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Leak Down Test Failed On #3 - Read All About It

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coppcar

Oct 31 2008, 07:00 PM

Post #1

2003 Pathfinder SE, VQ35, 87,000 miles, purchased 1 month ago.

NPORA Newbie



Group: Members

Posts: 6

Joined: 17-October 08

Year: 2003

When I inspected the truck prior to purchase it was in nice shape and clean. My inspection did not include a compression test. All other aspects of a typical on-site inspection and test drive were acceptable. No smoke, no deposits in exhaust, engine ran well. I got 23 mpg when I drove it 300 miles back home.

As I began to do all the routine maintenance and started reading the forums, I found instances where some folks were having oil consumption problems. I decided to check the right valve cover, which I've documented [here](#). I also decided to do a leak down test and that's where I'm now.

Engine is cold, **all plugs removed**. Pistons are cranked into TDC position by hand. Supply pressure to test device is 100 psi. Leak down tester is a dual gauge unit I made. If you're interested in how, let me know. If there's enough interest, I'll do a web page on it.

Cylinder 1 - 10%

Cylinder 2 - 10%

Cylinder 3 - 65% - Air is heard in the spark plug hole of cylinder 1. Head gasket?? Strange considering #1 does not leak into #3. You'd think if the head gasket had failed that air would move between both cylinders. Besides, failed head gaskets don't behave this way, right? No oil in coolant, no coolant in oil.

Cylinder 4 - 10%

Cylinder 5 - 7%

Cylinder 6 - 12%

I installed the spark plug into cylinder 1. Air is heard coming out of the exhaust pipe. Aha! An exhaust valve issue!

I'm trying to think of something that might help. I've read about some folks rapping the valve stem with a plastic mallet in an attempt to seat the valve. I looked at the valve train when the rocker cover was off, I don't think there's anything I could rap on. So, I'm thinking to myself, how can I introduce some sort of shock to the cylinder? I remove my gauge set and hooked up my 100 psi air supply direct to the plug adapter hose. I proceed to pressurize/depressurize several times in succession. I rotate the crank a bit, pressurize/depressurize some more. After a few dozen of these pressurize/depressurize cycles, the leakage has improved to 24%, which is wonderful, but it is still high. I'll cycle the pressure until I see no improvement and then I'll just button everything up and check again later. At least I have a baseline to start from and I have a new tool that I made myself, a leak down tester. How cool is that!

I'll check into GM top engine cleaner.

If you have any comments or suggestions, I'd love to hear them!!

Coppcar

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vengeful

Nov 1 2008, 01:17 PM

Post #2



Group: Members
Posts: 327
Joined: 20-December 07
From: Canada

If air was leaking into cyl 1 from 3, which shouldn't happen if they are not adjacent cylinders; then perhaps the valves were not properly seated is all I was considering and a compression test would give some additional data to help sort it out.

Sorry if I wasn't clear.

Model: LE
Year: 2002



Nov 4 2008, 10:15 AM

Post #7

NPORA Newbie

No apology necessary Bowtied. I hope I didn't sound condescending, it surely isn't my nature to be. I understand your comment now, I thought you were saying you weren't familiar with the leak down test concept.

Group: Members
Posts: 6
Joined: 17-October 08
Year: 2003

I think a compression and a leak down test are complimentary in some ways. You're right to suggest a compression test because it can generate more pressure in the cylinder than a leak down test can, which might seal up a marginally seating valve. This would more closely represent a cylinder in operation and alleviate fears of a serious engine problem. More than anything I think a leak down test provides a good baseline for engine condition that you can take into consideration later to help decide the proper fix. Cylinders 1 and 3 are next to each other and would account for the air heard in #1. I think it was air moving through the exhaust valve of 3 and you could hear it through #1's open exhaust valves. The truck is running very well now and there's no obvious effects of a faulty valve in #3. If it's a burned valve and if it isn't seating well, my friend says it will get worse. If it doesn't worsen, then I won't worry about it.

Now that I have the extension hoses made for my leak down tester, I'm going to assemble a compression gauge with release valve. I will then have an excellent set of diagnostic tools with all the various sizes of plug adapters for use in everything from lawn mowers to large engines. It was fun to make and learn to operate.

I did the Seafoam top engine cleaner before delivering the car to my wife. I didn't get the mushroom cloud that many refer to, but I did get some white smoke. I'll do another leak down and compression test later and let you know what I found.

This post has been edited by **coppcar**: Nov 4 2008, 10:25 AM



Nov 4 2008, 05:18 PM

Post #8

NPORA Old-Timer

The biggest flaws I noticed in your test was the engine was cold and all the plugs were pulled. Every time I've heard of doing a leak down test, it's specifically noted that the engine must be warm and you're instructed to leave all the plugs in except for the cylinder you're testing. While it's obvious that every cylinder besides #3 tested close and #3 was the odd one out, I think leaving the plugs in all cylinders besides #3 may help to pin-point where the air is leaking from.

