AirCare - Results and Observations in 2009 and 2010

Abridged Version

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This report may be viewed at www.aircare.ca

AirCare is a community-based program represented by the following Federal, Provincial and Regional agencies:

EXECUTIVE SUMMARY

This report presents observations and analysis of AirCare inspection and repair data for calendar years 2009 and 2010. For certain parameters, figures from earlier reports are provided to give an indication of long-term trends. In the reporting period, 90,582 failing vehicles were identified out of 802,261 tested (11%). Of these, more than 75% were re-inspected and passed. For these vehicles, pre-and post-repair mass emission data was used to quantify the emission reductions achieved. On an impact-weighted basis (discounting carbon monoxide emissions by a factor of 7), the percentage reduction in the light duty vehicle emission inventory resulting from AirCare repairs alone was 8.0% in 2009 and 7.2% in 2010.

There were 20,824 vehicles that did not return for a passing re-inspection after failing. For the 10,672 vehicles that failed in 2009 but did not return to pass within the expected time frame, 8,790 were still not licensed in the Lower Fraser Valley even as of August 2011. Therefore, it can be assumed with some confidence that the non-returning vehicles were effectively removed from use in the AirCare area. The emission reductions resulting from the removal of these vehicles correspond to a further reduction in the light-duty vehicle emissions inventory of 5.9% in 2009 and 6.1% in 2010.

Other benefits of the program, such as pre-inspection repairs and deterrence from tampering with emission control systems are not quantified in this report. The presence of an inspection program influences all vehicle owners to maintain their vehicles properly and to keep all emission control systems working as designed, even if the vehicle is new enough to be exempt from testing. In addition, the existence of the program improves the knowledge of the repair industry so that they can efficiently deal with emission-related repairs on any vehicle, whether it has failed a test or not. Without a program, it is reasonable to assume that the vehicle fleet as a whole would generate more emissions. The deterrence effect of the program can be almost as large as the direct benefits of repairs, bringing the impact of the program compared to no program at all to about 15% based on the difference between MOBILE 6.2C estimates for “No-I/M” and “With I/M” inventory values for the Lower Mainland fleet in 2010.

AIRCARE BENEFITS

As mentioned above, there are multiple mechanisms by which the AirCare program can reduce the annual inventory of emissions produced by motor vehicles. Two of the more quantifiable ones are discussed here.

DIRECT BENEFITS FROM VEHICLE REPAIRS

The reduction in emissions attributable to repairs performed on vehicles that have failed an AirCare inspection is a function of the number of repairs, the change in emissions output resulting from those repairs, and the number of kilometres driven per year.

As in previous years, the emission benefits were evaluated using full-duration IM240 emission tests performed on a representative sample of the fleet. “Sample” tests are performed after the mandatory test type has been administered and the pass/fail result determined. A minimum of 5,000 sample tests per year is prescribed in the service contract in order to provide enough examples to characterize the registered vehicle fleet. Additionally, for 1992-1997 vehicles, *all* of the failing IM240 tests are full-duration. The lane software requires that all re-inspections of vehicles that failed their initial IM240 test must also be full duration tests. This program feature resulted in more than 20,000 matched pairs of “initial fail” vs. “final pass” results being available on which to base the benefits analysis. The large mass emissions sample set makes it possible

to determine average emission outputs for various categories of vehicles based on their inspection results. This includes passing vehicles and the multiple combinations of failure modes observed.

There were 38,882 vehicles in 2009 and 38,403 vehicles in 2010 that were re-inspected and passed after failing their initial inspection. The "Base Inventory", using emission factors from the 10,000+ sample tests and the 20,000+ vehicles with direct, before and after emission results, was calculated for the registered light-duty vehicle fleet as of January 1st of calendar years 2009 and 2010. For the "Base" inventory, all registered vehicles were assigned an emission rate based on their age, type, emission control technology, and initial AirCare test result. For vehicles not tested because they were exempt (2003 model year and newer in 2009 and 2004 model year and newer in 2010), estimated IM240 emission factors were generated based on new vehicle certification standards. For vehicles that *did* go through the inspection process, the emission factors assigned in the base case were based on the results of the *initial* inspection. The "Base Inventory" takes into account the natural changes in emissions of the light-duty fleet resulting from fleet growth, retirement of older vehicles, and AirCare-related repairs in the previous year. The "Base Inventory" decreases naturally each year because of the combined effects of new emission control technology and retirement of older, high-polluting vehicles. The additional benefits from AirCare repairs in the year being analyzed are calculated by substituting the *fina*l inspection result for each failing vehicle and re-calculating the inventory. Subtracting the smaller, "With Repairs" inventory from the "Base Inventory" provides the mass of emissions reduced from repairs.

