Pollution Prevention Program
for
Automotive Body, Paint and Interior Repair and Maintenance

Prepared for Toronto Public Health
by
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Contents

1.0 BACKGROUND INFORMATION

1.1 ChemTRAC Facilities

In the Metropolitan Toronto area, 2,824 facilities[1] have self-declared with NAICS code 811121, which corresponds to the Automotive Body, Paint and Interior Repair and Maintenance sector. In the 2013 reporting year, 101 unique facilities reported to ChemTRAC whether or not they met or exceeded the reporting thresholds, representing approximately 3.6% of the facilities implicated in the sector.

1.2 Sector Releases

In the 2013 reporting year, the sector reported releases of two contaminants: particulate matter less than 2.5 microns ($PM_{2.5}$) and volatile organic compounds (VOCs). Thirteen facilities reported meeting or exceeding the reporting thresholds of PM2.5, and 92 for VOCs, respectively. In total, 94 facilities reported meeting or exceeding the thresholds for both PM2.5, and VOCs.

1.2.1 Particulate Matter Less than 2.5 microns ($PM_{2.5}$)

Total releases to air of PM2.5 were reported at 8,043 kg in the 2013 reporting year. Releases to air of PM2.5 are expected to be primarily from the sanding, grinding, welding, and painting operations. Discharges to air from the facility are both controlled (via filter or dust collector), or direct (uncontrolled). From our experience in the industry, paint booths feature internal filters to capture the paint solids, sand blasting is typically done in enclosures, while operations such as grinding and welding are typically uncontrolled.[2] Other ancillary operations such as fluids handling are not expected to emit comparably insignificant emissions. One of the facilities, Mister John Auto Collision, released 4,511 kg of PM 2.5, which entails more than half of the total contribution for that particular contaminant. The top 3 reporters from this sector comprise more than 80% of the releases. From the ChemTRAC data, the top 10 facilities with the highest air releases for PM2.5 are provided below in Table 1.

1.2.2 Volatile Organic Compounds (VOCs)

Total releases to air of VOCs where reported at 34,791 kg in the 2013 reporting year. Releases to air from the sector are primarily from painting activities, solvent based parts washing, and cleaning activities. Ancillary operations such as application of adhesives, and handling of automotive fluids are not expected to be significant. From the ChemTRAC data, releases of VOCs are dispersed amongst the reports with no

[1] Source: Composite of Scott's Directory, Industry Canada, and the 2013 ChemTRAC reporting year data set.
[2] Use of weld fume extraction systems are common in the metal fabrication, and machine shop industries, however, location, and weld type can often provide challenges for the automotive refinishing sector, and as such is not widely implemented. Based on Rubidium's experience in the sector.

facility representing more than 8% of the total releases. The top 10 facilities with the highest air releases is shown in Table 1.

Table 1. Top 10 Facilities with the Highest Air Releases within the Automotive Body, Paint and Interior Repair and Maintenance Sector

Pollutant	Air Release (kg)	Contribution (%)
Particulate Matter 2.5 (PM2.5)	**7894**	
Mister John Auto Collision	4511	56%
Summit Collision Carstar 1999 Ltd	1251	16%
Conquest Auto Centre Inc	771	10%
John's Unique Auto Body Ltd.	630	8%
Imperial Auto Collision	281	3%
Dupont Auto Collision	145	2%
Impera Body and Paint Shop Inc	101	1%
Mother Auto Body Auto Services	94	1%
Assured Automotive	63	1%
Assured Yorkdale Collision	47	1%
Volatile Organic Compounds (VOCs) Total	**13481**	
427 Auto Collision Ltd	2865	8%
Weston MB Collision Ltd	2261	6%
York Mills Automotive Centre	1699	5%
Ryding Auto Body	1302	4%
Premium Auto Collision Inc	977	3%
409 Auto Collision	960	3%
A A Auto Body	874	3%
Don Valley Auto Collision	867	2%
Michael & Michael Auto Collision Centre	840	2%
427 Queensway Collision Centre	836	2%

