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Rolling Coal & The 6.5

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PrivatePilot
Just Horsing Around

Joined Jun 1, 2008
17,552 Posts

Discussion Starter · #1 · Sep 12, 2010

Black smoke & the GM 6.5 Turbo Diesel FAQ

A topic that regularly rears its head here in the 6.5TD forum is "How can I make my 6.5 smoke like crazy?", or alternately "My 6.5 is pouring out black smoke, how can I make it stop!". This post aims to provide information relative to both sides of the question.

This is a long post that details not only intentional smoke, but also unintentional smoke..and how to remedy common issues that might cause it.

PLEASE KEEP THE COMMENTS CONSTRUCTIVE AND CLEAN.

Although this thread is a sticky and has (initially) been left open for constructive comments it WILL be locked (and junk comments deleted) at the first indication of the thread going sour. It's better if it's left open for questions and comments as opposed to being locked down, so please think before you comment!

So, lets get started.

"I want my 6.5 to smoke like crazy! Tell me how!"

Think twice. Ideally, you don't want smoke from your 6.5. Why? The architecture of the 6.5 does not tolerate the underlying reasons behind smoke well - best scenario, you just waste a bunch of fuel and potentially annoy those around you, but worse case, you destroy your engine, and I'll explain why shortly.

But wait!

"Waste fuel" you say? I thought smoke=more fuel=more power!

It's simply not true. A properly running diesel engine takes a measured amount of fuel, adds a measured amount of air to said fuel, and burns it efficiently - ideally you should see no smoke at all, and on the 6.5 specifically, this is what you want. If you ARE seeing smoke (intentionally or otherwise) it means that your mixture of fuel and air is somehow incorrect and your engine is running inefficiently. No diesel engine is *designed* to smoke - the only difference is that some tolerate it better than others.

Making smoke on the 6.5 doesn't equate to somehow having added more fuel - all that is happening is the engine is receiving the same amount of fuel but the amount of air being fed to the engine has decreased. The fuel and air charge load are no longer balanced properly, the engine cannot burn its fuel properly, and

About this Discussion

34 Replies 17 Participants

Last post:

[PrivatePilot](#) Apr 1, 2012

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you get smoke and no increase in power - to the contrary, on most diesel engines (the 6.5 included) you will likely *lose* power by running an inefficient mixture that causes smoke, not to mention that you're effectively just pumping your hard earned money out the tailpipe in the form of unburned fuel.

Making smoke unintentionally may occur for several reasons, the most common being the turbocharger failing to provide an adequate level of boost which I will touch on later.

Simply put, here's the facts:

1/ Black smoke does NOT equal power. It simply equals wasted fuel since black smoke is the primary indicator of unburned fuel passing through your exhaust. Just because you saw a tractor pull one day where the tractor was belching black smoke like a chimney doesn't mean it was the most powerful diesel at the pull - another diesel emitting nothing but heat plumes could be making just as much power, likely more. Black smoke = show, not power.

2/ On the 6.5 black smoke equals soaring Exhaust Gas Temperatures, or EGT's. The 6.5 is particularly sensitive to high EGT's due to it's IDI (indirect injection) architecture. Other diesels use direct injection which tolerates high EGT's much better. What does all this mean? Basically, if you let EGT's soar out of control (and black smoke will do it REALLY fast) you will start to melt parts on your 6.5 including valves, pistons, or your turbocharger, to name a few. It can happen FAST, and it can happen to you.

Further to the information above, it's the opinion of many diesel owners (and forum members here) that black smoke isn't appropriate regardless. While some people think it's "Cool", or "Looks good", the public at large simply see it as another filthy diesel truck that they can't wait to get away from. Smoking out the pedestrians at a traffic light or making the cars behind you fight to see the road is doing the diesel community in general a huge disservice, so please consider that you are putting forth a terrible image despite how "Cool" you might think it looks.

If you insist on making smoke anyways, here's some common sense guidelines:

1/ Do it somewhere where pedestrians don't have to breathe it.

2/ Do it somewhere where traffic isn't going to be blinded by it.