The table below shows the overall effect on the inventory of Hydrocarbons (HC), Carbon Monoxide (CO), and Oxides of Nitrogen (NO_x), from the repairs performed in 2009 and 2010. The percentage reductions due to repairs in 2009 were 10%, 9% and 4% for HC, CO and NOx respectively. In 2010, the percentage reductions were 9%, 8% and 4%.

Effect of Repairs on In-Use Light-Duty Vehicles Mass Emissions Inventory (tonne/year)

	2009			2010		
	HC	CO	NO_x	HC	CO	NO_x
Base Inventory for Year (tonnes)	5,105	77,926	6,712	4,490	69,652	6,200
Inventory after Repairs (tonnes)	4,617	70,591	6,412	4,099	63,887	5,922
Reduction from Repairs (tonnes)	488	7,334	299	391	5,765	278
Reduction from Base (%)	10%	9%	4%	9%	8%	4%

VEHICLES REMOVED FROM USE AFTER FAILURE

A portion of the vehicles that fail an AirCare inspection, about 23,000 of them in this reporting period, did not re-appear at an inspection centre after having failed. Since these vehicles were administratively blocked from licensing for anything more than 3 months after expiration of the licence in effect on the date of inspection, it is logical to assume that they would have been removed from use in the AirCare area by being scrapped, placed in storage or registered outside the program area. For the purpose of this analysis, vehicles were considered to be removed from use in a given calendar year if they were not licensed 4 or more months after the date of a failing test result (e.g. fail in January – August, still not re-licensed as of December 31st). There were 11,506 such cases in the 2009 calendar year and 11,263 for the 2010

calendar year. Assuming that these vehicles would have otherwise continued to operate in the absence of an AirCare program, an emissions benefit can be claimed from taking them off the road sooner than otherwise expected.

Emission Benefits from Removed-from-Use Vehicles in 2009 and 2010

	2009			2010		
Removal-from-Use Reduction	HC	CO	NO_x	HC	CO	NO_x
Total Tonnes per Year	413	5,318	218	357	4,479	202
% Reduction per Year	8%	7%	3%	8%	6%	3%

Although it must be recognized that some portion of this group would have been retired anyway, so the program cannot take credit for *all* of these removals from use, a calculation has been performed to determine the total avoided emissions associated with the retirement of these vehicles.

PRE-AIRCARE REPAIRS

Another mechanism by which the program can generate emission benefits is from repairs made prior to inspection. This is particularly likely for vehicles subject to On-Board Diagnostic (OBD) testing. Since 1998, vehicles in Canada are equipped with technology that continuously monitors the emissions system. When the OBD system detects an emissions-related fault or defect, the operator is warned by the illumination of the Malfunction Indicator Lamp or MIL. Owners of vehicles with illuminated MIL's can be virtually assured that their vehicle will fail the AirCare inspection and should be motivated to repair their vehicle prior to its initial inspection. Since these vehicles will simply register as a Pass on their initial inspection, there is no way to determine the number of pre-inspection repairs by using inspection data. As a result, no pre-inspection benefits are included in this report. However, it is certain that there were unquantifiable emissions reduction benefits resulting from pre-inspection repairs.

"WITH AIRCARE" SCENARIO COMPARED TO "WITHOUT AIRCARE"

The AirCare program has operated in the Lower Fraser Valley region of BC since 1992. In the 18 years between program start and the end of the evaluation period, more than 14 million inspections have been performed on more than 2 million individual vehicles, of which 862,000 have failed on at least one occasion. The cumulative effect of the program on vehicle maintenance habits, the ability of the repair industry to effectively diagnose and repair emission-related problems, and public awareness of air quality issues is difficult to quantify but has undoubtedly had a positive impact on the state of air quality in the region. The measure of this impact is ideally represented by a comparison of what the air quality situation actually was in 2010 compared to what it would have been if the AirCare program had never existed.

The imaginary scenario of "No AirCare Ever" can be simulated using the MOBILE 6C emission inventory model. This model has been used to estimate the light-duty inventory in the default (imaginary) scenario in which an AirCare program was not implemented in 1992, yet all other factors remained constant. This is the only available mechanism of establishing a "control" group against which the "with-AirCare" scenario can be compared.