1.3 Description of Sector Processes and Operations

Within the Automotive Body, Paint and Interior Repair and Maintenance sector facilities receive automotive vehicles from their customers which require body work as a result of a motor vehicle accident, vehicles that are undergoing customization or restoration, or vehicles undergoing routine or preventative maintenance. Operations generally performed in this sector include repairing, painting, and maintenance as required. The vehicles would generally receive fluid changes, such as brake fluid, oil, antifreeze, and refrigerants. The vehicle may also undergo general repair, parts cleaning, and parts management, such as switching out an old battery for a new one. During the repairing process parts might undergo sanding, grinding, or welding. Once the repairing of the vehicles have been completed it

will go through the refinishing stage where stripping of existing coatings, sanding and sandblasting, and painting occurs. Once refinished, the vehicle receive final touch ups and cleaned prior to returning it to its customers. For each process, various pollutants are emitted into the air, as shown in Figure 1.

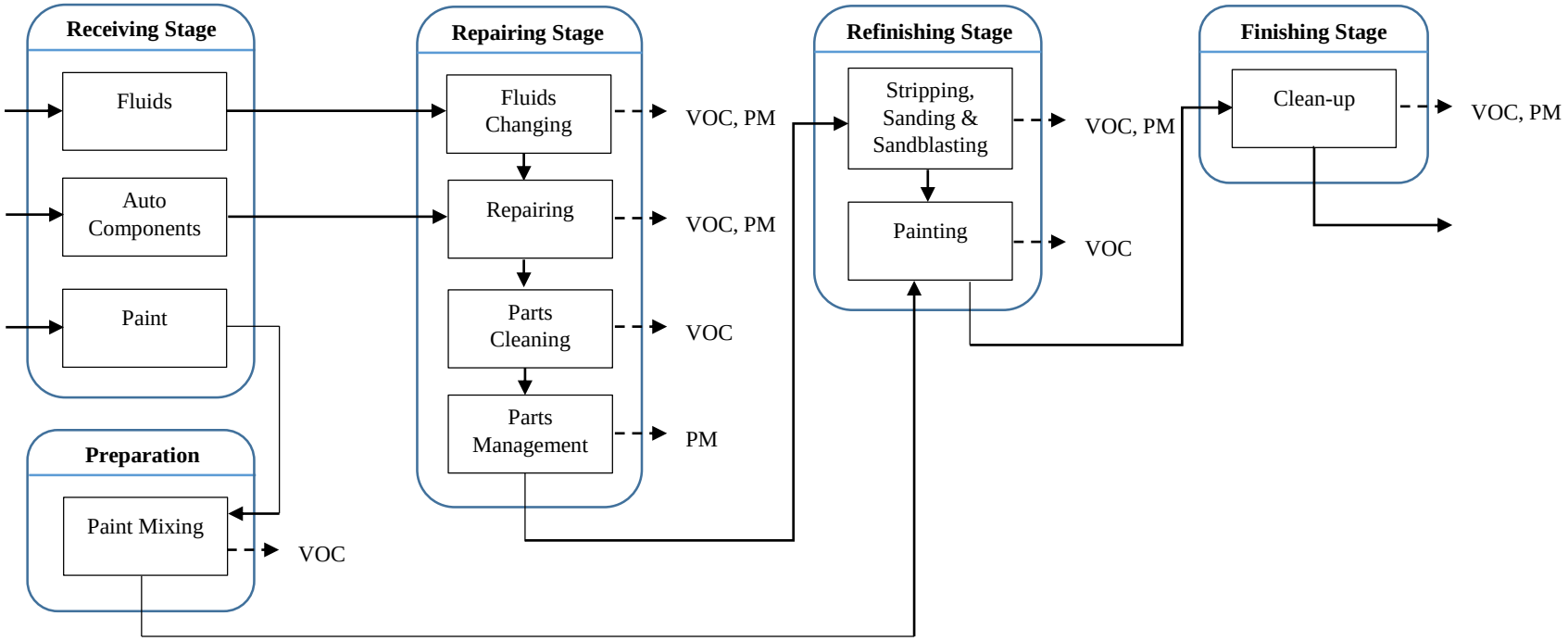

Figure 1. Process Flow Diagram of Automotive Body, Paint and Interior Repair and Maintenance Sector with Corresponding Process Emissions