3/ Do it somewhere where ideally the public isn't even going to see you and further harden their opinions on diesel engines being dirty, smelly filthy beasts.

4/ Especially on the 6.5TD, you need a pyrometer before making smoke. A pyrometer is a gauge that measures the temperature of your exhaust gasses and is typically used by diesel owners who tow large trailers and need to monitor their (properly running) diesels while pulling large grades. For the purpose of smoking, Installed properly it can be the difference between melting your engine or "rolling coal" safely. It should be installed pre-turbo (not after the turbo on the downpipe), and it must be fast-acting so you can see spikes as they occur quickly. An improperly installed pyro that doesn't reflect temperatures accurately or quickly can be useless against helping you save your engine.

On the 6.5 it's commonly accepted that 1200 degrees fahrenheit is the absolute top end of what's safe for EGT's. 1100 is safer and includes a margin of safety.

Any more and you're risking your engine, simple.



So, back on track - the next common "But why not?" question.

My friend with a Cummins smokes like crazy, why can't I?

Long story short, as mentioned, other diesel engines tolerate it better. The 6.5 can not. You can not treat a 6.5 like a Cummins or a Duramax - although they all burn diesel fuel, not all diesel engines are the same, and this is one easy example of how the 6.5 cannot be compared to the others.

Being able to tolerate it aside, again ask yourself if it's really worth it. Your buddy's Cummins or Duramax isn't making any more power for having made all that smoke, so other than your personal view that it "looks cool" (which as mentioned very few share) is it worth the expense of the extra fuel they are burning?

But the semis rolling up and down the roads all smoke like crazy!

Not anymore. When I started driving class-8 commercial trucks in the early 90's, as a brand new commercial driver I was operating late 80's equipment - all mechanical engines, no computers. They smoked - sometimes just a little, sometimes allot, but even then companies equated black smoke to wasted fuel and would do what they could to minimize it.

The reality today is that commercial trucks manufactured within the last 10 years are difficult to create smoke with. Anything within the last 5 years, even more difficult. A commercial truck manufactured since the introduction of DPF (Diesel Particulate Filters) are 100% IMPOSSIBLE to smoke.

In short, the days of seeing a tractor trailer rolling down the road with thick black streams of smoke rolling out of the stacks is now relegated to the history books, and very few of us miss it. Join the crowd.

Okay, but I'm going to turn up my pump or add a chip, THEN smoke = power, right?

Nope, if you add a custom programming chip or turn up your injector pump (on non electronic IP 6.5's) you should STILL not have any smoke if your setup is ideal. When you add more fuel you also need to add a corresponding amount of additional air, something that is typically automatically taken care of by the programming on your new power chip to increase boost by the turbocharger. Now that you've added more fuel AND more air you WILL make more power...but still without any smoke!

Ok, Ok..I get it. How about a LITTLE smoke?

It's not uncommon to get small amounts of black smoke on a diesel due to "Turbo Lag". Turbo lag occurs during the brief period between the engine being at one RPM or power load and suddenly being asked for more. Typically, this is the scenario:

- 1/ Your sitting at a traffic light at idle.
- 2/ Light turns green and you mash the accelerator pedal.
- 3/ The engine immediately receive a load of fuel but the turbo hasn't caught up! Turbo lag!
- 4/ For a split second you get a puff of black smoke while the exhaust spools up the turbo.
- 5/ The turbo catches up, provides proper boost levels, and away you go..with no smoke.

This scenario can (at least on the 6.5 specifically) be avoided if you make sure your exhaust pre-turbo is absolutely positively



1000% sealed (again, I will address this later), but even if it is occurring it won't hurt your engine so long as it's not excessive. Again, even with turbo lag you should only see a puff of black smoke and it should clear up almost as immediately as it starts. If it continues to pour smoke as long as you keep your foot into the pedal then you have issues.

So, my 6.5 is smoking like crazy, but I don't actually WANT it to - Help!

Okay, lets step back and look at things from a different perspective. We're no longer *trying* to make smoke, but lets address clearing up *unwanted* black smoke.

