developed markets.

The Big Three suffered global net losses in 1992 of $30 billion, due in large part to competition from foreign manufacturers. These competitive pressures have stimulated the development of a number of cooperative manufacturing and marketing ventures. Examples of such ventures include GM's "Geo," a compact sedan manufactured in a 50-50 joint venture between GM and Toyota, and a sport-utility vehicle produced in a 50-50 joint venture between GM and Suzuki. Another example is the Ford and Auto Alliance Michigan plant, which manufactures the Ford Probe and the Mazda MX-6 in a 50-50 venture between Ford and Mazda.

Production of passenger cars and light trucks increased 13 percent in 1993. Total sales also increased nine percent from 1992. These increases are likely the result of improvements in vehicle design and added features, product quality, and manufacturing technology. One factor dampening sales in the U.S. market is the fact that the general population is keeping their cars longer. Data collected by the AAMA shows that the mean average age of the passenger cars in the U.S. automobile fleet in 1993 was 8.3 years - the highest since 1948. Another factor expected to effect sales is that fewer individuals will be reaching driving age in the next several years. This negative impact could potentially be offset by the baby boom's entry into their peak earning years, a time when they can afford more expensive cars.

Future growth in the passenger car and light truck sector of the automotive industry is expected to be no more than one to two percent in the coming years. In response to an essentially saturated U.S. market for new passenger cars and light trucks, competition among foreign and U.S. manufacturers is growing. As a result of this competition, many companies have gone out of business, while others have become more competitive and increased their market share, often by investing in new or renovated facilities. In 1993, motor vehicle and equipment manufacturers spent approximately $12 billion on new plant facilities and equipment (AAMA, 1995), and AAMA estimates that motor vehicle and equipment manufactures spent an additional estimated $15.7 billion in 1994. Another benefit of the increased competition has been a reduction of operating expenses as manufacturers have made strides in improving technology and increasing productivity while reducing overhead.

In 1992, 28 percent of all vehicle miles traveled in the U.S. can be attributed to commercial truck use (AAMA Facts and Figures, 1994). In fact, the U.S. truck market tends to be a magnification of the U.S. economy's business cycle (outside of normal replacement cycles). U.S. sales of medium-and heavy-duty trucks (14,050 gross vehicle weight rating (GVWR) and greater), grew 16 percent between 1993 and 1994, an increase of approximately 50,000 units. Sales for the industry through the first five months of 1995 were 167,000 units, a 22 percent increase over the same period in 1994. New safety regulations outlined by the National Highway Traffic Safety Administration (NHTSA) will impact the truck and trailer industry. Safety performance standards for new anti-lock brake systems are expected to be complete by October 1995. Regulations for automatically adjustable brakes went into effect in October 1993 for hydraulic brakes and for air brakes in October 1994. Regulations proposed by NHTSA for under-ride guards are in the early stages of the regulatory development process. Once in place, these new regulations should reduce the number of fatalities that are attributed to rear-end collisions involving straight body trucks and truck trailers.

Motor Vehicle Equipment

According to the Department of Commerce's *U.S. Global Trade Outlook, 1995-2000*, the U.S. automotive parts industry is emerging from a massive restructuring that has enabled it to greatly strengthen its competitive position in relation to Japan, its major rival. Since 1987, productivity has increased about three percent annually and quality has improved greatly. The global automotive parts market will total about $460 billion in 1995 and an estimated $519 billion in 2000.

In 1992, the U.S. International Trade Commission estimated that there were approximately 5,000 U.S. parts and accessories manufacturers. These manufacturers are estimated to produce 22 percent, or $65 billion, of world production of certain motor vehicle parts. The U.S. is the third largest producer of automotive parts, behind Japan at 35 percent and the European Union at 23 percent of worldwide production. A reduction in passenger car production and an increase in the use of foreign-produced parts has resulted in a decline in shipments of U.S. parts, from $68 billion in 1988 to $65 billion in 1992. The drop in production has resulted in a decline of sales and employment. In 1988, 453,000 were employed in the motor vehicle equipment industry. Employment dropped to a low of 407,000 in 1991 before increasing to 437,000 in 1992.

The industry is currently undergoing a significant restructuring. Factors influencing this restructuring include: increased competition from Japan, new and innovative organizational systems, and the passage of the North American Free Trade Agreement (NAFTA). U.S. automakers and parts producers are trying to produce higher-quality motor vehicles and parts in a more cost effective manner. To accomplish this goal, lean and/or agile production techniques are being implemented. These techniques, which ultimately use less of everything in the production process, also limit the number of direct suppliers of components.

Original equipment suppliers have been subject to changes in supplier relations with the Big Three automakers over the past few years. Between 1988 and 1991, taking advantage of new manufacturing technologies, the Big Three gradually reduced the number of suppliers needed. Chrysler, for example, ordered parts from more than 3,000 suppliers in the 1970s, but by 1993 reduced the number of suppliers to between 600 and 800 per model line. As a result of this change in supplier relationships, original equipment manufacturers have altered their role in the industry by providing automakers with services such as financing for research and development, inventory, logistics, and tooling.

Economic uncertainties caused consumers to defer scheduled maintenance and servicing of their cars between 1988 and 1992. This resulted in a leveling off of aftermarket parts sales during the same years. Industry sources claim that better designed and engineered original equipment parts, such as longer lasting shock absorbers, also contributed to the flat market. New diagnostic technologies which identify possible faulty parts and reduce the need for preventative maintenance also played a role. The market is predicted to see a turn-around based on the Clean Air Act Amendments of 1990 and stricter emissions standards, which is anticipated to result in more used car repairs and an increase in replacement parts.

Future Economic Outlook

Estimates of third-quarter earnings for 1994 show that earnings of U.S. automakers will likely triple from the previous year. This boom in business comes despite plant closures that are traditional during the third quarter due to employee vacations and production changeovers for new fall models. AAMA estimates that the Big Three earned $2.3 billion during the period, compared to $773 million during third-quarter 1993. AAMA indicates that sales and earnings may be dropping in 1995.

According to AAMA, growth has continued through the first quarter of 1995, compared to the same period in 1994, with a combined earnings for the Big Three of about $4.3 billion. Financial strength over the last few quarters has been due, in part, to plants operating at high capacity, and to new models being sold without discounts. The weak dollar and strong Japanese yen also have played a role. Predictions for continued growth of that magnitude through the remainder of 1995, however, are less certain.

In the past 25 years, a growing number of foreign automobile manufacturers have started doing business in the U.S., and they now play an important role in the U.S. economy. Since the mid-1980s, seven large foreign automobile manufacturing plants have been constructed, representing an investment of over $11 billion (See Exhibit 4). According to AIAM, factories which produce automobile brands such as Honda, Isuzu, Mazda, Mitsubishi, Nissan, Subaru, and Toyota, provide approximately 36,000 manufacturing jobs in the U.S.; with over 216,000 jobs in the automotive supply industries. These plants have proven to be extremely efficient, with output increasing 90 percent since 1988. In 1992 alone, 1,787,500 passenger cars were produced in new U.S. factories by international companies, a figure second only to GM's output. One out of every four passenger cars produced in the U.S. today is the product of a foreign manufacturer.

Exhibit 4
Distribution of Automotive Assembly Plants - 1992

State	Number of Big Three Plants	Number of Foreign-Owned Plants
Michigan	16	1
Ohio	2	2
Kentucky	2	1
Illinois	2	1
Tennessee	1	1
Indiana	1	1
California	U.S. Foreign Joint Ventures 1	

Source: Ward's Automotive Reports, Automotive News Market Data Book.

The recent passage of the NAFTA should prove beneficial to the auto industry as goods and services will be able to flow more freely between the U.S. and Mexico and Canada. Although Mexico has been a strong market for U.S. automotive and heavy-duty aftermarket components in the past, exports to Mexico have been limited by quotas and other trade restrictions. The passage of NAFTA and the elimination of past barriers to truck imports should also prove beneficial to medium- and heavy-duty trucks manufacturers, and Mexico could prove to be one of the fastest growing truck markets of this decade.

Another recent development that should facilitate further trade between the U.S. and Mexico was the creation of the Pan American Automotive Components Exposition (PAACE). PAACE, which had its first meeting in July 1994, is sponsored by 12 North American associations. The purpose of the exposition is to bring an international show to the Mexican marketplace as well as establish PAACE as the dominant show for automotive and heavy duty equipment in the future. Plans are currently underway for PAACE 1995.

III. INDUSTRIAL PROCESS DESCRIPTION

This section describes the major industrial processes within the Motor Vehicles and Motor Vehicle Equipment industry, including the materials and equipment used, and the processes employed. The section is designed for those interested in gaining a general understanding of the industry, and for those interested in the inter-relationship between the industrial process and the topics described in subsequent sections of this profile -- pollutant outputs, pollution prevention opportunities, and Federal regulations. This section does not attempt to replicate published engineering information that is available for this industry. Refer to Section IX for a list of reference documents that are available.

This section specifically contains a description of commonly used production processes, associated raw materials, the byproducts produced or released, and the materials either recycled or transferred off-site. This discussion, coupled with schematic drawings of the identified processes, provide a concise description of where wastes may be produced in the process. This section also describes the potential fate (air, water, land) of these waste products.

III.A. Industrial Processes in the Motor Vehicle and Motor Vehicle Equipment Industry

There is no single production process for Industry Group Number 371. Instead, numerous processes are employed to manufacture motor vehicles and motor vehicle equipment. This section will focus on the significant production processes including those used in the foundry, metal shop, assembly line, and paint shop.

III.A.1. Motor Vehicle Equipment Manufacturing

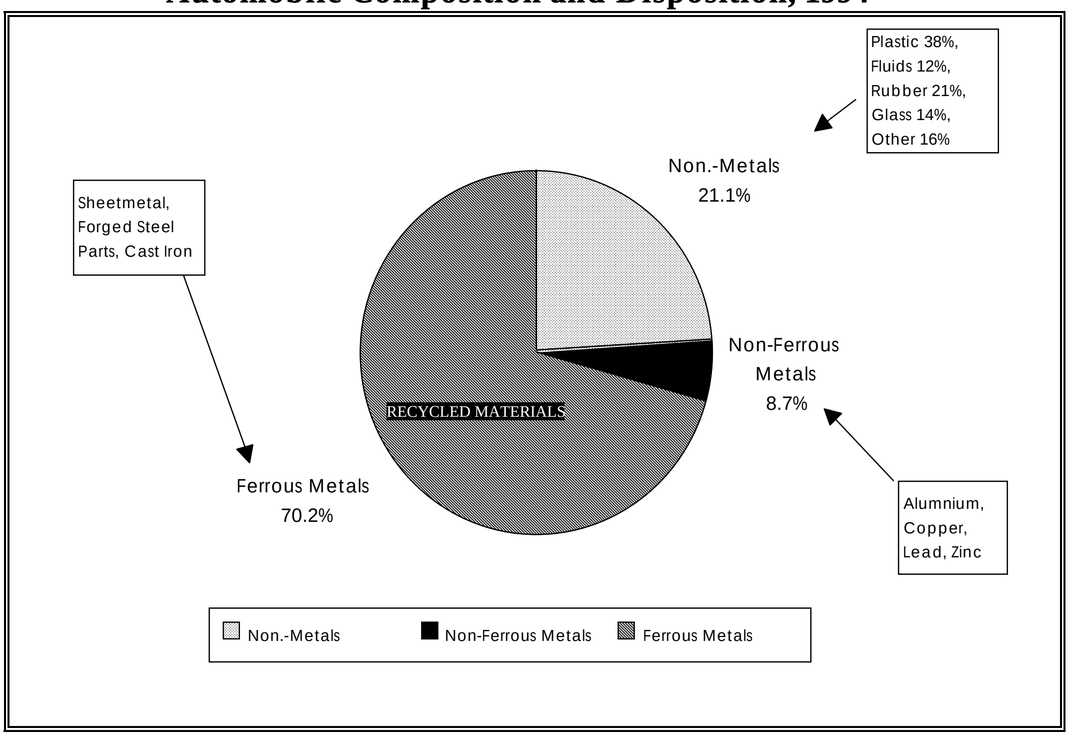
Motor vehicle parts and accessories include both finished and semi-finished components. Approximately 8,000 to 10,000 different parts are ultimately assembled into approximately 100 major motor vehicle components, including suspension systems, transmissions, and radiators. These parts are eventually transported to an automotive manufacturing plant for assembly.

According to a 1993 publication by the University of Michigan Transportation Research Institute entitled “Material Selection Process in the Automotive Industry," material selection plays a vital role in the production process. Materials are ultimately selected based on factors such as performance (strength vs. durability, surface finish, corrosion resistance), cost, component manufacturing, consumer preference, and competitive responses.

In the past, automobiles have been composed primarily of iron and steel. Steel has remained a major automotive component because of its structural integrity and ability to maintain dimensional geometry throughout the manufacturing process (See Exhibit 5).

In response to increasing demands for more fuel efficient cars, the past ten years have seen changes in the composition of materials used in automobiles (See Exhibit 6). Iron and steel use has steadily decreased, while plastics and aluminum has steadily increased. Aluminum and plastics are valuable car components not only for their lighter weight, but also because of their inherent corrosion resistance. Although the use of plastics in the automotive industry is increasing, expansion in this area is finite because of limitations in current plastics materials.

Exhibit 5
Automobile Composition and Disposition, 1994



Source: Automotive Industries, 1992 - from AAMA Motor Vehicle Facts and Figures '94.

Exhibit 6
Automotive Material Usage 1984 to 1994 Model Year
(in pounds)*

Material	1994	1992	1990	1988	1986	1984
Conventional Steel	1,388.5	1,379.0	1,246.5	1,337.0	1,446.0	1,487.5
High Strength Steel	263.0	247.0	233.0	227.5	221.0	214.0
Stainless Steel	45.0	41.5	31.5	31.0	30.0	29.0
Other Steels	42.5	42.0	53.0	46.5	47.0	45.0
Iron	408.0	429.5	398.0	426.5	446.5	454.5
Aluminum	182.0	173.5	158.5	150.0	141.5	137.0
Rubber	134.0	133.0	128.0	130.0	131.5	133.5
Plastics/Composites	245.5	243.0	222.0	219.5	216.0	206.5
Glass	89.0	88.0	82.5	86.0	86.5	87.0
Copper and Brass	42.0	45.0	46.0	49.5	43.0	44.0
Zinc Die Castings	16.0	16.0	19.0	19.5	17.0	17.0
Powder Metal Parts	27.0	25.0	23.0	21.5	20.0	18.5
Fluids and Lubricants	189.5	177.0	167.0	176.5	182.5	180.0
Other Materials	99.0	96.0	88.0	89.0	89.5	88.0
TOTAL	**3,171.0**	**3,135.5**	**2,896.0**	**3,010.0**	**3,118.0**	**3,141.5**

Source: "Material Usage, Vehicles Retired From Use and Vehicle Recycling" - from AAMA Motor Vehicle Facts & Figures '94.

* Represents consumption per passenger car unit built in the U.S., rounded to the nearest tenth of a pound.

The manufacturing processes used to produce the thousands of discrete parts and accessories vary depending on the end product and materials used. Different process are employed for the production of metal components versus the production of plastic components. Most processes, however, typically include casting, forging, molding, extrusion, stamping, and welding. Exhibit 7 lists major automotive parts and the primary materials and production processes used to manufacture them.

III.A.1.a. *Foundry Operations*

Foundries, whether they are integrated with automotive assembly facilities or independent shops, cast metal products which play a key role in the production of motor vehicles and motor vehicle equipment. As discussed previously, even though aluminum and other metals are used increasingly in the production of automobiles and their parts, iron and steel are still the major metal components of an automobile. Because of this, the following discussion will focus on iron foundries and the typical production processes.

The main steps in producing cast iron motor vehicle products are as follows (see Exhibit 8):

- Pattern design and production

- Sand formulation
- Mold and core production
- Metal heating and alloying
- Metal molding
- Mold shakeout
- Product finishing and heat treating
- Inspection.

The process begins with the mixing of moist silica sand with clay (3 to 20 percent) and water (two to five percent) to produce the "green sand," which forms the basis of the mold. Other additives, including organics such as seacoal or oat hulls, may be added to the green sand to help prevent casting defects. The core is then created using molded sand and often includes binders, such as resins, phenol, and/or formaldehyde. The core is the internal section of a casting used to produce the open areas needed inside such items as an engine or a drive train. After the core has been molded, it is baked to ensure its shape, and then combined with the rest of the casting mold in preparation for casting. At the same time the core is being created, iron is being melted. The iron charge, whether it be scrap or new iron, is combined with coal (as a fuel) and other additives such a calcium carbide and magnesium, and fed into a furnace, which removes sulfur, (usually an electric arc, an electric induction, or a cupola furnace).

Calcium carbide may be added for certain kinds of iron casting, and magnesium is added to produce a more ductile iron. Once the iron reaches the appropriate temperature, it is poured into the prepared mold. The mold then proceeds through the cooling tunnel and is placed on a grid to undergo a process called "shakeout. " During shakeout the grid vibrates, shaking loose the mold and core sand from the casting. The mold and core are then separated from the product which is ready for finishing.

The finishing process is made up of many different steps depending upon the final product. The surface may be smoothed using an oxygen torch to remove any metal snags or chips, it may be blast-cleaned to remove any remaining sand, or it may be pickled using acids to achieve the correct surface. If necessary, the item may be welded to ensure the tightness of any seams or seals. After finishing, the item undergoes a final heat treatment to ensure it has the proper metallurgical properties. The item is then ready for inspection. Inspection may take place in any number of ways be it visually, by x- or gamma ray, ultrasonic, or magnetic particle. Once an item passes inspection, it is ready to be shipped to the assembly area.

Exhibit 7
Identification of Major Automobile Parts by Material and Process

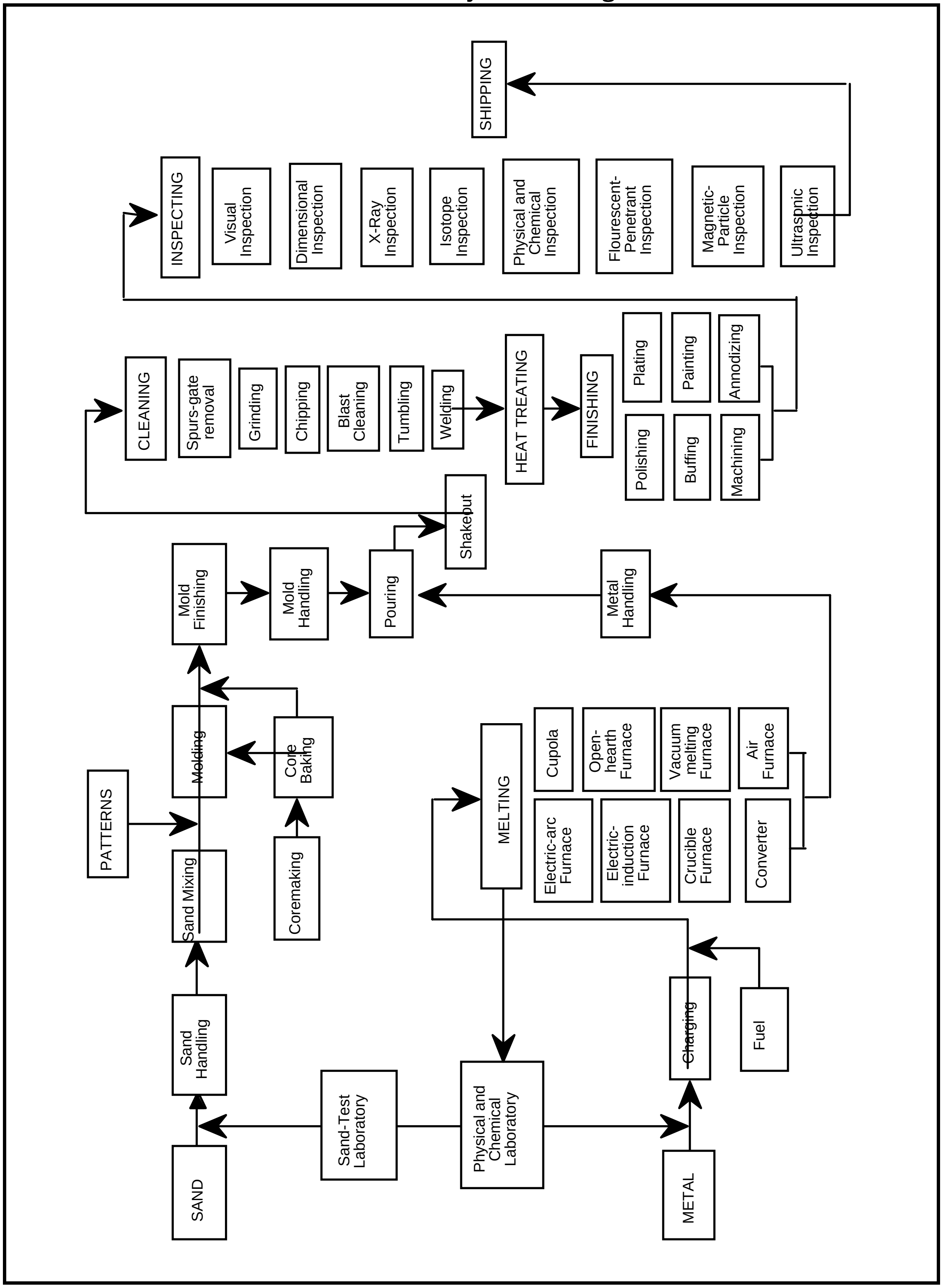
Automotive Part	Primary Materials	Primary Process
ENGINE		
Block	Iron Aluminum	Casting
Cylinder Head	Iron Aluminum	Casting Machining
Intake Manifold	Plastic Aluminum	Casting Molding Machining
Connecting Rods	Powder Metal Steel	Molding Forging Machining
Pistons	Aluminum	Forging Machining
Camshaft	Iron Steel Powder Metal	Molding Forging Machining
Valves	Steel Magnesium	Stamping Machining
Exhaust Systems	Stainless Steel Aluminum Iron	Extruding Stamping
TRANSAXLE		
Transmission Case	Aluminum Magnesium	Casting Machining
Gear Sets	Steel	Blanking Machining
Torque Converter	Magnesium Steel	Stamping Casting
CV Joint Assemblies	Steel Rubber	Casting Forging Extruding Stamping
BODY STRUCTURE		
Body Panels	Steel Plastic Aluminum	Stamping Molding
Bumper Assemblies	Steel Plastic Aluminum	Stamping Molding

Exhibit 7 (cont'd)
Identification of Major Automobile Parts by Material and Process

Automotive Part	Primary Materials	Primary Process
CHASSIS/SUSPENSION		
Steering Gear/Column	Steel Magnesium Aluminum	Casting Stamping Forging Machining
Rear Axle Assembly	Steel Plastic	Stamping Molding
Front Suspension	Steel Aluminum	Stamping Forging
Wheels	Steel Aluminum	Stamping Forging
Brakes	Steel Friction Materials	Stamping Forging
SEATS/TRIM		
Seats	Steel Fabric Foam	Molding Stamping
Instrument Panel	Steel Fabric Foam	Molding Stamping
Headliner/Carpeting	Synthetic Fiber	Molding
Exterior Trim	Plastic Aluminum Zinc Die Casting	Molding Casting Stamping
HVAC SYSTEM		
A/C Compressor	Aluminum Steel Plastic	Casting Molding Stamping
Radiator/Heater Core	Copper Aluminum Plastic	Extruding Molding
Engine Fan	Plastic Steel	Stamping Molding

Source: University of Michigan Transportation Research Institute, "Material Selection in the Automotive Industry," 1993.

Exhibit 8
General Foundry Flow Diagram



Source: American Foundrymen's Society Inc.

III.A.1.b. *Metal Fabricating*

Another major process in the manufacturing of automotive parts is metal fabrication. Metal fabrication involves the shaping of metal components. Many automotive parts, including fenders, hubcaps, and body parts are manufactured in metal fabricating shops. A typical large-scale production of these items starts with molten metal (ferrous or nonferrous) containing the correct metallurgical properties. Once the metal has been produced, it is cast into a shape that can enter the rolling process. Shearing and forming operations are then performed to cut materials into a desired shape and size and bend or form materials into specified shapes.

Shearing (or cutting) operations include punching, piercing, blanking, cutoff, parting, shearing, and trimming. Basically, these are operations that produce holes or openings, or that produce blanks or parts. The most common hole-making operation is punching. Piercing is similar to punching, but produces a raised-edge hole rather than a cut hole. Cutoff, parting, and shearing are similar operations with different applications: parting produces both a part and scrap pieces; cutoff and shearing produce parts with no scrap; shearing is used where the cut edge is straight; and cutoff produces an edge shape other than straight. Trimming is performed to shape or remove excess material from the edges of parts.

Forming operations shape parts by forcing them into a specified configuration, and include bending, forming, extruding, drawing, rolling, spinning, coining, and forging. Bending is the simplest forming operation; the part is simply bent to a specific angle or shape. Bending operations normally produce flat-shapes, while forming produces both two- and three-dimensional shapes.

Extruding is the process of forming a specific shape from a solid blank by forcing the blank through a die of the desired shape. Complicated and intricate cross-sectional shapes can be produced by extruding. Rolling is a process that passes the material through a set or series of rollers that bend and form the part into the desired shape. Coining is a process that alters the form of the part by changing its thickness; it produces a three-dimensional relief on one or both sides of the part, as found on coins.

Drawing and spinning form sheet stock into three-dimensional shapes. Drawing uses a punch to force the sheet stock into a die, where the desired part shape is formed in the space between the punch and die. In spinning, pressure is applied to the sheet while it spins on a rotating form so that the sheet acquires the shape of the form.

Forging operations produce a specific part shape, much like casting. The forging process is used in the automotive industry when manufacturing parts such as pistons, connecting rods, and the aluminum and steel portion of the wheels. However, rather than using molten materials, forging uses externally applied pressure that either strikes or squeezes a heated blank into a die of the required shape. Forging operations use machines that apply repeated hammer blows to a red-hot blank to force the material to conform to the shape of the die opening. Squeezing acts in much the same way, except it uses pressure to squeeze rather than strike the blank. Forging uses a series of die cavities to change the shape of the blank in increments. The blank is moved from station to station in the die to form the part. Depending on the shape, a forging die can have from one to over a dozen individual cavities.

Once shearing and forming activities are complete, the material is machined. This entails shaping or forming a workpiece by removing material from pieces of raw stock with machine tools. The principal processes involved in machining are hole-making, milling, turning, shaping/planing, broaching, sawing, and grinding.

III.A.1.c. *Metal Finishing/Electroplating*

Numerous methods are used to finish metal products. However, prior to applying the finishing application, the surface must be prepared. One of the most important aspects of a finished product is the surface cleanliness and quality. Without a properly cleaned surface, even the most expensive coatings will fail to adhere or prevent corrosion.

Pickling and salt bath processes are used to finish steel products by chemically removing oxides and scale from the surface of the steel. Most carbon steel is pickled with sulfuric or hydrochloric acid, while stainless steel is pickled with hydrochloric, nitric, and hydrofluoric acids. Steel generally passes from the pickling bath through a series of rinses. Alkaline cleansers are used to remove mineral oils and animal fats and oils from the steel surface. Common alkaline cleaning agents include: caustic soda, soda ash, alkaline silicates, and phosphates. Electrolytic cleaning as well as various abrasive methods, such as sand blasting, are also commonly used to remove surface oxides.

Steel products are often coated to inhibit oxidation and extend the life of the product. Coated products can also be painted to further inhibit corrosion. Common coating processes include galvanizing, tin coating, chromium coating, and terne coating (lead and tin). An example of a coated automotive part is the radiator, which is usually spray painted with a chromium coat to prevent corrosion; some water based coats are now being utilized. Rinse water from the coating process may contain zinc, lead, cadmium, or chromium.

Metal finishing and electroplating activities are performed on a number of metals and serve a variety of purposes; the primary purpose being protection against corrosion. This is particularly important to the automotive industry because of the harsh weather and road conditions to which automobiles may be subject. Metal finishing and electroplating can also be performed for decorative purposes. These plating processes involve immersing the article to be coated/plated into a bath consisting of acids, bases, salts, etc.