2.0 BARRIERS IDENTIFIED

2.1 Motivation

Within the sector, 94.5% of the facilities have less than 10 employees, and 86.4% have less than 5 employees[3]. The demographics of facilities with more than 10 employees are comprised of automotive dealerships (whom only a fraction of its employees are engaged in the activity), automotive supply stores (such as Canadian Tire), and automotive oil change and lubrication shops with automotive repair capabilities. Given the small size of most facilities, it is anticipated that the sector is primarily owner-operated with the exception of the larger facilities.

Motivational barriers identified within this sector include:

- Businesses feel that regulations will naturally mandate the use of lower VOC-paints requiring suppliers to provide appropriate solutions.[4]
- Many small businesses are skeptical about the business benefits of environmental improvements.[5]
- Lack of financial incentives
- Lack of pressure from customers[6]

2.2 Knowledge

With a limited number of staff, facilities are not positioned to employ specialists with an enhanced knowledge of P2 measures. Small facilities are more likely to learn from business-to-business discussions, suppliers, tradeshows or magazines, and from industry associations.

Within the sector, the following knowledge barriers have been identified:

- Limited or no technical resources in-house
- Business may not understand the necessary actions involved in implementation of a P2 technology or practice.[7]
- Unsure how new technologies will impact business
- Desire external expertise to validate potential opportunities[8]

[3] Source: Scott's Directory and Industry Canada
[4] The Future of Automotive Paint. http://www.bodyshopbusiness.com/the-future-of-automotive-paint/
[5] Revell et al, 2010. Small businesses and the environment: turning over a new leaf? *Business Strategy and the Environment*, *19*(5), 273–288. doi:10.1002/bse.628
[6] Hassanali, M. Pollution Prevention Practices in SMEs in the GTA. 2005.
[7] Heath & Heath, 2010. *How to change things when change is hard*. Crown Business.
[8] ChemTRAC Business Panel, 2012.

A major obstacle for the shops is little or no knowledge about pollution prevention technologies. The effectiveness, capital cost, annual savings, and payback period of the technology are all the key factors to deciding whether or not a pollution control technology should be implemented.

2.3 Financial Resources

Financial investment is one of the major barriers identified that prevent facilities from implementing P2 initiatives. Within the sector, the smaller facilities are typically focussed on their day-to-day survival rather than research, and investing capital for retrofits, new equipment, or other supplies in order to prevent or reduce pollution. As vehicle manufacturers adopt new technology within their vehicles, the automobile repair shops are required to follow suit including capitally intensive equipment to assist with electronic vehicle diagnostics, and the ability to repair such materials as aluminum, magnesium, and carbon fibre.[9]

The following financial barriers that have been identified within the sector include:

- Lack of financial capital to invest
- Short return on investment (typically a return on investment must be complete within a year)[10]
- Capital tied up in other investments (vehicle diagnostics equipment)

2.4 Time/Human Resources

This sector is comprised mainly of shops having between 1 and 10 employees. There is a considerable time demands placed on the owner, and employees resulting in a lack of resources to investigate P2 initiatives. It is not uncommon for the owner/operator to be involved in various functions, including: management of operations, customer service, sales, human resources, and accounting.

Time/Human Resource Barriers Include:

- The relatively small number of employees impacts a shop's ability to release employees for training without impacting operations.[11]
- Lack of available time to explore and research effectiveness of P2 opportunities

2.5 Organizational

No organizational barriers could be identified which were not already discussed in one of the other categories.

[9] http://www.canadianunderwriter.ca/news/tech-injection/1003493285/?&er=NA
[10] Based on experience working on P2 projects within the sector.
[11] Dornan, L. 2010. Manitoba Collision Repair Industry Study.