Group: Members
Posts: 926
Joined: 27-April 05
From: Fort Collins, CO
Year: 2001

It sounds like you're plenty familiar with the procedure. Personally, I've never had a leak down test result in a bad head gasket so I'm unaware of the symptoms. From what I've read, a bad head gasket is often assumed if the other 3 locations of air leak are inconclusive (intake - intake valves, exhaust - exhaust valves, crankcase - rings).

Good luck and it's nice to see someone documenting their problem so well instead of coming here and asking for help without providing any info on what has been done so far.

EDIT: It does appear that you went back and put the #1 plug in and heard the leak through the exhaust. I somehow missed that part.

This post has been edited by **tmorgan4**: Nov 4 2008, 05:06 PM



Nov 4 2008, 09:11 PM

Post #9

NPORA Newbie

Tmorgan,

Group: Members
Posts: 6
Joined: 17-October 08
Year: 2003

Thank you for your comments and compliment. I too saw references to warm/hot engine and leaving plugs in, but there is no way that I can think of at the moment to get every cylinder to TDC without manually turning the crank. It would be very difficult maybe even impossible to get a cylinder to TDC with all the plugs in. If you did try to leave the plugs in and then removed them just to get the piston up, and then reinstalled them, well you can just imagine the pain that would be.

The reason I chose to do the engine cold was because I was reassembling everything after a valve cover cleaning and didn't want to put everything back together, warm up the engine and then take stuff off to get to the plugs. By the time I took stuff off again wouldn't the engine be almost cold again, at least on some of the last cylinders tested? Or is the "warm" temperature not all that critical, as long as it isn't stone cold. This was my first ever leak down test and I did take shortcuts.

I think it might be helpful to describe the method I used to find each cylinder's TDC.

1. Starting at cylinder 1, rotate the crank clockwise to the TDC mark. Monitor pressure at the spark plug hole as the mark approaches TDC, pressure should start to build in the cylinder when approaching the compression stroke's TDC. When you're at TDC, move the crank back and forth and inch or so to seat the rings and then stop when the marks are aligned. Perform your leak down test.

-----Hint - I put my hose and plug adapter into the plug hole to monitor pressure. The hose I built is 3' long and easily reaches to the front of the engine from even the back plugs. I bought grease gun hoses from a farm store. They have 1/8" male NPT fittings on the end and were only \$6.50 each. The are rated at 3000 psi and work great. Simply make your plumbing fittings for each end and you're good to go. I gutted an old spark plug and soldered in a 1/4" x 1/8" NPT bushing to make the plug adapter. The other end of the hose gets a 'M' style air fitting.

2. Move to cylinder 2. Monitor the pressure at the plug hole and turn the crank clockwise. When pressure begins to build, insert a 1/4" aluminum or brass rod into the plug hole. Continue turning the crank until the aluminum rod stops rising. Move the crank back and forth and inch or so to seat the rings and then stop with the rod at its highest point. This is TDC on the compression stroke for the cylinder. Perform your leak down test.

3. Move to cylinder 3, 4, 5, 6 in succession and repeat the steps described in step 2.

4. If you encounter a cylinder out of specs, insert the sparkplugs for adjacent cylinders. Listen to the tailpipe, intake manifold and PCV circuit or other crankcase vent like the dip stick tube for hissing. Where there is hissing, there is leakage. If you find that the hissing is coming from the tailpipe or intake, then you have leaking valve. Since there is no way to physically tap on the valve stems (often suggested when doing this test on motorcycles), you might try what I did and introduce multiple pressurize/depressurize cycles to the problem cylinder. This had a positive effect on my leaking exhaust valve. As Bowtied suggested, it would be wise to do a warm engine compression test on the cylinder to see how it behaves when typical cylinder pressures are present.

5 You might also try the Seafoam decarbonization routine to clean up any carbon deposits on the valves. I disconnected the Evap vacuum tubing going the valve on top of the upper plenum and used this to draw in the Seafoam. This worked very well and I was assured of getting the liquid evenly distributed to all the cylinders. I will perform this exercise once per year.

As an aside, I used my new tool to leak down test my newly acquired '05 Yamaha Grizzly 660 ATV tonight. I was pleasantly surprised to find the leakage on this single cylinder beast to be 4.6%. This is an excellent reading and I should have no problems with this engine. When I adjusted the valves the cams were in great shape and no sludge was evident. I need to reassemble this thing so I have something to plow with. Snow is just around the corner in N. MN.

This post has been edited by **coppcar**: Nov 4 2008, 09:16 PM

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