The metals used in electroplating operations (both common and precious metal plating) include cadmium, lead, chromium, copper, nickel, zinc, gold, and silver. Cyanides are also used extensively in electroplating solutions and in some stripping and cleaning solutions.

Electroless plating is the chemical deposition of a metal coating onto a metal object, by immersion of the object in an appropriate plating solution. In electroless nickel plating, the source of nickel is a salt, and a reducer is used to reduce the nickel to its base state. A complexing agent is used to hold the metal ion in the solution. Immersion plating produces a metal deposit by chemical displacement. Immersion plating baths are usually formulations of metal salts, alkalies, and complexing agents (typically cyanide or ammonia).

Etching is the process used to produce specific design configurations or surface appearances on parts by controlled dissolution with chemical reagents or etchants. Etching solutions are commonly made up of strong acids or bases with spent etchants containing high concentrations of spent metal. The solutions include ferric chloride, nitric acid, ammonium persulfate, chromic acid, cupric chloride, and hydrochloric acid.

Anodizing uses the piece to be coated, generally with an aluminum surface, as an anode in an electrolytic cell. Anodizing provides aluminum parts with a hard abrasion- and corrosion-resistant film. This coating is porous, allowing it to be dyed or to absorb lubricants. This method is used both in decorative applications, including automotive trim and bumper systems, and in engineering applications such as aircraft landing gear struts. Anodizing is usually performed using either sulfuric or chromic acid often followed by a hot water bath, though nickel acetate or sodium potassium dichromate seal may also be used.

III.A.2. Motor Vehicle Assembly

Once the various automotive parts are produced, they are ready to be brought together for assembly. Automotive assembly is a complex process that involves many different steps. Assembly begins with parts which arrive in the assembly plant "just-in-time." "Just-in-time" is a concept that means parts arrive only when they are needed for assembly; only enough product is sent for a given day's work. This concept, which revolutionized the automotive industry, has improved productivity, lowered costs, and provided for better quality management.

Although techniques used to assemble an automobile vary from manufacturer to manufacturer, the first major step in assembly is the body shop. At this stage the car begins to take shape as sides are welded together and then attached to the underbody of the car. The underbody is composed of three primary pieces of galvanized steel which include the floor pan and components for the engine and trunk. After the underbody has been welded together by robotics, it is tested for dimensional and structural accuracy. It is then joined together in a tab-slot fashion with the side frame and various other side-assemblies. A worker then taps tabs into slots, and a robot clamps the tabs. Roof supports and the roof are now ready for installation. The car is now ready for final welding. Approximately 3,500-4,000 spots require welding. Most welding is done by robots, with workers doing only spot jobs. Trunk lids and hoods will then be installed.

III.A.3. Motor Vehicle Painting/Finishing

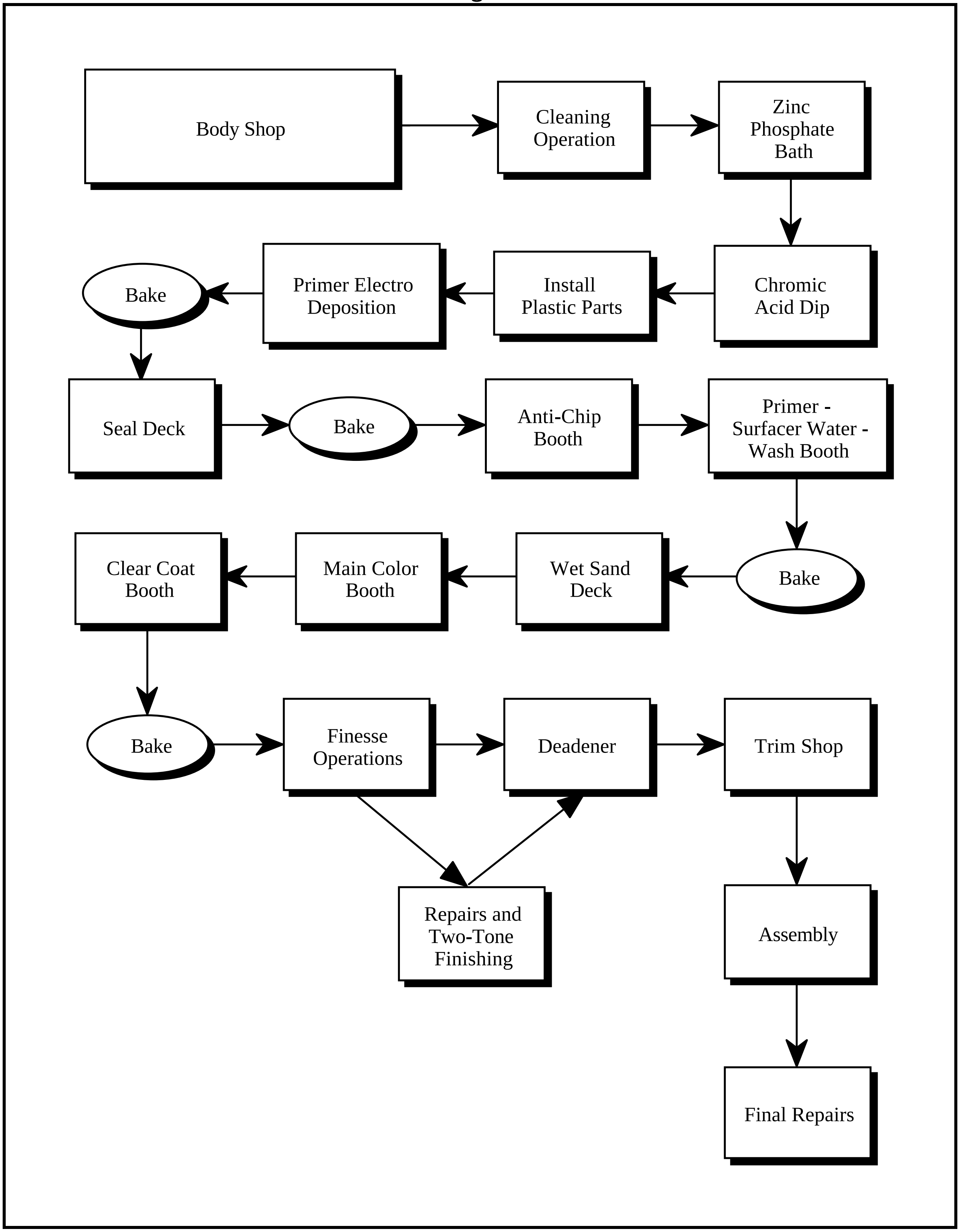
Automotive finishing is a multi-step process subdivided into four categories: 1) anti-corrosion operations, consisting of cleaning applications, a phosphate bath, and a chromic acid bath; 2) priming operations, consisting of a electrodeposition primer bath, an anti-chip application, and a primer-surfacer application; 3) joint sealant application; and 4) finishing operations, consisting of a color coat application, a clear coat application, and any painting necessary for two-tone color or touch-up applications. The stages of the automotive finishing process are illustrated in Exhibit 9.

After the automobile body has been assembled, anti-corrosion operations prepare the body for the painting/finishing process. Initially, the body is sprayed with and immersed in a cleaning agent, typically consisting of detergents, to remove residual oils and dirt. The body is then dipped into a phosphate bath, typically zinc phosphate, to prevent corrosion. The phosphate process also improves the adhesion of the primer to the metal. The body is then rinsed with chromic acid, further enhancing the anti-corrosion properties of the zinc phosphate coating. The anti-corrosion operations conclude with another series of rinsing steps.

Priming operations further prepare the body for finishing by applying various layers of coatings designed to protect the metal surface from corrosion and assure good adhesion of subsequent coatings. Prior to the application of these primer coats, however, plastic parts to be painted and finished with the body are installed.

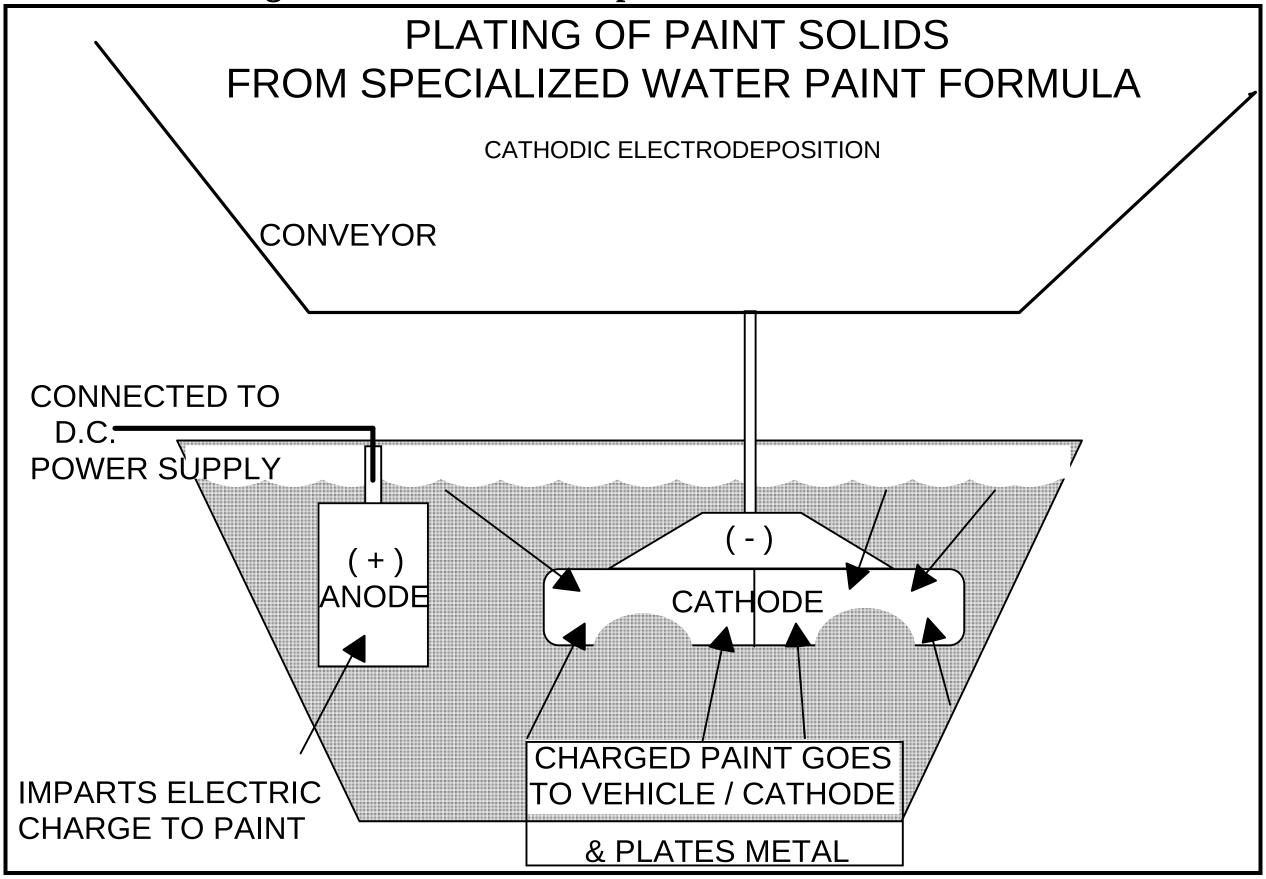
As illustrated in Exhibit 10, a primer coating is applied to the body using an electrodeposition method, creating a strong bond between the coating and the body to provide a more durable coating. In electrodeposition, a negatively-charged auto body is immersed in a positively-charged 60,000 to 80,000 gallon bath of primer for approximately three minutes. The coating particles, insoluble in the liquid and positively-charged, migrate toward the body and are, in effect, "plated" onto the body surface.

Exhibit 9
Car Painting Process



Source: American Automobile Manufacturers Association.

Exhibit 10
Plating of Paint Solids from Specialized Water Paint Formula



Source: American Automobile Manufacturers Association.

Although the primer bath is mostly water-based with only small amounts of organic solvent (less than five to ten percent), fugitive emissions consisting of volatile organic compounds (VOCs) can occur. However, the amount of these emissions is quite small. In addition to solvents and pigments, the electrodeposition bath contains lead, although the amount of lead used has been decreasing over the years.

Prior to baking, excess primer is removed through several rinsing stages. The rinsing operations use various systems to recover excess electrodeposited primer. Once the body is thoroughly rinsed, it is baked for approximately 20 minutes at 350 to 380 degrees Fahrenheit. VOC emissions resulting from the baking stage are incinerated at approximately 90 percent of automotive and automotive parts facilities.

Next, the body is further water-proofed by sealing spot-welded joints of the body. Water-proofing is accomplished through the application of a paste or putty-like substance. This sealant usually consists of polyvinyl chloride and small amounts of solvents. The body is again baked to ensure that the sealant adheres thoroughly to the spot-welded areas.

After water-proofing, the automobile body proceeds to the anti-chip booth. Here, a substance usually consisting of a urethane or an epoxy ester resin, in conjunction with solvents, is applied locally to certain areas along the base of the body, such as the rocker panel or the front of the car. This anti-chip substance protects the lower portions of the automobile body from small objects, such as rocks, which can fly up and damage automotive finishes.

The primer-surfacer coating, unlike the initial electrodeposition primer coating, is applied by spray application in a water-wash spray booth. The primer-surfacer consists primarily of pigments, polyester or epoxy ester resins, and solvents. Due to the composition of this coating, the primer-surfacer creates a durable finish which can be sanded. The pigments used in this finish provide additional color layers in case the primary color coating is damaged. The water-wash spray booth is generally 100 to 150 feet long and applies the primer-surfacer in a constant air stream through which the automobile body moves. A continuous stream of air, usually from ceiling to floor, is used to transport airborne particulates and solvents from primer-surfacer overspray. The air passes through a water curtain which captures a portion of the airborne solvents for reuse or treatment at a waste water facility. Efforts have been made at certain facilities to recycle this air to reduce VOC emissions.

After the primer-surfacer coating is baked, the body is then sanded, if necessary, to remove any dirt or coating flaws. This is accomplished using a dry sanding technique. The primary environmental concern at this stage of the finishing process is the generation of particulate matter.

The next step of the finishing process is the application of the primary color coating. This is accomplished in a manner similar to the application of primer-surfacer. One difference between these two steps is the amount of pigments and solvents used in the application process. VOC emissions from primary color coating operations can be double that released from primer-surfacer operations. In addition to the pigments and solvents, aluminum or mica flakes can be added to the primary color coating to create a finish with unique reflective qualities. Instead of baking, the primary color coat is allowed to "flash off," in other words, the solvent evaporates without the application of heat.

Pigments, used to formulate both primers and paints, are an integral part of the paint formulation, which also contains other substances. The pigmented resin forms a coating on the body surface as the solvent dries. The chemical composition of a pigment varies according to its color, as illustrated in Exhibit 11.

Exhibit 11
Chemical Components of Pigments Found in Paint

Pigment Color	Chemical Components
White	Titanium dioxide, white lead, zinc oxide
Red	Iron oxides, calcium sulfate, cadmium selenide
Orange	Lead chromate-molybdate
Brown	Iron oxides
Yellow	Iron oxides, lead chromate, calcium sulfide
Green	Chromium oxide, copper, phosphotungstic acid, phosphomolybdic acid
Blue	Ferric ferrocyanide, copper
Purple	Manganese phosphate
Black	Black iron oxide
Metallic	Aluminum, bronze, copper, lead, nickel, stainless steel, silver, powdered zinc

Source: McGraw Hill Encyclopedia of Science and Technology, 1987.

After the primary color coating is allowed to air-dry briefly, the final coating, a clear coat, is applied. The clear coat adds luster and durability to the automotive finish. This coating generally consists of a modified acrylic or a urethane and is baked for approximately 30 minutes.

Following the baking of the clear coat, the body is inspected for imperfections in the finish. Operators finesse minor flaws through light sanding and polishing and without any repainting.

Once the clear coat is baked, a coating known as deadener is applied to certain areas of the automobile underbody. Deadener, generally a solvent-based resin of tar-like consistency, is applied to areas such as the inside of wheel wells to reduce noise. In addition, anti-corrosion wax is applied to other areas, such as the inside of doors, to further seal the automobile body and prevent moisture damage. This wax contains aluminum flake pigment and is applied using a spray wand.

After painting and finishing, two types of trim are installed - hard and soft. Hard trim, such as instrument panels, steering columns, weather stripping, and body glass, is installed first. The car body is then passed through a water test where, by using phosphorous and a black light, leaks are identified. Soft trim, including seats, door pads, roof panel insulation, carpeting, and upholstery, is then installed. The only VOC emissions resulting from this stage of the process originate from the use of adhesives to attach items, such as seat covers and carpeting.

Next, the automobile body is fitted with the following: gas tank, catalytic converter, muffler, tail pipe, and bumpers. Concurrently, the engine goes through a process known as "dressing," which consists of installing the transmission, coolant hoses, the alternator, and other components. The engine and tires are then attached to the body, completing the assembly process.

The finished vehicle is then rigorously inspected to ensure that no damage has occurred as a result of the final assembly stages. If there is major damage, the entire body part is replaced. However, if the damage is minor, such as a scratch, paint is taken to the end of the line and applied using a hand-operated spray gun. Because the automobile cannot be baked at temperatures as high as in earlier stages of the finishing process, the paint is catalyzed prior to application to allow for faster drying at lower temperatures. Approximately two percent of all automobiles manufactured require this touch-up work. Because the paint used in this step is applied using a hand-operated spray gun, fugitive air emissions are likely to be generated (depending on system design).

Generally, spray and immersion finishing methods are to a certain extent interchangeable, and the application method for various coatings varies from facility to facility. The same variance applies to the number and order of rinsing steps for cleaning, phosphating, and electrodeposition primer operations. Spray rinsing the body prior to immersion rinsing decreases the amount of residues deposited in the bath and allows for greater solvent recovery.

In addition to the above-mentioned uses of solvents as ingredients of coatings, solvents are often used in facility and equipment cleanup operations. Efforts have been made at several facilities to reduce the amount of solvent used for this purpose, thereby reducing fugitive VOC emissions, and to reuse these solvents when preparing batches of coatings used in certain stages of the finishing process.

The expanded use of alternative coating methods, such as electrostatic powder spray, is being researched. Powder coatings are being used instead of solvent-based coatings for some initial coating steps, such as the anti-chip and the primer-surfacer process.

III.A.4. Emerging Industry Trends

Motor vehicles manufactured today are produced more efficiently, brought to market more quickly, and designed to be more environmentally sensitive than the models of the 1980s. As a result, these vehicles are proving to have less of a negative impact on the environment. Automobile manufacturers are striving to meet new air emission standards, and are developing motor vehicles and motor vehicle equipment that meet the demands of the growing market niche for “green” automobiles. Much of the information for this section was adapted from the 1994 publication entitled “Automotive Demand, Markets, and Material Selection Processes” by David J. Andrea and Brett C. Smith of the University of Michigan.

In order for motor vehicle and motor vehicle equipment manufacturers to remain competitive, it is becoming more important to strike a balance between environmental issues and industrial demands. Approaches such as life cycle assessment (LCA), design for recycling (DFR™), and design for disassembly (DFD) encourage the development of products that are more environmentally acceptable. These approaches are in various stages of implementation in the automotive industry. Evidence of their influence can be seen in some of the initiatives currently underway in the automotive industry, some of which are addressed later in this profile.

III.A.4.a. *Life Cycle Assessment*

LCA is an environmental approach that focuses on the environmental costs associated with each stage of the product life cycle (See Exhibit 12). LCA requires the evaluation of environmental effect at every stage of the cycle. The evaluation focuses on such factors the waste streams generated during material acquisition and manufacturing, as well as energy consumption during processing and distribution. Attempts to implement this structured approach have begun, although full LCAs for automobiles have not yet been achieved due to product complexity.

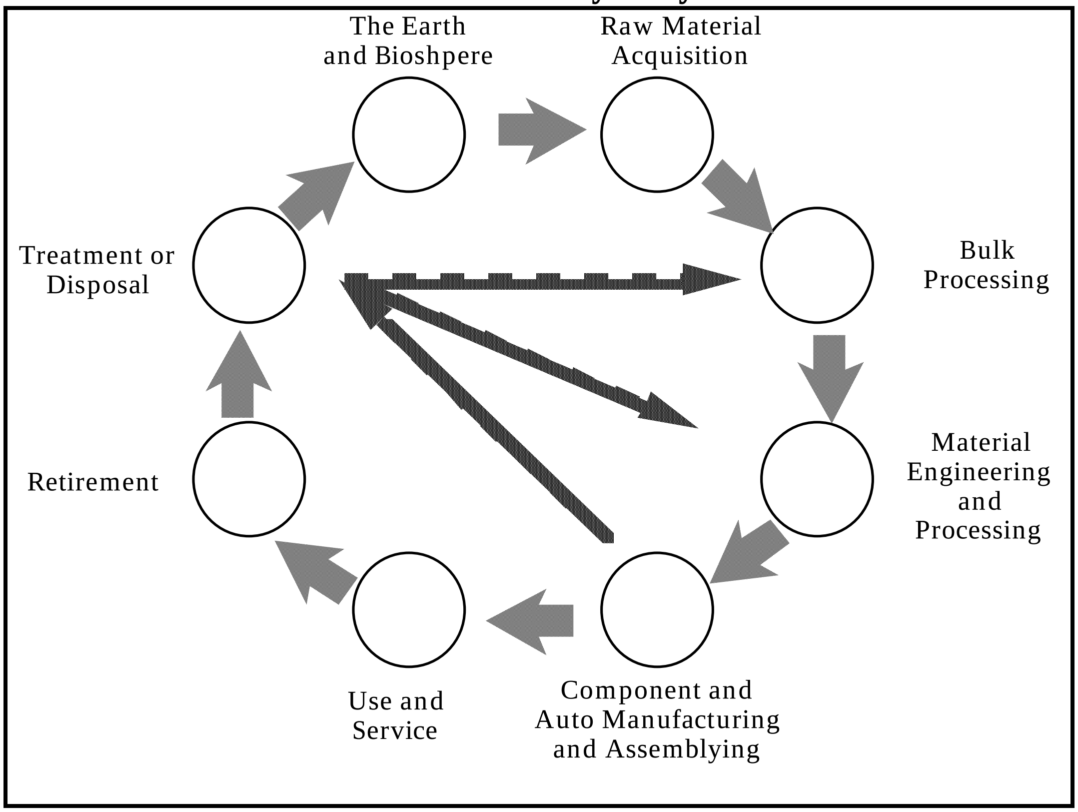
According to General Motors' 1994 Environmental Report, LCA is an important part of the company's commitment to product stewardship. To implement this commitment, GM environmental personnel work closely with vehicle design teams to integrate environmental principles into the earliest possible stages of the product program management process. As part of this process, various statements of work, which specify the health, safety, and facility environmental criteria that must be met before a product can be released to the next development phase, are used to provide a framework for an environmental and health evaluation of GM products. Ford and other automakers are also working to develop LCA technology. LCA promises to be a useful tool and its future applications in the automotive industry should improve overall industry environmental performance.

III.A.4.b. *Recycling*

An important part of LCA is the "retirement" of a given product. Once a product reaches the retirement stage, it becomes eligible for recycling, another environmental trend.

Autos have been recycled for many years in the U.S., and today approximately 94 percent (or approximately 9 million) of all automobiles scrapped in the U.S. are collected and recycled. This effort results in approximately 11 million tons of recycled steel and 800,000 tons of recycled nonferrous metals, and saves an estimated 85 million barrels of oil that would be used to manufacture new parts. The U.S. boasts one of the most effective and prosperous vehicle recycling industries in the world. At least 75 percent of the material collected from scrap vehicles (steel, aluminum, copper) is recycled for raw material use. According to the Automotive Recyclers Association (ARA), the automotive remanufacturing and recycling industry is responsible for approximately five billion dollars in annual sales.

Exhibit 12
The Product Life Cycle System



Source: *Automotive Demand, Markets, and Material Selection Process, Society of Automotive Engineers - Technical Paper Series, International Congress & Exposition, Detroit, Michigan, 1994.*

Three operations are primarily responsible for vehicle recycling - automobile scrappage/disassembly, automobile shredders, and materials recycling. There are an estimated 12,000 automobile scrappage/disassembly operations in the United States. Vehicles taken to these businesses are subject to two major dismantling steps: (1) drainage and removal of hazardous and recyclable fluids (oil, auto coolants, CFCs), and (2) removal of parts from the vehicle, which, if undamaged, are then cleaned, tested, inventoried, and sold, and if damaged, are recycled with similar materials. The remaining hulk is then flattened and taken to a shredder.

There are an estimated 200 shredding operations in North America. These operations use large machines to shred the hulk into fist-sized pieces which are then separated by material types: ferrous, nonferrous, and automotive shredder residue (ASR) or "shredder fluff."

Shredder output is first sorted by magnetic separation to "capture" the ferrous materials, which are then transported to a mill. Nonferrous metals are then hand-sorted from a conveyor belt and sold for use in new products. The remaining material (approximately 25 percent) is sent to landfills. This material is composed primarily of plastics, rubber, glass, dirt, fibers from carpet, seat foam, and undrained fluids. This waste currently constitutes about 1.5 percent of total municipal landfill waste. The amount of waste generated by shredding will be greatly reduced when vehicles are designed using concepts such as DFR and DFD.

III.A.4.c. *Other Initiatives*

Three important trends impacting vehicle development are: the increased use of lighter weight materials such as aluminum, plastic, and the various composites; the use of alternative fuels; and increased use of electric components.

The Federal Corporate Average Fuel Economy (CAFE) Requirements, which mandate average motor-vehicle fuel economy standards for passenger automobiles and light trucks, will push the increased usage of lighter-weight materials by encouraging lower vehicle weight and increased fuel efficiency. Industry experts predict that the use of lighter weight materials will increase 38 percent between 1992 and 2000. A study conducted by the University of Michigan Transportation Research Institute, Office for the Study of Automotive Transportation (OSAT), entitled Delphi VII, states that industry experts expect to see a three percent drop in average weight of a North American produced automobile by 1998 and an eight percent drop by 2003. Light-truck weight is expected to see similar reductions with a five percent decrease by 1998 and a seven percent decrease by 2003.

In order to produce lighter-weight vehicles, new lightweight materials are needed. The use of materials such as aluminum, magnesium, and plastic could potentially increase 15 to 20 percent by 2003. The use of heavier material such as steel and cast iron, which account for the majority of car weight, is expected to fall 9 to 15 percent within the same time frame (See Exhibit 13). Currently, Ford is the largest user of aluminum per vehicle in North America. In 1991, the use of aluminum in Ford vehicles was 15 percent above the industry average. Likewise, Ford researchers and engineers embarked on the "Synthesis 1020" program, which is part of a $25 million effort to determine the feasibility of a high-volume aluminum intensive vehicle (AIV). Under that initiative, Ford built 40 AIV's which now are being fleet-tested. Chrysler is also exploring the use of aluminum in cars and may begin building an aluminum intensive car in 1996, employing 600 to 700 pounds of aluminum per car. The reduction in weight for a midsize vehicle would cut gasoline consumption by one gallon for each 100 miles driven.

Exhibit 13
Material Content Forecast for Passenger Cars

Material Content	Estimated Current Weight 27.5 mpg*	Median Responses**		
		1988	1998	2003
Steel	1709	-1%	-5%	-9%
Cast Iron	430	-5%	-10%	-15%
Aluminum	174	+10%	+15%	+ 20%
Plastics	243	5%	10%	15%
Copper (including electrical)	45	0	0	0
Zinc	37	0	-4%	-4%
Magnesium	7	5%	8%	15%
Glass	88	0	0	0
Ceramics	2	2%	3%	5%
Powdered Metals	25	4%	4%	10%
Rubber				
-Tires (inc. spare)	94	0	0	0
-All other rubber	39	0	0	0

Source: Ward's Automotive Yearbook, 1992 and various OSAT estimates.