A dramatic reduction in total light-duty vehicle emissions between 1992 and 2010 would have happened even without the AirCare Program, due to the introduction of cleaner vehicles and the

retirement of older vehicles that had limited or no emission control technology. With the 18-year presence of AirCare, in 2010, the, impact-weighted inventory is 19,150 tonnes compared to an inventory of 149,300 tonnes in 1992 when the program started. This represents a total reduction of 87% in impact-weighted vehicle emissions over that 18-year period. Without AirCare the 2010 impact-weighted inventory would have been approximately 68,700 tonnes, which would have been a 54% reduction from 1992 levels. In the intervening period the total cumulative amount of impact-weighted emissions that have been prevented by the program is estimated at 652,700 tonnes.

The AirCare program continued to generate significant emission reductions during the 2009-2010 review period, and the effect of repairs, is still quite large. However, because the fleet is getting cleaner, the absolute magnitude of the emission reductions is declining. The program now serves to identify the vehicles that have developed an emission-related defect since their last inspection. These vehicles are then mostly repaired and restored to normal emissions output. This ongoing cycle counteracts the natural degradation of the fleet and potential benefits of the AirCare Program will persist as long as vehicles are less than 100% reliable.

INSPECTION STATISTICS

In 2009, there were 498,316 inspections performed while, in 2010, the total increased to 533,599 inspections.

Due to the fact that some vehicles may be tested more than once, the number of vehicles tested in any given calendar year is always less than the number of inspections. In 2009, there were 423,111 individual vehicles that were presented for an AirCare inspection. In 2010, this number was 459,388 vehicles. Registration data from ICBC suggest that there are almost 1.4 million light-duty vehicles registered in the AirCare-eligible area.

A variety of test types can be performed in the inspection lanes. Due to the fact that OBD tests apply only to 1998-and-newer model year vehicles, the number of OBD tests grows each calendar year. In 2009, 181,755 OBD inspections were performed. In 2010, however, the 2003 model year vehicles came into the program for the first time, resulting in a jump to more than 252,050 OBD inspections. Just about 20,200 vehicles failed their OBD inspection – meaning that they were presented for inspection in most cases with the MIL illuminated. This represents about 5% of the vehicles tested using the OBD procedure. The failure rate for IM240 tailpipe tests was about 14% while the failure rate for the oldest vehicles (1991-and-older) was almost 18%.

The inspection data also show that about 16,000 gas caps were flagged as being defective during the reporting period – about 4% of the vehicles tested. Estimating the impact of these repairs is difficult, but a modest estimate of 15 tonnes of hydrocarbons per year has been determined. OBD-equipped vehicles do not require a gas cap test because the OBD system includes a leak check of the fuel system.

The two tables below show the breakdown by inspection type and result for both 2009 and 2010.

Summary of Inspection Data in 2009 and 2010

	2009	2010
Inspections Performed	498,316	533,599
Vehicles Inspected	423,111	459,388
Failed Test for all Reasons Combined (Vehicles)	65,948 (49,018)	61,517 (46,663)
Failed Test for Emissions Only (Vehicles)	52,519 (36,435)	45,733 (31,726)
Tested According to OBDII (Vehicles)	181,755 (166,447)	252,050 (233,064)
Failed OBDII (Vehicles)	9,472 (8,812)	12,134 (11,433)
Tested According to IM240 Test (Vehicles)	158,730 (131,404)	147,892 (122,407)
Failed IM240 Test (Vehicles)	27,639 (18,921)	25,777 (17,893)
Tested According to ASM/Idle Test (Vehicles)	138,842 (113,524)	110,829 (90,946)
Failed ASM/Idle Test (Vehicles)	27,435 (20,273)	22,219 (16,336)
Tested Idle-Only Test (Vehicles)	4,210 (3,143)	4,467 (3,245)
Failed Idle-Only Test (Vehicles)	1,148 (782)	1,147 (753)
Diesel Vehicles Inspected (Vehicles)	8,072 (7,734)	9,245 (8,877)
Failed Diesel Opacity Inspection (Vehicles)	249 (207)	233 (207)
Unloaded Diesel Opacity Inspection (Vehicles)	889 (859)	874 (849)
Failed Unloaded Diesel Opacity Inspection (Vehicles)	5 (4)	7 (7)

Summary of Ancillary Tests for 2009 and 2010

	2009	2010
Gas Cap Pressure Tests Conducted	216,340	183,125
Failed Gas Cap Pressure Test	8,266	7,697
Failed Gas Cap Pressure Test (% Fail)	3.82%	4.20%
Failed Catalytic Converter Presence Test (% Fail)	0.05%	0.03%
Catalytic Converter Advisories (1987-and-Older Only in %)	3.68%	3.47%

RESPONSE TO FAILED INSPECTION

Vehicles that do not meet AirCare inspection standards must achieve either a Pass or Conditional Pass before they can be licensed and insured. For motorists needing time to complete repairs, a one-time, 3-month licensing option is available and many take advantage of this opportunity, placing a significant delay between the initial failing test and the re-inspection. In order to "close the loop" on the vehicles that failed in any given calendar year, it is necessary to look beyond the first three months of the following year to find associated re-inspections.

