HARD OR EXCESSIVE PEDAL PRESSURE DIAGNOSIS

Wingate would like to welcome you to this video entitled "Hard or Excessive Pedal Pressure Diagnosis".

In this video we shall examine the most common causes and rectification procedures associated with this area of customer concern.

Throughout the course of the video, reference to the flow chart will be made. The chart provides a logical procedure which the technician can employ to diagnose these types of problems.

With hard or excessive pedal pressure problems, customer concerns will most likely centre around excessive stopping distances and lack of response from the brakes.

As with all customer concerns a road test is necessary to first establish that the problem exists.

Of course when testing for any brake problems, a quiet area free from traffic in which to perform the testing is strongly recommended.

And remember, if you have difficulty in deciding if a problem exists, a comparison with another vehicle of the same make, model and specification is always helpful.

Following confirmation that a problem does exist, the next step is to perform a low speed brake test.

This is done by driving the vehicle at approximately 15kph on a flat concrete surface and then severely applying the brakes to bring the vehicle quickly to rest.

If the vehicle is then driven forward and the area the vehicle stopped examined, the marks left by the tyres should give an indication of the effectiveness of each individual brake.

A modern braking system in good condition should leave two even black lines from the front wheels and two considerably lighter ones from the rears.

The rear lines being lighter simply confirm the fact that modern systems are designed to prevent rear wheel locking, and that the majority of the braking is performed by the front wheels.

If we now refer to our flow chart we can see that one of two possible results should have been obtained.

The first is that no markings from the wheels was evident, or at best they were extremely faint. This would indicate a problem that would affect all the wheel brakes, such as a booster or master cylinder problem.

The second is that the wheel markings on one or more axles were uneven, suggesting a

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problem in one or more of the wheel brakes.

We shall start by following the path that indicates that none of the wheels were effective.

This would be identified by a lack of any definite wheel markings.

The first step test to be performed is a start-up and exhaust test on the booster.

This is intially done with the engine switched off. The brake pedal is then depressed approximately 10 times to exhaust all the vacuum retained in the booster and then held down.

When the engine is started the pedal should move steadily downwards a short distance.

Then, still keeping firm pressure on the pedal, the engine is again switched off and the pedal reaction noted. There should be no upward movement of the pedal.

If either the pedal does not move down, or moves down very slowly on start-up, or tries to move upwards when the engine is switched off, a problem exists with the power assistance.

It is however, too early to assume that the fault lies in the booster and further tests must be carried out. The flow chart indicats that the next test is for vacuum at the booster.

With the engine running remove the check valve from the booster, or in the case of vehicles with in-line check valves, the hose from the booster.

In each case a sharp rush of in-going air should be heard. On a petrol engine vehicle this should be accompanied with rough running, or stalling of the engine.

If this does not happen, switch the engine off and remove the check valve.

You should be able to draw air through it from the manifold side, but not blow through it.

Having examined the check valve the next step is to look at the flexible hose from the booster to the manifold.

Feel the hose for any hard or soft spots that may indicate that the hose has become blocked, or collapsed internally.

Remove the hose and blow through it. You should be able to blow through the hose without feeling any restriction.

The next check on the chart is the vacuum fitting in the manifold.

It is not uncommon for these fittings to become blocked with

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carbon deposits, particularly on vehicles which have been in service for some time or have worn engines.

Pulling the vacuum hose off when the engine is idling should be accompanied by the sound of a large amount of air being drawn in and on a petrol engine, rough running or stalling.

If this does not occur the fitting will have to be removed and unblocked.

The next test, should the vacuum fitting prove to be clear of restrictions, is to test the amount of vacuum.

This can be done by attaching a vacuum gauge to the fitting and comparing the readings against manufacturers specifications.

In the absence of these a good engine in a normal state of tune should produce at least minus 55 KPA when held steadily at approximately 1800 RPM.

Low manifold vacuum could be an indication of internal problems in the engine, inlet manifold leaks, or an engine which has been highly modified with a non-standard camshaft.

On diesel engines with auxiliary vacuum pumps the same procedure using a vacuum gauge can be performed. Again manufacturers specifications should be referred to.

Should the system pass all of the preceding tests, then the booster itself will have an internal fault and will have to be removed for overhaul.

If however, the booster had passed the start-up and exhaust test the chart would have directed us straight to the final check in the path which is the master cylinder and booster size.

A common practice amongst some service personnel when faced with low pedal problems is to fit a master cylinder of a larger diameter than was originally fitted to the vehicle.