* Miles Per Gallon
** Percent change in material content

In order to satisfy the requirements of the CAA by lowering the emission of hydrocarbons, carbon monoxide, and oxides of nitrogen, the use of alternative fuel sources is being explored. Various alternatives are being explored with different levels of success (See Exhibit 14). Oxygenated fuels, fuels that are blended with either alcohol or ethers, are slowly becoming more common in the United States. Oxygenated fuels are beneficial because they reduce emissions of carbon monoxide without requiring vehicle adjustments. This is particularly true in older cars (pre-1981) which do not have systems which maintain a constant air-fuel mixture. At least two States with severe carbon monoxide problems, Colorado and Arizona, have implemented mandatory oxygenated fuel programs in order to meet ambient air quality standards. Currently, the State of California plans to mandate the sale of electric cars beginning in 1998. Research and development on electric car technology by the U.S. car companies predates the California mandate by several years. The main problem with manufacturing as well as driving electric cars is the battery; a long-lasting battery has not yet been developed.

Exhibit 14
Use of Alternative Fuels Forecast

Alternative Fuels	Estimate 1992	Passenger Cars Median Response	
		1998	2003
Alcohol or Alcohol/gasoline (>10% alcohol; includes flex fuel or variable fuel)	0.5%	1.0%	5.0%
Diesel	1.2%	1.0%	2.0%
Electric	0.0%	0.2%	2.0%
Electric/gasoline hybrid	0.0%	0.0%	1.0%
Natural gas	0.0%	0.5%	2.0%
Propane	0.0%	0.1%	0.5%

Source: UMTRI Research Review, Delphi VII - Forecast and Analysis of the North American Automotive Industry, Information taken from various OSAT estimates.

Electronic components such as anti-lock brakes, electric windows, sun- and moon-roofs have become more prominent in vehicles. This being so, producers of specific motor-vehicle parts and accessories will be replaced or transformed from manufacturers of mechanically engineered products to producers of electronic goods. By the year 2000, the proportionate value of electronic components used in the automotive industry is expected to increase by more than 200 percent from 1987 levels. A study by Volkswagen estimates that by the year 2000, approximately 25 percent of a vehicle's manufacturing cost will be attributed to electronics.

III.A.4.d. *Manufacturer Initiatives*

In response to new standards and other environmental concerns, the Big Three have committed substantial resources to researching and developing new technology. One Big Three joint research initiative, under the umbrella of the U.S. Council for Automotive Research (USCAR), is Low Emission Paint Consortium (LEPC), which aims to develop new technologies for low emitting paint processes. In July 1995, the LEPC dedicated a new facility at Wixom, Michigan, to test powder paint and other technologies. In addition to other research initiatives relating to production, USCAR sponsors several that relate to releases from the car. One example is the Low Emissions Technologies Research and Development Partnership. This partnership was formed to explore ways to reduce automotive emissions by improving the performance of catalytic converters and other exhaust related components, and by refining the internal combustion process. The partnership is also researching the feasibility of alternative fuel sources such as ethanol/methanol gasoline mixtures, liquid natural gas (LNG), and liquid petroleum gas.

To respond to perceived future demands for electric cars, The Big Three, together with the U.S. Department of Energy (DOE), formed the U.S. Advanced Battery Consortium. The goal of this consortium is to develop new battery storage technology.

Another Big Three initiative is aimed at developing new materials for vehicles. The U.S. Automotive Materials Partnership will explore the use of materials such as polymer composites, aluminum, plastics, iron, steel, ceramics, and advanced metals. The use of these products in automotive manufacturing is expected to lead to lighter, cleaner, and safer vehicles. Automakers are also exploring the feasibility of developing aluminum vehicles. The Aluminum Association reports that a mid-size sedan using 1,000 pounds of aluminum would be 25 percent lighter and 20 percent more fuel efficient than a car composed entirely of steel. The aluminum content of cars has increased over the years from an average of 78 pounds in 1970 to 191 pounds today.

An additional Big Three initiative - the Vehicle Recycling Partnership (VRP) - is exploring techniques to increase automotive recycling. Although 94 percent of all vehicles are taken to recycling facilities, only 75 percent of a vehicle's actual weight is claimed for recycling purposes. One area of particular interest in automotive recycling is plastics. A recent industry study claims that as much as one billion pounds of automotive plastics end up in landfills. New technologies such as "polymer renewal" recycling are being developed to recycle thermoplastic polyester, nylon, and acetal into first-quality polymers. Ford was the first North American automaker to recycle plastic parts from previously built vehicles. Ford and GM also are making new parts from recycled plastic bumpers. According to AAMA, the automakers are helping to stimulate the market for used materials by incorporating recycled materials into the car. For example, Ford is making: protective seat covers from recycled plastic; splash shields from battery casings; grille opening reinforcements and luggage racks from recycled soda pop bottles; grilles from computer housings and telephones, head lamp housings from plastic water cooler bottles, and on a test basis, brake pedal pads from tires.

Heightened competition has led the Big Three to initiate several jointly funded research products, including the Partnership for a New

Generation of Vehicles (PNGV). PNGV is designed to generate technologies that will lead to more environmentally friendly cars. PNGV is joining Federal agencies, under the leadership of the Commerce Department's Technology Administration, to initiate the New Technology Initiative. The goal of this initiative, introduced by President Clinton in 1993, is to develop a new generation of vehicles with three times greater fuel efficiency.

III.B. Raw Material Inputs and Pollution Outputs

The many different production processes employed to manufacture a motor vehicle require a vast amount of material input and generate large amounts of waste. The outputs resulting from the various stages of production range from air emissions from foundry operations to spent solvents from surface painting and finishing.

Exhibit 15 highlights the production processes, the material inputs, and the various wastes resulting from these operations. Process waste pollutants are treated or neutralized before discharge.

Exhibit 15
Material Inputs/Pollution Outputs

Process	Material Input	Air Emissions	Process Wastes (Waste Water & Liquids	Other Wastes
Metal Shaping				
Metal Cutting and / or Forming	Cutting oils, degreasing and cleaning solvents, acids, and metals	Solvent wastes (e.g., 1,1,1-trichloroethane, acetone, xylene, toluene, etc.)	Acid / alkaline wastes (e.g., hydrochloric, sulfuric and nitric acids) and waste oils	Metal wastes (e.g., copper, chromium and nickel) and solvent wastes (e.g., 1,1,1-trichloroethane, acetone, xylene, toluene, etc.)
Heat Treating	Acid / alkaline solutions (e.g., hydrochloric and sulfuric acid), cyanide salts, and oils		Acid / alkaline wastes, cyanide wastes, and waste oils	Metal wastes (e.g., copper, chromium, and nickel)
Surface Preparation				
Solvent Cleaning	Acid / alkaline cleaners and solvents	Solvent wastes (e.g., acetone, xylene, toluene, etc.)	Acid / alkaline wastes	Ignitable wastes, solvent wastes, (e.g., 1,1,1-trichloroethane, acetone, xylene, toluene, etc.) and still bottoms
Pickling	Acid / alkaline solutions		Acid / alkaline wastes	Metal wastes
Surface Finishing				
Electroplating	Acid / alkaline solutions, metal bearing and cyanide bearing solutions		Acid / alkaline wastes, cyanide wastes, plating wastes, and wastewaters	Metal wastes, reactive wastes, and solvent wastes

Exhibit 15
Material Inputs/Pollution Outputs (cont'd)

Process	Material Input	Air Emissions	Process Wastes (Waste Water & Liquids	Other Wastes
Surface Finishing (contd)				
Surface Finishing	Solvents	Solvent wastes (e.g., 1,1,1-trichloroethane, acetone, xylene, toluene, etc.)		Metal paint wastes, solvent wastes, ignitable paint wastes, and still bottoms
Facility Cleanup	Solvents	Solvent wastes (e.g., 1,1,1-trichloroethane, acetone, xylene, toluene, etc.)		Solvent wastes and still bottoms

The discussion of pollution outputs from automotive manufacturing follows the same format as the discussion of the manufacturing process: foundry operations; metal fabricating; metal finishing; assembly; painting/coating; and dismantling/shredding.

III.B.1. Foundry Operations

Iron foundries create a number of wastes which may pose environmental concerns. Gas and particulate emissions are a concern throughout the casting process. Dust created during sand preparation, molding, and shakeout is of concern due to the carcinogenic potential of the crystalline silica in the sand. Gases containing lead and cadmium and other particulate matter and sulfur dioxide are also created during foundry operation, especially during the melting of the iron.

The wastewaters generated during foundry operations may also be of an environmental concern. Wastewaters are generated primarily during slag quenching operations (water is sprayed on the slag to both cool it as well as pelletize it) and by the wet scrubbers employed as air pollution control devices connected to furnaces and sand and shakeout operations. Due to the presence of cadmium and lead in iron, these metals may both be present in wastewaters.

Foundry operations also create many waste materials that meet the definition of a RCRA hazardous waste. Of primary concern is the calcium carbide desulfurization slag created during the melting of the iron. This slag readily reacts with water to create acetylene gas, a trait which causes it to be classified as a D003 reactive hazardous waste. Other materials such as wastewater sludges and baghouse dust may also fail the toxicity characteristic for lead and cadmium and would then be classified as D008 and D006 respectively. Foundries may also use solvents for cleaning, which when spent, may be characterized as characteristic (ignitable or toxic) or listed hazardous waste depending upon the formulations used.

III.B.2. Metal Fabricating

Each of the metal shaping processes can result in wastes containing constituents of concern (depending on the metal being used). In general, there are two categories of waste generated in metal shaping operations: scrap metal and metalworking fluids/oils.

Scrap metal may consist of metal removed from the original piece (e.g., steel or aluminum). Quite often, scrap is reintroduced into the process as a feedstock.

In general, metalworking fluids can be petroleum-based, oil-water emulsions, or synthetic emulsions that are applied to either the tool or the metal being tooled to facilitate the shaping operation. Metalworking fluid is used to:

- Keep tool and workpiece temperature down and aid lubrication,
- Provide a good finish
- Wash away chips and metal debris
- Inhibit corrosion or surface oxidation.

Metalworking fluids typically become contaminated and spent with extended use and reuse. When disposed, these oils may contain constituents of concern, including metals (cadmium, chromium, and lead), and therefore must be tested to see if they are considered a RCRA hazardous waste. Many fluids may contain chemical additives such as chlorine, sulfur and phosphorus compounds, phenols, cresols, and alkalines. In the past, such oils have commonly been mixed with used cleaning fluids and solvents (including chlorinated solvents). Air emissions may result through volatilization during storage, fugitive losses during use, and direct ventilation of fumes.

Surface preparation operations generate wastes contaminated with solvents and/or metals depending on the type of cleaning operation. Concentrated solvent-bearing wastes and releases may arise from degreasing operations. Degreasing operations may result in solvent-bearing wastewaters, air emissions, and materials in solid form. Solvents may be rinsed into wash waters and/or spilled into floor drains. Although contamination of the wastewater is possible, procedures are in place to prevent such pollution in the first place. Air emissions may result through volatilization during storage, fugitive losses during use, and direct ventilation of fumes. Any solid wastes (e.g., wastewater treatment sludges, still bottoms, cleaning tank residues, machining fluid residues, etc.) generated by the operation may be contaminated with solvents, some of which may meet RCRA hazardous waste listings F001 and F005.

Chemical treatment operations can result in wastes that contain metals of concern. Alkaline, acid, mechanical, and abrasive cleaning methods can generate waste streams such as spent cleaning media, wastewaters, and rinse waters. Such wastes consist primarily of the metal complexes or particles, the cleaning compound, contaminants from the metal surface, and water. In many cases, chemical treatment operations are used in conjunction with organic solvent cleaning systems. As such, many of these wastes may be cross-contaminated with solvents.

The nature of the waste will depend upon the specific cleaning application and manufacturing operation. Wastes from surface preparation operations may contribute to commingled waste streams such as wastewaters discharged to centralized treatment. Further, such operations can result in direct releases such as fugitive emissions and easily segregated wastes such as cleaning tank residues.

III.B.3. Metal Finishing

Surface finishing and related washing operations account for a large volume of wastes associated with automotive metal finishing. Metal plating and related waste account for the largest volumes of metal (e.g., cadmium, chromium, copper, lead, mercury, and nickel) and cyanide-bearing wastes.

Electroplating operations can result in solid and liquid wastestreams that contain constituents of concern. Liquid wastes result from workpiece rinses and process cleanup waters. Most surface finishing (and many surface preparation) operations result in liquid wastestreams. Centralized wastewater treatment systems are common, and can result in solid-phase wastewater treatment sludges. In addition to these wastes, spent process solutions and quench bathes are discarded periodically when the concentrations of contaminants inhibit proper function of the solution or bath. When discarded, process bathes usually consist of solid- and liquid-phase wastes that may contain high concentrations of the constituents of concern, especially cyanide (both free and complex).

Related operations, including all non-painting processes, can contribute wastes including scrap metals, cleaning wastewaters, and other solid materials. The nature of these wastes will depend on the specific process, the nature of the workpiece, and the composition of materials used in the process.

III.B.4. Motor Vehicle Assembly

Due to advances in technology, well designed operating procedures, and the implementation of strategies to limit waste from assembly, little hazardous waste is generated during the actual assembly of an automobile (with the exception of painting/finishing which is discussed in the following section).

The majority of wastes generated during assembly are solid wastes resulting from parts packaging. Parts packaging can be grouped into two categories - returnable and expendable. Returnable packaging (containers) is shipped back to the original suppliers once empty. It includes such items as: metal racks, metal skids, returnable bins, totes, and rigid plastic racks and dunnage. Expendable packaging is used once and recycled, for the most part. Examples include styrofoam peanuts, wood skids, plastic, corrugated boxes, metal barding, and shrink-wrap. Advances in packaging design, changes in purchasing, and the elimination of unneeded materials have greatly reduced the amount of expendable waste generated.

Additional wastes generated from assembly operations may be attributed to general plant operations, cleaning and maintenance, as well as the disposal of faulty equipment and parts.

III. B.5. Motor Vehicle Painting/Finishing

Many of the wastes generated during automotive production are the result of painting and finishing operations. These operations result in air emissions as well as the generation of solid and liquid wastes.

Air emissions, primarily VOCs, result from the painting and finishing application processes (paint storage, mixing, applications, and drying) as well as cleaning operations. These emissions are composed mainly of

organic solvents which are used as carriers for the paint. Solvents are also used during cleanup processes to clean spray equipment between color changes, and to clean portions of the spray booth. The solvent utilized during cleaning is generally referred as "purge solvent" and is often composed of a mixture of dimethyl-benzene,
2-Pranone, 4-methyl-2-pentanone, butyl ester acetic acid, light aromatic solvent naphtha, ethyl benzene, hydrotreated heavy naphtha,
2-butanone, toluene, and 1-butanol.

Various solid and liquid wastes may be generated throughout painting operations and are usually the result of the following operations:

- Paint application - paint overspray caught by emissions control devices (e.g., paint booth collection systems, ventilation filters, etc.);
- Paint drying - ventilated emissions as paint carriers evaporate;
- Cleanup operations - cleaning of equipment and paint booth area; and
- Disposal - discarding of leftover and unused paint as well as containers used to hold paints, paint materials, and overspray.

Solid and liquid wastes may also contain metals from paint pigments and organic solvents.

III. C. Post Production Motor Vehicle Dismantling/Shredding

Dismantling operations involve both automotive fluids and solids. The fluids, such as engine oil, antifreeze, and air conditioning refrigerant, are recovered to the extent possible, reprocessed for reuse or sent to energy recovery facilities. Many solid parts, such as the radiator and catalytic converter, contain valuable metal materials which are removed for recycling or reuse. In addition, the dismantler will remove and recycle the battery, fuel tank, and tires to reduce shredder processing concerns. The shredder processes the remaining automotive hulk, along with other metallic goods (such as household appliances), into ferrous materials, non-ferrous materials, and shredder residue. The residue is a heterogeneous mix that may include plastics, glass, textiles, metal fines, and dirt. This material is predominantly landfilled.

III. D. Management of Chemicals in Wastestream

The Pollution Prevention Act of 1990 (EPA) requires facilities to report information about the management of TRI chemicals in waste and efforts made to eliminate or reduce those quantities. These data have been collected annually in Section 8 of the TRI reporting Form R beginning with the 1991 reporting year. The data summarized below cover the years 1992-1995 and is meant to provide a basic understanding of the quantities of waste handled by the industry, the methods typically used to manage this waste, and recent trends in these methods. TRI waste management data can be used to assess trends in source reduction within individual industries and facilities, and for specific TRI chemicals. This information could then be used as a tool in identifying opportunities for pollution prevention compliance assistance activities.

While the quantities reported for 1992 and 1993 are estimates of quantities already managed, the quantities reported for 1994 and 1995 are projections only. The EPA requires these projections to encourage facilities to consider future waste generation and source reduction of those quantities as well as movement up the waste management hierarchy. Future-year estimates are not commitments that facilities reporting under TRI are required to meet.

Exhibit 16 shows that the motor vehicle, bodies, parts and accessories industry managed about 333 million pounds of production-related waste (total quantity of TRI chemicals in the waste from routine production operations) in 1993 (column B). Column C reveals that of this production-related waste, 66% was either transferred off-site or released to the environment. Column C is calculated by dividing the total TRI transfers and releases by the total quantity of production-related waste. In other words, about 33% of the industry's TRI wastes were managed on-site through recycling, energy recovery, or treatment as shown in columns D, E and F, respectively. The majority of waste that is released or transferred off-site can be divided into portions that are recycled off-site, recovered for energy off-site, or treated off-site as shown in columns G, H, and I, respectively. The remaining portion of the production-related wastes (25.7%), shown in column J, is either released to the environment through direct discharges to air, land, water, and underground injection, or it is disposed off-site.

From the yearly data presented below it is apparent that the portion of TRI wastes reported as recycled on-site has decreased and the portions treated or managed through energy recovery on-site have increased between 1992 and 1995 (projected).

Exhibit 16
Source Reduction and Recycling Activity for SIC 37

A	B	C	D	E	F	G	H	I	J
Year	Production Related Waste Volume (10^6lbs.)	% Reported As Released and Transferred	On-Site			Off-Site			Remaining Releases and Disposal
			% Recycled	% Energy Recovery	% Treated	% Recycled	% Energy Recovery	% Treated	
1992	333	65%	19.99%	0.26%	12.38%	36.54%	3.99%	2.27%	25.84%
1993	333	66%	18.42%	0.23%	14.75%	34.11%	3.82%	2.97%	25.71%
1994	317	—	14.47%	0.35%	16.54%	34.96%	3.97%	3.36%	26.36%
1995	337	—	15.60%	0.28%	15.81%	36.89%	3.92%	3.21%	24.48%

IV. CHEMICAL RELEASE AND TRANSFER PROFILE

This section is designed to provide background information on the pollutant releases that are reported by this industry. The best source of comparative pollutant release information is the Toxic Release Inventory System (TRI). Pursuant to the Emergency Planning and Community Right-to-Know Act, TRI includes self-reported facility release and transfer data for over 600 toxic chemicals. Facilities within SIC Codes 20-39 (manufacturing industries) that have more than 10 employees, and that are above weight-based reporting thresholds are required to report TRI on-site releases and off-site transfers. The information presented within the sector notebooks is derived from the most recently available (1993) TRI reporting year (which then included 316 chemicals), and focuses primarily on the on-site releases reported by each sector. Because TRI requires consistent reporting regardless of sector, it is an excellent tool for drawing comparisons across industries.

Although this sector notebook does not present historical information regarding TRI chemical releases over time, please note that in general, toxic chemical releases have been declining. In fact, according to the 1993 Toxic Release Inventory Data Book, reported releases dropped by 42.7% between 1988 and 1993. Although on-site releases have decreased, the total amount of reported toxic waste has not declined because the amount of toxic chemicals transferred off-site has increased. Transfers have increased from 3.7 billion pounds in 1991 to 4.7 billion pounds in 1993. Better management practices have led to increases in off-site transfers of toxic chemicals for recycling. More detailed information can be obtained from EPA's annual Toxics Release Inventory Public Data Release book (which is available through the EPCRA Hotline at 1-800-535-0202), or directly from the Toxic Release Inventory System database (for user support call 202-260-1531).

Wherever possible, the sector notebooks present TRI data as the primary indicator of chemical release within each industrial category. TRI data provide the type, amount, and media receptor of each chemical released or transferred. When other sources of pollutant release data have been obtained, these data have been included to augment the TRI information.

TRI Data Limitations

The reader should keep in mind the following limitations regarding TRI data. Within some sectors, the majority of facilities are not subject to TRI reporting because they are not considered manufacturing industries, or because they are below TRI reporting thresholds. Examples are the mining, dry cleaning, printing, and transportation equipment cleaning sectors. For these sectors, release information from other sources has been included.

The reader should also be aware that TRI "pounds released" data presented within the notebooks is not equivalent to a "risk" ranking for each industry. Weighting each pound of release equally does not factor in the relative toxicity of each chemical that is released. The Agency is in the process of developing an approach to assign toxicological weightings to each chemical released so that one can differentiate between pollutants with significant differences in toxicity. As a preliminary indicator of the environmental impact of the industry's most commonly released chemicals, the notebook briefly summarizes the toxicological properties of the top five chemicals (by weight) reported by each industry.

Definitions Associated With Section IV Data Tables

General Definitions

SIC Code -- the Standard Industrial Classification (SIC) is a statistical classification standard used for all establishment-based Federal economic statistics. The SIC codes facilitate comparisons between facility and industry data.

TRI Facilities -- are manufacturing facilities that have 10 or more full-time employees and are above established chemical throughput thresholds. Manufacturing facilities are defined as facilities in Standard Industrial Classification primary codes 20-39. Facilities must submit estimates for all chemicals that are on the EPA's defined list and are above throughput thresholds.

Data Table Column Heading Definitions

The following definitions are based upon standard definitions developed by EPA's Toxic Release Inventory Program. The categories below represent the possible pollutant destinations that can be reported.

RELEASES -- are an on-site discharge of a toxic chemical to the environment. This includes emissions to the air, discharges to bodies of water, releases at the facility to land, as well as contained disposal into underground injection wells.

Releases to Air (Point and Fugitive Air Emissions) -- Include all air emissions from industry activity. Point emissions occur through confined air streams as found in stacks, ducts, or pipes. Fugitive emissions include losses from equipment leaks, or evaporative losses from impoundments, spills, or leaks.

Releases to Water (Surface Water Discharges) - encompass any releases going directly to streams, rivers, lakes, oceans, or other bodies of water. Any estimates for stormwater runoff and non-point losses must also be included.

Releases to Land -- includes disposal of waste to on-site landfills, waste that is land treated or incorporated into soil, surface impoundments, spills, leaks, or waste piles. These activities must occur within the facility's boundaries for inclusion in this category.

Underground Injection -- is a contained release of a fluid into a subsurface well for the purpose of waste disposal.

TRANSFERS -- is a transfer of toxic chemicals in wastes to a facility that is geographically or physically separate from the facility reporting under TRI. The quantities reported represent a movement of the chemical away from the reporting facility. Except for off-site transfers for disposal, these quantities do not necessarily represent entry of the chemical into the environment.

Transfers to POTWs -- are wastewaters transferred through pipes or sewers to a publicly owned treatments works (POTW). Treatment and chemical removal depend on the chemical's nature and treatment methods used. Chemicals not treated or destroyed by the POTW are generally released to surface waters or landfilled within the sludge.

Transfers to Recycling -- are sent off-site for the purposes of regenerating or recovering still valuable materials. Once these chemicals have been recycled, they may be returned to the originating facility or sold commercially.

Transfers to Energy Recovery -- are wastes combusted off-site in industrial furnaces for energy recovery. Treatment of a chemical by incineration is not considered to be energy recovery.

Transfers to Treatment -- are wastes moved off-site for either neutralization, incineration, biological destruction, or physical separation.

In some cases, the chemicals are not destroyed but prepared for further waste management.

Transfers to Disposal -- are wastes taken to another facility for disposal generally as a release to land or as an injection underground.

IV.A. EPA Toxic Release Inventory for the Motor Vehicles and Motor Vehicle Equipment Industry

Exhibits 17-21 illustrate the TRI releases and transfers for the motor vehicles and motor vehicle equipment industry (SIC 37). Exhibit 18 shows the top TRI releasing transportation equipment facilities. As shown in Exhibit 19, the majority of TRI reporting facilities are located in Michigan, Ohio, Indiana, Illinois, and Tennessee. As mentioned earlier, these States, with the exception of Tennessee, have historically been the focal point of automobile manufacturing.

For the industry as a whole, solvents such as toluene, xylene, methyl ethyl ketone, and acetone, comprise the largest number of TRI releases. The large of quantity of solvent release, both fugitive and point source can be attributed to the solvent-intensive finishing processes employed by the industry. In addition to being used to clean equipment and metal parts, solvents are a component found in many of the coating and finishes applied to automobile during the assembly and painting/finishing operations.

The TRI database contains a detailed compilation of self-reported, facility-specific chemical releases. The top reporting facilities for this sector are listed below. Facilities that have reported only the SIC codes covered under this notebook appear in Exhibit 17. Exhibit 18 contains additional facilities that have reported the SIC code covered within this report, and one or more SIC codes that are not within the scope of this notebook. Therefore, Exhibit 18 includes facilities that conduct multiple operations — some that are under the scope of this notebook, and some that are not. Currently, the facility-level data do not allow pollutant releases to be broken apart by industrial process.

Exhibit 17
Top 10 TRI Releasing Auto and Auto Parts Facilities (SIC 37)

Rank	Total TRI Releases in Pounds	Facility Name	City	State
1	2,689,968	Ford Motor Co., Kansas City Assembly Plant	Claycomo	MO
2	2,519,315	Nissan Motor Mfg. Corp., USA Corp.	Smyrna	TN
3	1,820,840	Ford Motor Co., St. Louis Assembly Plant	Hazelwood	MO
4	1,733,637	Ford Motor Co., Michigan Truck Plant	Wayne	MI
5	1,693,900	GMC NATP Moraine Assembly Plant	Moraine	OH
6	1,669,603	Ford Electronics & Refrigeration Corp.	Connersville	IN
7	1,633,125	Cadillac Luxury Car Div., Detroit Hantranck Assembly	Detroit	MI
8	1,602,429	Ford Motor Co., Louisville Assembly Plant	Louisville	KY
9	1,523,625	North American Truck Platform, Pontiac E Assembly	Pontiac	MI
10	1,490,075	Purolator Prods, Inc.	Fayetteville	NC

Source: U.S. EPA, Toxics Release Inventory Database, 1993.

Exhibit 18
Top 10 TRI Releasing Transportation Equipment Facilities (SIC 37)

SIC Codes	Total TRI Releases in Pounds	Facility Name	City	State
3711, 3751	3,438,305	Honda of America Mfg., Inc.	Marysville	OH
3711, 3713	2,689,968	Ford Motor Co., Kansas City Assembly Plant	Claycono	ND
3711	2,519,315	Nissan Motor Mfg. Corp., USA Corp.	Smyrna	TN
3711	1,820,840	Ford Motor Co., St. Louis Assembly Plant	Hazelwood	MO
3711	1,733,637	Ford Motor Co., Michigan Truck Plant	Wayne	MI
3714, 3231	1,727,400	Harman Automotive, Inc.,	Bolivar	TN
3713	1,693,900	GMC NATP Moraine Assembly Plant	Moraine	OH
3714	1,669,603	Ford Electronics & Refrigeration Corp.	Commersville	IN
3711	1,633,125	Cadillac Luxury Car Div., Detroit Hantranck Assembly	Detroit	MI
3711	1,602,429	Ford Motor Co., Louisville Assembly Plant	Louisville	KY

Source: U.S. EPA, Toxics Release Inventory Database, 1993.

Note: Being included on these lists does not mean that the release is associated with non-compliance with environmental laws.