Motorists are free to repair their vehicles in any way they choose. A certified repair industry is available, consisting of about 270 repair shops. AirCare Certified Repair Centres (ACRC's) can submit repair data to the program administration via an on-line system called RepairNet. In order to be eligible for a Conditional Pass (the vehicle is allowed to re-license, even though it did not pass re-inspection), repair data must be entered by an ACRC prior to the re-inspection. ACRC's are supposed to submit repair data for every AirCare repair they do, but the number of repair data forms submitted has declined to about 8,500 in 2009 and 7,700 in 2010, despite a fairly stable volume of failing vehicles.

The table below summarizes the observed responses to a failed inspection in both 2009 and 2010.

Observations on Actions Taken after Failing Inspections

	2009	2010
Vehicles Not Returning for Re-inspection	10,672	10,152
Vehicles Repaired to Pass With Repair Information	5,788	5,838
Vehicles Re-Inspected to Pass Without Repair Information	27,425	26,089
Vehicles issued Conditional Pass	1,278	991
Gas Cap Replacements	3,855	3,593

The table shows that about 32,000 vehicles that failed in each year returned and passed a subsequent re-inspection. There were 5,788 vehicles repaired to pass by ACRC's in 2009 and 5,838 in 2010, based on the amount of repair data entered into the RepairNet system. This corresponds to about 20% of the total "repaired-to-pass" vehicle population. In both years, a much greater fraction of the failing vehicles returned and passed a re-inspection with no associated repair data. These "no-data" vehicles may have been repaired by non-certified repair facilities, by do-it-yourselfers, by certified shops that did not submit repair data, and some may have passed without any repairs having been performed at all. As there was no information available to indicate what transpired between the initial fail and the subsequent pass, it is impossible to categorize these "no-data" repairs. For the purpose of this analysis, however, it was assumed that any vehicle that was re-inspected and passed received some sort of corrective action that generated a reduction in emissions.

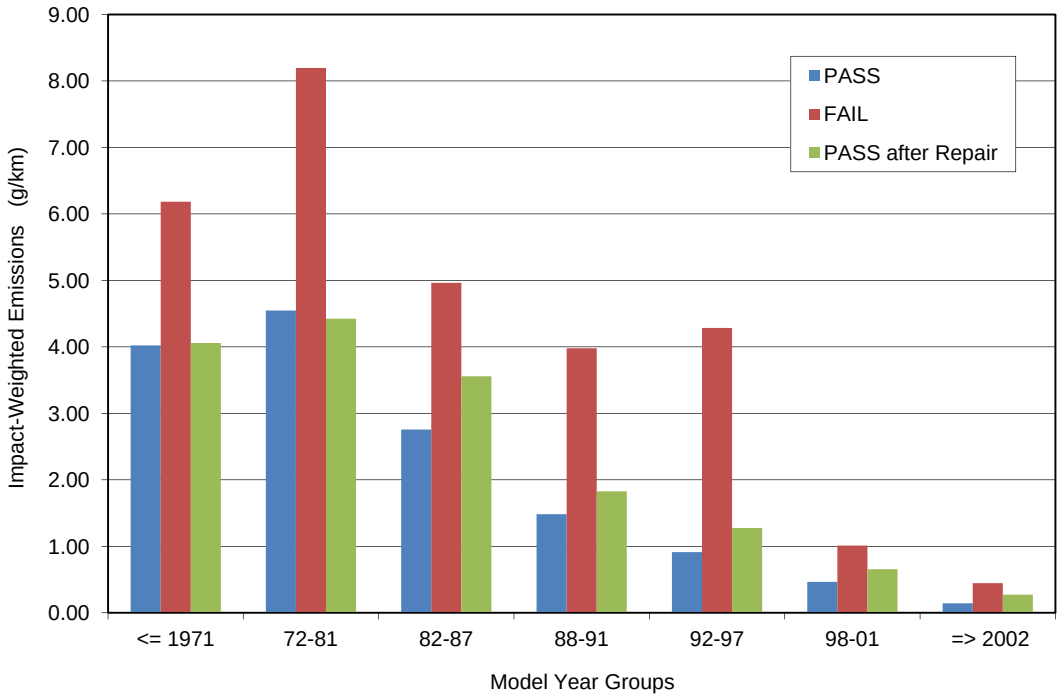
As mentioned earlier, only an ACRC can qualify a vehicle for a Conditional Pass. There were 1,278 such results in 2009 and 991 in 2010.

