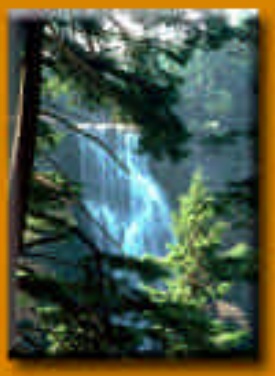
Shifting into High Gear



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The Benefits of Pollution Prevention Practices in the Automotive Aftermarket

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Acknowledgements

Support of the Aerospace and Automotive Branch of Industry Canada is gratefully acknowledged.

Research work and report preparation was carried out by Hine & Associates of Richmond Hill, Ontario. The assistance of the following members of the Project's Review Committee has been very valuable during the course of the project and in the preparation of the final report:

Keith Burns, PPG Canada Inc.
Grant Cavern, Canadian Tire Corporation
John Ely, Exide Canada
Larry Jefferies, CARSTAR Automotive
Tim MacDonald, Ideal Supply
Randy Moore, Mister Transmission
Larry Parkinson, Duracool
Patty Palermo, Motorcade

The following individuals kindly provided information and data on subject matter for the final report:

Bill Burns, Sata Corporation
Mike Bryan, Michael Bryan and Associates Inc
Angela Burridge, Department of Environment, Newfoundland
Graham Currie, Greater Vancouver Regional District, British Columbia
John Goodwin, Ontario Tire Dealers Association
Toby Matthews, Department of Environment, Newfoundland
Colleen W. McKenzie, Automotive Retailers Association
Glenda McKinnon-Peters, Department of Environment, Prince Edward Island
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Jerome Paris, Resource Recovery Fund Board, Nova Scotia
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February 25, 2004

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Executive Summary

The automotive aftermarket industry is a major contributor to Canada's Gross National Product, with retail sales of over $15 billion in 2002, and direct employment of approximately 393,000 workers. Automotive service and repair processes and procedures are vital to the Canadian economy as vehicle traffic is a primary means of efficiently transporting goods and services throughout this country and to our major trading partner, the USA.

Vehicle service and repair generates a variety of waste streams. As the general public becomes more environmentally conscious, the industry along with federal, provincial, and municipal governments, are increasingly interested in environmental best practices as a way to promote pollution prevention, eco-efficiency, and sustainable development. Furthermore, with the Canadian ratification of the Kyoto Accord, environmental best practice in the automotive sector is seen as an effective means of meeting international commitments on air pollution reduction.

Although many manufacturers, distributors, and vehicle repair facilities in the industry presently incorporate environmental best practices in their operations, it is not currently clear how prevalent these practices are, or how they contribute to an improved bottom line and enhanced customer image. Presently, industry best practices are largely anecdotal and have not been verified, qualified or quantified.

The objectives of this report are twofold:

1. **Determine the prevalence and extent of environmental practices (including eco-efficiency, 3Rs, and degree of compliance with industry regulations and guidelines) in the industry, and,**
2. **Help promote this aspect to the industry in terms of the benefits towards sustainable development and to the public so they have a better understanding of how car care impacts climate change.**

This report is unique in that it not only has provided a measure of how well environmental best practices in the automotive aftermarket are currently being implemented, but also has documented current best practices for dealing with a variety of common waste streams. The report also provides a number of recommendations that will likely yield the largest environmental and economic returns, increase the likelihood that industry will continue adopting these practices, and improve communication to consumers regarding the positive benefits of these environmental practices. With this well researched information at its disposal, industry, government, and public stakeholders can now make informed decisions on resource allocation, priorities, and future directions.

Summary of Key Findings

The first part of the report documents how well the industry has adopted best environmental practices for dealing with the following wastes and pollutants: air pollution from vehicle exhaust emissions, lead and lead-acid batteries, paints, solvents, cleaners, refrigerants, scrap tires, used oil, used filters and oil containers, used glass windshields, and vehicle parts. Both quantitative and qualitative data has been obtained and consolidated through an extensive research of published reports by industry associations, government agencies, and research institutes in Canada and the United States. The results indicate there is a wide variation in adoption and success of these practices, not only across Canada, but also within each waste category.

- British Columbia and Ontario have implemented effective programs that have reduced vehicle exhaust emissions such as hydrocarbons, carbon monoxide, and nitrous oxides, commonly known as 'greenhouse gases', smog or air pollution. The analysis suggests that additional reductions of an estimated 2 megatonnes of vehicle exhaust gases could be achieved by the industry if similar programs were implemented in other areas in Canada of high vehicle density. This combined with the successful implementation of consumer-based programs such as the 'One-Tonne Challenge' will provide the greatest opportunity to reduce greenhouse gas emissions and assist efforts to achieve Kyoto requirements in Canada.

- Recycling programs for lead-acid batteries is in place across Canada, and industry results from USA data indicates that about 97% of spent battery lead was recycled by consumers and retailers from 1997 to 2001.

- All provinces have some form of stewardship programs to recover and recycle used motor oil and other lubricants, but only Alberta, Manitoba and Saskatchewan measure progress and report the results on a regular basis. Only Alberta is reporting progress on the recycling of used oil containers. Further significant recycling opportunities exist across Canada.

- Formal scrap tire recovery and recycling programs are in place in all provinces except Ontario, where a stewardship program is under development. But only four provinces appear to be measuring the effectiveness of their programs.

- The performance of both industry and government in dealing with used refrigerants, waste paint and solvent emissions presents some interesting contrasts. For example, each province and territory has detailed regulations in place covering the recovery, handling, storage, and transportation of used refrigerants. Training of refrigerant service technicians is also required, and the purchase of refrigerants is restricted. Manufacturers of refrigerants for mobile air conditioning systems have devoted considerable resources to supply ozone-friendly, alternative technologies. However, there does not appear to be any system in place to measure how effective these regulations, and the new products, are in reducing the emission of refrigerants to the environment, and the benefits to the environment and society. Without a measurement system, it is very difficult to assess progress, and decide on future priorities in this area.

- Ontario and the Greater Vancouver Regional District have taken regulatory steps recently to reduce the emission of paint solvents and cleaners from collision repair facilities to the atmosphere. In addition, the major automotive refinish paint suppliers in Canada have initiated a number of effective pollution prevention and recycling programs for the end users of their products. For example, low solvent, water based coatings have been introduced, along with technology to reduce waste paint and facilitate recycling. These initiatives have undoubtedly resulted in substantial emission reductions and gains in sustainable development. However, the research did not uncover any data that could quantify these achievements. This represents a new opportunity for the industry to communicate what is likely to be a significant success story, thereby enhancing its image with consumers and other groups.

- Used windshield glass recycling appears to be a low priority in the industry because of the lack of financial incentives. An estimated 18-20 million kilograms per year of used glass is disposed in landfill sites.

- The End of Life Vehicle (ELV) Directive (2000/53/EC) came into force on October 21, 2000 in Europe. It sets short and long term targets from January 1, 2006 to January 1, 2015 to minimize the impact of end of life vehicles by setting challenging goals for recycling, re-use, and recovery of the materials used in vehicles. In Japan, The Automotive Recycling Law places similar requirements for end of life (scrap) vehicles. These laws could ultimately alter the landscape in the North American OEM, aftermarket, and vehicle recycling industries because public, political and environmental pressures can be expected to result in stronger requirements to optimize vehicle material recovery.

Overall, the results of this study have demonstrated that the automotive aftermarket industry during the past decade has made significant gains in pollution prevention activity. Some of the critical success factors include:

1. Program resources and financed infrastructure through 'eco fees', levies, and financial incentives,
2. Existence of provincial regulations, and
3. Leadership of industry associations and agencies.

Clearly however, there is much to be done to ensure that better data is gathered and analyzed to measure progress. Also, mechanisms for transferring lessons learned to other sectors of the industry need to be explored and systems implemented. The report makes a number of recommendations in this area.

The second part of this report documents the most current best practices for automotive aftermarket wastes, and includes a number of case studies that demonstrate the financial and environmental benefits. There are considerable, well-documented practices and information from reliable sources in both Canada and the USA. Published material from the trade press, from various aftermarket groups and associations, and discussions with industry representatives revealed that successful pollution prevention practices presently used include recycling, source reduction, reuse, waste diversion, and attention to common everyday work practices and procedures. In many cases, combinations of these techniques can result in significant waste reduction, a healthier work environment, and savings to the facility. Sufficient information from reliable sources is provided in this report to demonstrate that under current conditions, disposal is rarely the only, and preferred option, for a large number of waste streams.

Best environmental practices for each automotive waste stream are documented in a series of consistently organized, briefly worded, stand-alone units. This will facilitate the promotion of these practices throughout the industry. Each unit consists of a short background, a list of the best practices, well-supported case studies or success stories from people in the industry, and a short list of pertinent references where interested readers can find more information. AIA members and other representatives from the industry have provided sound ideas for the promotion of the best practices throughout the industry, and they are included in the following section on Recommendations.

Shifting into High Gear-Recommendations for the Industry Stakeholders

The research conducted in this report has indicated that successful P2 programs supported by industry best practices currently exist in areas of the Canadian automotive aftermarket sector. Since the progress reported has resulted from concerted efforts by industry, governments, and the public, the following recommendations are framed in the context that these stakeholders will participate actively in future initiatives.

The recommendations in this report are intended to focus on three main outcomes:

- **Identify which practices are likely to yield the biggest environmental and economic returns**
- **Identify ways to increase the likelihood that industry will adopt these practices, and**
- **Identify how best to communicate the positive environmental/economic benefits to consumers.**

These recommendations, in each of the three areas, are detailed in the following section.

1. Identify which practices are likely to yield the biggest environmental and economic returns

A. Develop and implement plans to extend existing vehicle exhaust reduction programs in British Columbia and Ontario to all major areas of high vehicle density. This can result in substantial reductions in greenhouse gas emissions, yield significant improvements in fuel efficiency that result from better-maintained vehicle engines, plus improve industry revenues from increased vehicle maintenance.

B. Conduct further research to determine how well the requirements of the refrigerants or Ozone Depleting Substances (ODS) regulations have been implemented by industry. Quantify barriers that exist to recycling, and what impact this has had on the reduction of emissions to the environment.

C. Quantify reductions in Volatile Organic Compounds (VOC) emissions that have resulted from the introduction of low solvent paint technology, high efficiency spray guns, on-site and off-site solvent recycling, and computerized paint mixing in the collision repair industry. At the present time, there does not appear to be any recent data to support what may be significant reductions.

D. Conduct additional research to identify, document, and promote firm opportunities for recycling or reusing used windshield glass at installers and vehicle recycling facilities. At present, the only significant disposal option for this waste is dumping in municipal landfill sites.

E. Encourage and support the development and implementation of scrap tire recycling in Ontario, the province with the highest vehicle registration where no formal program is currently in place.

F. Facilitate the development and implementation of effective used oil, used oil filters and containers outside the provinces of British Columbia, Alberta, Saskatchewan, and Manitoba.

G. Although recycling of lead-acid batteries is well established through retail outlets, identify how much lead and other heavy metals are being released to the environment through wheel balance weights, mercury switches, and electronic components.

H. Conduct additional research to assess the impact of the End of Life Vehicle (ELV) Directive passed by the European Union on energy conservation and sustainable development resulting from increased targets for vehicle recycling and reuse. Identify best practices from this significant initiative that could strengthen performance in the Canadian auto recycling industry.

2. Identify ways to increase the likelihood that industry will adopt these practices.

   A. The AIA, as the lead organization, should work with national and local industry associations to influence Best Practice adoption through the formation of a 'National Stakeholder P2 Advisory Committee'. Its objectives would be to produce information packages to promote the adoption and successful implementation of these Best Practices. Intense industry competitiveness requires that this information emphasize the financial benefits of recycling and other P2 practices.

   B. In addition to posting this report on the AIA web site, the following additional steps are recommended to increase the likelihood that industry will adopt these best practices:

      I. Post the Best Practices sections individually so that interested end users can download only what they want and need.
      II. Seek opportunities to promote the adoption of best practices at industry seminars, workshops, and industry association meetings through presentations, demonstrations and testimonials of success stories and case studies. For example, the regularly scheduled regional meetings of the Canadian Collision Industry Forum, CCIF, represent a truly significant opportunity to reach suppliers, distributors, and end users.
      III. Promote the adoption of Best Practices through regular articles published in trade magazines or journals. For example, the publisher of the Collision Repair Magazine has expressed an interest in publishing this material on a monthly basis. Other trade magazines should also be approached to ensure extensive exposure to the automotive aftermarket industry.
      IV. Enlist the support of manufacturers and retailers in the industry to distribute these Best Practices, and promote them to their customer base.

3. Identify how best to communicate the positive environmental/economic benefits to consumers.

   A. Utilize the Be Car Care Aware initiative as an outreach program to promote Best Practices among consumers and DIYs.

   B. Identify ways that the industry can promote the benefits of the 'One-Tonne Challenge' program to automotive consumers.

   C. Engage retailers to promote Best Practices through sales and marketing literature, technical bulletins, and via their web sites.

Introduction

The Automotive Aftermarket in Canada consists of a very large number of diverse businesses that provide a variety of products and services to the automotive sector. These services range from manufacturing, distribution, warehousing, collision repair, automotive recycling and general automotive repair to car washes. Important environmental concerns exist due to the substantial number of auto related materials, chemicals, and wastes that can enter the environment via spills, storm water, waste disposal, emissions, leaks, and poor work practices. These products include: antifreeze and other under hood chemicals, lubricants, greases and oils, refrigerants for air conditioning systems, lead-acid batteries, cleaning solvents, waste wash water, paints and solvents, recycled parts, and other automotive fluids.

The automotive aftermarket industry is very competitive. The recruitment and retention of high performance employees remains a challenge. Managers and owners must continue to seek ways to improve profitability. Sustainable business practices are designed to save money, protect the environment, earn customer trust, boost efficiency and productivity, strengthen the economy and create market opportunities.

With an increasingly environmentally conscious general public and Canadian ratification of the Kyoto Accord, the automotive aftermarket industry needs to document its current best environmental practices and identify areas for improvement. Many manufacturers in the industry incorporate the 3Rs (reduce, reuse, recycle) into what they do and, unlike many other industries, the use of remanufactured products is quite common. However, there is not currently a clear picture of how prevalent these practices are and how they contribute to both an improved economic bottom line and enhanced customer image. This report provides concrete evidence that can be used to promote more environmentally and economically sound behaviour among industry members and consumers.

Project Objectives

Industry best practices are largely anecdotal and have not been verified, qualified or quantified. Documentation of the best practices in this report will therefore help to:

1. **Determine the prevalence and extent of environmental practices (including eco-efficiency, 3Rs, and degree of compliance with industry regulations and guidelines) in the industry, and,**
2. **Help promote this aspect to the industry in terms of the benefits towards sustainable development and to the public so they have a better understanding of how car care impacts climate change.**

The Modern Vehicle and its Impact on the Environment

There can be no question that motor vehicles have contributed substantially to the growth and well being of our economy and our society by facilitating the transportation of people and goods throughout the world. However, in doing so, society is faced with serious environmental problems as a result of increased vehicle use.