Exhibit 19
TRI Reporting Auto and Auto Parts Facilities (SIC 37) by State

State	Number of Facilities	State	Number of Facilities
AL	11	NC	28
AR	10	ND	1
AZ	3	NE	5
CA	21	NH	1
CO	1	NJ	5
CT	4	NV	1
DE	2	NY	15
FL	6	OH	76
GA	14	OK	5
IA	12	OR	3
IL	31	PA	20
IN	63	PR	1
KS	9	RI	1
KY	24	SC	12
LA	1	SD	1
MA	2	TN	33
MD	4	TX	12
ME	1	UT	5
MI	101	VA	12
MN	7	WA	6
MO	22	WI	11
MS	6		

Source: U.S. EPA, Toxics Release Inventory Database, 1993.

Exhibit 20
Releases for Auto and Auto Parts Facilities (SIC 37) in TRI, by Number of Facilities
(Releases reported in pounds/year)

Chemical Name	# Facilities Reporting Chemical	Fugitive Air	Point Air	Water Discharges	Under-ground Inject-ion	Land Disposal	Total Releases	Average Releases per Facility
Toluene	154	1165126	5507143	13416	0	3978	6689663	43439
Sulfuric Acid	152	12783	46013	13000	0	0	71796	472
Xylene (Mixed Isomers)	150	1416695	21584687	23	0	0	23001405	153343
Copper	142	3423	9331	1261	0	4056	18071	127
Methyl Ethyl Ketone	125	1111122	3619253	13400	0	0	4743775	37950
Acetone	107	1149162	3422729	0	0	0	4571891	42728
Glycol Ethers	105	689599	6957693	7682	0	250	7655224	72907
Chromium	99	16632	9124	777	0	10	26543	268
Methanol	96	316128	2297245	0	0	0	2613373	27223
Ethylene Glycol	95	33573	163221	1052	0	415	198261	2087
Nickel	95	7746	2718	495	0	2233	13192	139
Zinc Compounds	95	31398	5906	3564	0	19528	60396	636
Manganese	85	4680	4710	614	0	0	10004	118
Phosphoric Acid	85	4826	13413	0	0	0	18239	215

Source: U.S. EPA, Toxics Release Inventory Database, 1993.

Exhibit 20 (cont'd)
Releases for Auto and Auto Parts Facilities (SIC 37) in TRI, by Number of Facilities
(Releases reported in pounds/year)

Chemical Name	# Facilities Reporting Chemical	Fugitive Air	Point Air	Water Discharges	Under-ground Inject-ion	Land Disposal	Total Releases	Average Releases per Facility
Hydrochloric Acid	83	6480	911854	0	0	0	918334	11064
N-Butyl Alcohol	78	247976	4852404	0	0	0	5100380	65389
Methyl Isobutyl Ketone	73	657257	5664383	0	0	0	6321640	86598
Barium Compounds	71	16614	16858	602	0	1252720	1286794	18124
1,1,1-Trichloroethane	67	1688511	1451218	0	0	0	3139729	46862
Dichlorodifluoromethane	56	206893	5012	0	0	0	211905	3784
Ethylbenzene	56	195835	2332692	0	0	0	2528527	45152
Lead	53	712	4107	559	0	0	5378	101
Benzene	49	15678	10293	0	0	0	25971	530
Methylenebis (Phenylisocyanate)	48	7384	2816	0	0	0	10200	213
Nickel Compounds	48	760	2515	510	0	190	3975	83
Nitric Acid	48	3857	4147	0	0	0	8004	167
Manganese Compounds	45	1541	2106	1320	0	1800	6767	150
1,2,4-Trimethylbenzene	43	84346	1206168	5	0	0	1290519	30012
Chromium Compounds	37	877	3295	1046	0	0	5218	141
Lead Compounds	34	1034	1455	752	0	0	3241	95
Styrene	33	669058	787529	0	0	0	1456587	44139
Ammonia	32	6788	139153	30	0	0	145971	4562
Copper Compounds	29	1255	2487	284	0	0	4026	139
Trichloroethylene	29	935372	1834267	0	0	0	2769639	95505
Dichloromethane	24	402279	410601	0	0	0	812880	33870
Asbestos (Friable)	17	71	2144	0	0	0	2215	130
Diethanolamine	16	505	4405	0	0	0	4910	307
Phenol	16	25785	268220	0	0	50906	344911	21557
Di(2-Ethylhexyl) Phthalate	14	250	41665	0	0	0	41915	2994
Formaldehyde	14	12515	177775	0	0	15115	205405	14672
Tetrachloroethylene	13	69959	293383	0	0	0	363342	27949
Freon 113	12	160695	73286	0	0	0	233981	19498
Aluminum (Fume Or Dust)	10	6130	800971	0	0	0	807101	80710
Cyclohexane	10	1110	1321	0	0	0	2431	243
Cobalt	9	512	269	250	0	0	1031	115
Methyl Tert-Butyl Ether	9	6627	4860	0	0	0	11487	1276
Cumene	7	5841	67234	0	0	0	73075	10439
Chlorine	6	13816	278	0	0	0	14094	2349
Zinc (Fume Or Dust)	6	979	182	43	0	0	1204	201
Antimony Compounds	4	0	0	0	0	0	0	0
Butyl Benzyl Phthalate	4	0	10792	0	0	0	10792	2698
Cyanide Compounds	4	5	279	3	0	0	287	72
Hydrogen Fluoride	4	6	345	0	0	0	351	88
Propylene	4	350	110	0	0	0	460	115
Sec-Butyl Alcohol	4	15305	42250	764	0	0	58319	14580
Toluene-2,4-Diisocyanate	4	1652	5105	0	0	0	6757	1689
Toluene-2,6-Diisocyanate	4	490	1502	0	0	0	1992	498
Bis(2-Ethylhexyl) Adipate	3	0	90052	0	0	0	90052	30017
Naphthalene	3	702	2926	0	0	0	3628	1209
Phosphorus (Yellow Or White)	3	15	0	0	0	0	15	5
Trichlorofluoromethane	3	500	250	0	0	0	750	250

Source: U.S. EPA, Toxics Release Inventory Database, 1993.

Exhibit 20 (cont'd)
Releases for Auto and Auto Parts Facilities (SIC 37) in TRI, by Number of Facilities
(Releases reported in pounds/year)

Chemical Name	# Facilities Reporting Chemical	Fugitive Air	Point Air	Water Discharges	Underground Injection	Land Disposal	Total Releases	Average Releases per Facility
2-Ethoxyethanol	3	3920	24300	0	0	0	28220	9407
4,4'-Isopropylidenediphenol	3	0	5	0	0	0	5	2
Chlorobenzene	2	12911	3230	0	0	0	16141	8071
Cobalt Compounds	2	250	250	0	0	0	500	250
Toluenediisocyanate (Mixed Isomers)	2	255	5	0	0	0	260	130
1,4-Dioxane	2	4000	250	0	0	0	4250	2125
Aluminum Oxide (Fibrous Form)	1	0	0	0	0	0	0	0
Antimony	1	0	0	0	0	0	0	0
Butyl Acrylate	1	880	9400	0	0	0	10280	10280
Carbon Tetrachloride	1	275509	826526	0	0	0	1102035	1102035
Cumene Hydroperoxide	1	250	5484	0	0	0	5734	5734
Dibutyl Phthalate	1	2	0	0	0	0	2	2
Diethyl Phthalate	1	750	60000	0	0	250	61000	61000
Ethylene Oxide	1	0	0	0	0	0	0	0
Isopropyl Alcohol (Manufacturing)	1	750	0	0	0	0	750	750
M-Xylene	1	0	8998	0	0	0	8998	8998
O-Xylene	1	0	0	0	0	0	0	0
Quinone	1	0	0	0	0	0	0	0
Total	**----**	**11,736,697**	**66,116,598**	**61,452**	**0**	**1,351,451**	**79,266,198**	**----**

Source: U.S. EPA, Toxics Release Inventory Database, 1993.

Exhibit 21
Transfers for Auto and Auto Parts Facilities (SIC 37) in TRI, by Number of Facilities
(Transfers reported in pounds/year)

Chemical Name	# Facilities Reporting Chemical	POTW Discharges	Disposal	Recycling	Treatment	Energy Recovery	Total Transfers	Average Transfers per Facility
Toluene	154	954	21709	2540713	83965	1739857	4387448	28490
Sulfuric Acid	152	22	710	4800000	1067714	0	5868446	38608
Xylene (Mixed Isomers)	150	1801	192692	14495581	183599	4256914	19130587	127537
Copper	142	2729	260467	23058138	26472	267	23348073	164423
Methyl Ethyl Ketone	125	1899	15933	4839058	92419	1153386	6102695	48822
Acetone	107	17402	10415	4237359	76693	1534387	5876256	54918
Glycol Ethers	105	2652452	45884	943328	228100	498232	4367996	41600
Chromium	99	3915	446383	7966830	46368	36	8463532	85490
Methanol	96	6312	31276	334497	41293	285819	699197	7283
Ethylene Glycol	95	169438	17890	210618	391126	306410	1095482	11531
Nickel	95	4313	133121	3730134	6971	5	3874544	40785
Zinc Compounds	95	35127	750093	2502350	272103	24930	3584603	37733

Source: U.S. EPA, Toxics Release Inventory Database, 1993.

Exhibit 21 (cont'd)
Transfers for Auto and Auto Parts Facilities (SIC 37) in TRI, by Number of Facilities
(Transfers reported in pounds/year)

Chemical Name	# Facilities Reporting Chemical	POTW Discharges	Disposal	Recycling	Treatment	Energy Recovery	Total Transfers	Average Transfers per Facility
Manganese	85	4167	232071	4698891	1689	2	4936820	58080
Phosphoric Acid	85	37205	84330	275	75444	0	197254	2321
Hydrochloric Acid	83	13855	20710	0	30375	0	64940	782
N-Butyl Alcohol	78	1885	43422	1017184	318581	372643	1753715	22484
Methyl Isobutyl Ketone	73	28787	5675	8971374	67282	1124723	10197841	139696
Barium Compounds	71	10860	3202950	55850	288758	2646	3561064	50156
1,1,1-Trichloroethane	67	867	7610	1113333	24921	65309	1212040	18090
Dichlorodifluoro-methane	56	0	225	45932	132	0	46289	827
Ethylbenzene	56	796	3491	2153976	5362	687526	2851151	50913
Lead	53	857	62803	2586617	59112	284	2709673	51126
Benzene	49	500	22	4215	578	5423	10738	219
Methylenebis (Phenylisocyanate)	48	5	36295	105801	15356	29161	186618	3888
Nickel Compounds	48	18060	162808	402186	82076	8	665138	13857
Nitric Acid	48	5	710	0	26895	0	27610	575
Manganese Compounds	45	17892	154918	2660652	35886	250	2869598	63769
1,2,4-Trimethylbenzene	43	26	40	323150	6012	182922	512150	11910
Chromium Compounds	37	4349	409788	637987	33227	1651	1087002	29378
Lead Compounds	34	7068	90442	824896	52401	675	975482	28691
Styrene	33	0	364260	1574	15750	41199	422783	12812
Ammonia	32	19330	0	0	210	258	19798	619
Copper Compounds	29	2913	183868	18303568	37197	630	18528176	638903
Trichloroethylene	29	565	5400	372186	71991	77401	587543	20260
Dichloromethane	24	9	0	128604	80182	261284	470079	19587
Asbestos (Friable)	17	0	1871982	0	250	0	1872232	110131
Diethanolamine	16	103572	555	105993	139	36200	246459	15404
Phenol	16	3366	187182	0	4132	7911	202591	12662
Di(2-Ethylhexyl) Phthalate	14	0	8120	0	2500	10925	21545	1539
Formaldehyde	14	937	15353	3602	301	3076	23269	1662
Tetrachloroethylene	13	1	2772	166884	32861	15000	217518	16732
Freon 113	12	0	0	155501	14524	25111	195136	16261
Aluminum (Fume Or Dust)	10	0	44377	731959	0	0	776336	77634
Cyclohexane	10	0		850	250	1550	2650	265
Cobalt	9	5	3865	231524	0	0	235394	26155
Methyl Tert-Butyl Ether	9	0	0	0	67	5849	5916	657
Cumene	7	0	0	2871	2	24829	27702	3957
Chlorine	6	21313	0	250			21563	3594
Zinc (Fume Or Dust)	6	48	99338	531602	51858	250	683096	113849
Antimony Compounds	4	1	3412	2400	513	0	6326	1582
Butyl Benzyl Phthalate	4	0	2894	0	1477	0	4371	1093
Cyanide Compounds	4	62	0	3400	38	0	3500	875
Hydrogen Fluoride	4	0	0	0	149	0	149	37
Propylene	4	0	0	0	0	0	0	0

Source: U.S. EPA, Toxics Release Inventory Database, 1993.

Exhibit 21 (cont'd)
Transfers for Auto and Auto Parts Facilities (SIC 37) in TRI, by Number of Facilities
(Transfers reported in pounds/year)

Chemical Name	# Facilities Reporting Chemical	POTW Discharges	Disposal	Recycling	Treatment	Energy Recovery	Total Transfers	Average Transfers per Facility
Sec-Butyl Alcohol	4	0	5627	0	745	7	6379	1595
Toluene-2,4-Diisocyanate	4	0	3900	32300	0	0	36200	9050
Toluene-2,6-Diisocyanate	4	0	980	8100	0	0	9080	2270
Bis(2-Ethylhexyl) Adipate	3	0	1540	0	0	0	1540	513
Naphthalene	3	0	0	0	0	653	653	218
Phosphorus (Yellow Or White)	3	0	250	80800	0	0	81050	27017
Trichlorofluoromethane	3	0	2702	0	1587	0	4289	1430
2-Ethoxyethanol	3	0	0	0	0	7200	7200	2400
4,4'-Isopropylidenedi-phenol	3	0	20401	0	0	0	20401	6800
Chlorobenzene	2	0	0	0	0	75	75	38
Cobalt Compounds	2	5	250	5570	5	0	5830	2915
Toluenediisocyanate (Mixed Isomers)	2	0	0	0	0	0	0	0
1,4-Dioxane	2	0	0	8140	0	1225	9365	4683
Aluminum Oxide (Fibrous Form)	1	0	19002	0	0	0	19002	19002
Antimony	1	0	5	56600	5	0	56610	56610
Butyl Acrylate	1	0	0	11	3	602	616	616
Carbon Tetrachloride	1	0	0	0	0	0	0	0
Cumene Hydroperoxide	1	0	0	0	0	516	516	516
Dibutyl Phthalate	1	0	0	0	0	173	173	173
Diethyl Phthalate	1	0	0	0	2375	0	2375	2375
Ethylene Oxide	1	0	1600		300	0	1900	1900
Isopropyl Alcohol (Manufacturing)	1	0	250	0	0	0	250	250
M-Xylene	1	0	0	0	0	2236	2236	2236
O-Xylene	1	0	0	0	0	9575	9575	9575
Quinone	1	0	0	0	0	0	0	0
Total	----	3,195,675	9,294,768	116,195,214	3,960,321	12,807,201	145,513,429	----

Source: U.S. EPA, Toxics Release Inventory Database, 1993.

IV.B. Summary of Selected Chemicals Released

The following is a synopsis of current scientific toxicity and fate information for the top chemicals (by weight) that facilities within this sector self-reported as released to the environment based upon 1993 TRI data. Because this section is based upon self-reported release data, it does not attempt to provide information on management practices employed by the sector to reduce the release of these chemicals. Information regarding pollutant release reductions over time may be available from EPA's TRI and 33/50 programs, or directly from the industrial trade associations that are listed in Section IX of this document. Since these descriptions are cursory, please consult the sources referenced below for a more detailed description of both the chemicals described in this section, and the chemicals that appear on the full list of TRI chemicals appearing in Section IV.A.

The brief descriptions provided below were taken from the 1993 Toxics Release Inventory Public Data Release (EPA, 1994), and the Hazardous Substances Data Bank (HSDB), accessed via TOXNET. The brief descriptions provided below were taken from the *1993 Toxics Release Inventory Public Data Release* (EPA, 1994), the Hazardous Substances Data Bank (HSDB), and the Integrated Risk Information System (IRIS), both accessed via TOXNET[1]. The information contained below is based upon exposure assumptions that have been conducted using standard scientific procedures. The effects listed below must be taken in context of these exposure assumptions that are more fully explained within the full chemical profiles in HSDB.

The top TRI release for the motor vehicles and motor vehicle equipment industry (SIC 37) as a whole are as follows: toluene, xylene, methyl ethyl ketone, acetone, glycol ethers, 1,1,1,-trichloroethane, styrene, trichloroethylene, dichloromethane, and methanol. Summaries for several of these chemicals are provided below.

Acetone

Toxicity. Acetone is irritating to the eyes, nose, and throat. Symptoms of exposure to large quantities of acetone may include headache, unsteadiness, confusion, lassitude, drowsiness, vomiting, and respiratory depression.

Reactions of acetone (see environmental fate) in the lower atmosphere contribute to the formation of ground-level ozone. Ozone (a major

[1] TOXNET is a computer system run by the National Library of Medicine that includes a number of toxicological databases managed by EPA, National Cancer Institute, and the National Institute for Occupational Safety and Health. For more information on TOXNET, contact the TOXNET help line at 1-800-231-3766. Databases included in TOXNET are: CCRIS (Chemical Carcinogenesis Research Information System), DART (Developmental and Reproductive Toxicity Database), DBIR (Directory of Biotechnology Information Resources), EMICBACK (Environmental Mutagen Information Center Backfile), GENE-TOX (Genetic Toxicology), HSDB (Hazardous Substances Data Bank), IRIS (Integrated Risk Information System), RTECS (Registry of Toxic Effects of Chemical Substances), and TRI (Toxic Chemical Release Inventory). HSDB contains chemical-specific information on manufacturing and use, chemical and physical properties, safety and handling, toxicity and biomedical effects, pharmacology, environmental fate and exposure potential, exposure standards and regulations, monitoring and analysis methods, and additional references.

component of urban smog) can affect the respiratory system, especially in sensitive individuals such as asthmatics or allergy sufferers.

Carcinogenicity. There is currently no evidence to suggest that this chemical is carcinogenic.

Environmental Fate. If released into water, acetone will be degraded by microorganisms or will evaporate into the atmosphere. Degradation by microorganisms will be the primary removal mechanism.

Acetone is highly volatile, and once it reaches the troposphere (lower atmosphere), it will react with other gases, contributing to the formation of ground-level ozone and other air pollutants. EPA is reevaluating acetone's reactivity in the lower atmosphere to determine whether this contribution is significant.

Physical Properties. Acetone is a volatile and flammable organic chemical.

Note: Acetone was removed from the list of TRI chemicals on June 16, 1995 (60 FR 31643) and will not be reported for 1994 or subsequent years.

Glycol Ethers

Due to data limitations, data on diethylene glycol (glycol ether) are used to represent all glycol ethers.

Toxicity. Diethylene glycol is only a hazard to human health if concentrated vapors are generated through heating or vigorous agitation or if appreciable skin contact or ingestion occurs over an extended period of time. Under normal occupational and ambient exposures, diethylene glycol is low in oral toxicity, is not irritating to the eyes or skin, is not readily absorbed through the skin, and has a low vapor pressure so that toxic concentrations of the vapor can not occur in the air at room temperatures.

At high levels of exposure, diethylene glycol causes central nervous depression and liver and kidney damage. Symptoms of moderate diethylene glycol poisoning include nausea, vomiting, headache, diarrhea, abdominal pain, and damage to the pulmonary and cardiovascular systems. Sulfanilamide in diethylene glycol was once used therapeutically against bacterial infection; it was withdrawn from the market after causing over 100 deaths from acute kidney failure.

Carcinogenicity. There is currently no evidence to suggest that this chemical is carcinogenic.

Environmental Fate. Diethylene glycol is a water-soluble, volatile organic chemical. It may enter the environment in liquid form via petrochemical plant effluents or as an unburned gas from combustion sources. Diethylene glycol typically does not occur in sufficient concentrations to pose a hazard to human health.

Methanol

Toxicity. Methanol is readily absorbed from the gastrointestinal tract and the respiratory tract, and is toxic to humans in moderate to high doses. In the body, methanol is converted into formaldehyde and formic acid. Methanol is excreted as formic acid. Observed toxic effects at high dose levels generally include central nervous system damage and blindness. Long-term exposure to high levels of methanol via inhalation cause liver and blood damage in animals.

Ecologically, methanol is expected to have low toxicity to aquatic organisms. Concentrations lethal to half the organisms of a test population are expected to exceed 1 mg methanol per liter water. Methanol is not likely to persist in water or to bioaccumulate in aquatic organisms.

Carcinogenicity. There is currently no evidence to suggest that this chemical is carcinogenic.

Environmental Fate. Liquid methanol is likely to evaporate when left exposed. Methanol reacts in air to produce formaldehyde which contributes to the formation of air pollutants. In the atmosphere it can react with other atmospheric chemicals or be washed out by rain. Methanol is readily degraded by microorganisms in soils and surface waters.

Physical Properties. Methanol is highly flammable.

Methylene Chloride (Dichloromethane)

Toxicity. Short-term exposure to dichloromethane (DCM) is associated with central nervous system effects, including headache, giddiness, stupor, irritability, and numbness and tingling in the limbs. More severe neurological effects are reported from longer-term exposure, apparently due to increased carbon monoxide in the blood from the break down of

DCM. Contact with DCM causes irritation of the eyes, skin, and respiratory tract.

Occupational exposure to DCM has also been linked to increased incidence of spontaneous abortions in women. Acute damage to the eyes and upper respiratory tract, unconsciousness, and death were reported in workers exposed to high concentrations of DCM. Phosgene (a degradation product of DCM) poisoning has been reported to occur in several cases where DCM was used in the presence of an open fire.

Populations at special risk from exposure to DCM include obese people (due to accumulation of DCM in fat), and people with impaired cardiovascular systems.

Carcinogenicity. DCM is a probable human carcinogen via both oral and inhalation exposure, based on inadequate human data and sufficient evidence in animals.

Environmental Fate. When spilled on land, DCM is rapidly lost from the soil surface through volatilization. The remainder leaches through the subsoil into the groundwater.

Biodegradation is possible in natural waters but will probably be very slow compared with evaporation. Little is known about bioconcentration in aquatic organisms or adsorption to sediments but these are not likely to be significant processes. Hydrolysis is not an important process under normal environmental conditions.

DCM released into the atmosphere degrades via contact with other gases with a half-life of several months. A small fraction of the chemical diffuses to the stratosphere where it rapidly degrades through exposure to ultraviolet radiation and contact with chlorine ions. Being a moderately soluble chemical, DCM is expected to partially return to earth in rain.

Methyl Ethyl Ketone

Toxicity. Breathing moderate amounts of methyl ethyl ketone (MEK) for short periods of time can cause adverse effects on the nervous system ranging from headaches, dizziness, nausea, and numbness in the fingers and toes to unconsciousness. Its vapors are irritating to the skin, eyes, nose, and throat and can damage the eyes. Repeated exposure to moderate to high amounts may cause liver and kidney effects.

Carcinogenicity. No agreement exists over the carcinogenicity of MEK. One source believes MEK is a possible carcinogen in humans based on limited animal evidence. Other sources believe that there is insufficient evidence to make any statements about possible carcinogenicity.

Environmental Fate. Most of the MEK released to the environment will end up in the atmosphere. MEK can contribute to the formation of air pollutants in the lower atmosphere. It can be degraded by microorganisms living in water and soil.

Physical Properties. Methyl ethyl ketone is a flammable liquid.

Toluene

Toxicity. Inhalation or ingestion of toluene can cause headaches, confusion, weakness, and memory loss. Toluene may also affect the way the kidneys and liver function.

Reactions of toluene (see environmental fate) in the atmosphere contribute to the formation of ozone in the lower atmosphere. Ozone can affect the respiratory system, especially in sensitive individuals such as asthma or allergy sufferers.

Some studies have shown that unborn animals were harmed when high levels of toluene were inhaled by their mothers, although the same effects were not seen when the mothers were fed large quantities of toluene. Note that these results may reflect similar difficulties in humans.

Carcinogenicity. There is currently no evidence to suggest that this chemical is carcinogenic.

Environmental Fate. The majority of releases of toluene to land and water will evaporate. Toluene may also be degraded by microorganisms. Once volatized, toluene in the lower atmosphere will react with other atmospheric components contributing to the formation of ground-level ozone and other air pollutants.

Physical Properties. Toluene is a volatile organic chemical.

1,1,1-Trichloroethane

Toxicity. Repeated contact of 1,1,1-trichloroethane (TCE) with skin may cause serious skin cracking and infection. Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations.

Exposure to high concentrations of TCE causes reversible mild liver and kidney dysfunction, central nervous system depression, gait disturbances, stupor, coma, respiratory depression, and even death. Exposure to lower concentrations of TCE leads to light-headedness, throat irritation, headache, disequilibrium, impaired coordination, drowsiness, convulsions and mild changes in perception.

Carcinogenicity. There is currently no evidence to suggest that this chemical is carcinogenic.

Environmental Fate. Releases of TCE to surface water or land will almost entirely volatilize. Releases to air may be transported long distances and may partially return to earth in rain. In the lower atmosphere, TCE degrades very slowly by photooxidation and slowly diffuses to the upper atmosphere where photodegradation is rapid.

Any TCE that does not evaporate from soils leaches to groundwater. Degradation in soils and water is slow. TCE does not hydrolyze in water, nor does it significantly bioconcentrate in aquatic organisms.

Trichloroethylene

Toxicity. Trichloroethylene was once used as an anesthetic, though its use caused several fatalities due to liver failure. Short term inhalation exposure to high levels of trichloroethylene may cause rapid coma followed by eventual death from liver, kidney, or heart failure. Short-term exposure to lower concentrations of trichloroethylene causes eye, skin, and respiratory tract irritation. Ingestion causes a burning sensation in the mouth, nausea, vomiting and abdominal pain. Delayed effects from short-term trichloroethylene poisoning include liver and kidney lesions, reversible nerve degeneration, and psychic disturbances. Long-term exposure can produce headache, dizziness, weight loss, nerve damage, heart damage, nausea, fatigue, insomnia, visual impairment, mood perturbation, sexual problems, dermatitis, and rarely jaundice. Degradation products of trichloroethylene (particularly phosgene) may cause rapid death due to respiratory collapse.

Carcinogenicity. Trichloroethylene is a probable human carcinogen via both oral and inhalation exposure, based on limited human evidence and sufficient animal evidence.

Environmental Fate. Trichloroethylene breaks down slowly in water in the presence of sunlight and bioconcentrates moderately in aquatic organisms. The main removal of trichloroethylene from water is via rapid evaporation.

Trichloroethylene does not photodegrade in the atmosphere, though it breaks down quickly under smog conditions, forming other pollutants such as phosgene, dichloroacetyl chloride, and formyl chloride. In addition, trichloroethylene vapors may be decomposed to toxic levels of phosgene in the presence of an intense heat source such as an open arc welder.

When spilled on the land, trichloroethylene rapidly volatilizes from surface soils. The remaining chemical leaches through the soil to groundwater.

Xylene (Mixed Isomers)

Toxicity. Xylenes are rapidly absorbed into the body after inhalation, ingestion, or skin contact. Short-term exposure of humans to high levels of xylenes can cause irritation of the skin, eyes, nose, and throat, difficulty in breathing, impaired lung function, impaired memory, and possible changes in the liver and kidneys. Both short- and long-term exposure to high concentrations can cause effects such as headaches, dizziness, confusion, and lack of muscle coordination. Reactions of xylenes (see environmental fate) in the atmosphere contribute to the formation of ozone in the lower atmosphere. Ozone can affect the respiratory system, especially in sensitive individuals such as asthma or allergy sufferers.

Carcinogenicity. There is currently no evidence to suggest that this chemical is carcinogenic.

Environmental Fate. The majority of releases to land and water will quickly evaporate, although some degradation by microorganisms will occur.

Xylenes are moderately mobile in soils and may leach into groundwater, where they may persist for several years.

Xylenes are volatile organic chemicals. As such, xylenes in the lower atmosphere will react with other atmospheric components, contributing to the formation of ground-level ozone and other air pollutants.