Black smoke, despite how bad it is for the 6.5 is also not an uncommon problem. Thankfully, it's often not a very complicated fix, but for all the reasons I addressed above (specifically, potentially melting your engine!) if you have unwanted black smoke you really should address it quickly.

The most common reasons for black smoke on the 6.5?

- 1/ Turbocharger malfunction
- 2/ Insufficient boost levels
- 3/ Wastegate failure
- 4/ Leaking pre-turbo exhaust.

Issue #1 (Turbocharger Malfunction) can be physical failure of the turbocharger. If the impeller assembly has been damaged (possibly by uncontrolled EGT's!) or is simply worn out the turbo cannot spool up as required, and no spool = no boost. No boost = incorrect fuel mixture = black smoke.

Issue #2 (insufficient boost levels) is the most common issue and is almost always directly related to #3 and #4 - a failure of the wastegate to operate correctly, or a large pre-turbo exhaust leak that is providing insufficient levels of hot exhaust to spool the turbocharger.

Issue #3 specifically is often caused due to a failed vacuum pump. Most models of the 6.5 engine use a vacuum pump which is connected (via an electronically controlled valve) to a vacuum pot on the turbocharger - this vacuum pot moves a physical lever which opens and closes a gate (the wastegate) inside the turbocharger that normally regulates the boost levels being provided to the engine. When the engine calls for more boost this gate closes and the turbo spools up to a high RPM and provides more boost to the engine. When lower boost levels are called for the vacuum pot is commanded to open the wastegate, the gate opens and exhaust bypasses the turbocharger and boost levels drop.

However, if the vacuum pump fails or the vacuum for some reason fails to make it to the vacuum pot as required (or the pot itself has failed) the wastegate does not close as commanded - this results in the engine making insufficient boost levels, resulting in smoke.

The solution to this specific problem is often simple - search the forums for "Vacuum Pump" or "Wastegate solenoid" to read countless threads on the issue and remedies for such.

Issue #4 is also not uncommon. Because of the fairly low efficiency of the turbocharger on 6.5 engines they do not tolerate exhaust leaks well. A turbocharger requires engine exhaust to drive the vanes that spool the turbo and in turn make boost. If the exhaust has a leak *before* the turbocharger this suddenly lowers the amount of exhaust being fed to the turbocharger,



resulting in lower turbocharger RPM's, ultimately leading to low boost levels..and the vicious circle is complete resulting in black smoke.

Common reasons for pre-turbo exhaust leaks? The easiest to diagnose and discover is the crossover pipe - this pipe takes exhaust from the drivers side exhaust manifold and feeds it under the engine and back into the passenger side exhaust manifold where it is eventually fed to the turbocharger. This pipe is a common spot for rust holes or failure of the "Donut" seals where it meets the manifolds. I have previously wrote a very detailed post on this subject which you can find here:

<http://www.dieselpplace.com/forum/showthread.php?t=386927>

Other issues causing pre-turbo exhaust leaks can be the joint between the turbocharger and the passenger side manifold itself, or exhaust manifold gaskets that have blown out and are now leaking right at the block.

Some issues are easier to fix then others, but once you diagnose exactly *where* your leak is post a new thread in the 6.5 forum (or search) and you'll find solutions.

So, there you have it - a fairly in depth (but not exhaustive) look at the GM 6.5 Turbo diesel and black smoke.

Like it or not, black smoke and the 6.5 do NOT mix. If your goal is to have a properly running (and fuel efficient) 6.5 that will have a long lifespan it's important to remedy any issues that cause sustained smoke.

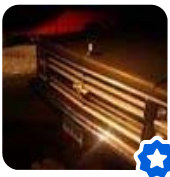
Your engine will thank you!

Mark - Courtice, Ontario, Canada.

SOLD: '97 C3500 Crew Cab Long Box Dually 6.5 Turbo Diesel.

[deejaaa](#), [EJackson15](#), [358258](#) and [3 others](#)

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iamDave0887

A Country Boy Can Survive...
Gone but not forgotten Member!

