

AirCare III SPECIAL ISSUE

AirCare III - The Next Generation

September 1, 2006 marked the beginning of the next generation of the AirCare program. Although the new AirCare testing contract began on September 1, 2006 (and runs through to December 31, 2011), the major program changes will not be implemented until January 1, 2007.

The following is a summary of the program model and important policy changes:

- OBD testing for 1998 and newer vehicles
- IM240 test for 1992-1997 model year vehicles

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A Letter from Martin Lay, AirCare CEO

On September 1, 2006 AirCare celebrated its 14th anniversary. Over the years, independent consultants have repeatedly recognized the program as the single largest emission reduction initiative in the Lower Fraser Valley region. Since 1992, effective AirCare-related repairs have reduced light-duty vehicle generated emissions by 29%.

The successes achieved by AirCare could not have been realized without the skill and technical expertise of the automotive repair industry. I would like to take this opportunity to say THANK YOU to all of the technicians who have grown with the program and helped AirCare achieve its goals!

AirCare recently signed a new five-year contract with Envirotest Canada that will run through December 31, 2011. The next generation of AirCare will be much more focused than in the past.

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Highlights from AirCare I and II - A Look Back

By Glenn Buholzer, Project Analyst, PVTT

Fourteen years ago, the Province of British Columbia implemented AirCare. The AirCare program has since become a way of life for most residents of the Lower Fraser Valley. To some, it is nothing more than an inconvenient hoop to jump through every so often. To those of us that understand vehicles and vehicle emissions, it is a no-brainer that repairing broken vehicles has a positive effect.

As the AirCare program moves into its third incarnation, a little reflection on what has transpired to date may help to put things into perspective for the road ahead.

AirCare I (1992 - 1999)

Despite some early bumps in the road, thanks to persistence from the program administrators, the inspection contractor, and the repair industry, AirCare, the first vehicle emissions inspection and maintenance (I/M) program in Canada, became the most effective program in the Greater Vancouver Regional District's air quality management plan and one of the most effective programs of its kind anywhere.

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A Letter from Martin Lay cont'd

The most significant program changes will include OBD testing for 1998 and newer light-duty vehicles, a seven model year exemption from testing for the newest vehicles, and a reduction in the size of the testing network from 42 lanes to 32 lanes (including the permanent closure of the Burnaby and South Surrey test centres).

The AirCare administration office is also changing. Sam Loo, former Manager, Certification, has accepted a position as Assistant Manager, Fleet Maintenance with Coast Mountain Bus Company (another TransLink subsidiary). Sam was one of the first AirCare employees hired in 1991 and held the position of Manager, Certification since 1992. Sam implemented many innovative changes in his time with AirCare – most notably was the RepairNet a web-based system that provides technicians with access to test and diagnostic information to assist them in effective vehicle repairs. This system has been copied by other



Martin Lay, AirCare CEO

jurisdictions – proving once again that imitation is the greatest form of flattery!

After 14 years with AirCare, Gord Alexander, Certification Auditor, has taken a well-earned retirement. He proved to be a valuable and tireless member of the AirCare staff. With his departure, Tim Jollimore is assuming a newly created position of Program Auditor. Tim is another long term AirCare

employee (since 1992) and holds an inter-provincial TQ. He will continue in his current role as Contract Performance Officer as well as take on several of Gord's former duties.

The next five years will be challenging as we all adjust to the reality of a smaller, more focused, program. As always, the AirCare certified repair industry will play an important role in ensuring that we continue to be as successful as in the past.

The AirCare program will be conducting a series of information sessions in November to update the repair industry on the new AirCare program model, our vision for the future of the program and new certification rules. You should all have received your invitations by now and I urge you to attend.

I look forward to seeing you all at the November information sessions.

Upcoming Meetings to Review Changes to AirCare Certification

The AirCare program will be hosting five information sessions in November to update AirCare Certified Repair Technicians and repair facility owners on the upcoming changes to the AirCare program, the new certification process, and general information on the new OBD test procedure and policies.