IV.C. Other Data Sources

The Aerometric Information Retrieval System (AIRS) contains a wide range of information related to stationary sources of air pollution, including the emissions of a number of air pollutants which may be of concern within a particular industry. With the exception of volatile organic compounds (VOCs), there is little overlap with the TRI chemicals reported above. Exhibit 22 summarizes annual releases of carbon monoxide (CO), nitrogen dioxide (NO_2), particulate matter of 10 microns or less (PM10), total particulates (PT), sulfur dioxide (SO_2), and volatile organic compounds (VOCs).

Exhibit 22
Pollutant Releases (Short Tons/Years)

Industry	CO	NO_2	PM_{10}	PT	SO_2	VOC
U.S. Total	97,208,000	23,402,000	45,489,000	7,836,000	21,888,000	23,312,000
Metal Mining	5,391	28,583	39,359	140,052	84,222	1,283
Nonmetal Mining	4,525	28,804	59,305	167,948	24,129	1,736
Lumber and Wood Products	123,756	42,658	14,135	63,761	9,149	41,423
Wood Furniture and Fixtures	2,069	2,981	2,165	3,178	1,606	59,426
Pulp and Paper	624,291	394,448	35,579	113,571	341,002	96,875
Printing	8,463	4,915	399	1,031	1,728	101,537
Inorganic Chemicals	166,147	108,575	4,107	39,082	182,189	52,091
Organic Chemicals	146,947	236,826	26,493	44,860	132,459	201,888
Petroleum Refining	419,311	380,641	18,787	36,877	648,153	309,058
Rubber and Misc. Plastic Products	2,090	11,914	2,407	5,355	29,364	140,741
Stone, Clay, Glass, and Concrete	58,043	338,482	74,623	171,853	339,216	30,262
Iron and Steel	1,518,642	138,985	42,368	83,017	238,268	82,292
Nonferrous Metals	448,758	55,658	20,074	22,490	373,007	27,375
Fabricated Metals	3,851	16,424	1,185	3,136	4,019	102,186
Electronics	367	1,129	207	293	453	4,854
Motor Vehicles, Bodies, Parts, and Accessories	**35,303**	**23,725**	**2,406**	**12,853**	**25,462**	**101,275**
Dry Cleaning	101	179	3	28	152	7,310

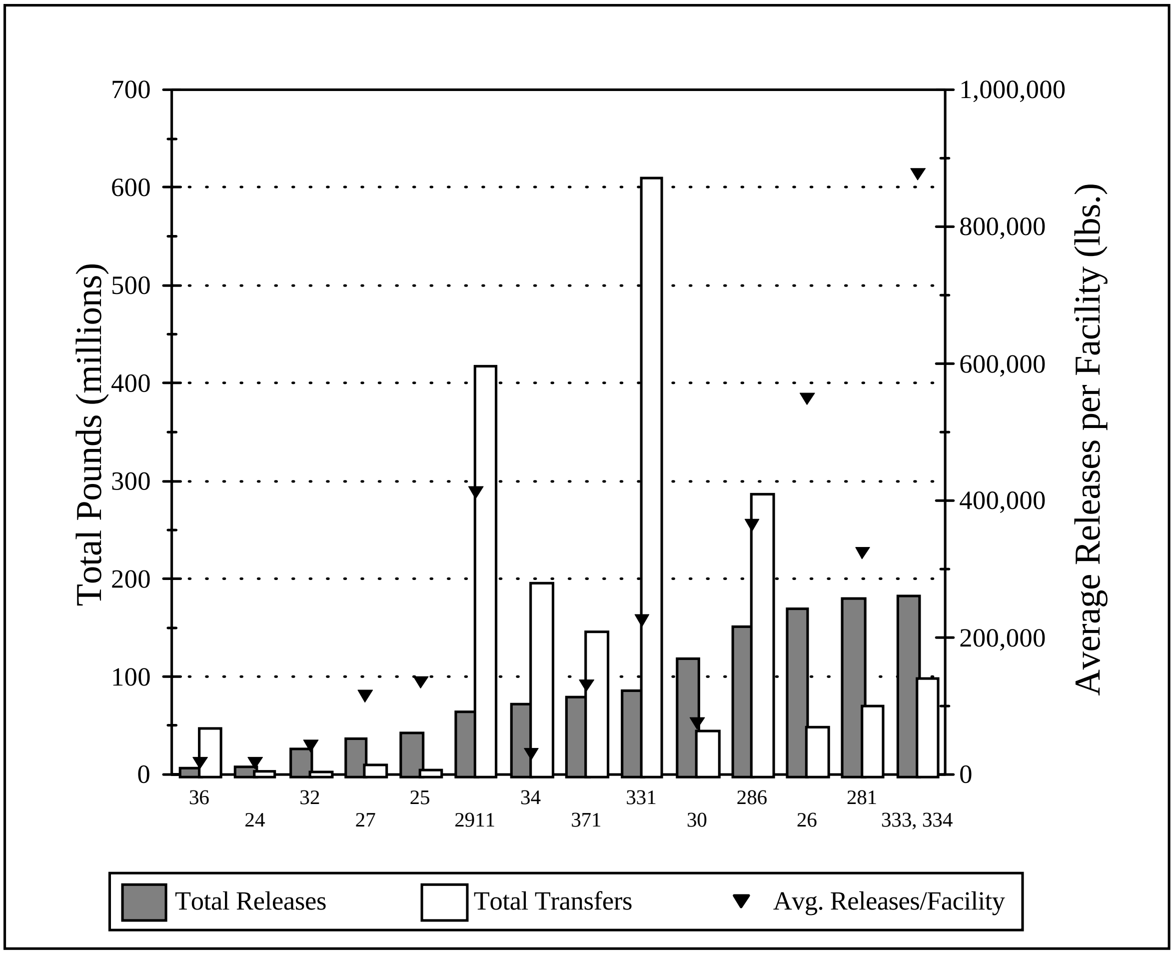
Source U.S. EPA Office of Air and Radiation, AIRS Database, May 1995.

IV.D. Comparison of Toxic Release Inventory Between Selected Industries

The following information is presented as a comparison of pollutant release and transfer data across industrial categories. It is provided to give a general sense as to the relative scale of releases and transfers within each sector profiled under this project. Please note that the following table does not contain releases and transfers for industrial categories that are not included in this project, and thus cannot be used to draw conclusions regarding the total release and transfer amounts that are reported to TRI. Similar information is available within the annual TRI Public Data Release book.

Exhibit 23 is a graphical representation of a summary of the 1993 TRI data for the motor vehicles assembly industry and the other sectors profiled in separate notebooks. The bar graph presents the total TRI releases and total transfers on the left axis and the triangle points show the average releases per facility on the right axis. Industry sectors are presented in the order of increasing total TRI releases. The graph is based on the data shown in Exhibit 24 and is meant to facilitate comparisons between the relative amounts of releases, transfers, and releases per facility both within and between these sectors. The reader should note, however, that differences in the proportion of facilities captured by TRI exist between industry sectors. This can be a factor of poor SIC matching and relative differences in the number of facilities reporting to TRI from the various sectors. In the case of the motor vehicles assembly industry, the 1993 TRI data presented here covers 609 facilities. These facilities listed SIC 37 (Motor Vehicles Assembly Industry) as a primary SIC code.

Exhibit 23 - bar graph
Summary of 1993 TRI Data: Releases and Transfers by Industry



SIC Range	Industry Sector	SIC Range	Industry Sector	SIC Range	Industry Sector
36	Electronic Equipment and Components	2911	Petroleum Refining	286	Organic Chemical Mfg.
24	Lumber and Wood Products	34	Fabricated Metals	26	Pulp and Paper
32	Stone, Clay, and Concrete	371	Motor Vehicles, Bodies, Parts, and Accessories	281	Inorganic Chemical Mfg.
27	Printing	331	Iron and Steel	333,334	Nonferrous Metals
25	Wood Furniture and Fixtures	30	Rubber and Misc. Plastics		

Exhibit 24 Summary
Toxic Release Inventory Data for Selected Industries

Industry Sector	SIC Range	# TRI Facilities	Releases		Transfers		Total Releases + Transfers (10^6 pounds)	Average Release+ Transfers per Facility (pounds)
			Total Releases (10^6 pounds)	Average Releases per Facility (pounds)	1993 Total (10^6 pounds)	Average Transfers per Facility (pounds)		
Stone, Clay, and Concrete	32	634	26.6	41,895	2.2	3,500	28.2	46,000
Lumber and Wood Products	24	491	8.4	17,036	3.5	7,228	11.9	24,000
Furniture and Fixtures	25	313	42.2	134,883	4.2	13,455	46.4	148,000
Printing	2711-2789	318	36.5	115,000	10.2	732,000	46.7	147,000
Electronics/Computers	36	406	6.7	16,520	47.1	115,917	53.7	133,000
Rubber and Misc. Plastics	30	1,579	118.4	74,986	45.0	28,537	163.4	104,000
Motor Vehicle, Bodies, Parts and Accessories	371	609	79.3	130,158	145.5	238,938	224.8	369,000
Pulp and paper	2611-2631	309	169.7	549,000	48.4	157,080	218.1	706,000
Inorganic Chem. Mfg.	2812-2819	555	179.6	324,000	70.0	126,000	249.7	450,000
Petroleum Refining	2911	156	64.3	412,000	417.5	2,676,000	481.9	3,088,000
Fabricated Metals	34	2,363	72.0	30,476	195.7	82,802	267.7	123,000
Iron and Steel	3312-3313 3321-3325	381	85.8	225,000	609.5	1,600,000	695.3	1,825,000
Nonferrous Metals	333, 334	208	182.5	877,269	98.2	472,335	280.7	1,349,000
Organic Chemical Mfg.	2861-2869	417	151.6	364,000	286.7	688,000	438.4	1,052,000
Metal Mining	10	Industry sector not subject to TRI reporting						
Nonmetal Mining	14	Industry sector not subject to TRI reporting						
Dry Cleaning	7215, 7216, 7218	Industry sector not subject to TRI reporting						

Source: U.S. EPA, Toxics Release Inventory Database, 1993.

V. POLLUTION PREVENTION OPPORTUNITIES

The best way to reduce pollution is to prevent it in the first place. Some companies have creatively implemented pollution prevention techniques that improve efficiency and increase profits while at the same time minimizing environmental impacts. This can be done in many ways such as reducing material inputs, re-engineering processes to reuse by-products, improving management practices, and employing substitution of toxic chemicals. Some smaller facilities are able to actually get below regulatory thresholds just by reducing pollutant releases through aggressive pollution prevention policies.

In order to encourage these approaches, this section provides both general and company-specific descriptions of some pollution prevention advances that have been implemented within the Motor Vehicles and Motor Vehicle Equipment industry. While the list is not exhaustive, it does provide core information that can be used as the starting point for facilities interested in beginning their own pollution prevention projects. When possible, this section provides information from real activities that can, or are being implemented by this sector -- including a discussion of associated costs, time frames, and expected rates of return. This section provides summary information from activities that may be, or are being implemented by this sector. When possible, information is provided that gives the context in which the techniques can be effectively used. Please note that the activities described in this section do not necessarily apply to all facilities that fall within this sector. Facility-specific conditions must be carefully considered when pollution prevention options are evaluated, and the full impacts of the change must examine how each option affects, air, land, and water pollutant releases.

Much of the automotive industry is involved in exploring pollution prevention opportunities. The discussion which follows highlights some of the current pollution prevention activities undertaken by manufacturers involved in all stages of the automotive manufacturing process. This is just a sampling of the numerous pollution prevention/waste minimization efforts currently underway.

V.A. Motor Vehicle Equipment Manufacturing

Non-Production Material Screening

As part of its Non-Production Material approval system, Chrysler Corporation implemented pollution prevention practices to eliminate, substitute, or reduce, to the extent possible, regulated substances from both products supplied to Chrysler as well as those resulting from their manufacturing process. First implemented in April 1993, the environmental strategy focuses on avoiding the use of regulated substances and materials of concern whenever possible as part of an effort to eliminate "end-of-pipe" controls. One example of how this screening approach has been utilized was the refusal to approve a transmission fluid for Chrysler's new TE Van which contained 10 to 30 percent butyl benzyl phthalate. This was accomplished by working with suppliers and design teams to identify a substitute material. As part of the initiative, suppliers are being requested to certify their parts regarding the presence of Chrysler's identified materials of concern.

Other similar Chrysler successes include:

- Elimination of hexavalent chromium from all materials and processes;
- Reformulating paints and solvents to exclude the majority of listed toxic solvents;
- Reformulating new coatings to reduce odor; and
- Elimination of lead from all paints except electrocoat primer.

Used Oil Recycling

In an effort to reduce the waste oil produced at Chrysler stamping, machining, and engine plants, the automobile manufacturer has developed comprehensive recycling programs with outside suppliers. More than 800 million gallons of used oil is recycled annually. Other company efforts designed to reduce waste oil include:

- Recovering and remanufacturing waste oil on-site for return to the process;
- Reducing the amount used by replacing petroleum-based metal working fluids with longer lasting semi-synthetic materials; and

- Developing purchasing programs to promote the use of recycled oils.

Trichloroethylene Reduction

Trichloroethylene (TCE) is traditionally employed by the automotive industry as a degreaser to clean oil from very thin aluminum parts. Although vapor collection systems are used during the degreasing process to collect and recycle TCE, some TCE inevitably remains on the high-surface-area parts. The remaining TCE then evaporates. In order to reduce emissions of TCE, Ford Motor Company developed a detergent and aqueous solution which was comparable to TCE. The new water wash did not etch or damage aluminum parts and met brazing process requirements. With assistance from a supplier, Ford also designed an enclosed water spray system for the new degreasing operations. According to AAMA, after a 1992 pilot evaluation proved successful, Ford began to convert production processes using heat exchangers (e.g., radiators) to one relying on aqueous cleaning instead of TCE degreasing. As a result, TCE releases at one plant dropped by 250,000 pounds annually. Ford expects comparable further reductions worldwide as the remaining plants implement this process change.

Elimination of Chromium From Radiator Paint

In past years, radiators were spray painted with a coating containing chromium for protection purposes. This process resulted in overspray paint waste (sludge) that contained hazardous constituents. Wastes were collected and shipped to an approved hazardous waste disposal facility. In order to minimize the risk associated with the material constituents and resultant waste associated with coating containing chromium, Chrysler's Dayton Thermal Products Plant explored the use of new products which would meet performance specifications for the required surface coating. The result is a water-based material which is chromium as well as lead-free. The use of this new water-based material will eliminate approximately 18,000 gallons of paint waste per year that was previously landfilled, as well as reduce substantially VOC emissions.

Lead-Free Black Ceramic Paint

Ceramic black glaze paint (ink), used for aesthetic purposes as well as an ultraviolet (UV) light shield for the adhesive (adhesive is sensitive to UV light), is applied to glass where the interior trim abuts the window. Application of the ink, which contains lead, to the glass involves a silk-screening process. In an attempt to minimize both solid and liquid waste, McGraw Glass (supplier for Chrysler assembly plants), launched a program to develop, test, and approve a lead-free black ceramic glass paint. A suitable substitute, which was approved and in use by 1994, would eliminate approximately 700 drums of hazardous waste per year.

Recovering Lead From Wastewater

One of the waste streams associated with battery-making operations is wastewater which contains lead. Although in the past it was possible to remove lead from the wastewater, it had not been possible to recycle the lead. In 1990, Delco Remy, a GM supplier, developed a method which allows the lead to be recycled. The process involves a series of steps and the use of a proprietary chemical (identified through a cooperative effort between the plant personnel and a chemical vendor) which allows lead to settle to the bottom when tank contents are neutralized. After the lead has settled, wastewater is decanted and filtered through a sand filter to remove remaining lead. The remaining water and lead are agitated with air to put lead back into suspension before the mixture is pumped into a filter press where water is removed leaving behind the lead. The dried, lead-containing mixture is then sent to a secondary smelter. As a result of this lead removing process, approximately 125,000 pounds of lead are reclaimed and recycled each year.

PCB Elimination Program

Polychlorinated biphenyls (PCBs), which are utilized as a coolant and flame retardant fluid in closed system high voltage electrical equipment, are one of the most persistent toxics used in the automotive industry. In order to eliminate the use of PCBs in its facilities, Chrysler initiated a program that would eliminate the use of PCB containing equipment at its facilities by 1998. The program also plans to minimize the risk of Superfund liability through alternate disposal practices. Similar programs are in place at GM and Ford.

Solvent-Free Spray Adhesive For Interior Trim

General Motors Inland Fisher Guide plant in Livonia, MI produces soft trim for the interior of automobiles. In order to produce car door panels that offer a variety of colors, textures, and materials, an assembly process which glues together small pieces is used. In the past, the adhesive used to bind these parts together contained four percent methylene chloride; 30 percent methyl ethyl ketone; 30 percent hexane, and 14 percent toluene. The combination of VOCs resulted in approximately 20 tons of emissions a year. In order to eliminate the emissions associated with this adhesive, a water-based adhesive was identified. The new adhesive, which was implemented in the beginning of 1993, converted the waste stream from hazardous to non-hazardous.

Reducing Chlorofluorocarbon Use

Chlorofluorocarbons (CFCs) and 1,1,1-trichlorethane are chemical substances that deplete the ozone layer. Depletion of the ozone layer causes skin cancer, cataracts and has other human and environmental effects. Under the Montreal Protocol on Substances that Deplete the Ozone Layer and the Clean Air Act, production of these chemicals will be halted by January 1996. The automobile industry used CFC-12 as a refrigerant in air conditioning systems, CFC-11 as foam blowing agent for flexible seating foams, and CFC-113 and 1,1,1-trichloroethane (methyl chloroform) as a solvent in electronics manufacturing and metal cleaning. The automobile industry undertook voluntary and cooperative projects with EPA's Stratopheric Protection Division to reduce and eliminate each of these uses. As a result of these efforts, recycling was implemented and most uses were halted well before regulations took effect (Stratopheric Protection Division 1995). For example, in order to reduce the use of CFCs, GM's Lansing Automotive Division (LAD) Facilities Division decided to remove CFCs wherever possible from its operating procedures. The first step was to identify CFC containing materials that were approved for purchase and which departments were authorized to use them. Departments were then sent a letter asking whether a non-CFC material could be substituted. Results from the inquiries led to identification of acceptable and cost-effective alternatives. Since mid-1992, no CFC-containing products have been purchased by LAD plants. In addition, LAD found a substitute for a degreaser it had been using that has only about 12 percent of ozone-depletion potential of the Freons it replaced. According to the Stratopheric Protection Division, another example of technology and engineering excellence is that Ford joined with other companies under the auspices of the International Cooperative for Ozone Layer Protection (ICOLP) to develop inert gas wave and "no clean" soldering which replaces CFC-cleaning of printed wiring boards, (PWBs). Electronics are the key to meeting vehicle emissions safety and security. The new process was designed for environmental reasons, but Ford found it also improved the quality of the PWBs.

V.B. Motor Vehicle Assembly

Plants Switch To Clean-Burning Gas

In an effort to reduce air emissions from manufacturing facilities, Ford has converted from coal-fired boilers to natural gas. An estimated $500,000 to $600,000 is saved each year in operating costs for each plant that converts from coal to natural gas. The environmental benefits of the conversion include: a reduction in carbon monoxide emissions by one half; a reduction in sulfur dioxide emissions by approximately 3,000 tons per year system wide; and a reduction in nitrogen oxide emissions of approximately 1,100 tons per year. The switch has also reduced particulate emissions by over 500 tons a year for Ford system-wide, and by as much as 95 percent at some facilities. In addition, 8,000 tons of ash a year, from coal burning, and 4,100 tons of ash collected by emission collectors will no longer have to be disposed of in a landfill.

Solid Waste Recycling

As part of an effort to reduce the amount of waste generated from assembly operations, Chrysler is using durable returnable containers. By using these containers, the company has successfully eliminated 55 percent of its expendable packaging wastes and diverted significant volumes of paper, cardboard, plastic and wood from landfills. Chrysler has designed new product programs which plan to eliminate 95 percent of packaging waste. In addition, each year the company salvages 700,000 tons of scrap metal and recycles thousands of tons of wooden pallets and cardboard from its plants. Chrysler has also instituted one of the largest paper recycling programs in the U.S., recycling more than 800 tons of paper per year.

Ford also has a program to reduce solid waste. At Ford Casting and Forging, steel drums are recycled in the foundry's melting process. Ford's North American assembly plants are recycling 380 million pounds of waste each year. European and North American suppliers have been asked to ship components in reusable and returnable containers. Ford's Romeo Engine Plant receives over 90 percent of its parts in returnable containers. Also, Ford uses recycled plastic shrink wrap from its own manufacturing operations to make plastic seat covers to protect seats during car shipment to dealers.

V.C. Motor Vehicle Painting/Finishing

Facility Emission Controls

During the past 10 years, automobile companies have reduced the amount of emissions resulting from vehicle painting operations through more efficient paint application techniques, use of lower solvent content paints, and incineration of process emissions. In an attempt to lower emissions without jeopardizing quality, a paint development pilot plant has been established at the Ford Wixom, Michigan Assembly Plant.

Rescheduling Paint Booth Cleaning Reduces Solvent Use And VOC Emissions

One of the major factors in customer satisfaction is the quality of a car's paint job. To insure that each vehicle of a given color has a uniform and consistent coating, paint spraying equipment must be cleaned properly each time a color is changed. It is also important that the paint booth be cleaned properly to prevent stray drops or flakes of old paint from dropping onto subsequent paint jobs. The solvent used in these cleaning operations is generally referred to as "purge solvent." One of the disadvantages of using purge solvent is that it readily evaporates causing VOC emissions. In March 1993 the GM Fairfax Assembly Plant initiated a new booth-cleaning schedule which reduced the number of required cleanings. In addition to changing cleaning frequency, the company also monitored the amount of purge solvent used in production and cleaning operations. Information from these monitoring activities helped to identify the most efficient cleaning techniques. Implementation of these practices is expected to greatly lower emissions from purge solvent.

Surface Coating Toxics Reduction Program

Painting operations account for the majority of total releases attributed to automobile assembly. This is because painting and finishing operations result in VOC emissions from solvents used as carriers to apply solids to the vehicle. In order to reduce the amount of toxics generated during the painting/finishing process as well as eliminate future regulatory burden, the following projects are either underway or being planned at Chrysler:

- Evaluation of the feasibility of using coatings which eliminate or reduce VOCs/toxics; the goal is a 75 percent reduction in toxics by 1996. Various process changes and material reformulation will be required.
- Elimination of lead from surface coatings - lead has already been eliminated from all Chrysler color coats (basecoats). Further reductions in lead are being pursued for the electrodeposition primer (E-coat), with a goal of total removal by 1995. A lead-free E-coat is currently being tested.

- Elimination of hexavalent chromium phosphate pre-treatment - hexavalent chromium has already been eliminated from phosphate pre-treatment. Trivalent chromium remains in the final rinse that seals the phosphate at all but one of Chrysler's assembly plants; elimination of trivalent chromium is slated for 1995.

V.D. Motor Vehicle Dismantling/Shredding

Management Standards For Used Antifreeze

An article in the September/October 1994 edition of *Automotive Recycling* stated that The Coalition on Antifreeze and the Environment, in conjunction with Automotive Recyclers Association (ARA), has developed voluntary management standards for antifreeze. Management standards were developed, in part, to encourage the Federal and State governments to consider less restrictive regulations on recycling and disposal of antifreeze. Recent data show that antifreeze can become hazardous when handled and stored improperly. The voluntary management standards address the following:

- **Handling** - procedures for good housekeeping and proper handling of antifreeze
- **Storage** - guidelines for proper storage, such as the use of dedicated and well-labeled collection equipment
- **Education** - methods for educating employees on the importance of keeping collected, used antifreeze free from exposure to chemicals such as petroleum products, cleaning solvents, and other solvent-containing materials. Employees should also be taught not to use chlorinated solvents to clean antifreeze collection equipment.

V.E. Pollution Prevention Case Studies

Pollution Prevention at General Motors Corporation

General Motor's internal pollution prevention initiative - Waste Elimination and Cost Awareness Reward Everyone (WE CARE) - was piloted in 1990 at selected GM facilities. The initiative was then expanded to GM's operations throughout the U.S. and Canada in 1991 and was introduced to Mexican facilities in 1992. The foundation for this program is provided in the mission statement:

To minimize the impact of our operations, we will reduce emissions to air, water, and land by putting priority on waste prevention at the source, elimination or reduction of wasteful practices, and the utilization of recycling opportunities whenever available. The responsibility for achievement of this goal is primarily dependent on both management's support and actions of every employee to modify existing methods, procedures, and processes and to incorporate waste prevention into all new endeavors.

WE CARE provides guidance to individual facilities for setting up a multi-discipline committee to direct pollution prevention efforts. These committee include representatives from the following departments: maintenance, quality control, materials management, production, engineering, purchasing, environmental affairs, as well as from the local union. In bringing together representatives from all aspects of the company, GM is making pollution prevention part of everyone's job. In 1992, GM encouraged employees to suggest ways to reduce the use of raw materials (especially toxics), reduce waste generation, and simple ways to benefit the environment.

GM has undertaken two broad-based initiatives to implement this philosophy; chemicals management and packaging reduction and recycling. Each is discussed below.

Chemicals Management

The automotive industry is a large consumer of chemicals including cleaners, machining fluids, hydraulic fluids, quenching fluids, water treatment chemicals, and solvents. These chemicals are known as indirect chemicals because they are not directly incorporated into the final product. Direct chemicals, which are incorporated into the final product, include automotive paints, vehicle lubricants, and fluids. GM aims to reduce chemical waste and save money by: (1) leveraging resources and expertise from other sources; and (2) reshaping the relation between the supplier and the customer. By developing and implementing an effective chemical management system, GM has reduced the amount of chemicals used at the source and reduced waste treatment and disposal costs.

Under the new chemical management program, GM no longer simply purchases chemicals from suppliers. Instead, they purchase a chemical service. The goal was to have one supplier for all of the indirect chemicals used at a facility. Since no one supplier can supply every chemical, the primary supplier is responsible for getting chemicals from secondary suppliers. Under the program, the primary supplier ultimately becomes a part of the production team by providing GM with chemical management, analysis, inventory control, and information management services. The benefits of this initiative include:

- Cost savings through the reduced number of suppliers, types and volumes of chemicals, and chemical inventories
- Better environmental control (waste treatment and disposal)
- Improved information management
- Improved chemical technology application
- Reduced purchase order processing
- Reduced freight.

The first assembly plant to implement this program went from having 35 different suppliers providing 348 chemicals, to 12 suppliers supplying 200 chemicals. This equates to a 66 percent reduction in the number of suppliers and a 43 percent reduction in the number of chemicals. Total savings were well over $750,000 per year.

Packaging Reduction and Recycling

One of the major waste streams associated with automotive assembly is solid waste. Solid waste is primarily the result of parts packaging from suppliers. The goal of GM's packaging reduction and recycling initiative was to reduce the amount of packaging coming into the plant and to ensure that packaging was easily recycled or returned.

Because GM has many different divisions and business units, one packaging strategy was not feasible. Therefore, each division was responsible for setting its own goals and strategies. Packaging guidelines and requirements were developed and communicated to suppliers. The guidelines, which were used throughout GM include:

- Eliminate packaging altogether, where possible
- Minimize the amount of material used in packaging
- Use packages that are returnable or refillable/reusable, where practical

- Use packaging that is recyclable and uses recycled material.

Requirements pertaining to expendable packaging (packaging which is used once and not recycled) were established for suppliers. These requirements pertained to package construction (easy to disassemble), the use of recycled material (use recyclable packaging), the use of lead and cadmium (do not use), and other provisions which reduce the amount of waste generated and facilitate recycling.

The GM Midsize Car Division has been able to reduce the amount of packaging waste going to landfill per vehicle manufactured by 75 percent in just two years as part of its "zero packaging-to-landfill" goal. As of September 1993, one GM assembly plant has been able to reduce the amount of waste to less than one pound of packaging per vehicle.

