vic roads

Testing Times

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Welcome

Welcome to Edition 16 of Testing Times.

Brakes and brake hoses take up the major part of this issue but even so, we have only just scratched the surface of this very important subject. We also cover noisy dump valves, “ozone cracking” of tyres and some areas where testers are being too tough or getting caught out because they are not tough enough.

Turbo & Supercharger Dump Valves

Forced induction engines [turbo or supercharged] have some system of controlling the induction pressure or boost. On turbocharged engines there is a valve (often called a waste gate) that allows some exhaust gas to bypass the turbo reducing its speed and thus boost. These bypassing exhaust gases must be returned to the exhaust system beyond the turbo and go through the catalytic converter(s) and muffler(s).

On supercharged engines the control on boost can be through a valve in the induction system that, when extra boost is not required, returns some of the compressed air to the inlet of the compressor again.

However, on both systems the control may not be fully effective for rapid engine speed changes such as when the foot is lifted off the throttle suddenly when changing gears. To ensure the engine never receives more than the set maximum boost there may be a pressure release valve in the inlet system – often called a dump valve. This operates just like a safety valve on any pressure vessel and opens when maximum boost has been reached.

Ever cracked open the valve on your Oxy bottle without a regulator fitted? Makes a hell of a loud noise doesn’t it? Well this can be a bit like the noise a turbo or supercharger dump valve makes when it vents directly into the atmosphere.

Most manufacturers vent these dump valves back into the inlet system to control this noise. However, there are exceptions. For example, the 3 litre turbocharged engine fitted to VL Commodores has an “Intake Manifold Pressure Relief Valve” that vents directly to the atmosphere. But, and this is the big BUT, the valve has a silencing system built into it.

There is another reason why dump valves should generally be “closed loop”. Any air that is vented to the atmosphere from the inlet system has already gone through the air flow meter and the engine management system will supply fuel according to this amount of air. Dumping of some of this air to the atmosphere will make the engine run rich and thus increase emissions.

There are a number of aftermarket replacement dump valves many of which vent to the atmosphere and, would you believe it, some, like those below are even fitted with little trumpets apparently to make gear changes noisier!!!!!!!!!!

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The EPA's position on aftermarket dump valves is that if the vehicle has been fitted with a non-OE dump valve it must not be of a type that vents to the atmosphere. Therefore, if you encounter a vehicle fitted with such a system it must be failed in a roadworthiness inspection.

Disc Brake Shudder

One of the most common complaints about disc brakes is that they shudder and/or the pedal pulsates. There are a several different causes of disc brake shudder such as:

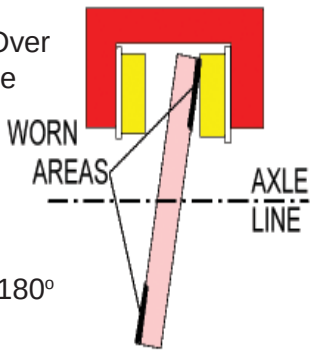
- **Disc Runout**
- **Disc Contamination/Glazing**
- **Disc Thickness Variation**

You should all be quite familiar with the first two so let's examine the last one in detail.

Disc Thickness Variation [DTV] is one of the major and least understood causes of brake shudder and pedal pulsations. The shudder caused by DTV is called cold shudder as it is not caused by temperature or friction variations.

So how does DTV cause the brakes to shudder and the pedal to pulsate? Let's take a look at how a disc brake works. When the brakes are applied, the disc pads on either side of the rotor move in and apply a clamping force to that part of the rotor between them. If the rotor is exactly the same thickness all the way round the clamping force will remain constant as the rotor rotates and the braking will be smooth. However, if the rotor thickness varies at all, the clamping force will be higher as the thicker parts go between the pads and lower for the thinner areas. This variation causes the brakes to shudder and the brake pedal to pulsate.

If the rotors are manufactured or machined to a uniform thickness, how does DTV occur? DTV is caused by the disc pads wearing the brake rotors unevenly when the brakes are **NOT** applied. Over thousands of kilometres the pads will lightly rub the rotor at the points of maximum runout. This continual light rubbing wears two areas, one on each side of the rotor and 180° apart as shown.



