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1kz-te Cracked head

Lomoski · Sep 28, 2018 · 3

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Lomoski

Joined: Nov 25, 2017

Messages: 215

Location: Canada

Sep 28, 2018

Thread starter

#1

Hey Gang,

So It appears I have a cracked head. Bubbles in the overflow bottle, using coolant (not much currently), when I start it cold without the rad cap on there are big bubbles and exhaust gasses.

So, I need to remove the head and get a new one on the way. My question is has anyone done a writeup on this already. What size are the E torx head bolts (why toyota, why?!)? I assume I need a headgasket, exhaust manifold gasket, new crush washers for injectors, new head bolts and a new timing belt while I have it apart. Am I missing anything?

Sorry if this has already been covered.

Lomo

Sep 28, 2018

#2



Onur

16711-58020

Moderator

GOLD Star

Joined: Aug 28, 2004

Messages: 27,595

Location:

Woodstock, NY USA

You will get better technical results in the diesel section of MUD. I will transfer this thread there.

Lomoski

GTS

GTSSportCoupe

2LTE abuser

Joined: Mar 23, 2012

Messages: 6,441

Location:

Victoria, BC, Canada

Sep 28, 2018

#3

That's really crappy, sorry to hear! How many kms on your truck?

Now, one thing to be aware of, is if you have a regular coolant leak, and air is getting into the system, the air can get pushed out again as the engine warms up. It can make the same kind of bubbles as what you are seeing. So make absolute sure you don't have any coolant leaks anywhere. Would be a drag to buy the new head etc only to find it's not the problem.

Not sure about the 1KZTE, but on the 2LTE the head bolts just need a regular 12 point socket. Nothing crazy.

As far as procedure. Follow the Toyota FSM 'to a T' and you'll be good to go. It's very important not to just rush through it. Take the extra time to clean and prep things well. Take pictures as you take things apart. Put the bolts and nuts back into parts as you take them off the engine so you don't mix them up.

Take the head to a automotive machine shop to have them transfer your valve train and set the valve clearances. Most do this by grinding the end of the valves rather than buying new shims.

Here is a pdf copy of the manual: [http://www.spidybot.com/ocquetteau/Nanni/Nanni 1KZ-TE Toyota Workshop.pdf](http://www.spidybot.com/ocquetteau/Nanni/Nanni%201KZ-TE%20Toyota%20Workshop.pdf)

Lomoski

Lon

Lomoski

Joined: Nov 25, 2017

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Location: Canada

Sep 28, 2018

Thread starter

#4

GTSSportCoupe said: 

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[Click to expand...](#)

Thanks for the reply. I don't have any coolant leaks anywhere. I checked and there's not leaks that o can find. Also there seems to be exhaust gasses coming out of the rad cap when running. Cold fluid but there's definitely smoke. It also has been fluctuating on the temp gauge when it is normally rock steady. I've got 280 000 on the clock. Had a bit of an overheating issue before I followed your advice and rebuilt the viscous clutch. Fan definitely wasn't working. I'm also getting air bubbles in the overflow while it's warmed up and running.

I've rebuilt s few heads in my day so hopefully this one will be pretty simple. I think I've found a complete one with valves so I shouldn't have to get the valve shims reset until it's broken in. It seems that the 1kz has external torx bolts not a regular bolt. Hoping it hasn't been missed for too long and there's no pitting in the cylinders as well. Not losing a lot of coolant so hopefully it's not been a problem.

Thanks for the manual. It's supposed to start snowing here soon so hopefully I can get it all rebuilt before I'm doing it in the cold, no garage!

Thanks GTS!

Lon

Lomoski

Joined: Nov 25, 2017

Messages: 215

Location: Canada

Sep 29, 2018

Thread starter

#5

Well cylinder 2 and 3 are cracked. Got the head off today relatively easy. Glad that I know what the problem is. Now to prevent it from happening again somehow. I've already replaced the water pump, retimed the viscous fan clutch with 7k fluid (while it's out in going to put 10k in). Thinking about evans waterless coolant. I have a pyro I'm going to install in my exhaust header while it's out, pre turbo.