EFFECTIVENESS OF REPAIRS

COMPARISON OF MASS EMISSION RATES

The following figure illustrates the relative emission rates for “first-time-pass”, “first-time-fail”, and “repaired-to-pass” vehicles of various age groups and types. It can be seen that the “Repaired to Pass” emission rate is typically slightly higher than the rate for “Initial Pass” vehicles (first bar in each grouping), although not in all cases. This is a result observed in all previous AirCare program analyses and also in other I/M programs across North America. Various explanations have been offered by researchers for this phenomenon, but most agree that the reasons include incomplete diagnoses that leave some emission defects unattended and perhaps the use of after-market catalytic converters istead of OEM parts.

Another obvious trend is that the emission output of vehicles has decreased dramatically over time as a result of more effective emission control technology. In fact, the emission levels of failing vehicles in the newest segment of the tested fleet are usually better than the passing vehicle levels of the older technology vehicles. Vehicles of model years 1998-and-newer were mostly tested according to the OBD test procedure. A portion of these vehicles also received a full-duration IM240 test in order to characterize the emissions output corresponding to the OBD pass or failure mode. A similar process was followed when the vehicle appeared for re-inspection, establishing a post-repair emission rate. This data provided the basis for the bars shown on the chart.



Impact-Weighted Emission Factors (HC + CO/7 + NOx)

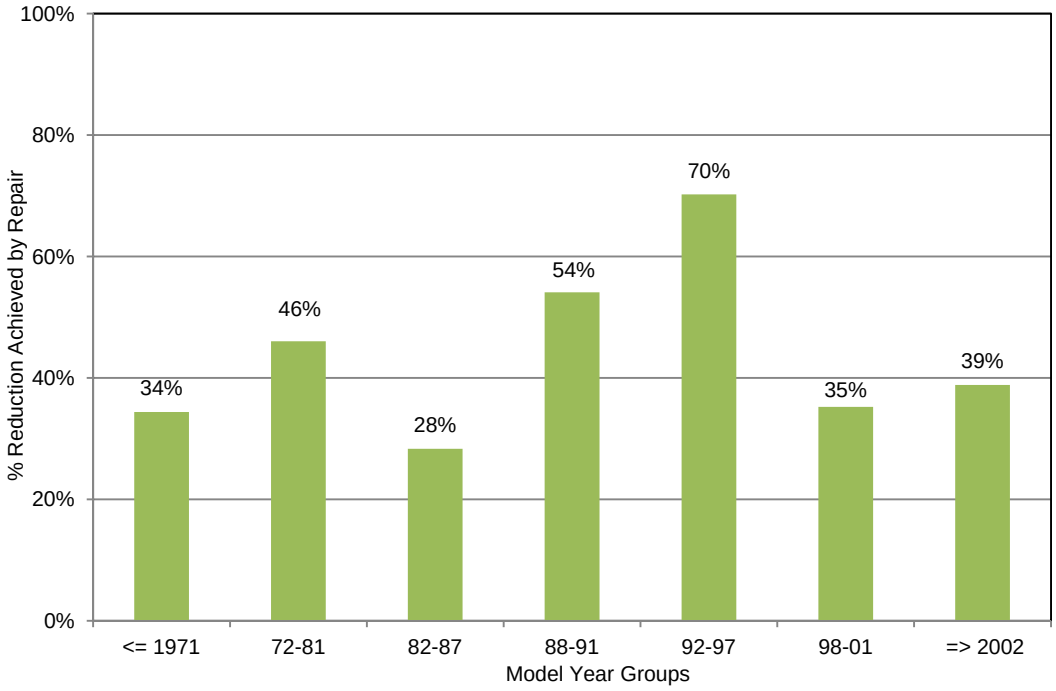
The chart shows that the average emission rate for *failing* 1998-and-newer vehicles is usually lower than the average for *passing* vehicles from model years 1992-1997. This reflects the strides made by new vehicle manufacturers in reducing tailpipe emissions and improving the durability of vehicle emission control systems in recent years. However, OBD has also

increased the stringency of in-use testing, because the system constantly monitors emission related parameters and will set codes and turn on the MIL whenever a fault is detected. Also, the OBD system can act in a preventative manner, flagging potential problems before tailpipe emissions have actually been affected. Some OBD faults, however, are related to the diagnostic system itself, meaning that the repair only restores proper operation of the OBD system with no effect on tailpipe emissions. Regardless, such repairs are valuable, as it is important that the OBD system be fully functional in order to detect the faults that do increase tailpipe emissions, should they occur.