2.6 Market

Within the automotive industry, the Original Equipment Manufacturers (OEMs) such as Ford, GM, Honda, etc. create detailed specifications for paints and finishes for each model of vehicle. Manufacturers of paint then have minimal ability to modify the formulation of paints for OEM approved colours[12], which is done to ensure compatibility with existing trim. (i.e. if the hood is damaged in a collision, only the hood needs to be repainted not the entire car). Replacement parts for vehicles are typically not painted prior to delivery, with the exception of structural components which are commonly electrocoated[13]. For custom colours, complete vehicle repainting, and aftermarket parts there is more flexibility in supply chain options.

The types of paints used by the facilities are often restricted by manufacturer specifications. Changes to product formulations including VOC content of paints, is also predominantly driven by regulatory requirements and not customer requirements.[14] Given the costs associated with vehicle repair, consumers are driven to the lowest repair cost options, and there is little external pressure on auto body shops to invest in green products. Work performed for insurance companies is lump sum, and based on established rates, which drives the auto repair industry to use as cost effective materials as possible.

2.7 Technological

Similar to the market barriers, lack of external pressure from customers is a limiting factor in adopting greening technologies within the sector. As this sector is reliant on the ability of the skilled trades, shops are further limited by the skill set of its workforce, and their previous training.[15] As new technology can often require specialized training, the repair shops are challenged with a limited ability to send staff for training without impacting their day-to-day business.

Technological barriers identified include:

- Lack of specialized staff training to implement new technology
- Fear of results / misinformation within the industry[16]

[12] Discussions with PPG. 2014.
[13] As spare parts are typically fabricated on the same lines, or in a similar manner as the components used in original production, parts which received a productive coating during originally production are typically supplied that way as spare parts.
[14] Discussions with Hamilton Automotive Association, 2015. John Norris.
[15] Canadian Underwriter. *Tech Injection.* http://www.canadianunderwriter.ca/news/tech-injection/1003493285/?&er=NA
[16] Autobody Profitability Handbook – Appendix 2. HVLP Background Information. Hamilton District Autobody Repair Association.

2.8 Regulatory

No regulatory barriers could be identified for this sector. However, there are noteworthy regulations which are highlighted below.

Facilities in this sector are required to obtain an Environmental Compliance Approval (ECA), or meet the registry requirements of the Environmental Activity Sector Registry (EASR) from the Ministry of Environment and Climate Change (MOECC) as the facilities discharge contaminants to the natural environment. Compliance in this sector is considered low, and was subject of a sector-wide compliance campaign in 2000-2001.[17]

Limits for VOCs in automotive refinishing products are established in Environment Canada regulation SOR/2009-197. A Table of the federal VOC limits is shown in Table 2 below.

Table 2. Federal VOC Limits for Automotive Refinishing Products

Product Category	VOC Concentration Limit (g/L)
Primer Surfacer	250
Primer Sealer	340
Pre-Treatment Wash Primer	660
Adhesion Promoter	840
Colour Coating	420
Uniform Finish Coating	540
Truck Bed Liner Coating	310
Temporary Protective Coating	60
Underbody Coating	430
Single Stage Coating	420
Multicolour Coating	680
Clear Coating	250
Other Coatings	250
Surface Cleaners	50

Manufacturers of these products are governed by federal regulations, which as a result of regulatory drivers impacts the supply-chain available to automotive refinishers.

3.0 POLLUTION PREVENTION OPPORTUNITIES

The following have been identified as potential P2 options for facilities:

- HVLP paint guns

[17] Gregory Zimmer, Supervisor Application Review Unit, Ministry of Environment and Climate Change

  - High volume low pressure spray gun offer a 30% transfer efficiency improvement over siphon feed guns.[18] Painter technique, and training are integral to achieving such improvements. Recommended hand speeds are approximately half for HVLP guns, typically require changing reducers, and maintaining specific atomizing air.
  - The capital cost of purchasing a HVLP paint gun is roughly $1,000, this saved a facility $15,750 per year due to usage reduction in paint, thinner and waste costs with a payback period of around 3 weeks.[19]