These two areas only need to be worn by 10 to 20 microns for brake shuddering to occur. When you consider the way the rotor has been worn and that there are 27 microns to one thousandth of an inch, you can see that running a dial gauge over the rotor will not detect DTV. In fact, the dial gauge will show even less runout than before the wear ocurred. You will need to use a micrometer to measure the thickness at about eight places around the rotor to detect DTV.

Rotor runout as small as 0.07mm [0.003"] may cause DTV on late model vehicles but it may not be apparent until the vehicle has travelled 5,000 to 10,000 km.

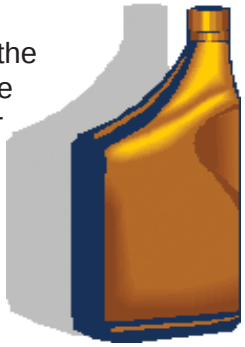
To reduce the likelihood of DTV occurring, obviously the brake components must be spotlessly clean before assembly, the rotor should be indexed to the hub to minimise runout and the wheel bearings must be in good condition and correctly adjusted. However, something that is often overlooked is that uneven or excessive wheel nut torque can distort the rotor leading to DTV. Rattle guns are notorious for being set at the maximum torque and this is usually much higher than the correct wheel nut torque.

How much shudder makes a vehicle un-roadworthy? From a mechanical point of view, shudder can affect the braking performance but it will probably have to be so violent that it shakes the fillings out of teeth and then some, before the deceleration gets below acceptable levels. From the comfort side though, because of the shudder, the driver may not apply the brakes as hard as is needed in an emergency and this is a safety issue. Mild shudder is acceptable but if you find it quite uncomfortable then it could be grounds for rejecting the vehicle.

Poor Performing Brakes

Ever had a vehicle that brakes unevenly in a slow stop but seems OK otherwise? Or a vehicle that seems to require a lot more pedal pressure than normal? Chances are you have a vehicle that has one or more deteriorated flexible brake hoses.

Flexible brake hoses consist of a central hollow core specially formulated to be inert to brake fluid. This central hollow core is surrounded by a woven fabric layer that gives the hose its burst strength and the whole lot is encased in a durable weatherproof sheath. However, this outer sheath is not necessarily very resistant to brake fluid.



The hose manufacturers and the brake fluid manufacturers have generally got their act together and produce compatible products. There has been the odd instance where a particular brand of brake fluid was not compatible with a particular make of brake hose [or vice versa] but that is not the problem here.

It appears that over time, with continual flexing, the inner core can deteriorate. It may crack or crumble and produce bits that start to restrict the fluid flow in some part of the system. Or it may swell and block or partially block the hose. Alternatively, cracks in the inner core may allow brake fluid to contact the inside of the flexible weatherproof sheath causing it to swell or produce contaminants.

Under light braking the fluid pressure may not be enough to force its way past the obstructed area causing erratic braking. In any case, any obstruction in the brake lines is likely to increase pedal pressures for both light and heavy braking.

The deterioration seems to be more noticeable on 4WDs which generally have much more suspension travel and hence hose flexing. And it seems even more noticable if the suspension height has been changed and the original flexible hoses are now near their limits of travel. Some designs that require the hose to bend tightly near the ends also seem more susceptible to this problem.

OK, so the flexible hoses are replaced but there have been examples of the problem persisting. In at least one case the crumbled and swollen material from the old flexible hose had travelled into other parts of the brake system and continued to cause a restriction.

In another case the contaminants from the deteriorated flexible hose[s] had caused the brake fluid in the whole system [other than that used to top up the master cylinder reservoir] to become thick and treacly. The message here is that when deteriorated flexible brake hoses are replaced, the whole system should be thoroughly flushed with clean fluid.

When checking the fluid level in the master cylinder reservoir it should appear clean and un-contaminated. Any sign of discolouration in the fluid is an indication that it needs replacing. Brake fluid is also hygroscopic, that is, it absorbs moisture from the air, and needs to be replaced frequently. Water in the brake fluid can corrode components resulting in damaged seals and fluid leaks. Also, with the high temperatures in the wheel cylinders, water can turn into vapour causing subsequent brake failure.