- **Vehicle exhaust contributes to the formation of greenhouse gases, acid rain and smog. In Canada, cars account for 11% of the carbon dioxide, 19% of the nitrogen oxides, 37% of the carbon monoxide, and 23% of volatile organic compounds (VOCs) released each year. Heavy-duty vehicles emit particulate matter, PM, in exhaust emissions. These air pollutants can cause serious respiratory problems in humans, reduce crop yields, and degrade buildings and other structures.**

- **Most motor vehicles manufactured prior to 1995 were equipped with air conditioners that contain CFCs (chlorofluorocarbons). The release of these chemicals during vehicle repair, or from malfunctioning equipment has contributed to the thinning of the Earth's protective ozone layer. Since the ozone layer filters out harmful ultraviolet (UV) radiation from the sun, its reduction has been linked with increased cases of skin cancer and premature fading or degradation of protective coatings.**

- **The ongoing operation and maintenance of vehicles requires the use of a wide variety of chemicals that are found in products such as antifreeze, motor and transmission oils, brake and power steering fluids, battery acid, windshield washer fluid, paints and solvents, cleaning materials and detergents. Improper disposal of these chemicals can cause serious environmental damage. For example, one litre of waste motor oil can contaminate 1 million litres of clean drinking water. Paints and solvents contain VOCs that contribute to air pollution, or smog.**

- **Concentrations of lead in the environment increased following the introduction of lead containing additives in gasoline. However, lead concentrations in air have declined substantially to below detectable limits since unleaded gasoline was introduced in Canada in the mid 1970s. Since 1990, the use of leaded gasoline in motor vehicles has been prohibited in Canada under the Canadian Environmental Protection Act (CEPA). Although leaded gasoline is no longer used in Canada, lead particles from gasoline emissions are still a source of lead in our environment today. In addition, leaded gasoline is still being used in many countries, so contamination of the atmosphere continues. Dust and soil can be a source of lead exposure.**

- **Cars and trucks burn approximately 80% of all oil consumed in Canada. Canada's reserves of conventional light crude oil, used in transportation fuels, have been declining since the mid 1970s.**

- **When products such as waste oil, colored newsprint, battery casings or lead-painted products are burned or sanded, lead fumes or particles are released into the air and may be inhaled. When products such as batteries and paint scrapings are thrown out and make their way into landfills they create a lead reservoir. This reservoir slowly leaches into soils, sediments, and water.**

- **Contamination at a vehicle parts recycling facility can pose a serious threat to human health and safety and to the environment. This can reduce the resale value of the property, and can result in very costly, time-consuming site remediation procedures.**

Recently, one of the most significant developments in vehicle recycling has taken place in Europe. The End of Life Vehicle (ELV) Directive (2000/53/EC) came into force on October 21, 2000 and it sets short and long term targets to minimize the impact of end of life vehicles by setting challenging goals for recycling, re-use, and recovery of the materials used in vehicles. The ultimate goal is to reduce the amount of ELV waste in landfill from 25% to 5% in 2015. Both OEM and manufacturers of parts and components in Europe will have to comply with the Directive. It also requires phasing out certain hazardous materials such as lead, mercury, cadmium, and chromium. This will impact both vehicle and equipment manufacturers.

The Status of Pollution Prevention Practices in the Automotive Aftermarket

Introduction

Canada's commitment under the Kyoto Protocol to reduce greenhouse gas emissions can be achieved by significant reductions in energy use. Recycling, reducing, and reusing are methods whereby energy required by the Canadian public and industrial processes can be significantly reduced. The Government of Canada has launched the 'One-Tonne Challenge' to encourage drivers of vehicles to reduce energy consumption by such steps as:

- Maintaining vehicles according to manufacturer's maintenance schedules
- Maintaining recommended tire pressure
- Using ethanol enhanced gasoline
- Walking, cycling, carpooling, or taking public transit
- Reducing vehicle idling

One of the objectives of this study is to provide an assessment of how well major pollution prevention (P2) initiatives are being implemented in the Automotive Aftermarket industry. This is the first time that the substantial amount of available data and information has been consolidated into one report. It is an important step in the overall goal to strengthen P2 programs, because the ability to measure progress is a key step in any improvement process.

The detailed data and results in Sections 4.1 to 4.8 below were obtained from recent reports published by government, industry, and associations. In some cases, anecdotal information, provided by authoritative sources within the industry, is included.

Table 1 below summarizes the extent to which major P2 practices have been adopted across Canada, how well progress is measured, and recommendations to strengthen P2 best practices.

Commendable progress is being made in a number of key areas such as the recycling of batteries, used oils, vehicle parts and scrap tires. The products derived from and uses for recycled or reprocessed automotive waste material are summarized in each of the Sections below. The substantial and tangible benefits from these recycling programs are:

- ✓ Reduced dependence on virgin raw materials for fuel or finished goods
- ✓ Reduced environmental burden on landfill sites extends their lifetime
- ✓ Reduced water, soil, and air contamination
- ✓ Provides full and part time employment opportunities
- ✓ Improved workplace health and safety
- ✓ Reduced health care costs

The refinish paint suppliers have provided the end users of their products with a number of effective ways to minimize waste solvent and paint. In fact, these initiatives are so effective that end users in the industry continue to adopt them without the force of regulations. Manufacturers of automotive air conditioning refrigerants have spent billions of dollars developing alternatives to CFCs and installers continue to work towards compliance with new regulations. Programs introduced in Ontario and British Columbia have achieved significant reductions in vehicle exhaust emissions.

However there are significant gaps in the implementation of these programs from one province to another. And except for a limited number of cases, the collection, assessment, and reporting of progress with P2 is spotty and not systematic. This is not surprising given that Natural Resources Canada has recognized that flows of recycled or recyclable materials in Canada are 'generally poorly characterized' and Canada 'is currently unable to meet its commitment to provide recycling data of official OECD environmental statistics'.

The collection and analysis of P2 and recycling data needs to improve because it is difficult to measure how effective some of these programs are, and therefore to answer the question whether society and stakeholders alike are receiving adequate benefits for the considerable public and private money that is being spent on them.

While it is clear that better data is needed, attempts have been made in this table to identify key activities or areas of development for those in industry and government to pursue. Some of these suggestions will require a relatively large amount of effort and resource, while others can achieve significant benefits with relatively less resource. Important to all effective P2 programs are the identification, communication, and implementation of best working practices at each and every service and repair facility.

A full summary of best environmental practices is included in Section 5.

Table 1: Extent of Environmental and P2 practices in Automotive Aftermarket

Pollutant or Waste Stream	Formal P2 Process in Place	Responsibility	Progress Measured and Reported	Areas for Improvement & Recommendations	Relative Resource Required	P2 Benefit
Air Pollution from vehicle exhaust emissions	Limited to Ontario and British Columbia	Drive Clean-Ontario AirCare-BC	Measured and reported annually	Promote consumer awareness for P2 and financial benefits of vehicle tune-ups Encourage/promote the extension of programs to rest of Canada	Small Large	Large Large
Lead and Lead-Acid Batteries	Regulations in 2 provinces. Industry sponsored programs across Canada	Ministry of Environments Industry	Primarily by US based manufacturers. Supported by vendors Non systematic Not consolidated	Annual systematic reporting of consolidated recycling results Promote P2 awareness for recycling amongst DIY	Small Small	Medium Medium
Paint and Cleaners	Limited to Ontario and GVRD	Provincial Ministries	No	Prepare, assess, and disseminate annual statistics to measure progress, quantify reductions. Promote P2 work practices through industry associations, CCIF, and workshops	Small Small	Medium Large
Refrigerants from A/C units	Regulations in all provinces	Provincial Ministries	1996 Industry Audit conducted in British Columbia	Agree/Develop meaningful benchmarks for measuring progress Prepare, assess, and disseminate annual statistics to measure progress, quantify reductions. Enforce existing regulations. Promote P2 practices through industry workshops	Medium Small Medium	Medium Medium Large
Scrap Tires	All provinces except Ont	Various, mostly NGO	In AB, SK, MB, BC only	Encourage/support Ont Stewardship efforts Promote best practices in Atlantic Canada, Quebec	Large Medium	Large Large
Used Oil, Filters, Containers	All provinces have a program	Various. MOE, NGO	In AB, SK, MB	Promote best practices to industry and DIY across Canada	Small	Medium
Vehicle Parts Recycling and Remanufacturing	All parts of Canada	Industry	Non systematic Not consolidated	Annual systematic reporting of consolidated recycling results Promote best P2 practices across Canada in partnership with existing local associations	Medium Small	Medium Medium
Windshield Glass	No	Individual business	No	Identify cost effective options to land fill disposal	Medium	Medium

Air Pollution and Smog: Reduction of Vehicle Exhaust Emissions

The Canadian Government ratified the Kyoto Accord in December 2002, and in doing so, promised to reduce emissions of greenhouse gases to 6% below 1990 levels by the year 2010. According to the David Suzuki Foundation, transportation is the single biggest source of greenhouse gas emissions at 178 megatonnes per year, accounting for about 25% of the total 700 megatonnes per year emitted in Canada.

On April 1, 2004 new diesel standards come into force in Ontario to limit the PM emissions from large, heavy-duty diesel powered trucks and buses. The Ontario government has also declared intentions to provide owners an incentive to keep their vehicles maintained well beyond the requirements needed to meet the new, stricter standards. Vehicle owners will be able to earn an exemption from the next year's annual test if they meet or surpass a 20% opacity standard. The MOE is also committed to develop strategies to limit the amount of time heavy-duty vehicles and buses are left idling.

Significant reductions in vehicle exhaust emissions will go a long way to improving air quality in Canada. Vehicle emission testing programs have been introduced in two provinces, British Columbia and Ontario.

The AirCare Program in British Columbia

AirCare has a mandate to identify vehicles with excess emissions and require that they be repaired. The results of a recent study by the AirCare program administration, 'AirCare. Evaluation of Benefits. Program Year Seven, July 2000' indicate that this program has been a success. An independent review by de la Torre Klausmeier Consulting, 'Review of the British Columbia AirCare Program, September 15, 2000' supports this view. In the report, the author states:

"AirCare continues to be one of the most effective I/M programs in North America"

During a seven-year period from 1992 to 1999, over 7 million inspections were performed on a total of 1.7 million individual vehicles. These numbers increased to 748,068 inspections in 2001 and 778,521 in 2002.
The following emissions reductions in year seven of the period from 1992 to 1999 are summarized in Table 2 below.

Table 2: AirCare Attributable Benefits (interval September 1998 to August 1999)

Greenhouse Gases	HC	CO	NOx
% Reduction from pre-AirCare	26.9 %	31.0%	8.8%
GVRD reduction, tonnes/yr	9,551	105,974	1,682
LFV reduction, tonnes/yr	10,363	114,982	1,824

HC=hydrocarbons, CO=carbon monoxide, NOx=oxides of nitrogen
GVRD=Greater Vancouver Regional District, LFV=Lower Fraser Valley region
Source of Data= 'AirCare. Evaluation of Benefits. Program Year Seven Report, July 2000'

The data in Table 2 indicates that greenhouse gas emissions were reduced in this 12-month period by an estimated grand total of 244,376 tonnes.

Drive Clean Program in Ontario

Ontario's Drive Clean program completed a Technical Review of the first two years of this program (1999-2000) to cut vehicle exhaust emissions. The data indicates that the program has been a success. During these two years the program has claimed to reduce smog causing emissions from vehicles by 15.2%, or 14, 800 tonnes.

A total of 2.8 million inspections were performed on just over 2 million light duty vehicles, with 84.2% passing the test.

An independent analysis of Drive Clean results to the end of 2001 has shown that, overall:

- **The main components of smog, nitrogen oxides (NOx) and volatile organic compounds (VOCs), were reduced by about 18,300 tonnes in Phase One and Phase Two.**
- **Carbon monoxide (CO) was reduced by 139,000 tonnes in Phase One and Phase Two.**
- **Carbon dioxide (CO2), a greenhouse gas that contributes to climate change, has been reduced in the two areas by an estimated 47,000 tonnes as a result of improved fuel economy in light-duty vehicles**
- **Particulate matter from heavy-duty diesel vehicles registered in Ontario had been reduced by almost 1,100 tonnes from 2000 to 2002, nearly twice the program target of a 660 tonnes reduction.**

Summary of Vehicle Exhaust Emission Programs

In summary, where programs have been implemented the success rate has been commendable. Additional emission reductions of an estimated 2 megatonnes could be achieved by the industry through extension of these types of programs to other areas in Canada of high vehicle density. This would result in a substantial reduction in the total vehicle exhaust emissions from the transportation sector. AIA recognizes that with changing vehicle technology, different types of testing may be required in the future. What is important is that programs be developed to help reduce the amount of emissions.

This 2 megatonnes reduction estimate was calculated using year 2002 vehicle registration data published by Statistics Canada and extrapolating to the rest of Canada. The basis for the calculation is British Columbia had 2,243,417 motor vehicle registrations (light duty vehicles), about 13% of all light duty motor vehicle registrations in Canada (see Appendix 1 of this report). Total emission reductions for BC in 2002 from Table 2 were 244,376 tonnes. If similar results were achieved in the remaining 87% of the Canadian vehicle population on a per vehicle basis, emission reductions of about 2 megatonnes of greenhouse gases could be achieved.

Similarly, the implementation of programs that restrict vehicle idling, and provide incentives to keep vehicles maintained beyond the requirements of the regulations can have a positive impact on air pollution.

These P2 programs are a win-win opportunity for the public, the economy, the environment, and the aftermarket industry. Since these pollution prevention programs are, in essence, forcing consumers to tune up their vehicles, fuel consumption is reduced because better maintained vehicles run more efficiently. This can reduce Canadian consumption of oil, a non-renewable natural resource. Air pollution is lowered, reducing health care costs. The vehicle service industry has recognized that there is a strong link between lower vehicle emissions and business profit. Wholesalers and installers are experiencing growth in sales of oxygen sensors, premium plugs, spark plug wires, and fuel additives as a result of environmental initiatives. The AirCare program has published data on the types of repairs carried out to achieve compliance, with a full list of parts used. This information may assist distributors and suppliers to more productively manage the inventory of tune–up related parts.

The 'One-Tonne Challenge'

Environment Canada has launched this program to help Canadians understand how they can reduce greenhouse gas emissions. This information helps to reinforce some of the benefits derived from the automotive vehicle emission programs outlined above. For example, the chart below outlines the potential emission reductions for vehicle related initiatives with an estimate total reduction assuming a modest 10% success rate for all 24.2 million vehicles registered in Canada.

Using ethanol enhanced gasoline	**0.1 tonnes**
Carpooling, walking, cycling, public transit	**0.2 to 0.8 tonnes**
Proper vehicle maintenance	**0.3 tonnes**
Total potential reductions in Canada at 10% success rate.	**1.4 million to 2.9 million tonnes**

See: 'Take the One-Tonne Challenge' http://www.climatechange.gc.ca

A successful promotion of this program will have a significant impact on reducing vehicle-related greenhouse gas emissions.

AIA will be launching a consumer awareness program called "Be Car Care Aware". "Be Car Care Aware" is a US-based consumer education campaign about the benefits of regular vehicle care, maintenance and repair. "Be Car Care Aware" is an integrated marketing and public relations campaign moving along on a continuum to build awareness and knowledge to prepare consumers to make sensible decisions about their vehicles. As awareness builds, consumers will take action, thus reducing vehicle neglect.

The Focus of the campaign will be on three key themes

- **Environment**
- **Safety / Dependability**
- **Savings /**

AIA believes that reversing unperformed maintenance will help to conserve energy and benefit the environment through the reduction of emissions.

Lead and Lead-acid Batteries

Lead is considered to be a toxic chemical. Studies have indicated that long-term exposure can cause brain and kidney damage, hearing impairment, increase in blood pressure, nerve disorders and mood changes.

On average, each automobile manufactured contains approximately 12 kilograms of lead. Data from reports published in the USA indicate that about 96% is used in the common lead-acid battery, the remaining 4% is used in a variety of applications such as wheel balance weights (1.7%), alloys and protective coatings (1.1%), vibration dampers (0.3%), and in solders, stabilizers in plastics, and other uses (0.9%).

The average composition of batteries varies, but typically lead and lead compounds are reported to make up about 60-80% of each battery. Automotive battery shipments in 2001 throughout North America totaled 106.6 million batteries (86.2 million replacements in the automotive aftermarket, and 20.4 million for the OEM batteries) that contain about 1.12 million tonnes of lead. It is estimated that about 42 million tonnes of lead enter the environment each year through landfills and vehicle dismantling and recycling processes. An estimated 5,000 tonnes of lead enters the environment and waterways from wheel balance weights falling off of wheel rims. Data from a USA report published by INFORM Inc. indicated that discarded lead-acid batteries accounted for 1.7 million tons of municipal solid waste in 1994, and that batteries accounted for about two-thirds of the lead in municipal landfill sites.