Joined Oct 30, 2007
14,352 Posts

#2 · Sep 12, 2010 (Edited)

Nice job man. :thumb:

Any of you guys that wish to add something **constructive** to this thread, feel free to do so, but the first negative comment with get this thread sanitized and locked down for good.

'06 GMC 3500 CCLB LBZ/Ally - EFI live tuned , 4" MBRP stainless exhaust, TransGo Jr, Transynd, Raptor 4G lift pump, Edge CTS3 Insight, Hikari 12K lumen LED headlights.

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RCpullerdude

Registered

Joined Jun 8, 2007
3,021 Posts

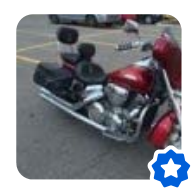
#3 · Sep 12, 2010

Very good thread, very good.

A 6.2, a 6.5, an LB7, and an LML.

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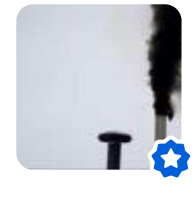
PrivatePilot
Just Horsing Around

Joined Jun 1, 2008
17,552 Posts



bikerdave
Registered

Joined Jan 11, 2009
92 Posts



4320Diesel
Resident Pinhead

Joined Mar 2, 2009
6,638 Posts

Wa_rWagon
Registered

✓ Discussion Starter · #4 · Sep 12, 2010 (Edited by Moderator)

iamDave0887 said: ⬆

Nice job man. :thumb:

Thanks.

iamDave0887 said: ⬆

the first negative comment with get this thread sanitized and locked down for good.

READ UP, Everyone! Please do NOT be the person responsible for causing this thread to get locked - it has the potential to be a good constructive (continuing) thread to help 6.5 newbies...as those of us who have been around a while know that this is a topic of discussion that comes up very often here.

Mark - Courtice, Ontario, Canada.
SOLD: '97 C3500 Crew Cab Long Box Dually 6.5 Turbo Diesel.

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#5 · Sep 12, 2010

thank you private pilot,,,,, and rc puller dude,,,, and i am dave ,,i have been watching this thread intently

as a engine builder by trade nothing annoy,s me more then a engine that does not run properly, lean/rich EXCESSIVE SMOKE ect and for the life of me i could not understand what is cool about wasting fuel ? and yes the stinche of it to pedestrians is just plain DISRESPECTFULL TO PEOPLE .

so i am so glad this is a sticky i will send numorous people to educate themselves here, as it is so well layed out. i could never begin to say thank you enough, this is a great thread

Dave

97 gmc ex cab 2500 siera hd 6,5 L (f code) full load w arctic package
340.000k auto trans 373 diff,s towing package fresh built engine at

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#6 · Sep 12, 2010 (Edited)

its about time someone took the time to explain it, PROPERLY to the new guys that figure "hey i got a diesel, im gonna pour coal so thick i can BBQ on it after." nice job :thumb: :beerchug:

:driver:1985 GMC (*The Brown Streak*) Sierra Classic 1500 4WD
With 6.2L V8 Diesel and 4speed NP833 trans with hurst shifter!

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#7 · Sep 12, 2010

Run a smoking 6.5 TD engine hard by towing a trailer. Soot up the fender from high boost and fuel screw up too high. Add a pre-turbo exhaust leak for fun. This is what I did and was unable to fix the exhaust leak before the truck hit an elk. The engine lives on but with the fuel turned down.



Joined Jun 13, 2008
635 Posts

Soot over everything including fender and trailer. Soot over everything around exaust leak back.

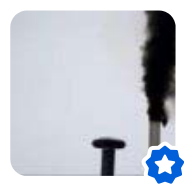
Melted glow plug wires and anything else close to the exhaust melted or burned. Including the paint on the inside floor of the cab under the downpipe.

Open the engine up:
Precups cracked and some fall out of the head.
Glowplugs burning - the metal casings of the glow plugs melts and burns off. Run long enough the burning plugs break and can FOD, grenade, the turbo.