All sessions will run from 6 p.m. to 9 p.m. at three area educational institutions. As these program changes will have a significant impact on the AirCare Certified Repair Industry, all technicians are encouraged to attend one of these seminars. To reserve a seat at the meeting date of your choice, call the Renee Schisler at 604-637-2225.

AirCare Seminar Schedule

Date	Location	Address
Monday, November 6, 2006	UCFV - Abbotsford Campus	33844 King Road - Theatre (B101)
Wednesday, November 15, 2006	BCIT - Burnaby Campus	Telus Theatre - Building SE6, Room 233
Thursday, November 16, 2006	BCIT - Burnaby Campus	Telus Theatre - Building SE6, Room 233
Tuesday, November 21, 2006	Kwantlen University College - Surrey Campus	12666 - 72nd Ave. - Conference Room
Wednesday, November 22, 2006	Kwantlen University College - Surrey Campus	12666 - 72nd Ave. - Conference Room

AirCare III - The Next Generation *cont'd*

- ASM 2525 + idle test for 1991 and older vehicles
- D147 test for 1997 and older diesel vehicles and all diesel trucks
- Continuance of current Repair Cost Limits

The AirCare program has performed OBD downloads on 1998 and newer vehicles in conjunction with tailpipe testing, since January 2001. The information gathered has been analyzed but has not been used in the pass/fail decision. The United States Environmental Protection Agency (US EPA) recommends that inspection and maintenance programs, like AirCare, use an OBD test rather than a tailpipe test for 1996 and newer vehicles. In fact, the US EPA no longer provides technical support (emissions standards, weight and horsepower parameters) for

traditional tailpipe testing for 2002 and newer vehicles.

Programs in Oregon, Maine, Vermont, and Wisconsin have already switched to OBD testing with other jurisdictions set to follow. The rationale is that OBD is a continual, comprehensive monitoring system, while traditional "tailpipe" emissions testing only partially represents actual driving patterns and conditions. AirCare will use OBD testing for 1998 and newer vehicles as 1998 represents the year the federal government required OBD II on all light-duty vehicles sold in Canada.

Policy Changes

On January 1, 2007, AirCare will implement a seven-model year exemption of the newest vehicles. In

2007, AirCare will test 2000 and older vehicles.

With the seven-model year exemption, the fleet of vehicles required to have an AirCare inspection prior to re-licensing will be significantly reduced. As a reference, this year, AirCare will inspect just over 600,000 vehicles. In 2007, only 514,000 vehicles will require testing and that total will fall to 491,000 by 2011.

As a result, the AirCare program will reduce its testing capacity by 10 lanes in 2007. The new test network will consist of 10 inspection centres with 32 test lanes. The Burnaby and South Surrey test centres will permanently close on January 1, 2007, as well as one test lane in the Coquitlam, South Vancouver, Maple Ridge, and North Vancouver test centres.

Highlights of AirCare I and II *cont'd*

Test Procedures and Standards

The AirCare program has always been regarded as an innovative leader. When the first generation of the program began, it used the latest emission testing technology and it adopted the most stringent test criteria used in any I/M program at the time.

The AirCare program was the first program to include NOx emission standards as part of the criteria for passing inspection. Of course, this required that dynamometers be used to bring the vehicles to road load type conditions. This, in turn, presented a difficult challenge to the repair industry: how to diagnose the cause of excess emissions that cannot be seen or measured in the repair facility. Fortunately, technicians that gained a good understanding of the operation of the engine components and systems that affect NOx emissions found that the good old process of elimination works fine. You don't need to be able to measure NOx in order to diagnose and fix the components that can cause NOx emission levels to be excessive.