Environmental regulations and stewardship programs in both the USA and Canada require that lead acid batteries are recycled. Extensive collection and distribution networks for used batteries exist throughout North America. Spent batteries are transported under regulations to recycling plants where the main components, lead, plastic, and sulphuric acid are reclaimed and recycled. A variety of new products such as new battery grids, fertilizer, glass, detergents, and plastic battery cases are produced from recycled battery components. Further information can be found at www.exide.com. Interstate returns lead acid batteries (such as automotive, marine/rv and motorcycle types) to smelters operating under a permit from the EPA in the USA to make valuable new products. Interstate wholesale distributor warehouses are located throughout the USA. StatsCan maintains an on line, searchable database that includes the addresses and phone numbers of battery recyclers in each province. http://www.recycle.nrcan.gc.ca/

The Battery Council International in Chicago reported in July 2003 that an impressive 97.1% of spent battery lead (equivalent to 10.5 billion pounds of lead) was recycled via consumers and retailers from 1997 to 2001. They cite statistics that battery industry recycling achievements far exceed recycling results for aluminium cans, paper, glass bottles and tires. For more information see www.batterycouncil.org

In Canada, the following lead-acid battery recycling data is available:

- Natural Resources Canada published an article in 1998 stating that, approximately 90% of used lead-acid batteries are being recycled.

- Exide Technologies reported that between 1998 and 2000 they recovered and recycled more than 70,000 tons of lead from used batteries. As a result, Exide was awarded the 2001 Environmental Consciousness Award. (Exide Technologies has a total of 11 recycling facilities; six in the U.S., four in Europe and one in New Zealand. All of them make Exide one of the few companies in the stored electrical energy industry with the capability to provide Total Battery Management [TBM] in its own facilities.)

- The Province of British Columbia implemented the BC Used Lead-Acid Battery Collection Program in 1991. Funding for the program comes from a $5 levy collected on the sale of all new lead-acid batteries weighting over 2 kg (automotive, motorcycle, and industrial). BC claims that virtually 100% of the end-of-life batteries generated in the province are recovered for a total of over 5 million spent batteries recycled since 1991.

- As part of their Extended Product Responsibility and Stewardship Program, Prince Edward Island reported the following recovery rates for batteries and battery-related materials: 60% in 1998, 70-75% in 1999, and 107% in 2000. The program is reported to be self-funding with revenues from the sale of lead and from a $5 fee charged when a new battery is purchased and the old one is not returned.

- The Government of the Yukon reports that each year about 6,400 used lead-acid batteries are disposed of.

With such an efficient system in place, how could P2 improvements be made?

Calculations can estimate how much lead is actually lost to the environment from vehicle service and repair in Canada. According to Statscan's data in Appendix 1, there were about 24.2 million vehicles registered in Canada in 2002. Assuming batteries are replaced every 5 years, roughly 20% of all vehicles are equipped with a total of 4.8 million new batteries each year and an equivalent number will be recycled or disposed of. If we assume the Battery Council recycling rate of 97% is achieved in Canada, then 3% or 144,000 old batteries will still find their way into the environment. This amounts to approximately 1.7 million kilograms, or 1700 tonnes of lead that finds its way annually to landfill and other sites. This figure does not include lead from other vehicle parts that is not generally recycled.

Data from the 2003 AIA Car Maintenance in Canada Report indicates that battery replacement in Canada remains the most popular do-it-yourself (DIY) vehicle maintenance activity. An estimated 61% of males, and 38% of females still changed their

own dead battery in 2002. While no statistics have been found on the recycling rate by DIYs, it may be fair to assume that this could be an area where further improvements can be made through consumer education. Canadian Tire Corporation is the leading outlet for DIYers in Canada. It has an active battery recycle program, as do a number of warehouse distributors such as NAPA.

Taken together, the information and data indicates that effective environmental recycling programs for lead acid batteries are in place both in Canada and the USA. Further efforts through consumer education and implementation of best practices during vehicle recycling can boost recycling rates above the current 97%, and continue to reduce lead entering the environment from lead-acid batteries and other automotive sources.

Paints, Thinners and Cleaners

Many automotive refinish paints, thinners and automotive cleaners and degreasers contain chemical solvents such as toluene, xylene, aliphatic hydrocarbons, and methyl ethyl ketone. These substances are often referred to as Volatile Organic Compounds, or VOCs. Overexposure to these chemicals can result in headaches, dizziness, sickness, cancer, and even death. When VOCs are emitted to the atmosphere they can combine with other air pollutants to produce smog. Efforts to reduce the amount of VOCs that emitted will not only improve workplace health and safety, but will reduce air pollution and smog.

In the USA, there are very strict federal, state, and district laws that reduce VOC emissions by restricting the use of VOCs in paints and cleaners. The Canadian Council of Ministers of the Environment, CCME, issued two Standards, PN 1278 and PN 1288, in 1998 that contain a number of recommendations for reducing VOC emissions from collision repair shops. These Standards were modeled after the federal USA EPA's National Rule for Auto Refinish.

As of the end of 2003, these Standards have been adopted in only two areas of Canada: the Greater Vancouver Regional District (GVRD), By-law 967-2001, and in the Province of Ontario as part of new Certificate of Approval (Air), or CofA requirements. These two areas represent approximately 48% of the Canadian vehicle registrations based upon 2002 StatsCan data (see Appendix 1).

Table 3 provides a summary of the main requirements for reducing VOC emissions from collision repair facilities in both areas. As can be seen from this information, the requirements are similar.

Table 3: Comparison of Ontario and GVRD air pollution prevention requirements

Requirement	Ontario CofA	GVRD By-law 967,2001
Use Low VOC refinish coatings	Y	Y
Use high efficiency spray guns	Y	Y
Use enclosed gun washer	N	Y
Operator training	Y	Y
'Approved' Spray Booth	Y	Y
Use good pollution control work practices	N	Y
Maintain coating VOC records	N	Y

Each one of the above requirements is intended to reduce VOC emissions in the workplace, and to the environment. However, the full benefits of these steps have not been quantified, and there is no comprehensive data to assess how well these requirements are being implemented by collision repair facilities. Unofficial reports from GVRD staff indicate that compliance with these requirements is very good, except for record keeping.

There is strong anecdotal evidence from various industry sources that compliance with these requirements across Canada would be beneficial P2 activities:

- All 5 of the large paint manufacturers/suppliers in Canada offer a comprehensive line of low VOC paint and cleaners that meet low VOC limits in the CCME Standard PN 1288. These products are based upon high solids or waterborne paint technology and are available throughout Canada, not just in Ontario and the GVRD. Since these companies together supply about 95% of the market, the potential for lower VOC emissions is quite significant.

- Refinish paint companies encourage end users of their products to use computers and digital weigh scales to minimize paint and solvent wastes.

- SATA, a supplier of high efficiency spray guns, has reported to the author in a personal communication that transfer efficiencies of their products exceed the 65% requirement, and that 98% of their spray gun sales are of the high efficiency type.

- In Ontario, training in work practices that reduce VOC emissions is available in three formats (classroom, Internet, CD ROM) and almost 1000 collision repair operators have been trained as of November 2003.

Quantitative data is required to fully understand the scope of existing VOC emission reductions and the potential for the future. The Canadian Paint and Coatings Association in Montreal, www.cdnpaint.org collects confidential sales data from the 5 major refinish paint suppliers in Canada. With the cooperation and assistance from the CPCA, industry could potentially use this process of data collection to quantify solvent emission reductions.

Refrigerants

The refrigerants in automotive air conditioning systems are primarily made up of chemical substances such as:

- Chlorofluorocarbons (CFCs),
- Hydrochlorofluorocarbons (HCFCs),
- Hydrofluorocarbons (HFCs).

Also known as ozone-depleting substances, or ODSs, they are very stable chemicals. When released into the air they travel upward and break down the protective ozone layer in the upper stratosphere. The stratosphere, located about 20 to 40 kms above ground level, is the Earth's natural protective layer, and shields people, animals, vegetation, and materials from the sun's harmful ultraviolet (UV) rays. Increased exposure to UV rays has been linked by scientists to skin cancer, cataracts, suppressed immune systems, and disruption of the food chain, lower crop production, and premature degradation of plastics, coatings, wood, and other materials.

Studies have shown that automotive air conditioners are not only beneficial to driver and passengers, but actually reduce fuel consumption at high speeds in hot climates. However, releases of automotive refrigerants to the atmosphere can occur at unacceptably high rates during manufacture, handling, shipping, and air conditioner servicing. Slow leakage from air conditioning systems also contribute to releases of refrigerants.

In the 1980s, Canada banned CFCs as propellants in aerosol cans, and as of January 1, 1996 banned the production and import into this country. Because HCFC do contribute to ozone depletion, Canada is phasing out the production and use of these refrigerants between 2010-2020. Environment Canada has published a Code of Practice that sets out a number of criteria for the automobile industry covering mechanical design of systems, manufacture, leak testing, servicing and venting, equipment conversion, training of personnel and keeping records.

The investments made by the automotive OEM and Aftermarket industries to reduce pollution by refrigerants has been estimated in an A.D. Little report to be about $5 billion during the period 1993-96, for the development of replacement refrigerants and improvements in automobile air conditioner design and operation.

During the past decade, the automotive industry has been replacing the most harmful, and most widely used CFC based refrigerants such as R-12, with less harmful HCFCs such as HFC-134a, or with blends, or with hydrocarbon (HC) based refrigerants formulated with propane and butane. HC refrigerants are lower cost, have low toxicity, do not have the same ozone-depleting properties, and they are flammable, so they have to be handled with adequate safety standards. Fortunately, it is very easy to replace HFC-134A with HC refrigerants. No modifications to the A/C system is required, operating at a lower head pressures, they place less strain on the system, especially the compressor. One of the biggest problems in using replacement refrigerants is ensuring the proper lubricant is used. Modification of the AC system may be required. Higher quality HC refrigerants contain lubricants and friction fighters that are compatible with all current lubricants.

In addition, federal and provincial governments have passed regulations that place significant pollution prevention requirements on the automotive air conditioning service and repair industry. Typically these regulations include:

1. Recovery and recycling requirements
2. Prohibiting venting
3. Restricting 'top ups'
4. Training certificates for mechanic and distributors
5. Restrictions on sale
6. Container requirements
7. Record keeping requirements.

More details on these regulations can be obtained from the provincial environment ministry or from a number of web sites, see www.canadianenvironmental.com or www.aiacanada.com/html/govt/ozone_e.htm

In 1996, the Automotive Retailers Association (ARA) in British Columbia conducted an audit to assess compliance with the Ozone Depleting Substances Regulation of the Waste Management Act. The audit surveyed 3732 businesses in the major population centres in BC. Included in the audit were businesses in the automotive service and repair sector such as collision repair, mechanical repair, dealers, auto dismantlers, fleets, air conditioning specialists, suppliers, and other miscellaneous facilities. The results of the audit are summarized in Table 4.

Table 4: Summary of ODS Compliance Audit of BC automotive service and repair facilities.

Requirement Audited	'In compliance' Assessment	Comments
Certification of technicians handling ODS.	93.4% in compliance. 6.6% no proof of compliance	Certification by HRAI*
Off site Sales records	8.6% in compliance	Most businesses unfamiliar with requirements of regulation
Refrigerant Systems and Equipment labeling	Only most recently acquired systems and equipment in inventory had tags pre-installed to record information	On older inventory before regulation in place, some sort of tag affixed with required information.
Labeling of vehicles serviced	Average of 70.6% of shops in compliance	Many shops had labels on vehicles not in full conformance with regulation.
Record keeping of vehicles serviced	Average of 76.2%	Most businesses had some records such as repair invoices
Compliance by industry sector	Range: Low of 25% for dismantlers and suppliers to high of 75% for collision repair	
Overall geographic compliance with regulation	Range: Low of 33.3% in Kamloops to high of 85.4% on Vancouver Island.	

*Note: HRAI is the Heating, Refrigeration and Air Conditioning Institute of Canada

Several other provincial ministries in Canada were approached to determine whether similar audits have been completed. Unofficial verbal reports indicated that inspections are done when complaints are made, and no quantitative data is available to measure success of these P2 processes.

Refrigerant Management Canada http://www.hrai.ca/rmc is a not-for-profit corporation established to manage the responsible disposal of Canada's stocks of surplus ODS refrigerants for the Canadian refrigeration and air conditioning industries, and to ensure that all surplus ODSs are managed to minimize ozone layer depletion. RMC is funded by a levy submitted by refrigerant manufacturers, importers and reclaimers on sales of refrigerants such as R-22. Their programs consist of a number of steps including refrigerant recovery, transportation, testing, record keeping, bulking and then shipment to disposal facilities. In December 2002, RMC shipped its first load of 13 tonnes to the Swan Hills Treatment Centre for processing and disposal. Anecdotal information from personal at HRAI indicated that barriers exist to recycling and reuse because of the large number of automotive facilities that handle relatively small quantities of material.

Comprehensive P2 regulations are in place provincially to reduce emissions of ODSs from vehicle repairs. The audit done by the Automotive Retailers Association in British Columbia has provided a quantitative assessment of industry performance almost 8 years ago. Further work is required to establish current performance.

Scrap Tires

Discarded tires that end up in 'tire piles' result in both environmental and health concerns for communities right across Canada. Scrap tire fires can burn for considerable periods because they are difficult to extinguish. The heavy black smoke released causes air pollution that contaminates soil and waterways. In 1990 a pile of 13 million tires in Hagersville, Ontario, burned out of control for over 2 weeks. Many disease causing vermin such as rats and mosquitoes thrive in tire piles. And tire piles occupy valuable land that could be used for more productive purposes.

For these reasons, active tire recycling programs now operate in Alberta, British Columbia, Manitoba, New Brunswick, Newfoundland and Labrador, Nova Scotia, Prince Edward Island, Quebec, Saskatchewan and the Yukon. A system in the Province of Ontario is under development.

- **Financial support for each of these systems is based on a levy, or environmental fee, charged on new tire purchases in the jurisdiction concerned.**
- **Levies across the country for passenger tires presently range from $2.00 to $5.00, while sales of larger truck tires may involve a higher fee, based on rim size.**
- **In some instances, a Government Ministry, Department or 'Crown Corporation' manages the tire recycling system. In other jurisdictions, multi-stakeholder 'Stewardship Boards' or similar agencies carry the central program responsibility.**

Industry representatives and other non-government stakeholders are actively involved in tire recycling across Canada. In some cases, the scrap tire program itself is one of several different operations managed by a large 'multi-material' recycling agency.

- **Less than 15% of the scrap tires collected through Canada's existing programs are now shipped for burning as Tire-Derived Fuel. The range of end uses for recycled tires is growing steadily more diverse from coast to coast.**
- **Current examples include a variety of construction materials, truck bed liners, vehicle mud flaps, livestock mattresses, industrial floor mats, noise suppression equipment, roadside pylon supports and engineered rubber bases under 'astro-turf' playing fields. This Canadian emphasis on finding new 'value-added' applications is expected to strengthen even further in the years ahead.**

More information can be found at The Canadian Association of Tire Recycling Agencies web site, http://www.catraonline.ca/index.html

A summary of the major achievements by tire recycling efforts in Canada is provided below in Table 5.