No power was my goal. I did not like the smoke. 1200 MAX EGT IMO is rumor on DB2 IP systems or my gauge is bad. Other than the above issues I did not melt a piston with extended 1500 degree pulls. As above it wasn't good for it, but, not the end of the world. Simply wasting fuel and hard on above parts.

2008 "Two cards four swipes" 2500HD 6.6L. Killerbee prototype LMM tune, TD-EOC, [Optima battery Mod](#), 115,000 miles. Is missed

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4320Diesel
Resident Pinhead
Joined Mar 2, 2009
6,638 Posts

#8 · Sep 12, 2010

well i have noticed, that unless the engine is revved up(above 1200 RPM) i wont get excessive EGT's, my idea for this is i have excessive EGT's inside the prechambers but with the reduced airflow from the engine not turning very fast the heat is absorbed into the cylinder walls and head instead of quickly going out the exhaust?? i have no other idea on why i cant hit 900°F pre turbo EGT with it pouring smoke at 1000 RPM with the wastegate unhooked, yet as soon as it gets above 1200 the EGTs spike so fast it almost blurs the needle of the pyro.

:driver:1985 GMC (The Brown Streak) Sierra Classic 1500 4WD
With 6.2L V8 Diesel and 4speed NP833 trans with hurst shifter!
[mikkeytoo](#)

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bellofello
Registered
Joined Jul 14, 2010
22 Posts

#9 · Oct 21, 2010

[4320Diesel](#) said: [↑](#)

well i have noticed, that unless the engine is revved up(above 1200 RPM) i wont get excessive EGT's, my idea for this is i have excessive EGT's inside the prechambers but with the reduced airflow from the engine not turning very fast the heat is absorbed into the cylinder walls and head instead of quickly going out the exhaust?? i have no other idea on why i cant hit 900°F pre turbo EGT with it pouring smoke at 1000 RPM with the wastegate unhooked, yet as soon as it gets above 1200 the EGTs snike so fast it almost blurs the needle of the nvrn

I have noticed the same thing. I've got my fuel turned up about.... just over a 1/4 turn, and 15 psi. EGT's are around stock when everything is running right.

When I fully open the wastegate I can load up while on the brakes, uuber black smoke, EGT's don't come up at all almost (maybe up to 700ish degrees), but when going down the road they FLY up in no time.

Oh, and I DO NOT do this at traffic lights and such. It's more of a weekend BBQ backyard thing. Driving around with your wastegate unhooked and keeping an eye on your pyro is a waste



of money, and probably couldn't be good for your ol rattler

-92 K1500,RCSB,6.5TD/80E/NP241c swapped in,14b FF,33's, a few mods

[Warloch](#)

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jifaire

Banned

Joined Jun 17, 2006
9,366 Posts

#10 · Oct 28, 2010

Couldn't pass this one up, PP ... nice job. Good, clear, concise explanation. Well done.

Much better than my snotty "put a tire in your bed, light it up, and smoke all you want" comment.

Not funnier, but better.

[Mmmph. Mrmphhh!](#)

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acesneights1

Premium Member

Joined May 13, 2007
5,971 Posts

#11 · Nov 27, 2010

All the ones I have owned with Heath Tunes seemed to get some haze. I would not say black but dark greyish when hammered hard. My stock tuned ones blow no smoke.

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bellofello

Registered

Joined Jul 14, 2010
22 Posts

#12 · Nov 28, 2010

Yep I agree, mine runs best with a light haze. My IP is turned up just passed 1/4 turn (mechanical pump) and boost @ 15 psi via homemade wastegate actuator. Stock was also smokeless.