Repair Effectiveness Index

Because it is the repair side of the equation that makes the difference, understanding which repairs have what effect is an important part of ensuring the program achieves air quality benefits. That is why the program was designed to capture repair data when failing vehicles returned to the inspection centre for re-inspection. In addition to evaluating the overall effect of repairs, it became apparent that repairs could be evaluated on an individual basis. This became known as the Repair Effectiveness Index

Vehicles Tested	Vehicles Failed	HC Reduction	CO Reduction	NOx Reduction
7,201,782	509,242	34.3%	38.4%	10.3%

Table 1: AirCare Program Statistics (1992 - 2000)

(REI). The REI was developed in 1995 based on emissions readings before and after repair, and the fact that vehicles that are not repaired because of the repair cost limit should not reflect negatively on the technician.

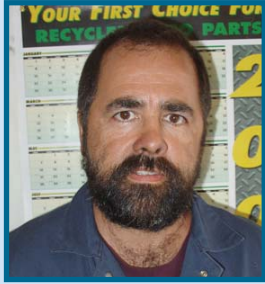
Program Effectiveness

Despite the early challenges, the program proved to be effective at reducing harmful emissions in the region (see table 1). Rob Klausmeier, of de la Torre Klausmeier Consulting, Inc., performed an independent review of the first generation of the program for the BC Ministry of Environment in 2000. Rob agreed with the calculated program benefits and found that "AirCare continues to be one of the most effective I/M programs in North America."

AirCare II (2000 - 2006)

The second generation of the program saw the introduction of new test procedures, the utilization of the "information superhighway," and new challenges for techs.

QUALITY REPAIR AWARDS



Ken Bebbington

AFS Automotive
Burnaby
(3-time winner)

John Badr

Mini-Tune and Brake
Surrey
(5-time winner)

Jarnail Dhaliwal

Kam Auto Repair
Surrey
(1st time winner)

Edward Fidel

Fidel Automotive
Vancouver
(7-time winner)

R. Gregory Krause

Jims Automotive
Langley
(1st time winner)

Michael L. Shaw

Clarke Hill Motors
Port Moody
(4-time winner)



Ralph Thomas Bender

John's Thistle Auto
Delta
(3-time winner)

Epifanio Capule Jr.

25th & Main Shell
Vancouver
(9-time winner)

Vikram Dhaliwal

Fowler Auto & LT Truck
Vancouver
(2-time winner)

Arthur Hovanessian

Arts Automotive
Vancouver
(7-time winner)

Chuck Fee Lee

ABC Main Auto Centre
Vancouver
(1st time winner)

Jaibir Singh

Kam Auto Repair
Surrey
(9-time winner)



Teen Yau Tse

Carline Brake & Muffler
Richmond
(6-time winner)

James Crawford

Jims Automotive
Langley
(2-time winner)

Hung Duong

Hung & Sons Auto Repair
Surrey
(4-time winner)

Mehar Johal

CJ Automotive
Surrey
(5-time winner)

Donald Eric Loeck

North Bluff Auto
White Rock
(9-time winner)

Harbhajan Singh Sohi

M&N Auto Repair
Vancouver
(2-time winner)

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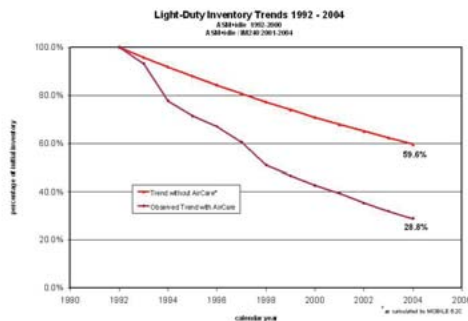
QUALITY REPAIR AWARD CRITERIA

TEI of 8.0 or higher & 13 to 24 repairs

TEI of 7.75 or higher & 25 or more repairs

Emissions Reductions since 1992

Using the US EPA's Mobile 6.2C emissions inventory model, it is estimated that vehicle emissions in 2004 were 71% lower than they were in 1992. New vehicle technology accounts for a 42% reduction in vehicle emissions over this time, and AirCare is attributed with reducing vehicle emissions by an additional 29%. This split is shown below:



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Quality Repair Awards cont'd

Peter Alan Thompson

Smart Care Auto Centre
Abbotsford
(5-time winner)

Kevan L. Wallbank

K & M Tune Up Centre
Abbotsford
(1st time winner)

Jim Wang

Sunbeam Auto Repair
Richmond
(4-time winner)

Gregory M. Weselak

Scottsdale Otto Repair
Surrey
(7-time winner)

Stephan Westbroek

Andersen Motors
Langley
(2-time winner)

AirCare Phone Numbers:

Main Phone:
604-435-SMOG

Main Fax:
604-453-5150

Tech Line:
604-453-5163

Certification:
604-453-5152

RepairNet Help:
604-453-5165

Policy:
604-453-5167

The ANALYZER

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2006 #3

Set, Ready, Go - OBDII

By Ron Leavitt, Emissions Technical Advisor, PVTT

January 2007 will mark the beginning of official On-Board Diagnostics II (OBDII) testing for the AirCare program. OBDII will be the primary method of testing 1998 and newer vehicles. IM240 tailpipe testing will only be used on 1998 and newer vehicles when they are not fully ready for or compatible with OBDII testing. We will discuss the OBDII test readiness requirements later, but first, a quick overview of what OBDII is and what it is intended to do.

The What and Why

OBDII has three main objectives:

- To identify emission related malfunctions causing high emissions.
- To reduce the time between the occurrence of a malfunction and its detection.
- To notify the driver of emissions defects and to help with the diagnosis and repair of the malfunction.

The OBDII system accomplishes these objectives by monitoring virtually every component and system that can affect emissions during normal driving, alerting the driver through a dashboard malfunction indicator lamp (MIL), and storing fault code information for technicians.

OBDII was phased in by California in 1994. C.A.R.B. and the US EPA required all 1996 and subsequent model-year vehicles sold in the US to be fully OBDII compliant. OBDII was required in Canada in 1998. OBDII introduced the establishment of performance requirements and a great deal of standardization.

OBDII systems expand the scope of monitored components and systems, as well as include more specific performance criteria for determining malfunctions (e.g., when tailpipe emissions exceed 1.5 times the federal standard).

OBDII also requires vehicle manufacturers to use the same Data Link Connector (DLC), to communicate with multiple scan tools, and report information such as fault codes in a generic format to ensure that all technicians (dealer or independent) have

access to a minimum set of fault information. On your scanner, this information will be under the generic or global OBDII menu.

Basic OBDII Requirements

The OBDII system monitors virtually all emission-related components and systems for malfunctions that can cause emissions to increase.

However, the OBDII system does not have a sensor in the tailpipe that turns on the MIL whenever emissions are high. Instead, the OBDII system monitors every component individually and turns on the MIL when any one component or system is clearly malfunctioning or when calculations indicate that malfunctions will cause the vehicle's emissions to be greater than 1.5 times the federal standard.

This means the MIL is not going to come on just because a car is old and all of the components are partially deteriorated. Rather, the system will only turn on the MIL when a component or system, by itself, is clearly outside of design specifications.

Incorporating OBDII systems checks into the AirCare inspection process will hopefully ensure that motorists fix each of these faulty components routinely, rather than letting numerous faults go unrepaired until emissions are very high.

At such a point, it is much more difficult to correct all the faults, and the expense can be very high. Put more simply, it is more sensible to require motorists to maintain their vehicles properly to avoid more expensive and difficult repairs and keeping emissions at a minimum.