Table 5: Recycling of Scrap Tires in Canada

Province	Governance	Program Started	Current Status	Recycled Tires since program inception
Alberta	Tire Recycling Management Association http://www.trma.com	1992	Industry in place to recycle over 3 million scrap tires per year	30 million tires recycled
British Columbia	Financial Incentives for Recycling Scrap Tires (First) Program http://wlapwww.gov.bc.ca	June 1991	Capture rate in 2000/2001 was 96% or 187,000 units. Program captures 285,000 PTEs per month	As of March 2001, 27 million PTEs diverted from landfill.
Manitoba	Tire Stewardship Board http://www.skyweb.ca/~mbtirebd/web.htm	1995	Virtually no tire piles left in Manitoba. 70 new full time jobs created by scrap tire processors	Over 85,000 tomes of scrap tires diverted from landfill. Over 6.5 million PTEs recycled
New Brunswick	Tire Stewardship Board http://www.nbtire.com/e/001e.htm	1996	Capture rate of 87% on scrap tires from replacement stream.	More than 3 million scrap tires diverted from landfill
Newfoundland	Multi-Materials Stewardship Board http://www.greenroutine.com	mid 2002	Tire levy in place Used Tire recovery agreement awarded	NA
Nova Scotia	Used Tire Management Programs managed by The Resource Recovery Fund Board (RRFB) http://www.rrfb/com	1997	374,000 stock piled tires cleaned up	More than 3.3 million tires diverted from landfill and incinerators
Ontario	Scrap Tire Diversion Program for Ontario http://www.ontariotirestewardship.ca/	Under development	Stakeholder consultations	More than 10-15% of scrap tires to landfill
Prince Edward Island	Island Waste Management Corp http://iwmc.pe.ca	1999	Tire levy in place Goal to collect and process all scrap tires	NA
Quebec	Recyc Quebec http://www.recyc-quebec.gouv.qc.ca	1993	New program announced in 2002. Nearly all 6 million scrap tires produced annually are recycled	About 36 million tires
Saskatchewan	Saskatchewan Scrap Tire Corp http://www.scraptire.sk.ca/links.html	1996	Capture rate of 73% of tire sales in 2001, over 577,000 tires recycled 56 landfills have been cleaned	2.5 million tires of various sizes diverted from landfill

Source: Annual reports, press releases, agency web sites, and, The Canadian Association of Tire Recycling Agencies, http://www.catraonline.ca/index.html

Note: PTE is passenger tire equivalents (standardized to weight of 8.2 kg)

This data indicates that effective recycling efforts exist or are emerging in most provinces. Once data becomes available from Ontario, Newfoundland, and PEI, a more complete analysis will be possible. Data from the Ontario Tire Dealers Association www.otda.com states that about 14 million new passenger car tires are sold every year in Ontario and that about the same number end up as scrap tires. This does not include truck, trailers, construction and off-road vehicles tires. Information provided at the Ontario Tire Stewardship meeting in September 16, 2003 indicated that more than 10-15% of scrap tires ended up in landfill sites, mostly in Michigan. Since Ontario has one of the largest vehicle registrations in Canada, significant progress in pollution prevention will be achieved when the province has implemented an effective program that produces similar results to those in Western Canada.

Used Oil, Oil Filters and Oil Containers

Used motor oil may contain unburned gasoline, ethylene glycol, and heavy metals such as lead, chromium, and zinc. If released into the environment, used oil can contaminate drinking water, soil, and waterways. This could have a harmful affect on the health of people, animals, aquatic life, and vegetation. Severely contaminated soil can reduce property values and result in expensive remedial measures.

The provinces of Alberta, Manitoba and Saskatchewan have implemented province wide recycling programs for used oil, used oil filters, and used oil containers. Typically the terms 'used oil' and 'used oil filters' refers to waste products that not only contain used crankcase oil but also hydraulic fluids, transmission fluids, power steering fluids, as well as sump type automatic transmission filters and fuel filters.

The following non-profit corporations/ associations have developed recovery and recycling programs.

- Alberta Used Oil Management Association (AUOMA)
- Manitoba Association for Resource Recovery Corp. (MARRC)
- Saskatchewan Association for Resource Recovery Corp. (SARRC)

Primary objectives of these programs are:

1. To establish a province-wide used oil, filter & container collection system that meets the requirements of the provincial Used Oil Collection Regulations
2. To maximize the cost effective collection of used oil, filters and containers in each province.

Key components of the product management program are [1] a Return Incentive (RI) paid to registered collectors picking up from farm, industrial, commercial and institutional markets and delivering to registered processors [2] a province wide system of Used Oil, Filter & Container EcoCentres that is accessible, convenient and cost effective in collecting used oil materials from the do-it-yourself (DIY), small farm and small commercial markets.

The program is funded by industry that remit Environmental Handling Charges (EHCs) to the provincial corporations or associations based on the sale of new collectible oil, oil filters and oil sold in containers. Members represent major oil, filter and container manufacturers and marketers in Canada and the United States. A new program was launch in mid 2003 in British Columbia (BCUOMA).

Ontario is expected to launch a similar program sometime in 2004, as is the province of Quebec. The specifics of each of these new programs will vary slightly from the existing programs, but the effectiveness from an environmental program should be very similar.

Data from the 2002 Annual Reports of the associations in Alberta, Manitoba and Saskatchewan indicate an impressive recycling rate for used oil and oil filters. Recycling of used oil containers is emerging. In Alberta, it has reached a rate of 45%, and a study is being conducted to determine the lifecycle of plastic oil containers and to learn how to overcome barriers to recycling them.

Table 6: Year 2002 Results from Used Oil Recycling Programs*

Province	Total Vehicle Registrations**	Used Oil Recycled (millions of litres)	Used Oil Filters Recycled (millions of filters)	Used Oil Containers Recycled (kilograms)
Alberta	3,116,087	66.42 (73%)	5.92 (89%)	1,215, 185 (45%)
Manitoba	820,002	11.8 (79%)	1.50 (75%)	164,000 (18%)
Saskatchewan	819,647	15.35 (77%)	5.92 (82%)	193,150 (19%)
Totals	4,755,736	93.57	9.23	1,572,335
	Average/vehicle***	19.64 litres	1.94 filters	0.33 kg

** Used Oil recycling data from 2002 Annual Reports*

***Year 2002 StatsCan Data from Appendix 1. Based upon total vehicles including light and heavy duty, and off road.*

**** The author has calculated this data by dividing the total amount recycled by the total number of vehicles registered in these 3 provinces.*

Though used oil regulations and stewardship programs exist in most of the other provinces, their used oil collection systems are in the early stages, and firm recycling data was not available. We can estimate the total potential for used oil recycling in Canada by extrapolating the average/vehicle results from Table 6 and applying it to the total number of vehicles in the rest of Canada. The extrapolated results, based upon total vehicle registrations in Canada are summarized in Table 7.

Table 7: Potential Used Oil related Recycling in rest of Canada*

Rest of Canada Total Vehicle Registrations	Potential Used Oil Recycled (millions of litres)	Potential Number of Recycled Oil Filters (millions of filters)	Potential amount of Used Oil Containers Recycled (kilograms)
19,442,439	381	38	6,400,000

** The results in Columns 2, 3, 4 were calculated from the total actual vehicle registrations in the rest of Canada, multiplied by the average recycling statistics in Table 6.*

Clearly, as the programs in other provinces develop to the same level of recycling, the benefits of used oil recovery will be substantial.

There is also one other industry initiative that will contribute to pollution prevention activities, with good upside profit potential. Consumers are becoming increasingly aware of the need to use quality parts and service to preserve their automotive investment. They have gotten the message that clean oil and filters are essential to the longevity of their automobile. The use of premium, long life, and high-end synthetic motor oils and oil filters are extending the change intervals, and ultimately will reduce the quantity of used oil/filters/containers on a per vehicle basis.

At the same time, DIY efforts are becoming more difficult even in the previously easy-to-do area of oil and filter changes. In Canada, only 32.5% of males, and 14.4% of females changed their own oil in 2002 according to AIA statistics. The likelihood of recycling oil increases if the work is done in a professional shop. This represents a good opportunity for jobbers and installers to promote sound environmental practices to consumers.

Vehicle Parts Recycling and Remanufacturing

The market demand for used parts has been the major source of income for vehicle dismantlers. Some of these parts are sold as is, and the remainder, which includes clutches, engines, starters, water pumps, alternators are 'remanufactured'. Key activities that are common at automotive recycling facilities include:

1. **Storage of vehicle and parts**
2. **Fluid draining**
3. **Dismantling vehicle and parts removal**
4. **Crushing**
5. **Shredding**

Soil, water, and air can become contaminated because work activities like this have the potential to release contaminants such as gasoline, oil, transmission fluid, grease, battery acid, antifreeze, brake fluid, solvents, VOCs, refrigerants, and heavy metals to the environment. In older sites, non-metallic materials known as automotive shredder residue, ASR, or 'fluff', may have been buried along with scrap tires, dead batteries, and other unmarketable materials. Without adequate environmental work practices, contamination at vehicle recycling facilities can pose a serious danger to human health and the environment. Furthermore, the cost of ASR landfill is estimated to be about $50-60 per ton in the USA.

As stated in the Introduction of this report, one of the most significant developments in vehicle recycling has taken place in Europe. The End of Life Vehicle (ELV) Directive (2000/53/EC) came into force on October 21, 2000 and it sets short and long term targets to minimize the impact of end of life vehicles by setting challenging goals for recycling, re-use, and recovery of the materials used in vehicles. This Directive could ultimately alter the landscape in the North American vehicle recycling industry because public, political and environmental pressures can be expected to result in stronger requirements to optimize vehicle material recovery.

The remanufacturing of vehicle parts has been an important sector of the vehicle recycling industry since the early days of the automobile. Today, parts remanufacturers are far more than 'parts recyclers' because they offer a cost effective alternative to new or new aftermarket replacement parts that meet OEM standards. In fact, automobile remanufacturers are the original environmentalists, and their efforts over the past 75 years have placed vehicle parts amongst the most recycled products in the automotive aftermarket industry.

In North America, total sales of remanufactured parts amounts to $8.2 billion, with an estimated $1 billion of the total in Canada. Approximately 76% by weight of an average car's make-up is recycled providing almost 40% of the ferrous scrap for the metal recycling industry.

When a vehicle is recycled, an average of 19 litres of operating fluids is obtained during the pretreatment drainage step. The composition of the 19 litres as reported by the Ontario Automotive Recyclers Association, www.oara.com is as follows:

Engine Oil	2.6 litres
Transmission Oil	1.3 litres
Drive Oil	1.1 litres
Steering Fluid	0.8 litres
Coolant/Antifreeze	2.8 litres
Fuel	10.4 litres

Source of data: , www.oara.com

Considering how many vehicles are recycled in Canada, this represents a significant source of recycled fluids. Education and promotion efforts amongst the vehicle recyclers could expect to result in substantial P2 benefits.

Other industry statistics and data support claims for substantial benefits from a high rate of vehicle recycling:

- Estimates range from 4 to 10 million vehicles are recycled annually in USA
- Nearly $50 million spent by recyclers on environmental compliance in 1997
- Automotive recycling businesses employ over 46,000 people at over 6,000 facilities in Canada and the USA
- Professional recyclers use computer and satellite systems for inventory management and customer service
- On average, a used part is reported to be 50% cheaper than a new part or like kind and quality
- An estimated 11 million gallons of oil is saved that would be used in the manufacture of new parts

According to the AIA 2003 Outlook Study, the remanufacturing industry's biggest environmental issue is the lack of consumer awareness of remanufactured parts as an alternative to new parts. The industry felt that it was important to reach consumers with the message that specifying remanufactured parts can provide them with both a financial and environmental benefit. Industry felt that the AIA was the association best placed to educate consumers and transmit a positive consumer message. This represents a good opportunity for the AIA to work alongside the remanufacturers to improve P2 results.

Used Automotive Windshield Glass

Vehicle windshields are manufactured with two layers of glass with a strong plastic membrane sandwiched between the panes. The plastic is usually PVC or PVB (poly vinyl butyral), and its presence in the windshield presents serious barriers to recycling the glass component of the windshield. In addition, plate glass is challenging in itself because it has a different chemical composition to container glass. Windshield glass can be successfully recycled into construction aggregate, Glasphalt, or secondary markets like floor tile only if the glass can be efficiently and effectively separated from the plastic film in the windshield. Technology exists to crush windshields and screen out film plastic residuals to recycle the glass, but according to industry sources they are expensive, and the practice is not commonplace. Asahi Glass in Japan is developing technology to improve the process for recycling windshield glass. A full-scale program is planned for 2004. However, there are few organizations that currently recycle windshield glass in North America.

British Glass, which represents the UK Glass Industry, has issued a position paper stating that recycling windshield glass in furnaces is not attractive because the risk of contamination by very small quantities of impurities can make the final product fail specification. This is a particularly interesting position in light of the ELV (end of life vehicle) directives/regulations that exist in Europe to improve recycling. Other reports indicate that only limited quantities of 'ELV glass' have been recycled in Europe because there is no established system for dismantling and collection.

In North America, automotive glass is not accepted in municipal 'blue box' recycling programs because of the safety concerns of the handling process, and because of its different chemical composition from container glass. According to automotive industry sources, the glass from broken windshields is normally sent to land fill sites for disposal. Used windshields that are intact may be recycled, but typically they must less than 2-3 years, not pitted or chipped, or scratched. Because used windshields are priced close to new OEM parts, there is little incentive for installers to use a recycled version.

No data could be found on the quantities of windshield glass recycled. From recent reports and discussions with industry personnel, it is assumed to be minimal, except for possible small-scale harvesting. The low level of windshield recycling or re-use in the automotive aftermarket stands in strong contrast to recycling of most other products researched in this report. Given the importance of sustainable development, the current situation represents a significant waste of raw materials, energy, and landfill space. Data on the amount of windshield glass going to landfill in Canada has not been identified, but it can be estimated from recent USA data, as follows.

In a 1997 Detroit area pilot project, the Great Lakes Institute for Recycling Materials reported that glass represented 14.8% of ASR (auto shredder residue) from scrapped, or end of life vehicles. (ASR consists of glass, metals, plastics, foam, textile fibers, dirt, and residual fluids and is often referred to as 'shredder fluff'). On average there are about 125 kilograms of ASR per scrap vehicle, which includes 18.5 kg of waste glass. In the USA, approximately 10 million vehicles are scrapped and dismantled each year. Making the reasonable assumption that the market in Canada is about 1/10th of the USA, then approximately 18.5 million kilograms of waste automotive glass ends up in Canadian landfills each year. The actual amount of glass sent to landfill is actually higher because this estimate excludes waste glass sent to landfill from windshield installers.

Recycling or reusing this 18.5 million kilograms of broken, unwanted glass material could have a substantially positive impact on energy use and raw material consumption. An estimate of the benefits can be obtained using data from the successful glass container recycling programs reported by the Recycling Council of Ontario in 1998:

- **For every ton of crushed glass used in manufacturing, 1.2 tons of raw materials are saved**
- **Glass produced from recycled material reduces related air pollution by 20% and water pollution by 50%**
- **Recycling one ton of glass saves about 40 litres of fuel**
- **Manufacturing glass from recycled materials saves half the water and 68% of the energy normally required.**

In addition, recycling of automotive glass will reduce the environmental burden on landfill sites across Canada. However, unless economically feasible ways are found to recycle or reuse this waste through the establishment of a financed infrastructure, it will very likely remain near the bottom of P2 priorities.

Best Practices for Handling and Disposal of Automotive Wastes

Introduction

The information from an extensive research of documented P2 best practices has been consolidated in the following sections, including case studies that demonstrate financial benefits. References are provided for readers who wish to obtain more detail.