Ford's Manufacturing Environmental Leadership Strategy includes the objective and practice of increasing the use of returnable containers and recycling expendable packaging. Ford's North American assembly plants now use returnable packaging for over 87 percent of all parts shipped to the plants. These plants alone recycle more than 380 million pounds of waste each year. Many parts are shipped in returnable containers and packaging plastic is made into protective seat covers for use during car shipment.

VI. SUMMARY OF FEDERAL STATUTES AND REGULATIONS

This section discusses the Federal statutes and regulations that may apply to this sector. The purpose of this section is to highlight, and briefly describe the applicable Federal requirements, and to provide citations for more detailed information. The three following sections are included.

- Section IV.A contains a general overview of major statutes
- Section IV.B contains a list of regulations specific to this industry
- Section IV.C contains a list of pending and proposed regulations

The descriptions within Section IV are intended solely for general information. Depending upon the nature or scope of the activities at a particular facility, these summaries may or may not necessarily describe all applicable environmental requirements. Moreover, they do not constitute formal interpretations or clarifications of the statutes and regulations. For further information, readers should consult the Code of Federal Regulations and other state or local regulatory agencies. EPA Hotline contacts are also provided for each major statute.

VI.A. General Description of Major Statutes

Resource Conservation And Recovery Act

The Resource Conservation And Recovery Act (RCRA) of 1976 which amended the Solid Waste Disposal Act, addresses solid (Subtitle D) and hazardous (Subtitle C) waste management activities. The Hazardous and Solid Waste Amendments (HSWA) of 1984 strengthened RCRA's waste management provisions and added Subtitle I, which governs underground storage tanks (USTs).

Regulations promulgated pursuant to Subtitle C of RCRA (40 CFR Parts 260-299) establish a "cradle-to-grave" system governing hazardous waste from the point of generation to disposal. RCRA hazardous wastes include the specific materials listed in the regulations (commercial chemical products, designated with the code "P" or "U"; hazardous wastes from specific industries/sources, designated with the code "K"; or hazardous wastes from non-specific sources, designated with the code "F") or materials which exhibit a hazardous waste characteristic (ignitibility, corrosivity, reactivity, or toxicity and designated with the code "D").

Regulated entities that generate hazardous waste are subject to waste accumulation, manifesting, and recordkeeping standards. Facilities that treat, store, or dispose of hazardous waste must obtain a permit, either from EPA or from a State agency which EPA has authorized to implement the permitting program. Subtitle C permits contain general facility standards such as contingency plans, emergency procedures, recordkeeping and reporting requirements, financial assurance mechanisms, and unit-specific standards. RCRA also contains provisions (40 CFR Part 264 Subpart S and §264.10) for conducting corrective actions which govern the cleanup of releases of hazardous waste or constituents from solid waste management units at RCRA-regulated facilities.

Although RCRA is a Federal statute, many States implement the RCRA program. Currently, EPA has delegated its authority to implement various provisions of RCRA to 46 of the 50 States.

Most RCRA requirements are not industry specific but apply to any company that transports, treats, stores, or disposes of hazardous waste. Here are some important RCRA regulatory requirements:

- **Identification of Solid and Hazardous Wastes** (40 CFR Part 261) lays out the procedure every generator should follow to determine whether the material created is considered a hazardous waste, solid waste, or is exempted from regulation.

- **Standards for Generators of Hazardous Waste** (40 CFR Part 262) establishes the responsibilities of hazardous waste generators including obtaining an ID number, preparing a manifest, ensuring proper packaging and labeling, meeting standards for waste accumulation units, and recordkeeping and reporting requirements. Generators can accumulate hazardous waste for up to 90 days (or 180 days depending on the amount of waste generated) without obtaining a permit.

- **Land Disposal Restrictions** (LDRs) are regulations prohibiting the disposal of hazardous waste on land without prior treatment. Under the LDRs (40 CFR 268), materials must meet land disposal restriction (LDR) treatment standards prior to placement in a RCRA land disposal unit (landfill, land treatment unit, waste pile, or surface impoundment). Wastes subject to the LDRs include solvents, electroplating wastes, heavy metals, and acids. Generators of waste subject to the LDRs must provide notification of such to the designated TSD facility to ensure proper treatment prior to disposal.

- **Used Oil Management Standards** (40 CFR Part 279) impose management requirements affecting the storage, transportation, burning, processing, and re-refining of the used oil. For parties that merely generate used oil, regulations establish storage standards. For a party considered a used oil marketer (one who generates and sells off-specification used oil directly to a used oil burner), additional tracking and paperwork requirements must be satisfied.

- **Tanks and Containers** used to store hazardous waste with a high volatile organic concentration must meet emission standards under RCRA. Regulations (40 CFR Part 264-265, Subpart CC) require generators to test the waste to determine the concentration of the waste, to satisfy tank and container emissions standards, and to inspect and monitor regulated units. These regulations apply to all facilities who store such waste, including generators operating under the 90-day accumulation rule.

- **Underground Storage Tanks** (USTs) containing petroleum and hazardous substance are regulated under Subtitle I of RCRA. Subtitle I regulations (40 CFR Part 280) contain tank design and release detection requirements, as well as financial responsibility and corrective action standards for USTs. The UST program also establishes increasingly stringent standards, including upgrade requirements for existing tanks, that must be met by 1998.

- **Boilers and Industrial Furnaces** (BIFs) that use or burn fuel containing hazardous waste must comply with strict design and operating standards. BIF regulations (40 CFR Part 266, Subpart H) address unit design, provide performance standards, require emissions monitoring, and restrict the type of waste that may be burned.

EPA's RCRA/Superfund/UST Hotline, at (800) 424-9346, responds to questions and distributes guidance regarding all RCRA regulations. The RCRA Hotline operates weekdays from 8:30 a.m. to 7:30 p.m., EST, excluding Federal holidays.

Comprehensive Environmental Response, Compensation, And Liability Act

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), a 1980 law commonly known as Superfund, authorizes EPA to respond to releases, or threatened releases, of hazardous substances that may endanger public health, welfare, or the environment. CERCLA also enables EPA to force parties responsible for environmental contamination to clean it up or to reimburse the Superfund for response costs incurred by EPA. The Superfund Amendments and Reauthorization Act (SARA) of 1986 revised various sections of CERCLA, extended the taxing authority for the Superfund, and created a free-standing law, SARA Title III, also known as the Emergency Planning and Community Right-to-Know Act (EPCRA).

The CERCLA **hazardous substance release reporting regulations** (40 CFR Part 302) direct the person in charge of a facility to report to the National Response Center (NRC) any environmental release of a hazardous substance which exceeds a reportable quantity. Reportable quantities are defined and listed in 40 CFR § 302.4. A release report may trigger a response by EPA, or by one or more Federal or State emergency response authorities.

EPA implements **hazardous substance responses** according to procedures outlined in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR Part 300). The NCP includes provisions for permanent cleanups, known as remedial actions, and other cleanups referred to as "removals." EPA generally takes remedial actions only at sites on the National Priorities List (NPL), which currently includes approximately 1300 sites. Both EPA and states can act at other sites; however, EPA provides responsible parties the opportunity to conduct removal and remedial actions and encourages community involvement throughout the Superfund response process.

EPA's RCRA/Superfund/UST Hotline, at (800) 424-9346, answers questions and references guidance pertaining to the Superfund program. The CERCLA Hotline operates weekdays from 8:30 a.m. to 7:30 p.m., EST, excluding Federal holidays.

Emergency Planning And Community Right-To-Know Act

The Superfund Amendments and Reauthorization Act (SARA) of 1986 created the Emergency Planning and Community Right-to-Know Act (EPCRA, also known as SARA Title III), a statute designed to improve community access to information about chemical hazards and to facilitate the development of chemical emergency response plans by State and local governments. EPCRA required the establishment of State emergency response commissions (SERCs), responsible for coordinating certain emergency response activities and for appointing local emergency planning committees (LEPCs).

EPCRA and the EPCRA regulations (40 CFR Parts 350-372) establish four types of reporting obligations for facilities which store or manage specified chemicals:

- **EPCRA §302** requires facilities to notify the SERC and LEPC of the presence of any "extremely hazardous substance" (the list of such substances is in 40 CFR Part 355, Appendices A and B) if it has such substance in excess of the substance's threshold planning quantity, and directs the facility to appoint an emergency response coordinator.

- **EPCRA §304** requires the facility to notify the SERC and the LEPC in the event of a release exceeding the reportable quantity of a CERCLA hazardous substance or an EPCRA extremely hazardous substance.

- **EPCRA §§311 and 312** require a facility at which a hazardous chemical, as defined by the Occupational Safety and Health Act, is present in an amount exceeding a specified threshold to submit to the SERC, LEPC, and local fire department material safety data sheets (MSDSs) or lists of MSDSs and hazardous chemical inventory forms (also known as Tier I and II forms). This information helps the local government respond in the event of a spill or release of the chemical.

- **EPCRA §313** requires manufacturing facilities included in SIC codes 20 through 39, which have ten or more employees, and which manufacture, process, or use specified chemicals in amounts greater than threshold quantities, to submit an annual toxic chemical release report. This report, commonly known as the Form R, covers releases and transfers of toxic chemicals to various facilities and environmental media, and allows EPA to compile the national Toxic Release Inventory (TRI) database.

All information submitted pursuant to EPCRA regulations is publicly accessible, unless protected by a trade secret claim.

EPA's EPCRA Hotline, at (800) 535-0202, answers questions and distributes guidance regarding the emergency planning and community right-to-know regulations. The EPCRA Hotline operates weekdays from 8:30 a.m. to 7:30 p.m., EST, excluding Federal holidays.

Clean Water Act

The primary objective of the Federal Water Pollution Control Act, commonly referred to as the Clean Water Act (CWA), is to restore and maintain the chemical, physical, and biological integrity of the nation's surface waters. Pollutants regulated under the CWA include "priority" pollutants, including various toxic pollutants; "conventional" pollutants, such as biochemical oxygen demand (BOD), total suspended solids (TSS), fecal coliform, oil and grease, and pH; and "non-conventional" pollutants, including any pollutant not identified as either conventional or priority.

The CWA regulates both direct and indirect discharges. The **National Pollutant Discharge Elimination System (NPDES)** program (CWA §402) controls direct discharges into navigable waters. Direct discharges or "point source" discharges are from sources such as pipes and sewers. NPDES permits, issued by either EPA or an authorized State (EPA has presently authorized forty States to administer the NPDES program), contain industry-specific, technology-based and/or water quality-based limits, and establish pollutant monitoring and reporting requirements. A facility that intends to discharge into the nation's waters must obtain a permit prior to initiating its discharge. A permit applicant must provide quantitative analytical data identifying the types of pollutants present in the facility's effluent. The permit will then set forth the conditions and effluent limitations under which a facility may make a discharge.

A NPDES permit may also include discharge limits based on Federal or State water quality criteria or standards, that were designed to protect designated uses of surface waters, such as supporting aquatic life or recreation. These standards, unlike the technological standards, generally do not take into account technological feasibility or costs. Water quality criteria and standards vary from State to State, and site to site, depending on the use classification of the receiving body of water. Most States follow EPA guidelines which propose aquatic life and human health criteria for many of the 126 priority pollutants.

Storm Water Discharges

In 1987 the CWA was amended to require EPA to establish a program to address **storm water discharges**. In response, EPA promulgated the NPDES storm water permit application regulations. Storm water discharge associated with industrial activity means the discharge from any conveyance which is used for collecting and conveying storm water and which is directly related to manufacturing, processing or raw materials storage areas at an industrial plant (40 CFR 122.26(b)(14)).

These regulations require that facilities with the following storm water discharges apply for a NPDES permit: (1) a discharge associated with industrial activity; (2) a discharge from a large or medium municipal storm sewer system; or (3) a discharge which EPA or the State determines to contribute to a violation of a water quality standard or is a significant contributor of pollutants to waters of the United States.
The term "storm water discharge associated with industrial activity" means a storm water discharge from one of 11 categories of industrial activity defined at 40 CFR 122.26. Six of the categories are defined by SIC codes while the other five are identified through narrative descriptions of the regulated industrial activity. If the primary SIC code of the facility is one of those identified in the regulations, the facility is subject to the storm water permit application requirements. If any activity at a facility is covered by one of the five narrative categories, storm water discharges from those areas where the activities occur are subject to storm water discharge permit application requirements.

Those facilities/activities that are subject to storm water discharge permit application requirements are identified below. To determine whether a particular facility falls within one of these categories, the regulation should be consulted.

Category i: Facilities subject to storm water effluent guidelines, new source performance standards, or toxic pollutant effluent standards.

Category ii: Facilities classified as SIC 24-lumber and wood products (except wood kitchen cabinets); SIC 26-paper and allied products (except paperboard containers and products); SIC 28-chemicals and allied products (except drugs and paints); SIC 29-petroleum refining; and SIC 311-leather tanning and finishing.

Category iii: Facilities classified as SIC 10-metal mining; SIC 12-coal mining; SIC 13-oil and gas extraction; and SIC 14-nonmetallic mineral mining.

Category iv: Hazardous waste treatment, storage, or disposal facilities.

Category v: Landfills, land application sites, and open dumps that receive or have received industrial wastes.

Category vi: Facilities classified as SIC 5015-used motor vehicle parts; and SIC 5093-automotive scrap and waste material recycling facilities.

Category vii: Steam electric power generating facilities.

Category viii: Facilities classified as SIC 40-railroad transportation; SIC 41-local passenger transportation; SIC 42-trucking and warehousing (except public warehousing and storage); SIC 43-U.S. Postal Service; SIC 44-water transportation; SIC 45-transportation by air; and SIC 5171-petroleum bulk storage stations and terminals.

Category ix: Sewage treatment works.

Category x: Construction activities except operations that result in the disturbance of less than five acres of total land area.

Category xi: Facilities classified as SIC 20-food and kindred products; SIC 21-tobacco products; SIC 22-textile mill products; SIC 23-apparel related products; SIC 2434-wood kitchen cabinets manufacturing; SIC 25-furniture and fixtures; SIC 265-paperboard containers and boxes; SIC 267-converted paper and paperboard products; SIC 27-printing, publishing, and allied industries; SIC 283-drugs; SIC 285-paints, varnishes, lacquer, enamels, and allied products; SIC 30-rubber and plastics; SIC 31-leather and leather products (except leather and tanning and finishing); SIC 323-glass products; SIC 34-fabricated metal products (except fabricated structural metal); SIC 35-industrial and commercial machinery and computer equipment; SIC 36-electronic and other electrical equipment and components; SIC 37-transportation equipment (except ship and boat building and repairing); SIC 38-measuring, analyzing, and controlling instruments; SIC 39-miscellaneous manufacturing industries; and SIC 4221-4225-public warehousing and storage.

Pretreatment Program

Another type of discharge that is regulated by the CWA is one that goes to a publicly-owned treatment works (POTWs). The national **pretreatment program** (CWA §307(b)) controls the indirect discharge of pollutants to POTWs by "industrial users." Facilities regulated under §307(b) must meet certain pretreatment standards. The goal of the pretreatment program is to protect municipal wastewater treatment plants from damage that may occur when hazardous, toxic, or other wastes are discharged into a sewer system and to protect the quality of sludge generated by these plants. Discharges to a POTW are regulated primarily by the POTW itself, rather than the State or EPA.

EPA has developed technology-based standards for industrial users of POTWs. Different standards apply to existing and new sources within each category. "Categorical" pretreatment standards applicable to an industry on a nationwide basis are developed by EPA. In addition, another kind of pretreatment standard, "local limits," are developed by the POTW in order to assist the POTW in achieving the effluent limitations in its NPDES permit.

Regardless of whether a State is authorized to implement either the NPDES or the pretreatment program, if it develops its own program, it may enforce requirements more stringent than Federal standards.

EPA's Office of Water, at (202) 260-5700, will direct callers with questions about the CWA to the appropriate EPA office. EPA also maintains a bibliographic database of Office of Water publications which can be accessed through the Ground Water and Drinking Water resource center, at (202) 260-7786.

Safe Drinking Water Act

The Safe Drinking Water Act (SDWA) mandates that EPA establish regulations to protect human health from contaminants in drinking water. The law authorizes EPA to develop national drinking water standards and to create a joint Federal-State system to ensure compliance with these standards. The SDWA also directs EPA to protect underground sources of drinking water through the control of underground injection of liquid wastes.

EPA has developed primary and secondary drinking water standards under its SDWA authority. EPA and authorized States enforce the primary drinking water standards, which are, contaminant-specific concentration limits that apply to certain public drinking water supplies. Primary drinking water standards consist of maximum contaminant level goals (MCLGs), which are non-enforceable health-based goals, and maximum contaminant levels (MCLs), which are enforceable limits set as close to MCLGs as possible, considering cost and feasibility of attainment.

The SDWA **Underground Injection Control (UIC)** program (40 CFR Parts 144-148) is a permit program which protects underground sources of drinking water by regulating five classes of injection wells. UIC permits include design, operating, inspection, and monitoring requirements. Wells used to inject hazardous wastes must also comply with RCRA corrective action standards in order to be granted a RCRA permit, and must meet applicable RCRA land disposal restrictions standards. The UIC permit program is primarily State-enforced, since EPA has authorized all but a few States to administer the program.

The SDWA also provides for a Federally-implemented Sole Source Aquifer program, which prohibits Federal funds from being expended on projects that may contaminate the sole or principal source of drinking water for a given area, and for a State-implemented Wellhead Protection program, designed to protect drinking water wells and drinking water recharge areas.

EPA's Safe Drinking Water Hotline, at (800) 426-4791, answers questions and distributes guidance pertaining to SDWA standards. The Hotline operates from 9:00 a.m. through 5:30 p.m., EST, excluding Federal holidays.

Toxic Substances Control Act

The Toxic Substances Control Act (TSCA) granted EPA authority to create a regulatory framework to collect data on chemicals in order to evaluate, assess, mitigate, and control risks which may be posed by their manufacture, processing, and use. TSCA provides a variety of control methods to prevent chemicals from posing unreasonable risk.

TSCA standards may apply at any point during a chemical's life cycle. Under TSCA §5, EPA has established an inventory of chemical substances. If a chemical is not already on the inventory, and has not been excluded by TSCA, a premanufacture notice (PMN) must be submitted to EPA prior to manufacture or import. The PMN must identify the chemical and provide available information on health and environmental effects. If available data are not sufficient to evaluate the chemical's effects, EPA can impose restrictions pending the development of information on its health and environmental effects. EPA can also restrict significant new uses of chemicals based upon factors such as the projected volume and use of the chemical.

Under TSCA §6, EPA can ban the manufacture or distribution in commerce, limit the use, require labeling, or place other restrictions on chemicals that pose unreasonable risks. Among the chemicals EPA regulates under §6 authority are asbestos, chlorofluorocarbons (CFCs), and polychlorinated biphenyls (PCBs).

EPA's TSCA Assistance Information Service, at (202) 554-1404, answers questions and distributes guidance pertaining to Toxic Substances Control Act standards. The Service operates from 8:30 a.m. through 4:30 p.m., EST, excluding Federal holidays.

Clean Air Act

The Clean Air Act (CAA) and its amendments, including the Clean Air Act Amendments (CAAA) of 1990, are designed to "protect and enhance the nation's air resources so as to promote the public health and welfare and the productive capacity of the population." The CAA consists of six sections, known as Titles, which direct EPA to establish national standards for ambient air quality and for EPA and the States to implement, maintain, and enforce these standards through a variety of mechanisms. Under the CAAA, many facilities will be required to obtain operating permits for the first time. State and local governments oversee, manage, and enforce many of the requirements of the CAAA. CAA regulations appear at 40 CFR Parts 50-99.

Pursuant to Title I of the CAA, EPA has established national ambient air quality standards (NAAQSs) to limit levels of "criteria pollutants," including carbon monoxide, lead, nitrogen dioxide, particulate matter, ozone, and sulfur dioxide. Geographic areas that meet NAAQSs for a given pollutant are classified as attainment areas; those that do not meet NAAQSs are classified as non-attainment areas. Under §110 of the CAA, each State must develop a State Implementation Plan (SIP) to identify sources of air pollution and to determine what reductions are required to meet Federal air quality standards.

Title I also authorizes EPA to establish New Source Performance Standards (NSPSs), which are nationally uniform emission standards for new stationary sources falling within particular industrial categories. NSPSs are based on the pollution control technology available to that category of industrial source but allow the affected industries the flexibility to devise a cost-effective means of reducing emissions.

Under Title I, EPA establishes and enforces National Emission Standards for Hazardous Air Pollutants (NESHAPs), nationally uniform standards oriented towards controlling particular hazardous air pollutants (HAPs). Title III of the CAAA further directed EPA to develop a list of sources that emit any of 189 HAPs, and to develop regulations for these categories of sources. To date EPA has listed 174 categories and developed a schedule for the establishment of emission standards. The emission standards will be developed for both new and existing sources based on "maximum achievable control technology" (MACT). The MACT is defined as the control technology achieving the maximum degree of reduction in the emission of the HAPs, taking into account cost and other factors.

Title II of the CAA pertains to mobile sources, such as cars, trucks, buses, and planes. Reformulated gasoline, automobile pollution control devices, and vapor recovery nozzles on gas pumps are a few of the mechanisms EPA uses to regulate mobile air emission sources.

Title IV establishes a sulfur dioxide emissions program designed to reduce the formation of acid rain. Reduction of sulfur dioxide releases will be obtained by granting to certain sources limited emissions allowances, which, beginning in 1995, will be set below previous levels of sulfur dioxide releases.

Title V of the CAAA of 1990 created an operating permit program for all "major sources" (and certain other sources) regulated under the CAA. One purpose of the operating permit is to include in a single document all air emissions requirements that apply to a given facility. States are developing the permit programs in accordance with guidance and regulations from EPA. Once a State program is approved by EPA, permits will be issued and monitored by that State.

Title VI is intended to protect stratospheric ozone by phasing out the manufacture of ozone-depleting chemicals and restrict their use and distribution. Production of Class I substances, including 15 kinds of chlorofluorocarbons (CFCs), will be phased out entirely by the year 2000, while certain hydrochlorofluorocarbons (HCFCs) will be phased out by 2030.

EPA's Control Technology Center, at (919) 541-0800, provides general assistance and information on CAA standards. The Stratospheric Ozone Information Hotline, at (800) 296-1996, provides general information about regulations promulgated under Title VI of the CAA, and EPA's EPCRA Hotline, at (800) 535-0202, answers questions about accidental release prevention under CAA §112(r). In addition, the Technology Transfer Network Bulletin Board System (modem access (919) 541-5742)) includes recent CAA rules, EPA guidance documents, and updates of EPA activities.

VI.B. Industry Specific Regulations

Though production processes associated with the industries listed under SIC 37 have few specific regulatory requirements, the diverse and complex nature of the industry makes it one of the most heavily regulated industries in the manufacturing sector.

The large number of facilities engaged in activities covered by SIC 37, as well as the diversity of processes and products involved, make it difficult to provide a precise regulatory framework; the statutes and regulations governing a producer of a specific part which uses a specific manufacturing process will differ significantly from those affecting an integrated manufacturing plant performing foundry, metal finishing, and painting operations. Thus, the discussion which follows identifies those regulations that are of concern to the industry at large.

VI.B.1. Clean Water Act (CWA)

The Clean Water Act regulates the amount of chemicals/toxics released by industries via direct and indirect wastewater/effluent discharges. Regulations developed to implement this Act establish effluent guidelines and standards for different industries. These standards usually set concentration-based limits on the discharge of a given chemical by any one facility. If a facility is discharging directly into a body of water, it must obtain a National Pollution Discharge Elimination System (NPDES) permit. However, if a facility is discharging to a publicly owned treatment works (POTW), it must adhere to the specified pretreatment standards. (Information provided by Chrysler indicates that all of the company's manufacturing facilities discharge process wastewater to POTWs. Much of their water is treated at an on-site industrial wastewater treatment plant prior to discharge to the POTW.)

The following regulations are potentially applicable to various stages in the auto and auto parts manufacturing and assembly processes. Because so many regulations are potentially applicable to segments of the industry, we have divided the regulations into the following categories: foundry/metal forming operations; metal finishing operations; and painting operations.

Foundry/Metal Forming Operations

The following effluent guidelines and standards are applicable to the activities performed during the foundry/metal forming operations.

- Iron and Steel Manufacturing (40 CFR Part 420)
- Metal Molding and Casting (40 CFR Part 464)
- Aluminum Forming (40 CFR Part 467)
- Copper Forming (40 CFR Part 468)
- Nonferrous Forming (40 CFR Part 471)
- Lead-Tin-Bismuth Forming Category (40 CFR Part 471 Subpart A)

- Zinc Forming Subcategory (40 CFR Part 471, Subpart H).

Metal Finishing Operations

The following effluent guidelines and standards are applicable to metal finishing activities:

- Electroplating (40 CFR Part 413)
- Metal Finishing (40 CFR Part 433)
- Coil Coating (40 CFR Part 465).

The standards applicable to metal finishing regulate discharges resulting from numerous activities performed by manufacturers of autos and auto parts. The metal finishing and electroplating guidelines address discharges from the following six activities: (1) electroplating; (2) electroless plating; (3) anodizing; (4) coating; (5) chemical etching and milling; and (6) printed circuit board manufacturing. If one of these operations is performed, the metal finishing guidelines provide effluent standards for 40 additional operations, including machining; grinding; polishing; welding; soldering; and solvent degreasing.

VI.B.2. Clean Air Act (CAA)

Several existing regulations promulgated under the CAA are applicable to various stages in the automobile production process. These are discussed below.

The Standards of Performance for Automobile and Light Duty Truck Surface Coating Operations (40 CFR Part 60, subpart MM) are applicable to assembly plant operations where prime coats, guide coats, and topcoats are applied. These standards prohibit assembly plants that begin construction, modification, or reconstruction after October 5, 1979 from discharging VOC emissions in excess of:

- 0.16 kg of VOC per liter of applied coating solids from each prime coat,

- 1.40 kg of VOC per liter of applied coating solids from each guide coat operation, and/or

- 1.47 kg of VOC per liter of applied coating solids from each top coat.

The Standards of Performance for Metal Coil Surface Coating (40 CFR Part 60, subpart TT) may be relevant to some facilities in the automotive industry. This standard regulates the discharge of VOCs.

The Standards of Performance for Fossil-Fired Steam Generators for Which Construction Commenced after August 17, 1971 (40 CFR Part 60, subpart D) are applicable to motor vehicle plants which have fossil-fuel-fired steam generating units of more that 73 megawatts (MW) heat input rate and fossil-fuel and wood-residue-fired steam generating units capable of firing fossil fuel at a rate of more that 73 MW (though these standards do not apply to electric utility steam generating units).

The regulations set emissions standards for sulfur dioxide, particulate matter, and nitrogen oxides, and contain compliance, performance, emissions testing, and recordkeeping requirements.

The Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units (40 CFR Part 60 subpart Dc) apply to motor vehicle and motor vehicle equipment plants which have steam generating units for which construction, modification, or reconstruction is commenced after June 9, 1989 and that have a maximum design capacity of 29 MW input capacity or less, but greater than or equal to 2.9 MW.

These regulations set emissions standards for sulfur dioxide and particulate matter and require certain compliance, performance, emissions testing, and recordkeeping requirements.

National Emission Standards for Hazardous Air Pollutants for Industrial Process Cooling Towers (40 CFR Part 63, subpart Q) apply to motor vehicle and motor vehicle equipment plants that have industrial process cooling towers (IPCTs) that are operated with chromium-based water treatment chemicals and are either major sources or are integral parts of facilities that are major sources. Major sources are those sources that emit or have the potential to emit 10 tons per year or more of any hazardous air pollutant or 25 tons per year or more of any combination of hazardous air pollutants.

The standards prohibit the use of chromium-based water treatment chemicals in:

- Existing IPCTs on or after March 8, 1996, and/or
- New IPCTs (IPCTs for which construction or reconstruction commenced after August 12, 1993) on or after September 8, 1994.