Due to the fact that the OBD system identifies the problem area, repairs can be more focussed and more efficient. Over 95% of OBD re-inspections were successful during the review period.

EMISSION REDUCTION AS A PERCENTAGE OF INITIAL FAIL RESULT

Another measure of the effectiveness of repairs is to take the initial test results for each vehicle that failed and compare them to the final post-repair result. The next figure shows the emission reductions indicated by this method. All data is from full-duration IM240 tests.



Effect of Repairs % Reduction = (Failed - Repaired) / Failed

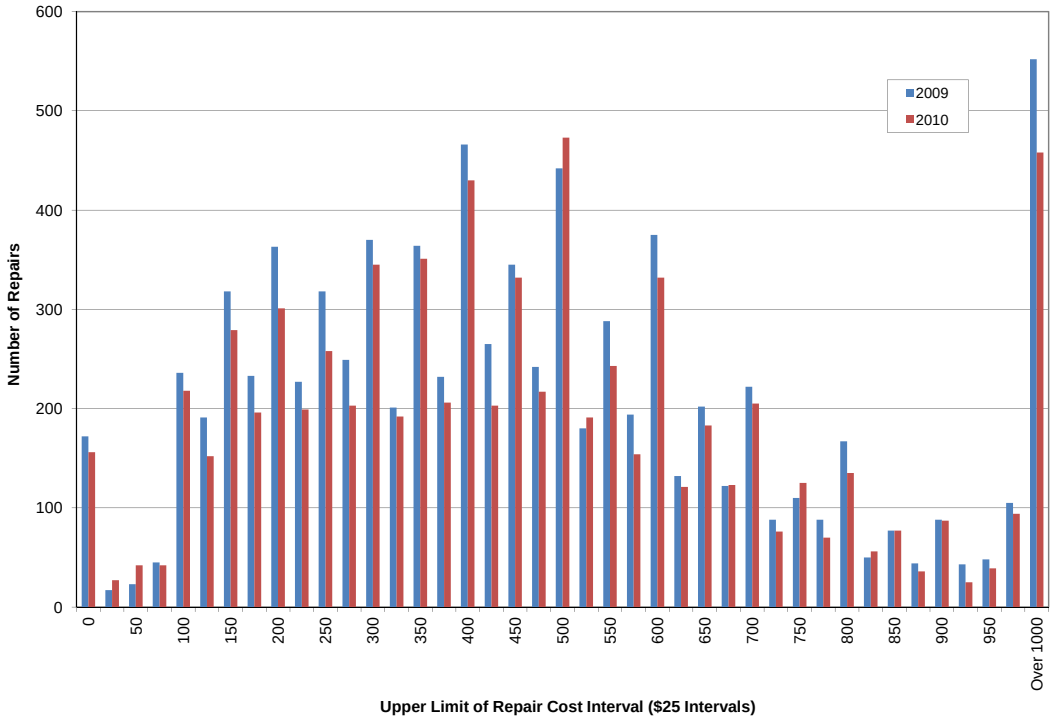
It is apparent that post-repair emission test results vary significantly according to age groupings. Vehicles subject to the IM240 test process showed an average reduction of 70% in emissions after repair. Older vehicles, tested according to the less-rigorous ASM/Idle test, showed lower percentage reductions ranging from 28% to 54%. However, because the older, failing vehicles typically emit 5 to 7 grams per kilometre of impact-weighted pollutants compared to about 4.5 g/km for failing 1992-1997 vehicles, a 40% reduction from 7 g/km is a larger absolute emission reduction (3.36 g/km) than a 70% reduction from 4.5 g/km (3.15 g/km).

For vehicles subject to OBD inspections, the average reduction in tailpipe emissions was 37%. While this may appear small compared to the IM240 test, it must be remembered that there are

a number of OBD failure modes that may have no direct effect on tailpipe emissions, for example, evaporative emission control defects, and OBD monitoring system defects. Analysis of the available data showed that OBD trouble codes associated with key emission control components like oxygen sensors or catalytic converters were strongly correlated with fairly large emission reductions. These cases, however, were offset by cases where the OBD repair had little or no indicated tailpipe emission benefit.

COST OF REPAIRS

The distributions of reported repair costs in 2009 and 2010 had much the same profile as in previous years. The median cost appears to be stabilizing from $400 in 2007 and $428 in 2006, to $425 and $430 in 2009 and 2010. Median values have been used instead of averages to minimize the effect of extreme values reported by repair shops. Some repairs are reported at zero cost and many with costs well over $1,000. It should be borne in mind that the applicability and representativeness of this data is compromised: the costs are only those reported as part of the repair data submitted by the certified repair industry, and these represent less than 20% of all repairs.