In general, the research revealed common elements of P2 best practices:

- **Recycling is the preferred option because many products are produced from petroleum, a non-renewable resource. Professional recycling organizations that service automotive facilities exist throughout Canada. Natural Resources Canada sponsors the web site http://www.recycle.nrcan.gc.ca/ in both official languages where recyclers of most products can be located.**

- **Source Reduction is a viable option where longer life alternatives can increase the lifetime of the product, thus decreasing the amount of waste generated.**

- **Reuse is a more limited option unless the waste product can be upgraded to meet vehicle specifications, or can be used in a less demanding process.**

- **Work practices in automotive facilities can reduce the amount of waste entering the environment through accidental leaks and spills.**

- **Disposal to landfill, municipal sewers, septic systems, or to the atmosphere is the least desirable option, and should be carried out with some pretreatment and only if permitted by local authorities.**

Table 8 provides an overview of the numerous P2 options available for a wide variety of automotive related wastes. Details are provided in the sections below. Before handling chemical products, always consult the Material Safety Data Sheet and follow WHMIS regulations and all recommended health and safety procedures.

Table 8: Overview of available P2 options

	P2 Best Practice Options				
Waste	**Recycling**	**Reduce**	**Reuse**	**Work Practices**	**Disposal**
Asbestos Brake Liners	x	√	x	√	√
Antifreeze Used	√	√	√	√	x
Automotive Parts	√	x	√	√	√
Batteries Used	√	√	x	√	x
Brake Fluids Used	√	x	x	√	√
Car Wash water	√	√	√	√	√
Containers/Packaging	√	√	√	√	√
Discharged Waste Water	√	√	x	√	√
Interceptor Sludge	x	√	x	√	√
Motor oil/filters used	√	√	x	√	x
Paint & Solvents	√	√	√	√	√
Refrigerants	x	x	x	√	√
Scrap Tires	√	√	√	√	x
Windshield Glass	√	x	√	x	√

Asbestos in Used Brake Liners and Used Brake Fluids

Up until the past 10 years, asbestos has been a component of brake pads and linings, clutch facings and various gaskets. Almost all new brake pads are asbestos free. Though asbestos material is not generally used in the production of replacement parts, workers in the automotive industry can become exposed to asbestos fibres from replacement or repair of old parts.

Asbestos released into the air tends to spread around a repair facility after a job is done, potentially exposing everyone, including customers. Do-it-Yourselfers can also come in contact with asbestos fibres. And because these fibres cling to clothing, skin, and shoes, family members can also come in contact with asbestos. Exposure to asbestos can result in respiratory problems like asbestosis and various forms of cancer. Evidence indicates that it takes 15 to 30 years for these diseases to show up after exposure.

Typically brake maintenance includes changing brake pads and shoes, cleaning and repairing drums and other parts, and topping off or replacing brake fluid.

To minimize exposure to asbestos dust, and prevent its release to the environment, the use of enclosed glove-box units are recommended. Brake Maintenance Vacuum Systems are available from automotive equipment vendors (see Table below under References). This enclosed box can be used in conjunction with a high efficiency particulate filtration system (HEPA filter) to vacuum the air from within the box and filter it through a series of filters.

Brake fluid is a mixture of chemicals and additives. Used brake fluid can either be recycled with used oil, or disposed of using a licensed waste hauler. If your brake fluids contain chlorinated chemicals, if may not be possible to recycle brake fluid wastes with your used oil. Check with your used oil recycler.

Name of Specific Waste	Synonym(s)
Asbestos	Asbestos fibres, asbestos dust, brake liners Brake shoes, brake pads.
Brake Fluids Used	Polyglycol, glycol ethers

Regulated by

Asbestos waste from used brake liners or other automotive parts may be leachate toxic and subject to provincial waste management regulations. Requirements can vary from province to province. Check with local authorities.

Current Industry Performance

There is no current data on the amount of automotive related asbestos waste disposed.

Benefits of Pollution Prevention

Minimize potential exposure of service technicians and other shop employees to asbestos fibres. Since asbestos can be carried home on shoes and clothes, the family car and home can become contaminated by asbestos.

Current Industry Best Practice(s)

1. The use of asbestos in brake liners, clutch facings, and various gaskets has been largely discontinued and replaced with non-asbestos friction materials.
2. Modern brake replacement parts still come with an asbestos warning to minimize exposure to dust.
3. The National Institute for Occupational Safety and Health (NIOSH), the Occupational Safety and Health Administration (OSHA), and the Environmental Protection Agency (EPA) recommend controlling asbestos exposure by containing brake and clutch dust and preventing its release into the garage or shop as much as possible.
4. Remove any visible dust from the unit being repaired or replaced using a HEPA (high efficiency particulate air) filter. Always follow the manufacturer's instructions for filter or collection bag change.
5. Use enclosure equipment, or see-through plastic shroud, which slips over the brake assembly and forms a tight seal against the backing plate.
6. Securely connect HEPA filter hose to shroud to allow vacuuming while the brake liner is being removed.
7. Use plastic drop sheets or other suitable material to minimize spread of dust.
8. Use low-pressure water when wet cleaning as high-pressure water will disperse asbestos fibres.
9. Compressed air must not be used to remove dust or other particulate matter from used brake liners.
10. Place used asbestos containing brake liners or other parts in heavy duty plastic bags, as required by local regulations, and store in labeled, rigid impermeable containers.
11. Used brake shoes, liners, pads and other particulate matter should be disposed of according to local regulations using a licensed waste hauler.
12. Drain used brake fluid into a properly labeled container using a drip pan to prevent spillage or leaks to the environment. Clean up spills as soon as possible with absorbent materials. Recycle or dispose via a licensed waste hauler.
13. Do not mix solvents, chlorinated cleaners, or other chemicals with used brake fluid.

References for more information

1. AIA Waste Management Guidelines, 2002 edition, Section 2.4 and Section 5 which covers provincial waste disposal regulations. http://www.aiacanada.com/downloads/envmanorder.pdf
2. 'Preventing Asbestos Disease Among Auto Mechanics', report from Coordinating Committee for Automotive Repair' see http://www.ccar-greenlink.org and use the 'Search' function.
3. 'Asbestos in your car and local auto repair shop' Asbestos Network, see http://www.asbestosnetwork.com
4. 'Alberta Asbestos Abatement Manual', prepared by the Government of Alberta, Workplace Health and Safety, August 2001, see http://www3.gov.ab.ca/hre/whs/publications/pdf/asbestos_manual.pdf
5. For brake maintenance vacuum systems see for example: http://www.nilfiskamerica.com/ http://www.jclayton.com/Home/About.asp

Antifreeze (Used)

Antifreeze is sold as a concentrated ethylene glycol or propylene glycol product mixed with water. Ethylene glycol is toxic and its sweet taste can tempt children or animals to drink it. Propylene glycol is less toxic, but it still can be harmful if swallowed. Because used antifreeze contains harmful chemicals such as benzene, chromium, lead, cadmium, and selenium, it must not be poured down the drain into municipal sewers or into septic tanks.

Antifreeze is made from petroleum-based chemicals so the preferred P2 best practice is recycling. The use of long-life products can reduce waste generation because less frequent changes are required. Mixing of regular and long-life antifreeze is not recommended.

Name of Specific Waste	Synonym(s)
Antifreeze (Used)	Engine coolant, radiator fluid, radiator coolants, Ethylene or Propylene glycol solutions

Regulated by

- Provincial waste management regulations because used antifreeze may be leachate toxic
- Transportation of Dangerous Goods Regulations
- Provincial spill reporting requirements
- Haulers must have valid permit and use waste manifest provided by the province

Current Industry Performance

Approximately 15% of all used antifreeze is recycled.

Benefits of Pollution Prevention

- Saves money! See Case Studies
- Reduces consumption of natural resources such as petroleum
- Dumping waste antifreeze may be illegal
- Recycled antifreeze is less expensive than virgin product
- Minimizes soil and drinking water contamination

Current Industry Best Practice(s)

Recycling is the preferred option because it conserves natural resources. There are three possibilities. The most appropriate option suited to your facility is best determined by you.

1. Off-site recycling: waste antifreeze is transported by a licensed waste hauler to a specialized recycling facility
2. On-site recycling: waste antifreeze is recycled by a special recycling unit owned and operated by the facility. You must make sure the recycled product meets OEM specifications and ASTM D-3306.
3. Mobile recycling service: a truck equipped with a recycling unit visits your facility and recycles your waste antifreeze on site.
4. When good antifreeze has to be removed for repairs, save it for reuse in a clean, properly labeled, leak-proof container. Refill system with removed antifreeze upon completion of repairs.
5. Replace antifreeze only when necessary. Encourage the appropriate use of long-life antifreeze to reduce amount of waste generated.
6. Encourage customers to fix or replace leaky radiators or hoses.
7. Minimize losses to the environment by catching leaks in a drip pan. Clean up leaks immediately. Transfer collected antifreeze to a properly labeled container for recycling.
8. Do not mix used antifreeze with used oil, or other liquid wastes.
9. Keep containers of waste antifreeze out of the reach of children and pets. Segregate used antifreeze from other wastes.
10. Keep drains covered to prevent spills from entering the water system.
11. Consider using the less toxic propylene glycol to replace ethylene glycol.

References for more information

1. AIA Waste Management Guidelines, 2002 edition, Section 2.1 and Section 5
http://www.aiacanada.com/downloads/envmanorder.pdf
2. 'Antifreeze Recycling. Best Environmental Practices for Auto Repair and Fleet Maintenance' USA EPA Report November 1999.
3. 'Used Antifreeze Handling, Recycling and Disposal' Montana Pollution Prevention Program Fact Sheet, February 1996.
4. 'Recycle Antifreeze' Maryland Department of Environmental Protection. August 2001.

Antifreeze On-Site Recycling Case Studies

Two case studies recently sponsored by the Nevada Division of Environmental Protection demonstrated financial savings that could be achieved with on-site recycling.

Facility	Used antifreeze generated (litres per year)	Cost of Recycler	Annual Savings
Valley Wagon (5 employee auto repair shop)	500	$2095	$980/yr
Kingsbury Auto (5 employee firm)	5450	$2150	$3150

Source: Nevada Small Business Development Center, Business Environmental Program

On-site recycling of antifreeze saved money in both small and large facilities. Savings were achieved in lower disposal costs and lower costs of virgin antifreeze. Care must be taken to use the appropriate additives to rejuvenate spent antifreeze. Various brands of recycling equipment based on technologies that include filtration, distilling, ion exchange and reverse osmosis.

Automotive Parts (Used)

The remanufacturing of automotive parts conserves substantial energy, reduces the amount of greenhouse gas emissions to the environment, and represents an important component of industry's efforts towards sustainable development. The Automotive Parts Rebuilders Association estimates savings of trillions of BTU's per year, about 85% of the energy that would otherwise have been used in producing a brand new part. Approximately 11 million barrels of oil is saved annually in North America by remanufacturing replacement automotive parts. Data in the Table below from the APRA demonstrates the relative material and energy consumption for the remanufacturing of alternators and starters compared to the newly manufactured part.

Remanufactured Part	Energy Consumption	Material Consumption
Starters	9%	11%
Alternators	14%	12%

Source: APRA and the Fraunhofer Institute, Germany

Many automotive remanufacturing companies are independent, small to medium sized businesses with fewer than 100 employees and less than $10 million in gross sales. The labor content is high and the cleaning cycle time typically represents a bottleneck in many remanufacturing operations. Quality is an important consideration driving some companies like Ideal Supply in Listowel, Ontario to obtain ISO quality designation.

Remanufacturing of automotive parts such as radiators, starters, alternators, brakes, clutches, engines and transmissions begins with an inoperative used part from a vehicle. This 'core' can be disassembled so the components can be cleaned, tested, repaired, reworked, or replaced. Typically parts that are manufactured from steel, cast iron, and other metals can be reused, but small components made of rubber or plastic are often simply replaced with a new component along with electronic components.

Parts that are removed from the vehicle may require the draining of fluids such as motor oil, antifreeze, washer fluid, and transmission oil. Older vehicles may contain asbestos in brake shoes. Since parts are likely to be contaminated with dirt and grease/oil residue, cleaning is also required prior to remanufacturing. These steps can result in leaks or spills of organic solvents, heavy metals, and glycols to the environment, leading to surface and ground water contamination and soil contamination. If greasy parts are stored outside uncovered, rainwater can wash contaminants off the parts into the ground or streams. Solvents from cleaners and aerosol cans released into the environment cause air pollution problems.

There are very sound reasons for implementing best environmental practices at parts remanufacturing facilities. Contamination at a vehicle parts remanufacturing facility can pose a serious threat to human health and safety and to the environment. This can reduce the resale value of the property, and can result in very costly, time-consuming site remediation procedures.

Name of Specific Waste	Synonym(s)
Automotive Parts (Used)	Rebuilt parts, remanufactured parts

Regulated by

Waste fluids and sludge generated from cleaning parts may be hazardous wastes and regulated by provincial regulations.

Current Industry Performance

Remanufacturing parts is common industry practice, but too many parts idiosyncrasies, and limited access to original design specifications could hamper growth of this sector.

Benefits of Pollution Prevention

- Saves money and maintains property values
- Reduces consumption of natural resources such as petroleum, metals
- Dumping automotive wastes may be illegal
- Reduces liability risk
- Minimizes air pollution and soil and drinking water contamination

Best Practices

1. Before removing/disassembling part, completely drain all fluids. Utilize drip trays and drip racks or other means to catch leaking fluids from parts and vehicle.
2. Drained liquids should be stored in sealed, properly labeled containers on impervious surfaces, and contained by dikes to control spills or leaks. Do not pour down the drain.
3. Do not mix different types of fluids such as used oil and antifreeze.
4. Train all employees in proper handling and storage methods. Keep training records.
5. Re-use drained fluids, recycle them, or dispose of them using a licensed waste hauler. Keep records of all materials transported off site for disposal.
6. Use a 2-stage or 3-stage parts cleaning process, using dirty solvent first, followed by clean solvent rinse.
7. Use drip trays to allow more drainage time for parts.
8. Remove parts slowly from washers to minimize splashing and evaporation. Use water based or detergent based cleaning solvents, or if not practical, the cleaners with the lowest solvent content.
9. Keep washers closed and turned off overnight or when not in use.
10. Consider on-site solvent recycling to reduce costs of buying virgin cleaners. See Case Studies below.
11. Use rags instead of disposable paper wipers to minimize garbage, and set up a control system to maximize rag use.

References for more information

1. AIA Waste Management Guidelines, 2002 edition, Section 2.16
http://www.aiacanada.com/downloads/envmanorder.pdf
2. 'Remanufacturing Industries Deliver Solid Economical and Environmental Benefits' by Tricia Judge, Automotive Parts Rebuilders Association publication, February 2002. http://www.apra.org
3. 'Remanufacturing: An Answer to Global Warming' published by the Automotive Parts Rebuilders Association, http://www.apra.org
4. 'Environmental Protection for the Automobile Recycling Industry in British Columbia' Volume 1, Best Management Practices, prepared by El-Rayes Environmental Corp., March 1996.

Case Study Solvent Recycler
Financial Benefits

Unit Cost plus Installation	$7,700
Annual operating costs	$3,868
Total Costs in Year 1	$11,568
Reduced annual purchase of virgin solvent	$4,752
Reduced waste solvent disposal costs (21 drums/yr)	$3,750
Total Savings	$8,502
Net Savings per year	$4,634
Simple Payback Period based on Initial Capital	1.6 years

Source: Washington EPA Publication #94-31, http://es.epa.gov/techinfo

The case study was carried out in a shop using the following cost data:
Labor rate $20/hr, ½ hr per week, disposal $200/drum waste solvent, virgin solvent $4.50 per gallon, power costs of $.06/kwh

Batteries (Used)

Since all components of a dead battery (lead, plastic, and sulphuric acid) can be recycled into useable products, recycling is by far the preferred option. An extensive, well-operated recycling network exists throughout Canada. Proper storage and handling practices in the workplace can reduce spills and minimize hazards to employees. Battery acid is particularly corrosive material. Dead batteries must not be landfilled.