- High-solids coatings
  - Although the cost of high-solids coating is 15-20% higher than conventional paints, less paint is used because of the superior coverage of the high-solid paints. No capital cost was invested by a company since high-solids coatings use convention application equipment. The auto shop was able to save $18,300 annually due to the reduction of paint used, which also resulted in less waste disposal costs.[20]
- Improve paint gun cleaning
  - To improve the cleaning of paint guns, a facility switched from cleaning guns in a bucket with paint thinner to using a system called Bonny Marlin (enclosed cleaning system). Installing the system reduced thinner use by 75% and paint waste disposal by 50%. The capital cost for the system was $7,120 and the annual cost saving was $3,866 less $868 per year in system maintenance cost. This resulted in less than 2.5 years payback period.[21]
- Controlled Paint Mixing and Recycle/Reuse of Waste Paint
  - To prevent over mixing of paints, the manager of a facility was responsible for mixing paint for all employees, rather than having multiple individuals mixing their own paint. Leftover paints were combined and used as a foundation paint on other vehicles. No capital cost was required and the amount saved per year was $9,700 due to reduction in paint and waste disposal costs.[22]

[18] Autobody Profitability Handbook – Appendix 2. HVLP Background Information. Hamilton District Autobody Repair Association.
[19] U.S Environmental Protection Agency (June 2001). *Guide to Industrial Assessments for Pollution Prevention and Energy* Efficiency – Appendix F: Pollution Prevention Opportunity Case Studies. p. F27. http://nepis.epa.gov/Exe/ZyPDF.cgi/1000418U.PDF?Dockey=1000418U.PDF
[20] Colorado Department of Public Health and Environment Pollution Prevention Program. *Colorado Pollution Prevention Case Studies for Auto Body Shops*. http://infohouse.p2ric.org/ref/02/01139.pdf
[21] Northeast Waste Management Officials' Association. *NEWMOA Pollution Prevention Technology Profile.* http://www.newmoa.org/prevention/p2tech/altspraygunwash.pdf
[22] Colorado Department of Public Health and Environment Pollution Prevention Program. *Colorado Pollution Prevention Case Studies for Auto Body Shops*. http://infohouse.p2ric.org/ref/02/01139.pdf

- Alternative Parts Washers
    - A facility replaced a hazardous solvent parts washer with an aqueous parts washer. The capitol cost for the unit was $1,300, and the annual cost saving was $14,874 per year with a 3 months payback period.[23]
- Thermal Parts Cleaning
    - Thermal bake-out units could be used in place of boil-out tanks to clean large engine parts. A facility installed one large and one small unit, for both bus-size large engine parts and conventional vehicle-size engine parts. The capital cost for the large and small unit was $73,000 and $48,000, respectively; however, the annual saving was $32,000 due to waste disposal cost savings with a 4.5 years payback period.[24]
- Nonhazardous Aerosol Cleaning Products, Reusable Aerosol Cans
    - A facility replaced its disposable aerosol cans with newly purchased non-hazardous lubricant, brake and carb cleaners along with hand held, air-powered, refillable aerosol cans. Refillable spray bottles were purchased for a total cost of $450, plus costs of cleaners. The annual saving was $1,461 per year for the cleaners with a 4 month payback period. Some facilities may even receive free refillable bottles with the purchase of bulk cleaners; resulting in no capital cost and with immediate payback.[25]

[23] U.S Environmental Protection Agency. *Case Studies in Aqueous Parts Cleaning*. http://www3.epa.gov/region09/waste/p2/autofleet/caseauto.pdf
[24] Colorado Department of Public Health and Environment Pollution Prevention Program. *Colorado Pollution Prevention Case Studies Compendium*. http://hermes.cde.state.co.us/drupal/islandora/object/co%3A1591
[25] California Department of Toxic Substance Control. *Refillable Spray Bottles*. https://www.dtsc.ca.gov/PollutionPrevention/VSR/upload/RefillableBottles02.pdf