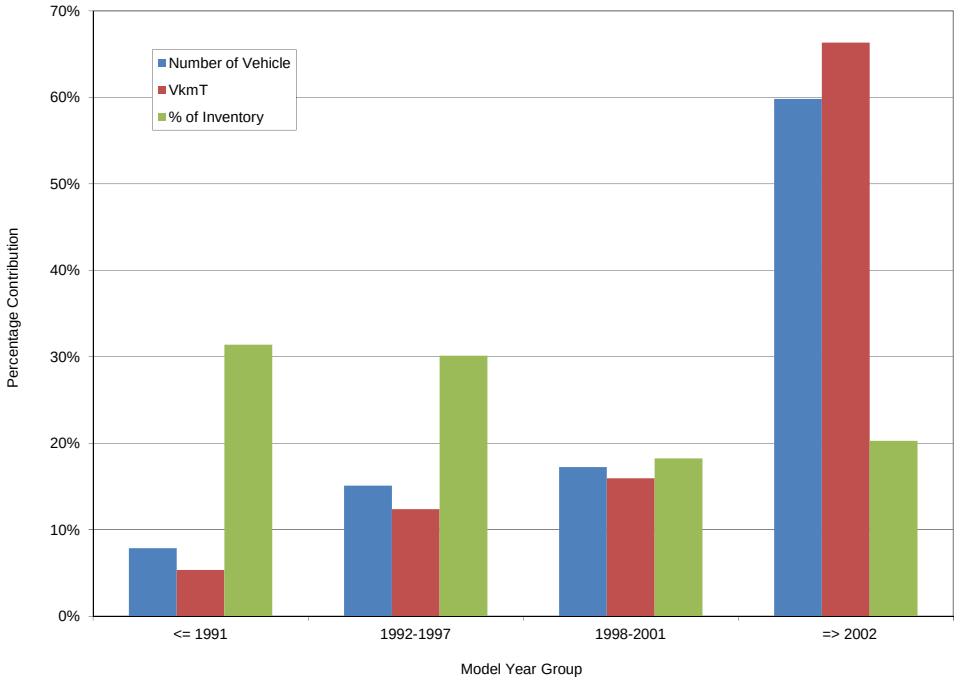


Distribution of Reported Repair Cost in 2009 and 2010

TOTAL EMISSIONS OUTPUT BY AGE GROUP

The total emission output by age/technology group is a function of the number of vehicles in each age group, their annual kilometres travelled, and their rate of emission output. For example, a relatively small population of high-emitting vehicles can contribute a significant fraction of the overall fleet emissions if the remainder of the population has very low emissions. The next figure shows the relationship between registered population, annual kilometres driven and percent of overall fleet emissions contributed by age group. On one hand, the number of vehicles and kilometres travelled increases steadily from the oldest to the newest age group.

On the other hand, the emissions inventory contributions decrease in much the same proportions from old to new. Vehicles from model years 2002-and-newer constitute 60% of the fleet and contribute 66% of vehicle-kilometres-travelled, but account for a disproportionately small 20% of the total emissions. Conversely, vehicles from the 1991-and-older model year group comprise only 8% of the fleet and contribute an even smaller 5% of the total vehicle-kilometres-travelled, but account for 31% of the total emissions – well out of proportion to their numbers and driving activity. It is quite clear that as long as older, high emitting vehicles remain in the fleet, they will continue to have a disproportionate effect on the overall inventory.



VkmT vs. Emissions Contribution by Model Year Group

Some I/M programs in the United States have gone exclusively to OBD inspections, because 1996 model year vehicles were required by law to be OBD compliant, meaning that 80%+ of the in-use fleet can be tested with OBD. The preceding data show, however, that the majority of excess emissions is attributable to the oldest vehicles in the fleet. It appears that emission control technology is becoming less susceptible to degradation over time but it remains to be seen how these vehicles will perform when they age beyond 10 years. Registration data suggest that the life expectancy of a vehicle is now around 15 years. If major emission control components fail in this timeframe, there will continue to be an indefinite and disproportionate contribution of emissions by the oldest fraction of the fleet.