Name of Specific Waste	Synonym(s)
Used Batteries and Battery Acid	Dead Batteries, Scrap Lead-Acid Batteries Dilute Sulphuric Acid, Electrolyte

Regulated by

- Provincial waste management regulations, Used Battery Regulations in Prince Edward Island and Northwest Territories
- Transportation of Dangerous Goods Regulations
- Provincial spill reporting requirements
- Registration or storage permits may be required and vary by province

Current Industry Performance

Approximately 97% of all used lead acid batteries are recycled.

Benefits of Pollution Prevention

- Minimizes soil and water contamination by lead and acid
- Safety hazard reduced
- Components can be recycled to produce new finished goods
- Your shop can receive income from sale of used batteries to recyclers

Current Industry Best Practice(s)

1. Recycling via battery recycling companies, metal recyclers, or scrap merchants is the best option. Contact your supplier for more details. Encourage DIY customers to return dead battery for recycling.
2. Regular battery maintenance can ensure full service lifetime. Encourage customers to clean battery posts and top up with distilled water where appropriate.
3. Place cracked batteries in a closed, leak-proof plastic container such as a polypropylene pail.
4. Do not drain acid from batteries.
5. Store used batteries in an upright position on wooden pallets lined with heavy polyethylene plastic. Layers should be no more than 3 batteries high, with cardboard honeycomb separating the layers to provide stability. This material is readily available from most battery suppliers.
6. Cover batteries top, bottom, and four sides with plastic sheets.
7. Inspect all used batteries regularly for leaks, especially those stored outside in cold weather.
8. Maintain records of your inspections.
9. Use baking soda or lime to neutralize spills of acid, and manage all spilled materials as a hazardous waste.

References for more information

1. AIA Waste Management Guidelines, 2002 edition, Section 2.2 and Section 5
http://www.aiacanada.com/downloads/envmanorder.pdf

Success Stories

The Exide Technologies manufacturing facility in Maple, Ontario, Canada, between 1998 and 2000, recovered and recycled more than 70,000 tons of lead from spent (or used) batteries in Canada, directing the reclaimed material into the production of new lead-acid batteries. The facility also recovered some 478,000 pounds of plastic containers and 217,000 pounds of paper and corrugated materials in 2000.

Source: http://www.ewire.com

The owner of a collision repair shop in Brantford Ontario recently reported the following success story:

"Damaged and or poor batteries generate approximately $1.25 per unit. Recently I have actually started retailing batteries in my collision facility. Just think of this as another profit center: Make money on the new batteries and the old that you discard of. Depending on the arrangements you make with your battery supplier, some require that you return a battery for every new that you sell. Work out the numbers and select the best choice, based on service and profitability in your locality."

Cleaners (Used)

The cleaning and degreasing of vehicle parts is a frequent step in an automotive a repair job to prepare equipment for painting, plating, coating, or to improve appearance or operation. Common methods of cleaning include wipe cleaning, cold cleaning, or vapour degreasing.

Solvents such as mineral spirits, petroleum distillates, and varsol are often used in cleaners because they dissolve grease and oils quickly. However, they contain organic solvents or VOCs, and suffer from the following disadvantages:

- **Organic solvents contribute to air pollution, or smog, when they are allowed to evaporate into the air when the part is dried.**
- **Workers are often in close contact with cleaners and exposure to solvents can cause headaches, sickness, and dizziness. Some solvents are toxic to humans and wildlife. Some solvents can cause cancer.**
- **Organic solvents are flammable, increasing the fire liabilities in your service or repair facility if there are leaks or spills.**
- **Some parts of Canada are restricting the use of VOCs as cleaners.**
- **Organic solvents are derived from crude oil. As the price of oil rises, so do the costs of cleaners formulated with organic solvents.**

Although it is often very difficult to completely eliminate the need for cleaning or degreasing, a number of new products and new procedures are being introduced to the automotive repair industry to reduce costs, minimize exposure to workers, lower risk of fire, and reduce air pollution.

The Best Management Practices outlined below have been complied from a variety of industry and government reports. They are based on the principles of finding ways to reduce, eliminate, or substitute existing products or procedures. For example, aqueous cleaners are water based solutions can contain no VOCs and are non-flammable. They work by using heat, agitation, and soap action to break down dirt and grease into smaller particles. One of the following practices, or a combination of several, can prove to be successful in your shop, and save money in the process.

Name of Specific Waste	Synonym(s)
Cleaners (Used)	Waste cleaners, spent solvent, waste degreasers, thinners, degreasing fluids, engine and parts cleaners, varsol.

Regulated by

Used cleaners may be flammable liquids and/or leachate toxic and therefore subject to provincial waste management regulations or local sewer use by-laws. The transportation of these products and their wastes may be covered by Transportation of Dangerous Goods regulations.

Current Industry Performance

A growing number of waste reduction practices and viable alternatives are being adopted by the automotive repair industry.

Benefits of Pollution Prevention

- Reduce solvent emissions to environment
- Reduce worker exposure to solvent fumes
- Reduce the risk of a fire
- Save Money! See Case Studies below.

Current Industry Best Practice

1. Parts should be precleaned by draining off oil, then scraping off grease and road dirt with a rag prior to cleaning with cleaner. This pre-step reduces the amount of cleaner used.
2. Drip trays can be used to reduce solvent loss to the environment by catching spills or droplets of cleaner.
3. Reclaim waste solvent cleaners using a commercial Solvent Recycler.
4. Explore ways to reduce the volume of solvent-based cleaners. Enclosed parts cleaners, spray cleaners, ultrasonic, or immersion type units can reduce solvent wastage and save money.
5. Examine whether water based cleaners, containing rust inhibitors, or semi-aqueous cleaners, power washers, or even enzyme type cleaners can be substituted for solvent based cleaners.
6. Examine the use of Cabinet Parts Cleaners using water and detergents instead of solvents.

References for more information

1. AIA Waste Management Guidelines, 2002 edition, Section 2.10, 2.14, 2.17and Section 5
http://www.aiacanada.com/downloads/envmanorder.pdf
2. 'Pollution Prevention for Cleaning and Degreasing' Environment Canada-Ontario Region Fact Sheet #13, October 1996.
3. 'Aqueous Parts Cleaning-Best Environmental Practices for Auto Repair', report by USA Environmental Protection Agency, November 1999.
4. 'Cabinet Parts Washers at Auto Repair Shops' Waste Reduction Case Study done by Nevada Environmental Protection.
5. 'Switching to Water-based Cleaners in Repair and Maintenance Parts Cleaning' report by California EPA, February 1999.

Case Studies

The following are actual examples of large and small auto repair facilities that saved money and reduced pollution by switching from mineral spirits (solvent) to water based parts cleaning. All figures are annual costs.

Auto Repair Facility	Mineral Spirits	Aqueous Cleaning	Annual Saving $
Corvette Service Company	$3,170	$3,114	$56
Atlas Spring	$35, 640	$30,641	$4,999
Diesel Specialties	$19,240	$6,089	$13,151
Newhall Carburetor	$4,627	$1,815	$2,812
Bob's Transmission	$10,085	$3,468	$6,617
Nissan Dealership	$38,170	$28,145	$10,025

Source: 'Water-based repair and maintenance cleaning. Case Study conversions' prepared by Institute for Research and Technical Assistance Pollution Prevention Center, December 1998.
http://home.earthlink.net

Discharged waste water, oil and sludge wastes

In many automotive facilities, wastewater is generated by cleaning and rinsing operations such as the washing down of service bay floors, the rinsing of dirty tools and parts, and the cleaning of equipment. If a spill occurs, water is usually used as part of the clean up procedures, and becomes waste. Wash water will become contaminated or 'polluted' when it mixes with oil, grease, antifreeze, battery acid, solvents, paints, gasoline, and other chemical products used in an automotive service or repair facility. Similarly, oil, gasoline, grease or other chemicals that have been inadvertently spilled during the course of service or repair work may contaminate storm water that runs off a shop's parking lot.

Toxic chemicals in wastewater can pose a threat to human health and the environment. The problem becomes worse if these chemicals are also persistent, becoming more concentrated as they move up the food chain from plants, to wildlife, to people.

Most repair facilities are equipped with interceptors that are usually installed below a facilities floor to collect and separate oil and solids. Interceptor wastes consist of oil and sludge and they must be periodically removed to maintain operational efficiency.

Wastewater is discharged to the sanitary or the storm sewer systems when a service bay or a facility's parking lot is washed down. Typically cities and municipalities have sewer systems that collect and convey sanitary sewage and some storm water to wastewater treatment plants that are designed to treat wastewater. In the treatment process, sewage sludge is produced containing 3% to 10% solids, and is separated from the wastewater. However, some toxic industrial chemicals may not be efficiently removed by the treatment process, and will find their way into the environment in the water discharged from the WWTP's. Also, these chemical contaminants can accumulate in the sewage sludge and re-enter the environment when sludge is incinerated or spread on plots of agricultural land.

Oils and grease can have negative impacts on wastewater collection and treatment systems. Most wastewater collection system blockages can be traced to contamination by oils and grease. Blockages in the wastewater collection system are serious, causing sewage spills, manhole overflows, or sewage backups in homes and businesses.

Fires and explosions can occur when flammable solvents find there way into the sewer systems from gasoline spills, or by deliberate discharge.

Release of acids such as sulphuric acid to the sewer systems will lower the acidity, or pH, of wastewater. This is a concern due to the corrosive impact that acids have on infrastructure.

Minimizing wastewater generation will reduce environmental liability, save money, and keep your shop of tightening regulations. The following best management practices have been complied from a list of reports by industry and government.

Name of Specific Waste	Synonym(s)
Interceptor Wastes (oil and sludges)	Non-domestic waste water, rinse water, effluent, Contaminated waste water, Discharged waste water

Regulated by

- Provincial spill reporting requirements, provincial or federal clean water regulations
- Municipal waste water discharge or sewer use by-laws
- Transportation of interceptor sludge may be covered by provincial manifest requirements and Transportation of Dangerous Goods regulations.

Current Industry Performance

No information is currently available

Benefits of Pollution Prevention

- Dumping hazardous wastes to sewer may be illegal
- Minimizes soil and drinking water contamination

Current Industry Best Practice(s)

1. Use drip pans to collect leaks of oil, antifreeze, solvents and all other wastes generated by your shop.
2. Contain and clean up large and small spills immediately using appropriate equipment such as rags, mops, absorbent pads or material such as kitty litter. Dispose of all spill materials properly. Ask your supplier about opportunities to recycle spent absorbents.
3. Sweep your floor every day with a broom to prevent unnecessary build up of dirt and other contaminants.
4. When washing shop floors, minimize water use by attaching an 'economizer' type spray nozzle to your hose.
5. Consider sealing floors with epoxy or other suitable sealant. Sealed floors look great to customers, take less time and money to clean, and absorb less contamination.
6. All automotive facilities that discharge wastewater should do so through an interceptor or alternative separation treatment system.
7. Install progressively finer grates over floor drain to filter out solids before they enter your shop's interceptor. This reduces solids accumulation and the frequency of interceptor clean out.
8. Examine possibilities with your recycler of used oil to re-refine interceptor oil and sludge. This may be possible if the waste meets the processing specifications of the recycler.
9. Wastewater must be discharged in accordance with local sewer use by-laws.
10. No gasoline, cleaning solvents, or gasoline-contaminated products should be sent to the interceptor.
11. Inspect your inceptor at least once every three months, and immediately after spills. Each compartment should be checked for cracks or corrosion that might cause leaks to the environment.
12. Service and clean out should be performed on a regular schedule, depending upon the size of your facility, and local regulatory requirements. More information is available from the AIA in reference 1 and from the CPPI in reference 2, below.
13. Keep log sheets on all inspections, clean outs, and maintenance work associated with the interceptor. Past records should be archived every two years, and filed for a minimum of ten years as best practice.

References for more information

1. AIA Waste Management Guidelines, 2002 edition, Section 4 and Sections 2.6 & 2.7
http://www.aiacanada.com/downloads/envmanorder.pdf
2. 'Best Management Practices-Automotive Repair Operations that Discharge to a Sanitary Sewer System', report prepared by the Canadian Petroleum Products Institute, March 2003.
3. 'Oil/Water Separators'-Best Environmental Practices for Auto Repair and Fleet Maintenance', report by the USA EPA Region 9, November 1999.
4. 'Floor Cleanup' report by USA EPA Region 9, November 1999.

Success Stories

- ✓ Salem Boys Auto used graded pavement, grates and screens to minimize solids loading on their Oil/Water Separators and decreased sludge clean out costs by 75%
- ✓ A postal fleet maintenance facility in the USA reduced OWS effluent hydrocarbon concentration by 80%.

Recycled Automotive Parts

Automotive recycling facilities employ over 40,000 people in the USA and Canada. The industry is a major source of used vehicle parts and lower cost scrap metal for the steel manufacturing industry. Key activities that are common at automotive recycling facilities include:

- **Storage of vehicle and parts**
- **Fluid draining**
- **Dismantling vehicle and parts removal**
- **Crushing**
- **Shredding**

These facilities can be expected to experience more environmental issues because such a wide range of work activities takes place on site. Parts that are removed from the vehicle may require the draining of fluids such as motor oil, antifreeze, washer fluid, and transmission oil. Older vehicles may contain asbestos in brake shoes. Fuels such as gasoline and diesel oil are found in most scrap vehicles, and spills may be fairly common when liquids are transferred.

Since parts are likely to be contaminated with dirt and grease/oil residue, cleaning is also required prior to reselling. These steps can result in leaks or spills of organic solvents, heavy metals, and glycols to the environment, leading to surface and ground water contamination and soil contamination. If greasy parts are stored outside uncovered, rainwater can wash contaminants off the parts into the ground or streams. Solvents from cleaners and aerosol cans released into the environment cause air pollution problems.

Soil, water, and air can become contaminated because work activities like this have the potential to release contaminants such as gasoline, oil, transmission fluid, grease, battery acid, antifreeze, brake fluid, solvents, VOCs, refrigerants, and heavy metals to the environment. In older sites, non-metallic materials known as 'fluff' may have been buried along with scrap tires, dead batteries, and other unmarketable materials

Contamination at a vehicle parts recycling facility can pose a serious threat to human health and safety and to the environment. This can reduce the resale value of the property, and can result in very costly, time-consuming site remediation procedures. There are very sound reasons for implementing best environmental practices at parts remanufacturing facilities.

- **Reduces consumption of natural resources such as petroleum, metals for the manufacture of new parts**
- **Provides a low cost alternative for the consumer seeking automotive parts.**
- **Dumping automotive wastes may be illegal**
- **Reduces the demand for landfill space**
- **Minimizes air pollution and soil and drinking water contamination**
- **Keeps land and roadways clear of abandoned or disabled vehicles by providing a place to deposit these vehicles**

The following best practices provide guidance on general handling and storage practices. Facility operators are referred to the detailed practices throughout this section when handling specific wastes. For example, the best environmental practices for dealing with antifreeze are found in the report's section on Antifreeze.

Name of Specific Waste	Synonym(s)
Recycled Automotive Parts	Used car parts, used vehicle parts

Regulated by

Waste fluids and sludge generated from removing parts from scrap vehicles or from cleaning used parts may be hazardous wastes and regulated by provincial waste regulations, spill reporting regulations, storage and transportation of hazardous materials regulations.

Current Industry Performance

Recycling used automotive parts is a common and beneficial industry practice. The Automotive Recyclers Association reported that in 1997 auto recyclers in North America acquired 4.7 million vehicles for the purpose of recycling, with gross annual revenues of $8.2 billion in the USA and Canada.