-92 K1500,RCSB,6.5TD/80E/NP241c swapped in,14b FF,33's, a few mods

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T

TDP69

Registered

Joined Jan 10, 2011
10 Posts

#13 · Jan 10, 2011

Thank you! very good. i learned a lot. I am new to the diesels

1995 Chevrolet 2500 6.5 TD
2wd

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bigred1994

#14 · Feb 25, 2011

my 6.5 puff a little but with high po injectors optical bump heads done and all the expensive jazz i get a lil extra fuel but my cummins thats another thing if it aint smoken its broken black on



Registered
Joined Feb 23, 2011
20 Posts

an extremly hard pull but driving normal just a haze on shifts
pulling 300 ft at the fair she poors coal for 75 ft then clears up till
the load demand comes up
(black not bad all the time just means ur fuel is rich when needed
but it burning it when it poors grey thats raw fuel un burnt

-1994 chevy k 3500 4x4 6.5td relocated pmd ,
k&n turbo cone , vp delete, homemade boost controler @12psi, 3in no

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P

projecthog
Registered
Joined Apr 26, 2011
79 Posts

#15 · May 22, 2011

Nice sticky, thanks,

On my way from the Bodyshop to the safety Mechanic I noticed
that there was a goodly amount of black smoke when I stepped
on it a bit.
I only did it once, as I do not think black smoke is good or cool. I
will have it home finally this week when I get home myself from a
romp through the states and provinces.
I have no experience with the 6.5's, but I'm learning heaps about
what to check for what problems.

This sticky fits the bill perfectly, and I'll be at it when I finally get
the old girl in a corner.

I am assuming that there wil be some minor problems, but the
engine runs decent unless you floor it at lets say about 50 Mph,
which produces the smoke for longer then I think it should, and
then there is some hesitation too but not bad at all.
Turbo lag could be it, but I doubt if that's the only thing that
needs looking at. Anyway, lots to put to proof here.

Again, Thanks for the sticky.

Regards, PH.

_Main mover;
'96 GMC sierra 3500 XLT 4x4 Std, 6.5 longbox dually, Vin

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Harleyndner
Registered
Joined May 31, 2011
21 Posts

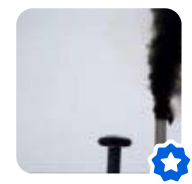
#16 · May 31, 2011

I had some problem with my 1994 6.5 TD , when climing high
roads,
what I did to fix is cancelling the waste gate , installed large K&N
air filter and and moved CDR pipe towards the air filter instead of
inside air intake elbow.
the result non smoking very clean at all condition exept when
pulling hard from standing ,small amount of grey smoke.

**2011 Silverado 2500 HD crew cab , K&N cold air intake ,
resonator delete , steet tuned - Kory Willis , 4" turbo back**

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4320Diesel

Resident Pinhead

Joined Mar 2, 2009
6,638 Posts

#17 · May 31, 2011

by cancelling you mean wiring closed? yea, thats not a good remedy for anything.

:driver:1985 GMC (The Brown Streak) Sierra Classic 1500 4WD
With 6.2L V8 Diesel and 4speed NP833 trans with hurst shifter! ,

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Harleyndner

Registered

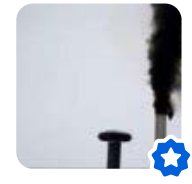
Joined May 31, 2011
21 Posts

#18 · Jun 1, 2011

I have tied the waste gate lever so no wiring involved
It works by vacuum line that is still connected.
Computer doesn't know about it

2011 Silverado 2500 HD crew cab , K&N cold air intake , resonator delete , steet tuned - Kory Willis , 4" turbo back

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4320Diesel

Resident Pinhead

Joined Mar 2, 2009
6,638 Posts

#19 · Jun 1, 2011

what? so you unplugged the WG solonoid, but left the vacuum line hooked on? or you just hooked the WG directly to the vacuum pump?

:driver:1985 GMC (The Brown Streak) Sierra Classic 1500 4WD
With 6.2L V8 Diesel and 4speed NP833 trans with hurst shifter! ,

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Harleyndner

Registered

Joined May 31, 2011
21 Posts

#20 · Jun 26, 2011

I had to replace vaccum pump, now all connected factory settings.
Only thing changed is EGR. , i have cancelled it, no exhaust circulation any more it runs better now

2011 Silverado 2500 HD crew cab , K&N cold air intake , resonator delete , steet tuned - Kory Willis , 4" turbo back

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