AirCare Review

The service delivery contract for the AirCare program, negotiated in 2006, has a 5-year term that expires on December 31, 2011. In anticipation of the need to renew the contract and in keeping with instructions from the provincial government at the time of the previous program renewal, an independent study was commissioned to determine if it would be beneficial to continue the program for an additional term beyond 2011. A Review Steering Committee was formed, consisting of members from key stakeholder agencies to define the terms of reference

for the review and to select an appropriate consultant. In November, 2009, the committee chose SENES Consultants of Vancouver and Sierra Research of California to perform the review. The final report from the consultants was received in July of 2010 with the conclusion that retaining the program until 2020 would reduce emissions enough to prevent episodes of poor air quality that could lead to health care costs that exceeded the cost to society of operating the program. Key points in the analysis were that assumptions built into inventory models for mobile sources were overly optimistic about the long-term durability of emission controls in the most modern technology vehicles. Using more realistic assumptions about the degradation in emissions performance of these vehicles over time, the consultants determined that the benefits of AirCare relative to a No-AirCare scenario in 2010 and 2020 were much larger than predicted by the standard model. However, even without changing the assumptions in the model, the benefits of retaining AirCare continued through the 2012-2020 period. The consultants used approved models for correlating emission inventory reductions to ambient air quality improvements and linked these to another model that predicts the health impacts of exposure to episodes of poor air quality or continuous exposure to elevated background concentrations. Although the changes attributable to AirCare's operation were at the limits of the models' capabilities, the results were favourable to retaining the program. The Review Committee generated its own summary report of the consultants' work and submitted it to the Solicitor General in August of 2010. Metro Vancouver presented the findings of the review to their Environment Committee and to the full Metro Vancouver Board and received unanimous approval for continuing the program to 2020 provided that a heavy-duty testing program was included. Early in 2011 the Fraser Valley Regional District also voted its support for continuation of the program to 2020. At the time of writing this report, the Provincial Government has not yet provided direction as to the future of the program.

CONCLUSIONS

- On an impact-weighted basis, repairs directly related to AirCare failures reduced total light-duty vehicle-generated emissions by 8.0% in 2009 and 7.2% in 2010. A further potential 6.1% and 5.8%, respectively, resulted from a portion of the failing vehicle fleet being removed from use.
- The impact-weighted emissions attributable to light-duty vehicles decreased from 149,300 tonnes in 1992 to 19,150 tonnes by 2010 (an 87% reduction). This is the combined effect of new vehicle technology (54%) and AirCare (33%).
- The total cumulative amount of impact-weighted emissions that have been prevented by the AirCare program since 1992 is estimated at 652,700 tonnes.
- On average, vehicles passing re-inspection had emissions 28%-70% lower than the initial failing result. Reductions on a percentage basis were highest (70%) for the 1992-1997 model year group, but it is necessary to factor in the absolute emission rate in order to determine which group produces the largest inventory reductions
- AirCare continues to accelerate the retirement of excess emitting vehicles. Of the 10,672 vehicles that failed in 2009 and have never appeared for a re-inspection, more than 82% of them were not re-licensed 4+ months after failing, suggesting that they are no longer operating in the AirCare region.
- The amount of repair data submitted by AirCare Certified Repair Centres continues to decline each year. Less than 20% of re-inspections now have associated repair data.
- As the number of certified repairs decreases, the number of Conditional Passes also decreases. In 2010, the number fell below 1,000, the lowest level recorded so far in the

history of the program. This confirms that a much higher percentage of failing vehicles are being successfully repaired than in previous years.

- The annual emission benefits related to repairs and removal from use appear to be stabilizing, suggesting a mature program in equilibrium. The cumulative, long-term benefits of AirCare testing have contributed to an accelerated decline in total emissions attributable to light-duty vehicles since the program began.
- The proportion of On-Board Diagnostic tests continues to increase with about 5% of the vehicles appearing for inspection with the MIL light commanded on. Due to the illumination of the warning light informing the vehicle driver of an impending AirCare failure, it is reasonable to assume that a portion of the OBD-eligible fleet was repaired prior to being tested. Thus, the failure rate likely underestimates the true percentage of 1998-and-newer model year vehicles that are in operation with the MIL illuminated, and the program benefits calculation underestimates the total emission reduction benefits of AirCare program.
- As directed by the provincial government, the AirCare program underwent a consultant's study in 2010 to assess whether the program was worth retaining after 2011, when the current testing contract is set to expire. The review concluded that even the newest emission control technology was still susceptible to the same issues that have historically caused excess emissions in older vehicles, such as failure to perform preventative maintenance and ignoring the MIL light when problems do crop up. While the onset of elevated emissions may be delayed by better technology, there will always be a minority of vehicles that develop emission-related defects in their declining years.
- The consultant's determined that the projected emission reductions attributable to AirCare in 2020 would prevent exposure of the population to poor air quality that would, in turn, prevent health care costs that significantly exceed the cost of the program to local residents.