Benefits of Pollution Prevention

- Reduces consumption of natural resources such as petroleum, metals for the manufacture of new parts
- Provides a low cost alternative for the consumer seeking automotive parts.
- Dumping automotive wastes may be illegal
- Reduces the demand for landfill space
- Minimizes air pollution and soil and drinking water contamination
- Keeps land and roadways clear of abandoned or disabled vehicles by providing a place to deposit these vehicles

Best Practices

1. Vehicle crushers and drain racks should be situated on a self-contained impervious surface, protected from the weather, and surrounded by a dike to contain spills.
2. Concrete pads and secondary containment structures should be regularly inspected for cracks, and repair as required to contain leaks.
3. Before removing/disassembling part, completely drain all fluids. Utilize drip trays and drip racks or other means to catch leaking fluids from parts and vehicle.
4. Drained liquids should be stored in sealed, properly labeled containers on impervious surfaces, and contained by dikes to control spills or leaks. Do not pour down the drain.
5. Do not mix different types of fluids such as used oil and antifreeze. Use dedicated drain pans or funnels for different waste streams to avoid cross-contamination.
6. Train all employees in proper handling and storage methods. Keep training records.
7. When transferring liquids use funnels to minimize spills, and use self-closing funnels when adding material to waste containers.
8. Re-use drained fuels such as gasoline and diesel oil. Other wastes like antifreeze, used oil, and solvents can be recycled, re-used, or disposed using a licensed waste hauler. Keep records of all materials transported off site for disposal.
9. Use a 2-stage or 3-stage parts cleaning process, using dirty solvent first, followed by clean solvent rinse.
10. Use drip trays to allow more drainage time for parts.
11. Remove parts slowly from washers to minimize splashing and evaporation. Use water based or detergent based cleaning solvents, or if not practical, the cleaners with the lowest solvent content.
12. Keep washers closed and turned off overnight or when not in use.
13. Consider on-site solvent recycling to reduce costs of buying virgin cleaners.
14. Use rags instead of disposable paper wipers to minimize garbage, and set up a control system to maximize rag use. Discourage use of disposable paper towels or wipes if they are to be used with hazardous solvents or wastes.
15. Train employees to properly handle all wastes according to these best practices. Keep records of the training sessions.

References for more information

1. AIA Waste Management Guidelines, 2002 edition, Section 2.16
http://www.aiacanada.com/downloads/envmanorder.pdf
2. Information from Autmotive Recyclers Association web site, see http://www.autorecyc.org
3. "Environmental Protection for the Automobile Recycling Industry in British Columbia' Volume 1, Best Management Practices, prepared by El-Rayes Environmental Corp., March 1996.

Recycling Success Story

ADDCO Industries Inc of North York, Ontario is an vehicle recycling company that combines environmental responsibility, planned recycling, sophisticated information technology with strong relationships with insurance and automotive OEM industries.

The floor of AADCO's 20,000 sq.ft. facility has been specially treated with an epoxy coating to prevent fluids from seeping into the concrete. One wall is lined with storage containers holding fluids — engine oil, fuel, coolant, brake fluid and transmission oil — recovered from the vehicles in a step called "greening." (An average car can contain about 19 litres of operating fluids.) They are either reused or recycled.

Another area of the plant is lined with batteries, transmissions, differentials and engines. High-bay shelving holds various body components — doors (with their wiring harnesses intact), bumpers, windshields, dashboards, steering wheels and more. Everything is tagged with bar codes for quick identification.

Source: Canadian Auto World, September 18, 2000. Volume 9, Number 17.

Used Paint and Thinners

Automotive paints are used in the vehicle repair process following a collision or simply to improve the vehicle's appearance. Paint may be applied to the entire vehicle or a section of it, or to parts and components such as bumpers. Generally the term automotive paint refers to a number of categories of coatings used in the refinish industry such as etch primers, sealers, filling primers, basecoats and clearcoats, paint thinner and paint hardeners. Used paint and thinners are typically generated as a result of:

1. **Mixing quantities in excess of that required for the repair**
2. **Sub-standard colour match**
3. **Off-specification product**
4. **Improperly mixed product**

Automotive refinish paint formulations can contain organic solvents, pigments, isocyanate based catalysts, and a variety of other chemicals. Used paints are flammable and will burn if exposed to an open flame, and thus present a potential fire hazard. Indiscriminate release of used paints to the environment can pollute air, soil, and waterways. Overexposure to solvents and other paint components can cause serious health and safety problems.

During the past 15 years or more, refinish paint suppliers have worked with end users of their products to achieve significant success preventing pollution and improving workplace safety through application of the 3R principles:

- **Reduce paint consumption**
- **Recycle used paint and components**
- **Reuse used paint**

These efforts have produced a substantial number of specific, well accepted best practices, such as painting with low VOC paints, high efficiency spray guns, and others summarized in the Table below. Spraying with HVLP guns can save between 20% and 40% of paint consumption, for example. Paint suppliers training programs, including ones such as 'Profit from Good Environmental Management', teach these work practices.

Many of the following best practices have been implemented throughout the refinish industry, and there is general consensus that solvent emissions and worker exposure have been reduced. However, there does not appear to be any statistics that quantifies just how much progress has been made in this important area.

Name of Specific Waste	Synonym(s)
Used Paint	Waste paint, waste thinners, waste reducers. Spent solvents

Regulated by

- Provincial waste management regulations because used paint and thinners are flammable and may be leachate toxic
- Transportation of Dangerous Goods Regulations
- Provincial spill reporting requirements
- Haulers must have valid permit or license, and must use waste manifest required by the province
- Regulations for refinish paint in Ontario and in the Greater Vancouver Regional District of British Columbia.
- Storage and mixing rooms covered by local fire codes.

Current Industry Performance

Consistent P2 efforts have reduced emissions, but no data or statistics are available.

Benefits of Pollution Prevention

- Saves money! See Case Studies
- Reduces consumption of natural resources such as petroleum
- Improves employee productivity through a healthier work environment
- Enhances image of collision repair shop
- Recycled thinners are less expensive than virgin product
- Minimizes soil and drinking water contamination
- Reduces disposal costs.
- Minimizes liability.

Current Industry Best Practice(s)

Reduce

1. Use low VOC formulated paint products based upon high solids or water-based technology that are available from your paint supplier.
2. High efficiency spray guns such as HVLP can save between 20% and 40% of paint use, increase life of spray booth filters, and reduce paint sludge in interceptor sump.
3. When using HVLP guns, use proper spraying techniques such as set up each gun to ensure proper pressure at the tip, use larger diameter air hose, use proper tip, keep gun square to the target and the same distance from the target throughout the stroke.
4. Mix only the amount of paint you need for the job. Use digital scales to weigh small quantities of paint accurately. Computer mixing systems provide an easy means to label excess paint for later use.
5. Closely follow mixing instructions on the paint cans or in technical manuals from paint suppliers.
6. Do not 'cocktail' your own paint mixtures. This could result in wasted material and time.
7. Maintain a paint system approach. Using combinations of different suppliers' paint could lead to premature failure of the coating, resulting in a re-do.
8. Drain all useable amounts of paint out of containers. Use small amount of thinner to remove residual paint from container.
9. Spray small sample panel to verify correct colour match before re-spraying vehicle.
10. Manage paint inventory using a 'first in first out' approach to minimize waste and stale dating.
11. Use a computer based inventory system to help manage paint purchases.
12. Restrict access to paint room and closely monitor usage to minimize shrinkage.
13. Store paint so it lasts by keeping container lid on, and avoid extremes in temperature. Cold temperatures can freeze water based paints.
14. Use enclosed spray gun washers to minimize solvent use for cleaning guns.
15. Keep all sample containers shut or covered to minimize solvent evaporation.
16. Change spray booth filters on a regular basis.
17. Set up a spill prevention program, and train all employees in spill prevention practices.
18. Consider use of liquid masking to save time and reduce paper masking waste.
19. Examine ways to reduce packaging waste by using can crushers, cardboard compactors, or returning waste packaging to supplier for reuse or recycling.

Recycle

1. Paint thinners and reducers can be recycled using on site or off site Solvent Recyclers.
2. Do not mix used thinners or reducers with other wastes such as gasoline, oil, brake fluids, antifreeze, etc.
3. If possible, use left over colours to tint primers. Consult you paint supplier first.

Reuse

1. Unused paint may have another market value. Contact local recycling council or waste exchange organization in your province.
2. Extra paint may be given to customers for touch-up use.

References for more information

1. AIA Waste Management Guidelines, 2002 edition, Section 2. 10 and Section 5
http://www.aiacanada.com/downloads/envmanorder.pdf
2. 'HVLP Spray Guns: Cost Effective, environmentally friendly technology' USA EPA report
EPA 744-F-00-004, April 2001.
3. 'Best Practices for the Paint Mixing Room' USA EPA report, 744-F-00-003, June 2000.
4. 'Engineering Data Sheet 4-16: Solvent Recovery Equipment' Ontario Ministry of Labour Guideline, May 1996.
5. 'Keep your shop in Tune' Best Management Practice Guide, Oregon Pollution Prevention Outreach Team, http://www.ecobiz.org
6. 'Best Management Practices for Automotive Service Facilities' New Hampshire Department of Environmental Services report R-WMD-01-4

Success Stories

- ✓ A 2001 study conducted by the USA Environmental Protection Agency in Iowa demonstrated that shops saved between $6900 and $13000 per year in paint purchases by switching to HVLP guns and adopting proper painting techniques. Because HVLP reduces paint overspray, savings of $1500 per year were achieved by reducing the frequency of spray booth filter replacement.

- ✓ The owner of a 6-employee body shop in Reno, Nevada switched to HVLP guns and saved $336 per year in disposal costs, and reduced paint costs by over $5000 per year.

- ✓ A shop owner in Brantford Ontario realized a net savings of $3961 per year in garbage disposal costs by compacting cardboard and crushing all used metal containers. The same owner saved $9600 per year by recycling paint thinners using an on site Solvent Recycler. He encourages each shop owner to 'do the math' and save money.

- ✓ Waste reduction results at Vintage Class Motor Cars in Carson City, Nevada demonstrated significant savings. Switching to HVLP guns saved a net $$2490 per year. Installation of a solvent recycler netted $1400 per year savings in solvent purchases and $1560 from reduced disposal costs.

Refrigerants (Used)

Refrigerants in vehicle air conditioning systems are compressed gases. The use of these refrigerants in a closed loop system like a vehicle air conditioner is both beneficial and safe as long as the refrigerant does not escape to the environment. Release of these gases to the environment reduces ozone concentrations in the upper atmosphere, adversely affecting humans, animals and plants, and contributes to global warming. Releases from air conditioners can arise from slow leaks during normal operation or during the maintenance, repair, or replacement of an AC system.

Refrigerant manufacturers have developed technology to produce safer refrigerants and hydrocarbon based refrigerant blends to reduce ozone depletion and global warming.

The storage, transportation, use, and disposal of refrigerants are governed by a number of federal, provincial, and territorial regulations and codes of practice. Pollution Prevention best work practices outlined below have been compiled from industry and government reports. Shop owners and managers must ensure that their operations fully comply with the regulatory requirements of their provincial or territorial jurisdictions. A list of the regulations can be found on the AIA's web site, www.aiacanada.com

Name of Specific Waste	Synonym(s)
Refrigerants (Used)	ODS (ozone depleting substances), CFC's Freons, R-12, CFC-12, R-134a, fluorocarbon Refrigerants, HFC's

Regulated by

- Federal or provincial 'Ozone Depleting Substances' regulations
- Transportation of Dangerous Goods Regulations
- Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems
- Federal or provincial emission release reporting requirements

Current Industry Performance

Mandatory regulations exist in all provinces but data on P2 performance is not available.

Benefits of Pollution Prevention

- ✓ Reduces damage to stratospheric ozone layer
- ✓ Compliance with local regulations reduces risk of investigations, fines

Current Industry Best Practice(s)

1. Banned refrigerants like R-12 must be captured and recycled, never vented to atmosphere
2. Deal with professional recyclers that adhere to responsible recycling codes of practice.
3. Replace banned refrigerants with new ozone-friendly technology based upon pure hydrocarbon or pure R-134a (hydrofluorocarbon) products. Most new vehicles have an identification decal or sticker that specifies what kind of refrigerant is required.
4. R-12, R-134a, and hydrocarbon refrigerants are incompatible and must not be intermixed.
5. Approved refrigerants must be captured and either recycled or re-used in the vehicle.
6. Only certified technicians with a valid permit can maintain refrigerant equipment and manage refrigerant waste. Special training for technicians is required for certification. Some provinces require environmental awareness training for jobbers, distributors as well as service technicians.
7. Do not over charge the system with refrigerant. Too much refrigerant can reduce cooling efficiency the same as too little refrigerant. Use a calibrated charging cylinder or weighing scale. Never heat the can of refrigerant to make it empty faster because it could explode, releasing refrigerant to the environment.
8. Leak check the AC system.
9. Fill out and apply retrofit label over original R-12 label, then test drive the vehicle.
10. Written records of refrigerants removed, collected, received, recycled and transported should be kept in accordance with provincial regulations.
11. Follow all provincial regulations and codes of practice.

12. Encourage customers to run the AC system for ten minutes at least once a week all year long to lubricate the seals and minimize refrigerant leaks.
13. Encourage customers to have their AC system inspected annually for leaks and wear, and to have all system deficiencies repaired. Replace system dryer filter that contains an R-134a compatible desiccant during compressor replacement to minimize future leaks or refrigerant.

References for more information

1. AIA Waste Management Guidelines, 2002 edition, Section 2.1 and Section 5
http://www.aiacanada.com/downloads/envmanorder.pdf
2. Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems, Environment Canada Report EPS 1/RA2, March 1996.

Scrap Tires

Vehicle tires become scrap or used tires when they are damaged due to road hazards, general wear and tear, or when the threads are worn out and no longer fit for use in their original intended application. They are generally composed of natural or synthetic vulcanized rubber, steel wire beads, and steel mesh-reinforcing belts.

Improper disposal or storage practices can devalue property, pose a fire hazard, and create habitats for undesirable, disease carrying rodents and mosquitoes. Another major issue is the management of existing stockpiles. Many consider them as liabilities, not assets, because the spending priority on funds from tire levies may not be allocated to stockpile removal. Unfortunately, scrap tires have become the poster child for bad littering behaviour, and can tarnish the industry's image.

Numerous uses and applications have been developed for recycled rubber and tires, including rethreading and reuse. As a result, recycling is the preferred option. Tire burning is no longer a disposal practice, and disposal at landfill sites is considered by the industry as one of the last options for dealing with scrap tires.

Furthermore, by promoting environmental best practices among consumers, installers can realize additional sales, by encouraging regular tire rotation and the purchase of premium brand tires to lengthen lifetime and reduce waste.

Name of Specific Waste	Synonym(s)
Scrap Tires	Used tires

Regulated by

- Used tire regulations exist in most provinces
- Local regulations or by-laws may require a permit for storage and can restrict quantity of scrap tires stored on site
- Municipal by-laws may strict dumping of used tires in landfill sites

Current Industry Performance

Recycling programs exist in most provinces, with recycling rates quite high in some jurisdictions. Millions of scrap tires are recycled each year by the automotive industry in Canada.

Benefits of Pollution Prevention

- Reduces consumption of natural resources
- Dumping used tires may be illegal
- Recycled tires can be made into a variety of useful products
- Carelessly discarded used tires devalue property and are unsightly

Current Industry Best Practice(s)

Recycling is the preferred option because it conserves natural resources. Tires should be repaired, rethreaded or reused when possible, and when it is safe to do so.

1. Tires should be stored in quantities that meet local requirements or permit requirements. Check with your local authorities or provincial regulations.
2. Storage area should be designated away from public access and preferably have a containment such as a strong surrounding fence or wire cage.
3. Storage of used tires should be organized for easy access, or inventory count.
4. Maintain up-to-date inventory and keep records of tires moved off-site.
5. Contact your local recycling council for leads on recycling opportunities in your area.
6. Encourage the purchase of higher quality tires that last longer and create less waste.
7. Promote steps amongst consumers to maximize tire life such as the need for regular tire rotation, and proper inflation.