Flexible Brake Hoses

While we are talking about flexible brake hoses, the condition of the outer casing can also be a reason to reject a vehicle. If the outer casing shows signs of cracking [sometimes called ozone cracking] that could let the weather get to the woven fabric layer then they should not be passed.

This cracking usually appears more severe near the ends where the greater flexing adds to the damage.

Classic, Historic and Veteran Vehicles

Some testers are requiring older vehicles to meet much higher standards than required by law. For example, any vehicle built before 1935 is not required to have a brake lamp and direction indicator lamps are only required on cars built after August 1966. Reversing lamps were only required on some vehicles from January 1972 and so on.

For pre ADR vehicles, all the requirements are set out in Schedule 8 of the Road Safety [Vehicles] Regulations 1999. This is an essential document for all LVTs as it also extends the application of some ADRs to earlier vehicles and over-rides the ADR requirements in some other instances. If you haven't already got a copy contact VicRoads' bookshop.

Beware of Written Off Vehicles

Under new legislation, vehicles that are written off by an insurance company may be required to undergo a Vehicle Identity Validation [VIV] inspection as well as getting a Roadworthiness Certificate [RWC] before they can be re-registered.

Vehicles are written off by an insurance company because they do not consider them to be economically repairable. Some of these vehicles may have only minor damage but others may have substantial structural and other damage. The VIV inspector will want to see the vehicle in the fully repaired condition and in many cases this is after you have issued a RWC. As a result, there is likely to be someone "looking over your shoulder" when you issue a RWC for a written off vehicle. A number of testers have been caught out by this extra inspection because they have issued a RWC for a written off vehicle before it had been fully or properly repaired. This was sometimes on the [very questionable] understanding that the owner would complete the repairs later.

Would you trust anyone who presented a partially repaired vehicle to you - one that the insurance company said was not economical to repair - to properly complete repairs after you have issued a RWC? How could you be sure the repairs were properly done or if they were done at all?

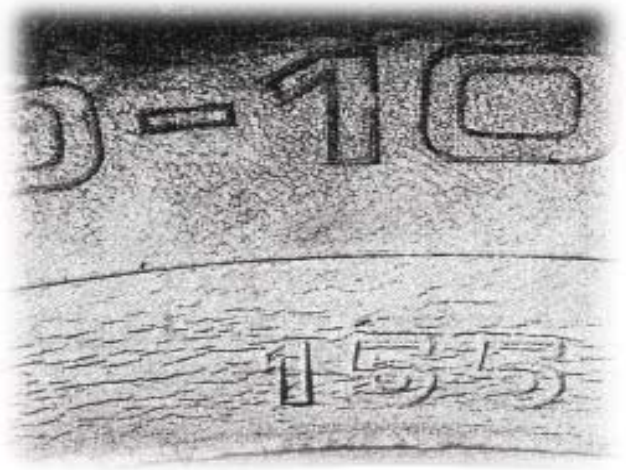
Just as with any other vehicle, all structural damage must have been properly repaired and all un-roadworthy items rectified before a RWC is issued. Remember, it's your licence that is on the line so don't take that risk !!!!

Cracked Tyres

Tread separations, deep sidewall cuts, damaged or exposed cords - these are all quite obvious tyre defects - but what about all those fine sidewall cracks you sometimes see?

That pattern of fine cracks is called "ozone cracking" and is caused by prolonged exposure to sunlight. It might also be caused or made worse by excessive sidewall loads or under inflation. Whatever the reason, it indicates that the rubber has started to lose flexibility and that is not good thing for a tyre. But just how bad must the cracking be before you reject the tyre?

Fine surface cracking like that in the upper part of the picture below is acceptable.



However, if it has got to the stage in the lower part of the picture or it exposes any of the cord material then the tyre should be rejected.

Fees

Annual renewal of your licence is now $16.00.

A new licence, or if you change the location of your testing premises, or to add additional premises onto your licence, costs $80.00 per site.

A book of 100 Roadworthiness Certificates now costs $122.00 (including GST)

Note:

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