Chromium Electroplating

Human health studies suggest that various adverse effects result from acute, intermediate, and chronic exposure to chromium. As a result, in January 1995, EPA established National Emission Standards for Chromium Emissions From Hard and Decorative Chromium Electroplating And Chromium Anodizing Tanks (40 CFR Part 9 and 63, Subpart N) The regulation is an MACT-based performance standard that sets limits on chromium and chromium compounds emissions based upon concentrations in the waste stream (e.g., mg of chromium/m^3 of air).

EPA holds that these performance standards allow a degree of flexibility since facilities may choose their own technology as long as the emissions limits (established by the MACT) are achieved. The standards differ according to the sources (e.g., old sources of chromium emissions will have different standards than new ones), further reducing the standards' rigidity.

VI.B.3. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

CERCLA has had a much greater impact on the Big Three with facilities built before RCRA's enactment than it has had on the so-called transplant companies which have newer plants.

VI.B.4. Resource Conservation and Recovery Act (RCRA)

RCRA was passed in 1976, as an amendment to the Solid Waste Disposal Act, to ensure that solid wastes are managed in an environmentally sound manner. A material is classified under RCRA as a hazardous waste if the material meets the definition of solid waste (40 CFR 261.2), and that solid waste material exhibits one of the characteristics of a hazardous waste (40 CFR 261.20-24) or is specifically listed as a hazardous waste (40 CFR 261.31-33). A material defined as a hazardous waste is then subject to Subtitle C generator (40 CFR 262), transporter (40 CFR 263), treatment, storage, and disposal facility (40 CFR 254 and 265) and land disposal requirements (40 CFR 268). The motor vehicle and motor vehicle equipment manufacturing industry must be concerned with the regulations addressing all these. Most automobile and light truck assembly and component manufacturing facilities are not considered hazardous waste treatment, storage or disposal facilities requiring RCRA permits, although they may generate hazardous waste subject to RCRA management requirements.

The greatest quantities of RCRA listed waste and characteristically hazardous waste are identified in Exhibit 25. For more information on RCRA hazardous waste, refer to 40 CFR Part 261.

Exhibit 25
Hazardous Wastes Relevant to the Automotive Industry

EPA Hazardous Waste No.	Hazardous Waste
D001	Wastes which are hazardous due to the characterization of ignitibility
D002	Wastes which are hazardous due to the characteristic of corrosivity
D006 (cadmium) D007 (chromium) D008 (lead) D009 (mercury) D010 (selenium) D011 (silver) D035 (methyl ethyl ketone) D039 (tetrachloro-ethylene) D040 (trichloro-ethylene)	Wastes which are hazardous due to the characteristic of toxicity for each of the constituents.
F001	Halogenated solvents used in degreasing: tetrachloroethylene, methylene chloride, 1,1,1-trichloroethane, carbon tetrachloride, and chlorinated fluorocarbons; all spent solvent mixtures/blends used in degreasing containing, before use, a total of 10% or more (by volume) of one or more of the above halogenated solvents or those solvents listed in F002, F004, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.
F002	Spent halogenated solvents; tetrachloroethylene, methylene chloride, trichlorethylene, 1,1,1-trichloroethane chlorobenzene, 1,1,2-trichloro-1,2,2-trifluoroethane, ortho-dichlorobenzene, trichlorofluoromethane, and 1,1,2-trichloroethane; all spent solvent mixtures/blends containing, before use, one or more of the above halogenated solvents or those listed in F001, F004, F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.
F003	Spent non-halogenated solvents: xylene, acetone, ethyl acetate, ethyl benzene, ethyl ether, methyl isobutyl ketone, n-butyl alcohol, cyclohexanone, and methanol; all spent solvent mixtures/blends containing, before use, only the above spent non-halogenated solvents; and all spent solvent mixtures/blends containing, before use, one or more of the above non-halogenated solvents, and, a total of 10% or more (by volume) of one of those solvents listed in F001, F002, F004, F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.
F004	Spent non-halogenated solvents: cresols and cresylic acid, and nitrobenzene; all spent solvent mixtures/blends containing, before use, a total of 10% or more (by volume) of one or more of the above non-halogenated solvents or those solvents listed in F001, F002, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.

Exhibit 25 (cont'd)
Hazardous Wastes Relevant to the Automotive Industry

EPA Hazardous Waste No.	Hazardous Waste
F005	Spent non-halogenated solvents: toluene, methyl ethyl ketone, carbon disulfide, isobutanol, pyridine, benzene, 2-ethoxyethanol, and 2-nitropropane; all spent solvent mixtures/blends containing, before use, a total of 10% or more (by volume) of one or more of the above non-halogenated solvents or those solvents listed in F001, F002, or F004; and still bottoms from the recovery of these spent solvents and spent solvents mixtures.
F006	Wastewater treatment sludges from electroplating operations except from the following processes: (1) sulfuric acid anodizing of aluminum; (2) tin plating on carbon steel; (3) zinc plating (segregated basis) on carbon steel; (4) aluminum or zinc-aluminum plating on carbon steel; (5) cleaning/stripping associated with tin, zinc, and aluminum plating on carbon steel; and (6) chemical etching and milling of aluminum.
F007	Spent cyanide plating bath solutions from electroplating operations.
F008	Plating bath residues from the bottom of plating baths from electroplating operations where cyanides are used in the process.
F009	Spent stripping and cleaning bath solutions from electroplating operations where cyanides are used in the process.
F010	Quenching bath residues from oil baths from metal heat treating operations where cyanides are used in the process.
F011	Spent cyanide solutions from salt bath pot cleaning from metal heat treating operations.
F012	Quenching waste water treatment sludges from metal heat treating operations where cyanides are used in the process.
F019	Wastewater treatment sludges from the chemical conversion coating of aluminum except from zirconium phosphating in aluminum can washing when such phosphating is an exclusive conversion coating process.

Source: Sustainable Industry: Promoting Strategic Environmental Protection in the Industrial Sector, Phase 1 Report, EPA, OERR, June 1994.

VI.C. Pending and Proposed Regulatory Requirements

Numerous regulatory requirements which might affect the automotive industry are under consideration. Summaries of some of these potential future regulations are discussed below.

VI.C.1. Motor Vehicle Parts Manufacturing

Clean Water Act (CWA)

Although Congress did not reauthorize the Clean Water Act in 1994, future legislative requirements and/or reform may impact the motor vehicle manufacturer. Several of the regulations currently under consideration or development will have a significant impact on the automotive industry. The effluent guidelines and standards for Electroplaters (40 CFR Part 413) and Metal Finishers (40 CFR Part 433) are currently under review. EPA is also currently developing effluent guidelines and standards for the metal products and machinery industry (Phase II, 40 CFR Part 438), which are Scheduled to be finalized by December 1999. It is likely that EPA will integrate new regulatory options for metal finishing industry processes into this guideline.

The Effluent Guidelines and Standards for the Metal Products and Machinery Category, Phase II, will propose effluent limitation guidelines for facilities that generate wastewater while processing metal parts, metal products and machinery, including: manufacture, assembly, rebuilding, repair, and maintenance. The Phase II regulation will cover eight major industrial groups, including: motor vehicles, buses and trucks, household equipment, business equipment, instruments, precious and nonprecious metals, shipbuilding, and railroads. The court-ordered deadline is December 31, 1997.

Clean Air Act (CAA)

In addition to the CAA requirements discussed above, EPA is currently working on several regulations that will directly affect the metal finishing portion of the motor vehicle manufacturing industry. Many proposed standards will limit the air emissions from various industries by proposing Maximum Achievable Control Technology (MACT) based performance standards that will set limits on emissions based upon concentrations of pollutants in the waste stream. Various potential standards are described below.

Organic Solvent Degreasing/Cleaning

EPA has also proposed a NESHAP (58 FR 62566, November 19, 1993) for the source category of halogenated solvent degreasing/cleaning that will directly affect the metal finishing industry. This will apply to new and existing organic halogenated solvent emissions to a MACT-equivalent level, and will apply to new and existing organic halogenated solvent cleaners (degreasers) using any of the HAPs listed in the CAA Amendments. EPA is specifically targeting vapor degreasers that use the following HAPs: methylene chloride, perchloroethylene, trichloroethylene, 1,1,1-trichloroethane, carbon tetrachloride, and chloroform.

This NESHAP proposes to implement a MACT-based equipment and work practice compliance standard. This would require that a facility use a designated type of pollution prevention technology along with proper operating procedures. EPA has also provided an alternative compliance standard. Existing operations, which utilize performance-based standards, can continue if they reach the same limit as the equipment and work practice compliance standard.

Steel Pickling, HCl

Hydrochloric acid (HCl) and chlorine are among the pollutants listed as hazardous air pollutants in Section 112 of the Clean Air Act Amendments of 1990. Steel pickling processes that use HCl solution and HCl regeneration processes have been identified by the EPA as potentially significant sources of HCl and chlorine air emissions and, as such, a source category for which national emission standards may be warranted. EPA is required to promulgate national emission standards for 50 percent of the source categories listed in Section 112(e) by November 15, 1997. EPA plans to promulgate this standard by September 30, 1996.

VI.C.2. Motor Vehicle Painting/Finishing

Clean Air Act (CAA)

The 1990 CAAA identified a number of ozone non-attainment areas throughout the U.S. and gave those States most affected by high VOC emissions until November 1993 to develop implementation plans to combat the problem. The legislation further required that States reduce VOCs by 15 percent by 1996 and that States with extreme problems reduce emission an additional three percent each year following. Although State VOC limits have been established, national limits have not. A national rule on VOC limits is likely to come next year.

VOCs are one of the primary emissions from the automotive painting/finishing process and come from common paint solvents. Though no standards are currently proposed, industry officials are making their thoughts known. According to Ron Hilovsky, manager of regulatory affairs for PPG Fleet Finishes, as stated in an August 1994 article in Heavy Duty Trucking entitled “You Can Breath Easier, “ national limits will effectively eliminate lacquer products and systems.

According to Heavy Duty Trucking, limits for paints and finishes are likely to be based on the pounds of VOCs released per gallon. Most topcoats have VOC levels of 5.5 lbs/gallon or more. New limits on VOCs are likely to be as follows:

- Pretreat/wash primer - 6.5 lbs./gallon
- Primer/primer surfacer - 4.6 lbs./gallon
- Primer sealer - 4.6 lbs./gallon
- Topcoats (including single-stage solids and metallics and basecoat/clearcoat) - 5.0 lbs./gallon
- Tri and quad coat basecoat/clearcoat - 5.2 lbs./gallon
- Specialty coatings - 7.0 lbs./gallon.

VI.C.3. Motor Vehicle Dismantling/Shredding

According to AAMA, future U.S. regulatory activity affecting the vehicle recycling process, if it occurs at all, is likely to aim at improving the efficiency of the existing and already successful market infrastructure. For example, it may promote:

- Common definitions and terms
- Market incentives for the use of recycled materials, and
- Common standards for operating dismantling and shredding facilities

VII. COMPLIANCE AND ENFORCEMENT HISTORY

Background

To date, EPA has focused much of its attention on measuring compliance with specific environmental statutes. This approach allows the Agency to track compliance with the Clean Air Act, the Resource Conservation and Recovery Act, the Clean Water Act, and other environmental statutes. Within the last several years, the Agency has begun to supplement single-media compliance indicators with facility-specific, multimedia indicators of compliance. In doing so, EPA is in a better position to track compliance with all statutes at the facility level, and within specific industrial sectors.

A major step in building the capacity to compile multimedia data for industrial sectors was the creation of EPA's Integrated Data for Enforcement Analysis (IDEA) system. IDEA has the capacity to "read into" the Agency's single-media databases, extract compliance records, and match the records to individual facilities. The IDEA system can match Air, Water, Waste, Toxics/Pesticides/EPCRA, TRI, and Enforcement Docket records for a given facility, and generate a list of historical permit, inspection, and enforcement activity. IDEA also has the capability to analyze data by geographic area and corporate holder. As the capacity to generate multimedia compliance data improves, EPA will make available more in-depth compliance and enforcement information. Additionally, sector-specific measures of success for compliance assistance efforts are under development.

Compliance and Enforcement Profile Description

Using inspection, violation, and enforcement data from the IDEA system, this section provides information regarding the historical compliance and enforcement activity of this sector. In order to mirror the facility universe reported in the Toxic Chemical Profile, the data reported within this section consists of records only from the TRI reporting universe. With this decision, the selection criteria are consistent across sectors with certain exceptions. For the sectors that do not normally report to the TRI program, data have been provided from EPA's Facility Indexing System (FINDS) which tracks facilities in all media databases. Please note, in this section, EPA does not attempt to define the actual number of facilities that fall within each sector. Instead, the section portrays the records of a subset of facilities within the sector that are well defined within EPA databases.

As a check on the relative size of the full sector universe, most notebooks contain an estimated number of facilities within the sector according to the Bureau of Census (See Section II). With sectors dominated by small businesses, such as metal finishers and printers, the reporting universe within the EPA databases may be small in comparison to Census data. However, the group selected for inclusion in this data analysis section should be consistent with this sector's general make-up.

Following this introduction is a list defining each data column presented within this section. These values represent a retrospective summary of inspections and enforcement actions, and solely reflect EPA, State, and local compliance assurance activities that have been entered into EPA databases. To identify any changes in trends, the EPA ran two data queries, one for the past five calendar years (August 10, 1990 to August 9, 1995) and the other for the most recent twelve-month period (August 10, 1994 to August 9, 1995). The five-year analysis gives an average level of activity for that period for comparison to the more recent activity.

Because most inspections focus on single-media requirements, the data queries presented in this section are taken from single media databases. These databases do not provide data on whether inspections are State/local or EPA-led. However, the table breaking down the universe of violations does give the reader a crude measurement of the EPA's and States' efforts within each media program. The presented data illustrate the variations across regions for certain sectors.[2] This variation may be attributable to State/local data entry variations, specific geographic concentrations, proximity to population centers, sensitive ecosystems, highly toxic chemicals used in production, or historical noncompliance. Hence, the exhibited data do not rank regional performance or necessarily reflect which regions may have the most compliance problems.

Compliance and Enforcement Data Definitions

General Definitions

Facility Indexing System (FINDS) -- this system assigns a common facility number to EPA single-media permit records. The FINDS identification number allows EPA to compile and review all permit,

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2 EPA Regions include the following States: I (CT, MA, ME, RI, NH, VT); II (NJ, NY, PR, VI); III (DC, DE, MD, PA, VA, WV); IV (AL, FL, GA, KY, MS, NC, SC, TN); V IL, IN, MI, MN, OH, WI); VI (AR, LA, NM, OK, TX); VII (IA, KS, MO, NE); VIII (CO, MT, ND, SD, UT, WY); IX (AZ, CA, HI, NV, Pacific Trust Territories); X (AK, ID, OR, WA).

compliance, enforcement, and pollutant release data for any given regulated facility.

Integrated Data for Enforcement Analysis (IDEA) -- is a data integration system that can retrieve information from the major EPA program office databases. IDEA uses the FINDS identification number to "glue together" separate data records from EPA's databases. This is done to create a "master list" of data records for any given facility. Some of the data systems accessible through IDEA are: AIRS (Air Facility Indexing and Retrieval System, Office of Air and Radiation), PCS (Permit Compliance System, Office of Water), RCRIS (Resource Conservation and Recovery Information System, Office of Solid Waste), NCDB (National Compliance Data Base, Office of Prevention, Pesticides, and Toxic Substances), CERCLIS (Comprehensive Environmental and Liability Information System, Superfund), and TRIS (Toxic Release Inventory System). IDEA also contains information from outside sources such as Dun and Bradstreet and the Occupational Safety and Health Administration (OSHA). Most data queries displayed in notebook Sections IV and VII were conducted using IDEA.

Data Table Column Heading Definitions

Facilities in Search -- are based on the universe of TRI reporters within the listed SIC code range. For industries not covered under TRI reporting requirements, the notebook uses the FINDS universe for executing data queries. The SIC code range selected for each search is defined by each notebook's selected SIC code coverage described in Section II.

Facilities Inspected --- indicates the level of EPA and State agency facility inspections for the facilities in this data search. These values show what percentage of the facility universe is inspected in a 12 or 60 month period. This column does not count non-inspectional compliance activities such as the review of facility-reported discharge reports.

Number of Inspections -- measures the total number of inspections conducted in this sector. An inspection event is counted each time it is entered into a single media database.

Average Time Between Inspections -- provides an average length of time, expressed in months, that a compliance inspection occurs at a facility within the defined universe.

Facilities with One or More Enforcement Actions -- expresses the number of facilities that were party to at least one enforcement action within the defined time period. This category is broken down further into Federal and State actions. Data are obtained for administrative, civil/judicial, and criminal enforcement actions. Administrative actions include Notices of Violation (NOVs). A facility with multiple enforcement actions is only counted once in this column (facility with 3 enforcement actions counts as 1). All percentages that appear are referenced to the number of facilities inspected.

Total Enforcement Actions -- describes the total number of enforcement actions identified for an industrial sector across all environmental statutes. A facility with multiple enforcement actions is counted multiple times (a facility with 3 enforcement actions counts as 3).

State Lead Actions -- shows what percentage of the total enforcement actions are taken by State and local environmental agencies. Varying levels of use by States of EPA data systems may limit the volume of actions accorded State enforcement activity. Some States extensively report enforcement activities into EPA data systems, while other States may use their own data systems.

Federal Lead Actions -- shows what percentage of the total enforcement actions are taken by the U.S. EPA. This value includes referrals from State agencies. Many of these actions result from coordinated or joint State/Federal efforts.

Enforcement to Inspection Rate -- expresses how often enforcement actions result from inspections. This value is a ratio of enforcement actions to inspections, and is presented for comparative purposes only. This measure is a rough indicator of the relationship between inspections and enforcement. This measure simply indicates historically how many enforcement actions can be attributed to inspection activity. Related inspections and enforcement actions under the Clean Water Act (PCS), the Clean Air Act (AFS) and the Resource Conservation and Recovery Act (RCRA) are included in this ratio. Inspections and actions from the TSCA/FIFRA/EPCRA database are not factored into this ratio because most of the actions taken under these programs are not the result of facility inspections. This ratio does not account for enforcement actions arising from non-inspection compliance monitoring activities (e.g., self-reported water discharges) that can result in enforcement action within the CAA, CWA and RCRA.

Facilities with One or More Violations Identified -- indicates the number and percentage of inspected facilities having a violation identified in one of the following data categories: In Violation or Significant Violation Status (CAA); Reportable Noncompliance, Current Year Noncompliance, Significant Noncompliance (CWA); Noncompliance and Significant Noncompliance (FIFRA, TSCA, and EPCRA); Unresolved Violation and Unresolved High Priority Violation (RCRA). The values presented for this column reflect the extent of noncompliance within the measured time frame, but do not distinguish between the severity of the noncompliance. Percentages within this column can exceed 100% because facilities can be in violation status without being inspected. Violation status may be a precursor to an enforcement action, but does not necessarily indicate that an enforcement action will occur.

Media Breakdown of Enforcement Actions and Inspections -- four columns identify the proportion of total inspections and enforcement actions within EPA Air, Water, Waste, and TSCA/FIFRA/EPCRA databases. Each column is a percentage of either the "Total Inspections," or the "Total Actions" column.

VII.A. Motor Vehicles and Motor Vehicle Equipment Compliance History

Exhibit 26 provides a Regional breakdown of the five year enforcement and compliance activities for the automobile industry. Of 2,734 total inspections performed during the five-year period, 1,255 (46 percent) were conducted in Region V. This large percentage is due to the concentration of automobile manufacturers in the Great Lakes Region.

Exhibit 26
Five Year Enforcement and Compliance Summary for the Motor Vehicle Assembly Industry

A	B	C	D	E	F	G	H	I	J
Motor Vehicle Assembly SIC 37	Facilities in Search	Facilities Inspected	Number of Inspections	Average Number of Months Between Inspections	Facilities w/one or more Enforcement Actions	Total Enforcement Actions	State Lead Actions	Federal Lead Actions	Enforcement to Inspection Rate
Region I	9	8	27	20	4	12	58%	42%	0.44
Region II	21	18	84	15	7	28	71%	29%	0.33
Region III	38	25	248	9	6	16	94%	6%	0.06
Region IV	131	91	619	13	13	65	97%	03%	0.11
Region V	284	182	977	17	34	69	75%	25%	0.07
Region VI	29	16	82	21	5	10	70%	30%	0.12
Region VII	47	34	144	20	7	23	62%	48%	0.16
Region VIII	8	4	9	53	1	1	100%	0%	0.11
Region IX	25	7	18	83	3	16	94%	6%	0.89
Region X	6	5	8	45	0	0	—	—	n/a
Total/Average	598	390	2216	16	81	240	80%	20%	0.11

VII.B. Comparison of Enforcement Activity Between Selected Industries

Exhibits 27-30 contain summaries of the one and five year enforcement and compliance activities for the motor vehicles and motor vehicle equipment industry, as well as for other industries. As shown in exhibits 27 and 28, the automotive industry has a moderately high enforcement to inspection rate when compared to other industries. Exhibits 29 and 30 provide a breakdown of inspection and enforcement activities by statute. Of all the automotive facilities inspected, approximately 54 percent were performed under RCRA and 33 percent under CAA. The large percentages of CAA and RCRA inspections for this industry are due to the high levels of VOC emissions released during solvent-intensive manufacturing processes. The low number of CWA inspections is fairly surprising due the large quantities of water used during metal finishing and painting/finishing processes.

Exhibit 27
Five Year Enforcement and Compliance Summary for Selected Industries

A	B	C	D	E	F	G	H	I	J
Industry Sector	Facilities in Search	Facilities Inspected	Number of Inspections	Average Number of Months Between Inspections	Facilities w/One or More Enforcement Actions	Total Enforcement Actions	State Lead Actions	Federal Lead Actions	Enforcement to Inspection Rate
Metal Mining	873	339	1,519	34	67	155	47%	53%	0.10
Non-metallic Mineral Mining	1,143	631	3,422	20	84	192	76%	24%	0.06
Lumber and Wood	464	301	1,891	15	78	232	79%	21%	0.12
Furniture	293	213	1,534	11	34	91	91%	9%	0.06
Rubber and Plastic	1,665	739	3,386	30	146	391	78%	22%	0.12
Stone, Clay, and Glass	468	268	2,475	11	73	301	70%	30%	0.12
Nonferrous Metals	844	474	3,097	16	145	470	76%	24%	0.15
Fabricated Metal	2,346	1,340	5,509	26	280	840	80%	20%	0.15
Electronics/Computers	405	222	777	31	68	212	79%	21%	0.27
Motor Vehicle Assembly	598	390	2,216	16	81	240	80%	20%	0.11
Pulp and Paper	306	265	3,766	5	115	502	78%	22%	0.13
Printing	4,106	1,035	4,723	52	176	514	85%	15%	0.11
Inorganic Chemicals	548	298	3,034	11	99	402	76%	24%	0.13
Organic Chemicals	412	316	3,864	6	152	726	66%	34%	0.19
Petroleum Refining	156	145	3,257	3	110	797	66%	34%	0.25
Iron and Steel	374	275	3,555	6	115	499	72%	28%	0.14
Dry Cleaning	933	245	633	88	29	103	99%	1%	0.16

Exhibit 28
One Year Enforcement and Compliance Summary for Selected Industries

A	B	C	D	E		F		G	H
Industry Sector	Facilities in Search	Facilities Inspected	Number of Inspections	Facilities w/One or More Violations		Facilities w/One or More Enforcement Actions		Total Enforcement Actions	Enforcement to Inspection Rate
				Number	Percent*	Number	Percent*		
Metal Mining	873	114	194	82	72%	16	14%	24	0.13
Non-metallic Mineral Mining	1,143	253	425	75	30%	28	11%	54	0.13
Lumber and Wood	464	142	268	109	77%	18	13%	42	0.15
Furniture	293	160	113	66	41%	3	2%	5	0.04
Rubber and Plastic	1,665	271	435	289	107%	19	7%	59	0.14
Stone, Clay, and Glass	468	146	330	116	79%	20	14%	66	0.20
Nonferrous Metals	844	202	402	282	140%	22	11%	72	0.18
Fabricated Metal	2,346	477	746	525	110%	46	10%	114	0.15
Electronics/Computers	405	60	87	80	133%	8	13%	21	0.24
Motor Vehicle Assembly	598	169	284	162	96%	14	8%	28	0.10
Pulp and Paper	306	189	576	162	86%	28	15%	88	0.15
Printing	4,106	397	676	251	63%	25	6%	72	0.11
Inorganic Chemicals	548	158	427	167	106%	19	12%	49	0.12
Organic Chemicals	412	195	545	197	101%	39	20%	118	0.22
Petroleum Refining	156	109	437	109	100%	39	36%	114	0.26
Iron and Steel	374	167	488	165	99%	20	12%	46	0.09
Dry Cleaning	933	80	111	21	26%	5	6%	11	0.10

*Percentages in Columns E and F are based on the number of facilities inspected (Column C). Percentages can exceed 100% because violations and actions can occur without a facility inspection.

Exhibit 29
Five Year Inspection and Enforcement Summary by Statute for Selected Industries

Industry Sector	Number of Facilities Inspected	Total Inspections	Enforcement Actions	Clean Air Act		Clean Water Act		Resource Conservation and Recovery Act		FIFRA/TSCA/ EPCRA/Other*	
				% of Total Inspections	% of Total Actions	% of Total Inspections	% of Total Actions	% of Total Inspections	% of Total Actions	% of Total Inspections	% of Total Actions
Metal Mining	339	1,519	155	35%	17%	57%	60%	6%	14%	1%	9%
Non-metallic Mineral Mining	631	3,422	192	65%	46%	31%	24%	3%	27%	<1%	4%
Lumber and Wood	301	1,891	232	31%	21%	8%	7%	59%	67%	2%	5%
Furniture	293	1,534	91	52%	27%	1%	1%	45%	64%	1%	8%
Rubber and Plastic	739	3,386	391	39%	15%	13%	7%	44%	68%	3%	10%
Stone, Clay and Glass	268	2,475	301	45%	39%	15%	5%	39%	51%	2%	5%
Nonferrous Metals	474	3,097	470	36%	22%	22%	13%	38%	54%	4%	10%
Fabricated Metal	1,340	5,509	840	25%	11%	15%	6%	56%	76%	4%	7%
Electronics/ Computers	222	777	212	16%	2%	14%	3%	66%	90%	3%	5%
Motor Vehicle Assembly	390	2,216	240	35%	15%	9%	4%	54%	75%	2%	6%
Pulp and Paper	265	3,766	502	51%	48%	38%	30%	9%	18%	2%	3%
Printing	1,035	4,723	514	49%	31%	6%	3%	43%	62%	2%	4%
Inorganic Chemicals	302	3,034	402	29%	26%	29%	17%	39%	53%	3%	4%
Organic Chemicals	316	3,864	726	33%	30%	16%	21%	46%	44%	5%	5%
Petroleum Refining	145	3,237	797	44%	32%	19%	12%	35%	52%	2%	5%
Iron and Steel	275	3,555	499	32%	20%	30%	18%	37%	58%	2%	5%
Dry Cleaning	245	633	103	15%	1%	3%	4%	83%	93%	<1%	1%

* Actions taken to enforce the Federal Insecticide, Fungicide, and Rodenticide Act; the Toxic Substances and Control Act, and the Emergency Planning and Community Right-to-Know Act as well as other Federal environmental laws.