References for more information

1. AIA Waste Management Guidelines, 2002 edition, Section 2.15 and Section 5
http://www.aiacanada.com/downloads/envmanorder.pdf
2. 'Scrap Tires and the Environment' by the Rubber Manufacturers Association, http://www.rma.org

Used Oil and Oil Filters

Consumers are increasingly more aware of the positive impact that regular oil and filter changes have on the longevity of their vehicles, resulting in a continuing trend to premium or long-life synthetic oils. At the same time, DIY efforts are dropping because virtually all vehicles need to be jacked up to do and oil and filter change. The retail sector of oil and filter sales continues to show upside profit potential which can be enhanced by a well managed, oil and filter recycling program in your facility. Since consumers are accepting environmental handling charges, they can help fund your recycling efforts.

Used oil and filters are collected from vehicle engines or other mechanical parts and usually fall into one of the following categories:

- **Lubricating oils from engines**
- **Hydraulic oil from gearboxes, transmissions, and brake fluids**
- **Metal working fluids from cutting, grinding or quenching**

Generators of used oil and filters in the automotive industry typically include quick lube shops, service stations, and vehicle repair facilities. Used oil collected from vehicles is usually contaminated by heavy metals such as lead, water, dirt, rust, benzene, corrosive acids and other impurities. It may be designated as a hazardous waste depending upon the types and amounts of chemical impurities it contains. Used oil filters are also generated as a waste when a vehicle's oil is changed. If not disposed of responsibly, used oil and filters can cause serious environmental and human health problems by leaching into soil and drinking water.

Use oil filters and empty plastic oil containers also present an opportunity to recycle raw materials and minimize disposal in land sites, ditches, back yards, and sheds. Used oil filters consist of a filtering media, a metal casing, and a rubber gasket. Some provinces have initiated programs to recycle used oil filters to recover natural resources such as steel, and to recycle used containers into useful products such as fencing, plastic pipes, and lawn furniture. Statistics from the Recycling Council of Ontario indicate that each ton of oil filters that are recycled can produce 1,700 pounds of new steel, conserve 10 cubic yards of landfill space, and reclaim 60 gallons of used oil!

Best management practices have been developed by industry and governments to maximize recycling efforts and to minimize disposal. These work practices apply to all sizes and types of shops that generate used oil, and are based upon good housekeeping, handling and storage work procedures.

Name of Specific Waste	Synonym(s)
Oil and filters (Used)	Used crank case oil, used transmission oil, used lube oil, used power steering fluid, used brake oil

Regulated by

- Provincial waste management regulations because used oil may be leachate toxic
- Transportation of Dangerous Goods Regulations
- Provincial spill reporting requirements
- Federal and provincial clean water acts and regulations, eg The Fisheries Act
- Used oil haulers must have valid permit and use waste manifest provided by the province
- Above ground or underground storage tanks must be in compliance with codes, standards and may require a storage permit.

Current Industry Performance

Recycling programs for used oil and filters are currently in place in most provinces. Some provinces have extended recycling initiatives to include plastic containers.

Benefits of Pollution Prevention

- Reduces consumption of natural resources such as petroleum
- Dumping waste oil and filters may be legal
- Minimizes soil and drinking water contamination
- Avoids costly clean-ups

Current Industry Best Practice(s)

Recycling is the preferred option because it conserves natural resources. Most provinces operate extensive oil and oil filter recycling programs. Here are the proven steps to maximize recycling, and minimize waste in your shop.

1. Used oil should be stored in leak-proof containers and tanks that are maintained in good condition, and well labeled. Don't allow tanks to rust, leak, or otherwise deteriorate. Repair any defects immediately.
2. Never mix used oil with other contaminates such as PCB's, solvents, paints, antifreeze, gasoline and other waste liquids in your shop.
3. Generally you can mix used oil with used transmission oil, synthetic oils, gear oils, cutting and cooling oils, but consult with your oil recycling company to be certain.
4. Transfer used oil used carefully using a funnel if you have to transfer if from one container to another. Avoid drips and allow funnel to drain.
5. Use drip pans to catch leaks and collect spills. Have absorbent materials available to contain any oil that leaks onto the floor.
6. Clean up oil immediately, don't let it get into floor drains. Return it to your used oil storage container.
7. Oil filters should be punctured on the dome end and allowed to 'hot-drain' for at least 12 hours into a used oil container or drip pan. (Hot draining is draining the filters immediately after removal from a running engine.) Crushing the filter will remove even more used oil for recycling.
8. Store drained used oil filters in sealed, labeled containers and send for recycling where possible. If recycling or used oil filters is not possible, dispose of through a licensed waste contractor.
9. Promote the use of premium brand or long-life motor oils. This will reduce the interval of oil changes and the amount of waste oil generated.
10. Consider purchasing quality branded motor oil in bulk to reduce the number of plastic containers that have to be disposed of, or recycled.

References for more information

1. AIA Waste Management Guidelines, 2002 edition, Section 2.8, 2.9 and Section 5
http://www.aiacanada.com/downloads/envmanorder.pdf
2. Information on Used Oil Recycling Associations in Canada, see *http://www.usedoilrecycling.com*
3.'Managing Used Oil: Advice for Small Businesses" USA Environmental Protection Agency fact sheet, see
http://www.epa.gov/epaoswer/hazwaste/usedoil/usedoil.htm
4. 'Oil and Filter Retailing-For you and your Customers' by Dennis Mellersh, Jobber News, pg 20, June 2003.
5. 'Used Oil Management' Fact Sheet #11 from Environment Canada, Ontario Region, October 1996.
6. 'Recyclable Materials-Used Oil' Recycling Council of Ontario Fact Sheet, see *http://www.rco.on.ca*

Vehicle Wash Facilities

Wash water and sediment from vehicle washing facilities contains oils, lubricants, tar, dirt and other particulate matter, heavy metals and microorganisms. Unrestricted disposal of wastewater can seriously contaminant soil, ground water, and drinking water. Furthermore, since global warming has reduced water levels in some areas of the country such as the Great Lakes, water conservation efforts are becoming increasingly important to our economy and society.

It makes good economic and environmental sense for operators and owners of vehicle car wash facilities to implement best management practices:

- **Proper maintenance practices can reduce operating costs of equipment and reduce material costs**
- **Water recycling can reduce charges from your municipality for supplying fresh water and for sewer use. Savings of 60-90% in water and sewer bills can be achieved according to industry sources.**
- **Conservation measures can reduce the burden on municipalities for supplying fresh water, and treating contaminated water.**
- **Dirty water results in poor car washes and can result in odors in pits and recovery tanks.**
- **Water conservation measures imposed by municipalities during droughts can restrict the operation of your facility and your revenues.**

Industry studies have provided evidence that water recycling in car wash facilities is not only practical, but also it is also economic and environmentally wise. For example, the data below demonstrates that car wash recycling uses far less drinking water than other methods.

Method of Car Washing	Average consumption of drinking water per car wash
Hand washing with a hose	400-560 litres
Conventional car wash facility	150 litres
Self service car wash facility	100-110 litres
Recycling water in car wash facility	10-50 litres

Source: Lenntech http://www.lenntech.com/car-wash.htm and WashTechnologies Inc, see http://www.autocareforum.com

In March 2003, the Canadian Petroleum Products Institute published a series of Best Management Practices for Vehicle Wash Operations. This is an excellent resource for operators who wish to minimize the effects on the quality of wastewater sent to sewers or septic systems. A copy of this report is available on line at http://www.cppi.ca/tech/BMPwash.pdf
The information below is excerpted from this report, and other reports indicated in the Reference section below.

Name of Specific Waste	Synonym(s)
Vehicle wash water	Wastewater, car wash wastewater

Regulated By

Possible Acts and Regulations covering the handling and disposal of vehicle wastewater:

- Federal Fisheries Act
- Provincial Spill Reporting requirements, Fuel Handling Codes, Fire Codes.
- Permits for equipment installation such as oil/water separators
- Provincial waste disposal regulations and health and safety Acts
- Municipal Sewer Use By-laws

Current Industry Performance

Wastewater reuse and recycling, employing a variety of methods including neutralization filtration, biological treatment, disinfection, and oil/water/solids separators, is commercially available and growing in use.

Benefits of Pollution Prevention

- Saves money!
- Reduces consumption of natural resources
- Dumping waste water to sewer may be illegal
- Minimizes soil and drinking water contamination
- Minimizes impact of decreasing water levels

Best Practices

- ✓ Use only biodegradable, low-phosphate content water based cleaners. Avoid the use of solvent borne or chlorinated hydrocarbon cleaners. Cleaners with a pH of 5.5 to 9.5 will minimize dissolving heavy metal contaminants.
- ✓ All cracked or damaged pavement should be repaired to avoid any leakage of product to the environment.
- ✓ Inspect and repair any piping, valves, joints, welds, tanks, etc that may leak or spill products into the environment.
- ✓ Store all detergents, cleaning agents, and machinery lubrication oils in properly labeled, sealed containers.
- ✓ Most vehicle wash facilities have one or more sedimentation pits and a few may also have an oil/water separator.

Inspection and maintenance of these sediment pits and oil/water separators should adhere to the following:

1. Sampling ports should be readily and easily accessible at all times.
2. The sediment pits and oil/water separators should be inspected once per month and the depth of bottom sludge and floating oils should be measured.
3. The solids in the sedimentation pit(s) should not exceed 75 percent of the wetted height of the sedimentation pit. (As solids build up in the bottom of the pit the efficiency of the pit decreases and the chance of sludge passing through increases).
4. Settled solids in the oil/water separator should not be left to accumulate in excess of the lesser of 15 cm or 25% of the wetted height of the oil/water separator.
5. Floating oil and grease in the oil/water separator should not be left to accumulate in excess of the lesser of 5 cm or 25% of the wetted height of the oil/water separator because the efficiency of the interceptor decreases with increasing levels of floating material. Due to the volatile nature of some oils, solvents and fuels, these materials should not be left to accumulate as they can cause health and safety concerns.
6. A sediment pit and oil/water separator should be cleaned out within seven days if during inspection the measured amounts exceed the criteria noted in the three points above.
7. When a sedimentation pit or an oil/water separator is cleaned, the oil and grease and bottom solids should not be disposed of into any sewer connected to a sewage treatment facility or at any location where it may be introduced to a storm sewer or a watercourse. Clean out should be done by a provincially licensed and approved waste collector.
8. Hot water, detergents, solvents or any other chemical agents should not be used to flush oil out of the oil/water separator.

9. Proper signage should be posted that informs people that engine washing and the disposal of oil, brake fluid, transmission fluid, antifreeze or other prohibited substances into a sewer connected to a sewage treatment facility is not allowed.

10. All fuel spills should be immediately cleaned-up with rags or sorbents and disposed of according to applicable provincial regulations.

11. Rags used for spill clean up should be stored in closed containers awaiting collection and/or cleaning.

12. Absorbents used for spill clean up should be stored in closed containers awaiting disposal by a government licensed contractor.

References for more information

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Used Automotive Windshield Glass

Approximately 18 to 20 million kilograms of windshield glass are disposed of annually in Canadian landfill sites from various sources. As a result, natural resources are wasted, and landfill sites reach their capacity more quickly, and others have to be opened at great cost to society and the environment.

Instead of disposing windshields, there are several options that must be explored to reduce waste:

1. Windshields that are intact can be reused as long as they meet quality standards. Listed below are some Internet sites that may find buyers for used windshields or by-products.

- **House of Glass contains windshield recycling exchange listings www.glasschange.com**
- **Canadian Recycle Xchange promotes trade by bringing sellers and buyers together www.recyclexchange.com**
- **Global Recycling Network specializes in the trade of recyclables reclaimed in municipal land sites such as glass and fiberglass, www.grn.com**
- **Glass Recycling, www.glasslinks.com**
- **Recycler's World, www.recycle.net**

2. A company in New York State, Andela Tool & Machine sells a windshield 'stripper which they claim is unique in its ability to remove all of the glass from the plastic laminate. Their Pulverizer is reported to produce a glass sand product that is safe to handle with rounded edges so it can be used in the community as driveway or landscaping material.

Contact: **Andela Products Ltd**
493 State Route 28
Richfield Springs, New York
13439 USA
Tel: 315-858-0055
Fax: 315-858-2669
info@andelaproducts.com

Name of Specific Waste	Synonym(s)
Automotive Windshield Glass	Flat glass, plate glass

Disposal Restrictions

Cannot be recycled in community 'blue box' recycling programs. Check with local landfill authorities to see if any disposal restrictions apply.

Current Industry Performance

Disposal at a landfill site is the most common practice. Recycling and reuse are options, but generally not considered economically feasible.

Benefits of Pollution Prevention

- Reduces consumption of natural resources such as petroleum fuels, limestone, sand, soda, and plastics.
- Reduces environmental burden on landfill sites

Current Industry Best Practice(s)

1. Windshields can be reused if they meet quality standards requirements.
2. Windshields that are scratched, cracked, or pitted cannot be reused.
3. Some recycling companies will re-sell used windshields.
4. Pulverizers are available to crush windshields and separate the film plastic residues. Commercially available windshield strippers can break down automobile windshields into two products that can be recycled, pulverized glass and plastic laminate sheets.

References for more information

1. Andela Products Ltd in Richfield Springs, New York sell windshield strippers. Contact *info@andelaproducts.com*, *www.andelaproducts.com*, or 315-858-0055
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Case Study

When the Integrated Waste Division of the Sonoma County Public Works Department needed new office space, it constructed an addition to its existing administrative building, using recycled content materials to the greatest extent possible.
Upon completion of its new addition, the Integrated Waste Division had a facility demonstrating that recycled content materials can be successfully integrated into construction projects, while remaining cost-effective and aesthetically pleasing.

Floor tiles were manufactured using 70% recycled windshield glass by Terra Green Technologies, Inc. Richmond, IN, USA.

Source: http://www.nrc-recycle.org/brba/casestudies/sonoma.htm

Appendix 1

Motor Vehicle Registrations 2002 *(Data from Statistics Canada, CANSIM table, http://www.statcan.ca/english/Pgdb/trade14a.htm)*

	Canada	AB	BC	MB	NB	NL	NS	ON	PE	QC	SK	YT, NT, NU
Vehicles less than 4500 kg	17,543,653	2,089,420	2,271,267	601,942	442,703	249,639	519,875	6,559,352	73,390	4,056,125	634,980	44,960
Vehicles between 4500 and14999kg	366,958	86,634	68,001	9,911	7,591	4,037	9,330	81,278	1,830	56,349	39,719	2,278
Vehicles over 15000 kg	277,335	67,363	13,806	12,859	3,587	2,866	7,313	105,488	2,560	35,678	23,501	2,314
Subtotal	18,187,946	2,243,417	2,353,074	624,712	453,881	256,542	536,518	6,746,118	77,780	4,148,152	698,200	49,552
Buses	79,359	12,577	8,379	3,604	2,794	1,313	1,835	27,880	53	16,723	3,831	370
Motorcycles & mopeds	350,082	49,170	29,560	7,234	11,079	3,985	7,905	107,530	1,107	127,308	4,344	860
Trailers	4,161,488	732,128	271,194	96,818	71,223	27,087	46,685	1,621,007	9,263	1,167,575	108,373	10,135
Off-road, construction, farm vehicles	1,419,300	78,795	27,356	87,634	45,232	102,915	50,329	465,276	1,856	551,759	4,899	3,249
Subtotal	6,010,229	872,670	336,489	195,290	130,328	135,300	106,754	2,221,693	12,279	1,863,365	121,447	14,614
Grand Total	24,198,175	3,116,087	2,689,563	820,002	584,209	391,842	643,272	8,967,811	90,059	6,011,517	819,647	64,166

Note: These data are not comparable with the motor vehicle registrations prior to 1999. Although the data still come from provincial and territorial governments, vehicle counts were tabulated from registration files used by the Canadian Vehicle Survey. A standardized methodology was applied to the files, providing more consistent results across jurisdictions.

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