Whilst this has the effect of increasing the pedal height, it also greatly increases the pedal effort.

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Booster and master cylinder combinations are the result of hundreds of hours of intensive design and testing. Under no circumstances should the master cylinder or booster size ever change from what was originally specified for the vehicle.

Wingate catalogues have all component sizes and part numbers listed for each model, making checking an easy process.

That concludes this path of the flow chart. We shall now follow the path where only some of the wheels were found to be effective during the low speed brake test.

The first check in this path is the lining material on the wheels that showed up as being ineffective.

It must be stressed however, that even though only one wheel on an axle may be ineffective, lining materials are always changed on both wheels of an axle.

Lining materials can suffer from a number of problems and when examining them, the technician should look for glazing, caused by continuous gentle braking and indicated by the friction surface of the material and the disc or drum, having a highly polished appearance, or burning, caused by repeated heavy usage, such as when towing a caravan.

Burning is easily recognised as the linings will appear black and usally have deep cracks over the surface of the material.

Some discolouration of the drum or disc can also be expected to accompany this condition.

Leaking hydralic cylinders or axle seals can also change the linings effectiveness by covering them with grease, oil or hydraulic fluid.

If the problem has only occurred since the brakes were re-lined the cause may be that the pads were not bedded in properly, or not bedded in at all.

You may need to question the customer as to how they drove the vehicle immediately after the brakes were re-lined to help establish if this was the problem.

Finally, the type of lining material itself should be checked to see if it is suitable for the vehicle.

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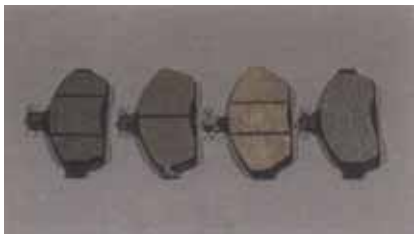
There is a wide variety of materials available on the market today and not all are suitable for every vehicle.



Pads which cannot be identified from the markings on their backs as being suitable for the vehicle should be discarded and replaced with those originally specified by the manufacturer.

Next on the flow chart is check for seized hydraulic pistons.

In the case of disc brakes this can be done by removing one caliper at a time and trying to push the piston back into its housing.

If this is successful, have an assistant slowly press the brake pedal to bring the piston back out again.

When doing this the brake pedal should be pushed no further than it normally travels to avoid damage to the master cylinder, and care must be taken not to push the piston too far out of its bore.

For drum brakes the process is somewhat easier. Remove one drum at a time, and get an assistant to slowly depress the brake pedal. Again making sure not to push it further than it would normally travel.

Observe the brake shoes and confirm that each one is moving when the pedal is depressed.

If only one shoe moves, place a screwdriver between the shoe and the backing plate to stop it moving and then check for movement of the other shoe. If it still does not move, the wheel cylinder piston is most likely seized.

Often an indication that a piston has seized, particularly with disc brake caliper pistons, is that the dust boot has torn, allowing moisture and dirt to enter and form corrosion around the piston.

Next step on the chart is an inspection of the brake pipes and flexible hoses.

Steel pipes can become flattened or kinked from stone damage, accidents or when other repairs are being carried out.

Flexible hoses can become damaged and twisted when calipers are replaced after being overhauled or having pads replaced.

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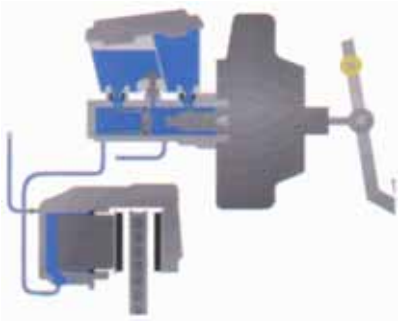
A simple check for this is to attach a length of transparent hose to the bleed nipple, holding it vertically upwards and then release the bleeder screw a quarter to half a turn.

Providing the nipple is not blocked, fluid should run up the transparent hose under the force of gravity, due to the master cylinder reservoir being higher than the bleed nipple.



Our last check is to ensure that the hydraulic cylinders are the correct size for the vehicle specification.

In some cases where vehicles are available with different engines, braking system specification may vary to cope with different performance levels.

In the reverse of what applied to master cylinders, wheel cylinders, and brake cylinders, that are smaller than those that were originally specified, will greatly reduce the amount of force applied to the brake shoes and disc pads.

Finally as with all brake repairs, once the problem has been diagnosed and repaired, a thorough road test should be performed before returning the vehicle to the customer.

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