OBDII System Monitors

The OBDII system monitors the status of up to 11 emissions control related subsystems by performing either continuous or periodic functional tests of specific components and vehicle conditions. The first three testing categories — misfire, fuel

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Set, Ready, Go - OBDII cont'd

trim, and comprehensive components are continuous, while the remaining eight only run after a certain set of conditions have been met. The algorithms for running these eight, non-continuous monitors are unique to each manufacturer and involve such things as ambient temperature and driving conditions. Most vehicles will have at least five of the eight remaining monitors (catalyst, evaporative system, oxygen sensor, heated oxygen sensor, and exhaust gas recirculation system) while the remaining three (air conditioning, secondary air, and heated catalyst) are not necessary applicable to all vehicles.

These monitors are required to detect malfunctions and illuminate the MIL generally before emissions exceed 1.5 times the applicable Federal Test Procedure (FTP) standards. The FTP is a special laboratory test that is required to be conducted by auto manufacturers to show their vehicles comply with emission regulations before they are allowed for sale in North America. The test simulates city and highway driving after the vehicle has been parked overnight.

So, even though a malfunctioning component may not seem to cause an emission increase during some conditions (like an ASM test), it probably does under other driving conditions. For all comprehensive components, the MIL is required to illuminate when any individual component is out of specification or fails to work when commanded.

Generally, the OBDII system is required to illuminate the MIL after the same fault has been found in two different driving cycles, which helps to avoid MIL illumination for random faults or abnormal conditions. The MIL is only allowed to extinguish when the same fault has not been detected on three successive driving cycles under similar operating conditions to when the code was set.

Diagnostic Trouble Codes (DTCs) remain stored for around 40 additional driving cycles to make sure that information is still available to repair technicians even after the MIL is extinguished.

Monitor Readiness

Monitor readiness indicates whether a monitor has run its test sequence and completed. The monitor status is the key to whether a vehicle is ready for OBDII testing. There are two possible outcomes for supported monitors, however, different scan tools do use different terminology.

Ready indicates the monitor has run its test sequence successfully. Some scan tools will show the status as complete or done.

Not Ready indicates the monitor has not successfully completed its test sequence. Some scan tools will show the status as not complete or not done.

There are several reasons why a vehicle may arrive for testing without the required readiness code set including:

- Failure to operate the vehicle under the conditions necessary to run / complete the monitor(s) in question.
- A recent resetting of the OBDII system either through the use of a scan tool or by disconnecting the battery.
- A fraudulent attempt to avoid AirCare program requirements by clearing OBDII codes just prior to testing.

Continuous Monitoring Tests			OBD Support Level	
Monitor	Availability	Status		
✓ Misfire	Supported	Complete	OBD II (California ARB)	
✓ Fuel System	Supported	Complete	Fuel System 1 Status	
✓ Component	Supported	Complete	CLOSED LOOP - using oxygen sensor(s) as feedback for fuel control.	
Non-Continuous Monitoring Tests			Fuel System 2 Status	
Monitor	Availability	Status		
✓ Catalyst	Supported	Complete	CLOSED LOOP - using oxygen sensor(s) as feedback for fuel control.	
⊗ Heated Catalyst	Unsupported		Secondary Air Status	
⊗ Evaporative System	Supported	Not Complete	N/A	
⊗ Secondary Air System	Unsupported		Power Take Off	
⊗ A/C System	Unsupported		PTO OFF	
✓ Oxygen Sensor	Supported	Complete		
⊗ Oxygen Sensor Heater	Supported	Not Complete		
✓ EGR System	Supported	Complete		

Sample display of readiness monitor of OBD download

Pass, Fail, Fallback IM240, Reject...

While most AirCare technicians have already had some experience performing OBDII repairs, they have not had to deal with them as AirCare failures. The outcome of an official OBDII test can be summarized as; Pass, Fail, Fallback, and Reject. The outcome of the test will be based on whether the MIL is commanded on and how many monitors are complete.