Exhibit 30
One Year Inspection and Enforcement Summary by Statute for Selected Industries

Industry Sector	Number of Facilities Inspected	Total Inspections	Enforcement Actions	Clean Air Act		Clean Water Act		Resource Conservation and Recovery Act		FIFRA/TSCA/ EPCRA/Other	
				% of Total Inspections	% of Total Actions	% of Total Inspections	% of Total Actions	% of Total Inspections	% of Total Actions	% of Total Inspections	% of Total Actions
Metal Mining	114	194	24	47%	42%	43%	34%	10%	6%	<1%	19%
Non-metallic Mineral Mining	253	425	54	69%	58%	26%	16%	5%	16%	<1%	11%
Lumber and Wood	142	268	42	29%	20%	8%	13%	63%	61%	<1%	6%
Furniture	293	160	5	58%	67%	1%	10%	41%	10%	<1%	13%
Rubber and Plastic	271	435	59	39%	14%	14%	4%	46%	71%	1%	11%
Stone, Clay, and Glass	146	330	66	45%	52%	18%	8%	38%	37%	<1%	3%
Nonferrous Metals	202	402	72	33%	24%	21%	3%	44%	69%	1%	4%
Fabricated Metal	477	746	114	25%	14%	14%	8%	61%	77%	<1%	2%
Electronics/ Computers	60	87	21	17%	2%	14%	7%	69%	87%	<1%	4%
Motor Vehicle Assembly	169	284	28	34%	16%	10%	9%	56%	69%	1%	6%
Pulp and Paper	189	576	88	56%	69%	35%	21%	10%	7%	<1%	3%
Printing	397	676	72	50%	27%	5%	3%	44%	66%	<1%	4%
Inorganic Chemicals	158	427	49	26%	38%	29%	21%	45%	36%	<1%	6%
Organic Chemicals	195	545	118	36%	34%	13%	16%	50%	49%	1%	1%
Petroleum Refining	109	439	114	50%	31%	19%	16%	30%	47%	1%	6%
Iron and Steel	167	488	46	29%	18%	35%	26%	36%	50%	<1%	6%
Dry Cleaning	80	111	11	21%	4%	1%	22%	78%	67%	<1%	7%

* Actions taken to enforce the Federal Insecticide, Fungicide, and Rodenticide Act; the Toxic Substances and Control Act, and the Emergency Planning and Community Right-to-Know Act as well as other Federal environmental laws.

VII.C. Review of Major Legal Actions

As indicated in EPA's *Enforcement Accomplishments Report, FY 1991, FY 1992,* and *FY 1993* publications, eight significant enforcement cases were resolved between 1991 and 1993 for the motor vehicle industry. Two of these cases involved CAA violations, two were comprised of CERCLA violations, while the other four involved one RCRA, one TSCA, one CWA, and one action involving violations of multiple statutes. The companies against which the cases were brought are primarily motor vehicle and motor vehicle parts manufacturers.

VII.C.1. Review of Major Cases

This section provides summary information about major cases that have affected this sector. Four of the eight cases resulted in the assessment of a civil penalty. Penalties ranged from $50,000 to $1,539,326, and the average civil penalty paid was $691,965. In three cases, the defendant was required to spend additional money to improve production processes or technologies, and to increase further compliance. For example, in U.S. v. General Motors Corporation (1991), a consent decree was entered requiring GM to install a coating system that reduces VOCs from its paint shop operations from approximately 3,400 tons per year to 750-800 tons per year. GM also paid a civil penalty of $1,539, 326.

A Supplemental Environmental Project (SEP) was required in one of the cases. The settlement in In the Matter of the Knapheido Manufacturing Co., includes SEPs to partially offset the $428,533 penalty. The initial SEP requires performance of an environmental compliance audit, which will identify and propose additional SEPs as binding commitments.

In U.S. v. Raymark Industries, Inc. (1991), the Department of Justice filed a civil complaint requesting that the court order the company to study and perform corrective action at its facility in Stratford, CT. Raymark had manufactured automobile brakes and friction products at this 34-acre facility and had disposed of its hazardous wastes (principally lead-asbestos wastes and dust) onsite. In some areas, this lead-asbestos fill is 17 feet deep. The complaint requests that the court order Raymark to comply with an administrative order issued by EPA in 1987, pursuant to §3031 of RCRA, which instructs the company to study its site in order to ascertain the nature and extent of the hazard created by the presence and release of hazardous waste. Raymark has failed to comply with the terms of the order. Based on the results of this study, the complaint also requests that Raymark be ordered to carry out a corrective action plan as approved by EPA.

In U.S. v. Chrysler Corporation et. al. (1993), the court entered a CERCLA consent decree under which the settling defendants will clean up the PCB contamination at the Cater Industrials Superfund site in Detroit, Michigan and pay about $3 million in past costs. The total cost of the cleanup is estimated to be $24 million Settling defendants include Chrysler, Ford, GM, Michigan's two public utilities, and the City of Detroit. Unusual features of the decree include provisions for EPA to perform some of the work, and a special covenant not to sue in accordance with §122(f)(2) of CERCLA.

VII.C.2. Supplemental Environmental Projects

Below is list of Supplementary Environmental Projects (SEPs). SEPs are compliance agreements that reduce a facility's stipulated penalty in return for an environmental project that exceeds the value of the reduction. Often, these projects fund pollution prevention activities that can significantly reduce the future pollutant loadings of a facility.

In December, 1993, the Regions were asked by EPA's Office of Enforcement and Compliance Assurance to provide information on the number and type of SEPs entered into by the Regions. Exhibit 31 contains a sample of the Regional responses addressing the automotive industry. The information contained in the chart is not comprehensive and provides only a sample of the types of SEPs developed for the automotive industry.

Exhibit 31
Supplemental Environmental Projects

Case Name	EPA Region	Statute Type of Action	Type of SEP	Estimated Cost to Company	Expected Environmental Benefits	Final Assessed Penalty	Final Penalty After Mitigation
Ford Motor Company St. Paul, MN	5	TSCA	Pollution Reduction	$ 35,000	Remove and destroy a PCB transformer and replace it with a non-PCB transformer to reduce the risk of discharge of PCBs into the environment.	$ 26,000	$ 10,100

VIII. COMPLIANCE ASSURANCE ACTIVITIES AND INITIATIVES

This section highlights the activities undertaken by this industry sector and public agencies to voluntarily improve the sector's environmental performance. These activities include those independently initiated by industrial trade associations. In this section, the notebook also contains a listing and description of national and regional trade associations.

VIII.A. Sector-Related Environmental Programs and Activities

The automotive industry is involved in numerous sector-related environmental activities. Some of these efforts are highlighted below.

Common Sense Initiative

The Common Sense Initiative (CSI), a partnership between EPA and private industry, aims to create environmental protection strategies that are cleaner for the environment and cheaper for industry and taxpayers. As part of CSI, representatives from Federal, State, and local governments; industry; community-based and national environmental organizations; environmental justice groups; and labor organizations, come together to examine the full range of environmental requirements affecting the following six selected industries: automobile manufacturing; computers and electronics, iron and steel, metal finishing, petroleum refining, and printing.

CSI participants are looking for solutions that:

- Focus on the industry as a whole rather than one pollutant
- Seek consensus-based solutions
- Focus on pollution prevention rather than end-of-pipe controls
- Are industry-specific.

The Common Sense Initiative Council (CSIC), chaired by EPA Administrator Browner, consists of a parent council and six subcommittees (one per industry sector). Each of the subcommittees have met and have identified issues and project areas for emphasis, and workgroups have been established to analyze and make recommendation on these issues.

EPA/Auto Protocol

Procedures for assessing compliance during automobile painting and finishing operations were first outlined in a December 1988 EPA publication entitled, Protocol for Determining the Daily Volatile Organic Compound Emission Rate of Automobile and Light-Duty Truck Topcoat Operations, (EPA-450/3-88-018). This document, which is referred to as the EPA/Auto Protocol, contains information on recordkeeping, testing, and compliance calculation procedures. The Protocol has been used to demonstrate compliance with emission limits for topcoat and spray primer/surface coating activities.

EPA and AAMA have discussed and hope to update the protocol. AAMA hopes to have an automotive spraybooth capture efficiency procedure as well as some acceptable spraybooth/oven split test modifications for in-plant simulation incorporated into the protocol as a technical update.

Research

The American Industry/Government Emissions Research Cooperative Research and Development Agreement (AIGER CRADA)

AIGER CRADA was officially launched in October 1992. The founding members - U.S. EPA, the California Air Resources Board, and USCAR's Environmental Research Consortium - came together to identify, encourage, evaluate, and develop the instrumentation and techniques needed to accurately and efficiently measure emissions from motor vehicles as required by the Clean Air Act and the California Health and Safety Code. This effort will help ensure that technologies are commercialized and available to emissions testing facilities.

Partnership For A New Generation Of Vehicles

Partnership For A New Generation Of Vehicles (PNGV), one of several research consortia under USCAR, is a partnership between domestic automotive manufacturers and the Federal government. The partnership is aimed at strengthening U.S. competitiveness by expanding the industry's technology base. Research will be performed in the following three areas:

- Advanced manufacturing techniques to make it easier to get new product ideas to the marketplace quickly;

- Technologies leading to near-term improvements in automobile efficiency, safety, and emissions; and
- Research leading to production prototypes of a vehicle capable of up to three times current fuel efficiency.

President's Council on Sustainable Development - Eco-Efficiency Task Force

The purpose of the Eco-Efficiency Task Force is to develop and recommend to the President's Council on Sustainable Development a strategy for making eco-efficiency and sustainable development standard business practices in American industry. The Task Force will highlight how changes in economic, regulatory, statutory, and other policies will encourage industry to become more aware of the interdependence among environmental, economic, and social well-being, and recommend policies effective in promoting sustainable business practices. The Task Force is sub-divided into five Eco-Efficiency Task Force Teams: Autos Team; Chemicals Sector Team; Eco-Industrial Park Team; Policy Team; and Printers/Small Business Team. The three goals of the Auto Team are to recommend ways to:

- Improve the "eco-efficiency" of automobile manufacturing by making pollution prevention, waste reduction, and product stewardship standard business practices
- Improve the system of environmental policy and regulation affecting automobile manufacturing
- Improve the sustainability of road-based transportation.

As part of its efforts, the Auto Team is collecting information on the "life cycle" analysis of automobile painting operations at a GM assembly plant. The team is also collecting data from the paint and pigment industry, the steel, plastics, and aluminum manufacturing industries, as well as the auto repainting industry. The project will assess the environmental, energy, and economic implications of various auto body material/coating choices such as solvent, water, or powder. The Task Force is expected to deliver its findings in late 1995.

Outreach and Education Activity

Pollution Prevention and Waste Minimization in the Metal Finishing Industry Workshop

The University of Nebraska-Lincoln sponsored a *Pollution Prevention and Waste Minimization in the Metal Finishing Industry* workshop in 1993. The workshop was designed for managers and operators of electroplating and galvanizing operations; engineers; environmental consultants; waste management consultants; Federal, State, and local government officials; and individuals responsible for training in the area of metal finishing waste management. Topics covered:

- Saving money and reducing risk through pollution prevention and waste minimization;
- Incorporating pollution prevention into planning electroplating and galvanizing operations;
- Conducting waste minimization audits;
- Developing and analyzing options for pollution prevention / waste minimization; and
- Implementing a pollution prevention / waste minimization program.

For more information concerning this workshop, contact David Montage of the University of Nebraska at W348 Nebraska Hall, Lincoln, NE 68588-0531.

Hazardous Waste Management for Small Business Workshop

The University of Northern Iowa, with support from U.S. EPA, Des Moines Area Community College, Northeast Iowa Community College, Scott Community College, and Indiana Hills Community College, sponsored a *Hazardous Waste Management for Small Business* workshop. This workshop was geared for small businesses and was intended to provide practical answers to environmental regulatory questions. Small businesses covered by the workshop include: manufacturers, vehicle maintenance and repair shops, printers, machine shops, and other businesses that generate potentially hazardous waste. Topics covered included: hazardous waste determination, waste generator categories, management of specific common waste streams, including used oil and solvents, and pollution prevention. For more information regarding workshop, contact Duane McDonald (319) 273-6899.

Environmentally Conscious Painting Workshop

Kansas State University, NIST/Mid-America Manufacturing Technology Center, Kansas Department of Health & Environment, EPA Region VII, Allied Signal, Inc., Kansas City Plant, and the U.S. Department of Energy sponsored the *Environmentally Conscious Painting* workshop. This workshop covered topics such as upcoming regulations and the current regulatory climate, methods to cost-effectively reduce painting wastes and emissions, and alternative painting processes. For more information regarding this workshop, contact the Kansas State University Division of Continuing Education (913) 532-5566.

Pollution Prevention Workshop for the Electroplating Industry

Kansas State University Engineering Extension, EPA Region VII, Kansas Department of Health and Environment, and the University of Kansas sponsored the *Pollution Prevention Workshop for the Electroplating Industry*. The workshop described simple techniques for waste reduction in the electroplating industry, including: plating, rinsing processes and wastewater, wastewater management options, metals recovery options, waste treatment and management, and product substitutions and plating alternatives. For more information regarding this workshop, contact the Kansas State University Division of Continuing Education at (800) 432-8222.

VIII.B. EPA Voluntary Programs

33/50 Program

The "33/50 Program" is EPA's voluntary program to reduce toxic chemical releases and transfers of 17 chemicals from manufacturing facilities. Participating companies pledge to reduce their toxic chemical releases and transfers by 33 percent as of 1992 and by 50 percent as of 1995 from the 1988 baseline year. Certificates of Appreciation have been given to participants who met their 1992 goals. The list of chemicals includes 17 high-use chemicals reported in the Toxics Release Inventory.

Sixty-six companies listed under SIC 37 (transportation) are currently participating in the 33/50 program. They account for approximately 20 percent of the 405 companies under SIC 37, which is slightly higher than the average for all industries of 14 percent participation. It should be noted, however, that the two digit SIC 37 covers a large number of small firms performing numerous manufacturing processes. (Contact: Mike Burns (202) 260-6394 or the 33/50 Program (202) 260-6907)

Exhibit 32 lists those companies participating in the 33/50 program that reported under SIC code 37 to TRI. Many of the participating companies listed multiple SIC codes (in no particular order), and are therefore likely to conduct operations in addition to the motor vehicle assembly industry. The table shows the number of facilities within each company that are participating in the 33/50 program; each company's total 1993 releases and transfers of 33/50 chemicals; and the percent reduction in these chemicals since 1988.

Exhibit 32
Motor Vehicle Assembly Facilities Participating in the 33/50 Program

Parent Facility name	Parent City	ST	SIC Codes	# of Participating Facilities	1993 Releases and Transfers (lbs.)	% Reduction 1988 to 1993
American Honda Motor Co., Inc,	Torrance	CA	3711	2	3,254,180	*
Chrysler Corporation	Highland Park	MI	3711	8	3,623,717	80
Ford Motor Company	Dearborn	MI	3465, 3711	19	15,368,032	15
General Motors Corporation	Detroit	MI	3711	23	16,751,198	*
Harsco Corporation	Camp Hill	PA	3711, 3713	1	415,574	**
Navistar International Corp.	Chicago	IL	3711	1	180,834	*
New United Motor Manufacturing	Fremont	CA	3711	1	420,125	**
Northrop Grumman Corp.	Los Angeles	CA	3711	1	2,357,844	35
Superior Coaches	Lima	OH	3711	1	87,900	44

*** = not quantifiable against 1988 data.**
**** = use reduction goal only.**
***** = no numerical goal.**

Environmental Leadership Program

The Environmental Leadership Program (ELP) is a national initiative piloted by EPA and State agencies in which facilities have volunteered to demonstrate innovative approaches to environmental management and compliance. EPA has selected 12 pilot projects at industrial facilities and Federal installations which will demonstrate the principles of the ELP program. These principles include: environmental management systems, multimedia compliance assurance, third-party verification of compliance, public measures of accountability, community involvement, and mentoring programs. In return for participating, pilot participants receive public recognition and are given a period of time to correct any violations discovered during these experimental projects. (Contact: Tai-ming Chang, ELP Director (202) 564-5081 or Robert Fentress (202) 564-7023)

Project XL

Project XL was initiated in March 1995 as a part of President Clinton's *Reinventing Environmental Regulation* initiative. The projects seek to achieve cost effective environmental benefits by allowing participants to replace or modify existing regulatory requirements on the condition that they produce greater environmental benefits. EPA and program participants will negotiate and sign a Final Project Agreement, detailing specific objectives that the regulated entity shall satisfy. In exchange, EPA will allow the participant a certain degree of regulatory flexibility and may seek changes in underlying regulations or statutes. Participants are encouraged to seek stakeholder support from local governments, businesses, and environmental groups. EPA hopes to implement fifty pilot projects in four categories including facilities, sectors, communities, and government agencies regulated by EPA. Applications will be accepted on a rolling basis and projects will move to implementation within six months of their selection. For additional information regarding XL Projects, including application procedures and criteria, see the May 23, 1995 Federal Register Notice, or contact Jon Kessler at EPA's Office of Policy Analysis (202) 260-4034.

Green Lights Program

EPA's Green Lights program was initiated in 1991 and has the goal of preventing pollution by encouraging U.S. institutions to use energy-efficient lighting technologies. The program has over 1,500 participants which include major corporations; small and medium sized businesses; Federal, State and local governments; non-profit groups; schools; universities; and health care facilities. Each participant is required to survey their facilities and upgrade lighting wherever it is profitable. EPA provides technical assistance to the participants through a decision support software package, workshops and manuals, and a financing registry. EPA's Office of Air and Radiation is responsible for operating the Green Lights Program. (Contact: Susan Bullard at (202) 233-9065 or the Green Light/Energy Star Hotline at (202) 775-6650)

WasteWi$e Program

The WasteWi$e Program was started in 1994 by EPA's Office of Solid Waste and Emergency Response. The program is aimed at reducing municipal solid wastes by promoting waste minimization, recycling collection, and the manufacturing and purchase of recycled products. As of 1994, the program had about 300 companies as members, including a number of major corporations. Members agree to identify and implement actions to reduce their solid wastes and must provide EPA with their waste reduction goals along with yearly progress reports. EPA in turn provides technical assistance to member companies and allows the use of the WasteWi$e logo for promotional purposes. (Contact: Lynda Wynn (202) 260-0700 or the WasteWi$e Hotline at (800) 372-9473)

Climate Wise Recognition Program

The Climate Change Action Plan was initiated in response to the U.S. commitment to reduce greenhouse gas emissions in accordance with the Climate Change Convention of the 1990 Earth Summit. As part of the Climate Change Action Plan, the Climate Wise Recognition Program is a partnership initiative run jointly by EPA and the Department of Energy. The program is designed to reduce greenhouse gas emissions by encouraging reductions across all sectors of the economy, encouraging participation in the full range of Climate Change Action Plan initiatives, and fostering innovation. Participants in the program are required to identify and commit to actions that reduce greenhouse gas emissions. The program, in turn, gives organizations early recognition for their reduction commitments; provides technical assistance through consulting services, workshops, and guides; and provides access to the program's centralized information system. At EPA, the program is operated by the Air and Energy Policy Division within the Office of Policy Planning and Evaluation. (Contact: Pamela Herman (202) 260-4407)

NICE^3

The U.S. Department of Energy and EPA's Office of Pollution Prevention are jointly administering a grant program called The National Industrial Competitiveness through Energy, Environment, and Economics (NICE3). By providing grants of up to 50 percent of the total project cost, the program encourages industry to reduce industrial waste at its source and become more energy-efficient and cost-competitive through waste minimization efforts. Grants are used by industry to design, test, demonstrate, and assess the feasibility of new processes and/or equipment with the potential to reduce pollution and increase energy efficiency. The program is open to all industries; however, priority is given to proposals from participants in the pulp and paper, chemicals, primary metals, and petroleum and coal products sectors. (Contact: DOE's Golden Field Office (303) 275-4729)

VIII.C. Trade Associations/Industry Sponsored Activity

As one of the most highly regulated industries in the U.S., the automotive industry is constantly forced to identify and develop new ways to produce motor vehicles and motor vehicle parts more efficiently and with less waste. In an effort to pool resources, three manufacturers have formed a partnership to promote pollution prevention initiatives. Information is also provided on the various trade associations which support the industry.

VIII.C.1. Environmental Programs

Automobile Pollution Prevention Project (Auto Project)

Auto Project is a voluntary partnership between the Big Three automobile manufactures and the State of Michigan (on behalf of eight Great Lakes States and the U.S. EPA) to promote pollution prevention. Initiated on September 24, 1991, Auto Project is the first public/private initiative focused specifically on the environmental impacts resulting from automobile manufacturing. Auto Project is administered by the American Automobile Manufacturers Association (AAMA) and the Michigan Department of Natural Resources (MDNR). The purpose of the project is to:

- Identify Great Lakes Persistent Toxic (GLPT) substances and reduce their generation and release
- Advance pollution prevention within the auto industry and its supplier base
- Reduce releases of GLPT substances beyond regulatory requirements
- Address regulatory barriers that inhibit pollution prevention.

A progress report released in February 1994 states that significant accomplishments have been achieved in the last two years and that releases of the listed GLPT substances by auto companies have been cut by 20.2 percent in the first year of the Auto Project. Other accomplishments of Auto Project include:

- Developed criteria for identification of GLPT substances
- Identified 65 GLPT substances based on the criteria
- Provided highlights of historical pollution prevention efforts
- Established priorities and identified opportunities to reduce the generation and release of the listed substances
- Provided pollution prevention case study information for technology transfer to auto suppliers and other companies
- Established a pilot program to identify and reduce regulatory barriers to pollution prevention actions.

In October 1993 a comprehensive evaluation of the first two years of the Auto Project was conducted by members of the Great Lakes environmental community. Results of the evaluation were documented in a 1993 report entitled *So Much Promise, So Little Progress - An Evaluation of the State of Michigan/Auto Industry Great Lakes Pollution Prevention Initiative* written by the Ann Arbor, Michigan Ecology Center. The report concludes that although still promising, Auto Project has been mostly unsuccessful. The Great Lakes environmental groups claimed the following:

- Auto companies have not conducted the promised surveys of pollution generated by individual plants and manufacturing processes
- Auto companies have initiated few new pollution prevention projects
- Auto company suppliers, who account for more toxic releases than the auto companies themselves, have not been brought into the project
- Stakeholders (environmental groups and labor) have not had adequate opportunities to participate
- Auto companies have yet to establish clear goals or timetables for eliminating toxic substances from their processes.

VIII.C.2. Summary of Trade Associations

Trade Associations

Automotive Manufacturers

American Automobile Manufacturers Association (AAMA) 1401 H Street, NW, Suite 900 Washington, DC 20005 Phone: (202) 326-5500 Fax: (202) 326-5567	Members: 3 Staff: 100 Budget: $14,000,000 Contact: Andrew H. Card, Jr.

Founded in 1913, AAMA, formerly the Motor Vehicle Manufacturers Association, represents manufacturers of passenger and commercial cars, trucks, and buses to improve vehicle safety, reduce air pollution, and assist in long-term energy conservation objectives. This association compiles statistics, disseminates information, and conducts research programs and legislative monitoring on Federal and State levels. AAMA also maintains patents and communications libraries, and publishes the following annual documents: *Motor Vehicle Facts and Figures, Motor Vehicle Identification Manual*, and *World Motor Vehicle Data Book.*

Association of International Automobile Manufacturers (AIAM) 1001 19th Street, North, Suite 1200 Arlington, VA 22209 Phone: (703) 525-7788 Fax: (703) 525-3289	Members: 35 Budget: $4,200,000 Contact: Phillip Hutchinson

Founded in 1964, AIAM represents companies that manufacture automobiles or automotive equipment and that import into, or export from, the United States. This association acts as a clearinghouse for information, especially with regard to proposed State and Federal regulations in the automobile industry as they bear on imported automobiles, and reports proposed regulations by State or Federal governments pertaining to equipment standards, licensing, and other matters affecting members. AIAM publishes materials on State and Federal laws, regulations, and standards.

American Foundrymen's Society (AFS) 505 State Street Des Plaines, IL 60016 Phone: (708) 824-0181 Fax: (708) 824-7848	Members: 13,500 Staff: 52 Contact: Ezra L. Kotzin

Founded in 1896, AFS represents foundrymen, patternmakers, technologists, and educators and sponsors foundry training courses through the Cast Metals Institute on all subjects pertaining to the castings industry. The Society conducts educational and instructional activities on the foundry industry and sponsors ten regional foundry conferences and 400 local foundry technical meetings. AFS maintains the Technical Information Center, a literature search and document retrieval service, and the Metalcasting Abstract Service, which provides abstracts of the latest metal casting literature. In addition to providing environmental services and testing, AFS publishes *Modern Casting* (monthly), which covers current technology practices and other influences affecting the production and marketing of metal castings.

Automotive Presidents Council (APC) 1325 Pennsylvania Avenue, NW, 6th Floor Washington, D.C. 20004 Phone: (202) 393-6362 Fax: (202) 737-3742	Members: 50 Contact: Christopher Bates

Founded in 1966, APC represents presidents and chief executive officers of leading manufacturing companies producing automotive parts, equipment, accessories, tools, paint, and refinishing supplies. This council provides a forum in which chief executives can discuss areas of mutual interest or top management problems, share ideas, and exchange solutions.

Automotive Parts and Equipment

Automotive Parts and Accessories Association (APAA) 4600 East West Highway, Suite 300 Bethesda, MD 20814 Phone: (301) 654-6664 Fax: (301) 654-3299	Members: 2000 Staff: 26 Budget: $3,000,000 Contact: Lawrence Hecker

Founded in 1967, this association represents automotive parts and accessories retailers, distributors, manufacturers, and manufacturers' representatives. APAA conducts research, compiles statistics, conducts seminars, provides a specialized education program, and operates a speakers' bureau and placement service. This association publishes *APAA Frontlines* (bimonthly), *APAA Government Report* (periodic), *APAA Tech Service Report* (monthly), *APAA Who's Who* (annual), *APAA Membership Directory* (periodic), *Computer News for the Automotive Aftermarket* (monthly), and *Foreign Buyers Directory* (annual).

Motor and Equipment Manufacturers Association (MEMA) #10 Laboratory Drive P.O. Box 13966 Research Triangle Park, NC 27709-3966 Phone: (919) 549-4800 Fax: (919) 549-4824	Members: 750 Staff: 62 Budget: $3,500,000 Contact: Robert Miller

Founded in 1904, MEMA represents manufacturers of automotive and heavy-duty original equipment and replacement components, maintenance equipment, chemicals, accessories, refinishing supplies, tools, and service equipment. This organization provides the following manufacturer-oriented services: marketing consultation; Federal and State legal, safety, and legislative representation and consultation; personnel services; and manpower development workshops. In addition, MEMA conducts seminars on domestic and overseas marketing, Federal trade regulations, freight forwarding, and credit and collection. This association publishes the following documents: *Automotive Distributor Trends and Financial Analysis* (periodic), *Credit and Sales Reference Directory* (semiannual), *International Buyer's Guide of U.S. Automotive and Heavy Duty Products* (Biennial), *Marketing Insight* (quarterly), and *Autobody Supply and Equipment Market*.

Finishing and Dismantling

Paint, Body, and Equipment Association (PBEA) c/o Martin Fromm and Associates 9140 Ward Parkway, Suite 200 Kansas City, MO 64114 Phone: (816) 444-3500 Fax: (816) 444-0330	Members: 100 Staff: 6 Contact: Barbara Aubin

Founded in 1975, PBEA represents warehouse distributors and manufacturers specializing in the automotive paint, body, and equipment field. This organization conducts management seminars and publishes an annual *Membership Directory* and a bimonthly *Newsletter*.

Automotive Recyclers Association (ARA) 3975 Fair Ridge Drive 320 Terrace Level North Fairfax, VA 22033 Phone: (703) 385-1001 Fax: (703) 385-1494	Members: 5,500 Staff: 12 Budget: $1,100,000 Contact: William Steinkuller

Founded in 1943, ADRA represents firms that sell used auto, truck, motorcycle, bus, farm, and construction equipment parts, as well as firms that supply equipment and services to the industry. This organization seeks to improve industry business practices and operating techniques through information exchange via meetings and publications, including *ADRA Newsletter* (monthly), *Automotive Recycling* (bimonthly), and *Industry Survey* (biennial).

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Contacts

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	American Automobile Manufacturers Association (AAMA)	(313) 872-4311
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* Many of the contacts listed above have provided valuable background information and comments during the development of this document. EPA appreciates this support and acknowledges that the individuals listed do not necessarily endorse all statements made within this notebook.

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