Because the presence of unset readiness codes among the non-continuous monitors could be a sign of attempted fraud, it is important that all OBDII equipped vehicles be checked to confirm that all of the monitors are complete before presenting them for official testing. Lets look at the criteria for each of these outcomes and how they affect the vehicle owner on initial inspection;

- To pass the OBDII test, the MIL cannot be commanded on and only one monitor may be incomplete.
- To fail the OBDII test, the MIL must be commanded on. This will be based on the command being read in the scan data, not from a visual observation of the MIL. A vehicle will not be failed based on a trouble code in memory, only when the MIL is commanded on.
- A fallback IM240 test will be performed if there are two or three monitors not ready. Once this occurs all retests for the vehicle will be IM240 tests until the vehicle passes.

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Highlights of AirCare I and II cont'd

Revised Test Procedures

More comprehensive test procedures were introduced for 1992 and newer vehicles and for diesel vehicles from all model years. The transient nature of the driving trace used for the IM240 and D147 test procedures required a new type of dynamometer be installed in every inspection lane. New gas analysers also had to be installed to measure lower ranges of emissions on a second-by-second basis for the duration of the test.

Internet

AirCare Certified Repair Centres collectively said good riddance to their leased imprinter and said hello to RepairNet and "electronic repair data forms". For some, this change was quite straightforward because their shop already had a computer with an Internet connection. For others, the learning curve was quite steep and the adjustment was significant. However, most everyone would agree that it was a step in the right direction.

More Challenging Repairs

The more comprehensive IM240 test procedure and more stringent standards meant that technicians had to change their way of thinking about what was acceptable performance from a catalytic converter. Techs also found that there are certain defects that cause excess

region (see table 2). Note that the figures in Table 2 are only up to and including 2004. An independent review conducted in 2004 concluded "AirCare strongly supports the goals of the GVRD and FVRD Air Quality Management Plans, having contributed the largest reduction in emissions of the range of measures implemented by the GVRD. This large

Vehicles Tested	Vehicles Failed	HC Reduction	CO Reduction	NOx Reduction
2,861,420	491,662	21%	19%	19%

Table 2: AirCare Program Statistics (2001 - 2004)

emissions under transient loads, but not during steady cruising conditions. In order to properly diagnose these failures, techs needed to better utilize their ability to measure O₂ sensor response under various transient conditions.

Program Effectiveness

AirCare successfully integrated entirely new testing technology into the existing program and continued to be effective at reducing harmful emissions in the

contribution to emission reductions in the LFV is projected to continue in the near future."

It is clear that AirCare has been a tremendous success. Over the years, the evolution of the program has required that the repair industry evolve to meet the challenges of diagnosis and repair. We are confident that the upcoming challenges of AirCare III will be met by the repair industry, thereby ensuring continued air quality benefits for the region.

Set, Ready, Go - OBD-II cont'd

- The vehicle will be rejected from testing (not failed) if there are four or more monitors not ready. In other words, the vehicle was not ready to be tested.

The Technicians Role

The technicians' role in the OBDII test and repair process is to identify the root cause of the OBDII test failure, correct the fault, and the verify the repair. There are various methods for verifying if the repair is successful.

Two common methods are usually used. One is to use your scan tool to clear codes and reset all the monitors to not ready, then complete a specific drive cycle that will allow the monitors to run and switch to ready, verifying all the

monitored systems and components are operating correctly.

Another, and some would say recommended strategy, is to allow the OBDII system to turn off the MIL by running three trips, targeting the operating conditions that the vehicle was under when the MIL was turned on. When this process is used, the OBDII system will turn the MIL off, however the code(s) will still be retained.

When the vehicle is returned for re-inspection after repair with repair data submitted, the test outcome will be as follows:

If there are less than two monitors not completed and the MIL is not

commanded on, the vehicle will receive a pass on reinspection

If the vehicle returns for reinspection with two or more monitors not complete or the MIL is commanded on, the vehicle will only receive a conditional pass.

Regardless of which method you use, be sure your customer understands that their vehicle must have no more than one monitor not ready when it is returned for reinspection so the vehicle will receive a passing test result.