Anything I'm missing? I've flushed the rad as well and am running Toyota red at 60%.

Dougal

GTS

GTSSportCoupe

Sep 29, 2018

#6

Glad it was ok to get apart! If that's 280,000 on the original, I guess it's done alright. If your next head lasts that long it'll be good for the life of the vehicle most likely.

2LTE abuser

Joined: Mar 23, 2012
 Messages: 6,441
 Location:
 Victoria, BC, Canada

I think you've done most of the right steps to keep it cool now. I'd think a pyrometer would be an important next step when you get it all back together though. And a bit of tuning to run leaner (more boost with no increase in fuel) would be good too. These IDI turbos run too high EGT's from the factory IMHO. If you could fit it in the budget sometime, an intercooler would achieve much cooler EGT's. The Evan's is great too, but not totally necessary unless you start towing a travel trailer or something.

Lomoski

Lon

Lomoski

Joined: Nov 25, 2017
 Messages: 215
 Location: Canada

Sep 29, 2018

Thread starter

#7

GTSSportCoupe said: 

Glad it was ok to get apart! If that's 280,000 on the original, I guess it's done alright. If your next head lasts that long it'll be good for the life of the vehicle most likely.

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I have a pyro that I'm going to install. Did you do yours pre or post turbo? I'm going to install it tomorrow.

An intercooler sounds like a good idea. Can you take one from a different model and make it work?

I've also got a boost gauge that I'm going to install tomorrow as well. How do you increase the boost on these turbos being that they are electronic controlled.

Thinking I'll add a snorkel as well in the spring, money dependant.

Thanks again!

Sep 30, 2018

#8

rosco

roscoFJ73

Joined: Jul 22, 2003
 Messages: 17,687
 Location:
 Perth Western
 Australia

Have you asked anyone about welding the cracks. It works well as long as the metal hasn't gone porous.

How many klms has the engine done?

Sep 30, 2018

#9

GTS

GTSSportCoupe

2LTE abuser

Joined: Mar 23, 2012
 Messages: 6,441
 Location:
 Victoria, BC, Canada

Lomoski said: ⤴

I have a pyro that I'm going to install. Did you do yours pre or post turbo? I'm going to install it tomorrow.

An intercooler sounds like a good idea. Can you take one from a different model and make it work?

[Click to expand...](#)

I have a EGT probe both pre and post turbo. Oddly enough, I only see about 100F difference on the 2LTE. I've heard of up to 300F difference on other motors (1HDT) though. This must have to do with how well the turbine flows on the given motor? Generally the most accurate reading is pre turbo. Try to put it directly in the exhaust stream where all the runners meet.

Intercoolers for the 70 series Prado's are generally custom. However, there are versions of the 1KZTE that came from the factory with a top mount intercooler. I suppose you could look at putting one of those on and cutting a hole in your hood. Personally I think top mount intercoolers would actually be better called "interheaters". I think a front mount is the only way to go. Look at some of the LJ78 designs for some ideas. There are some pictures in this thread: [Opinions on this water to air intercooler for LJ78 / 2LTE?](#)

Boost gauge is a great idea and definitely necessary for tuning. Most of Toyota's engines start to hit a fuel cut around 14 psi (not sure about the 1kzte though). With no intercooler, you probably don't want to go above that anyhow. To increase boost to 14psi, you simply put a manual boost controller on the boost hose that goes to the wastegate on your turbo. (I've been using this cheap type with decent success: [Voodoo MBC Blue Silver Manual Turbo Boost Controller Add upto 30 PSI Made in USA | eBay](#)) To reduce fuel (if needed), pull the cap of your spill control valve on the back of the injection pump. Take a picture of the screw setting. Release the lock nut, and turn the screw out a touch (for less fuel). In for more fuel. Never turn it in more than 7/8 of a turn! Tighten the lock nut. I'd think if you increase your boost to 14, you could turn out the spill control valve about 1/8 turn. This will reduce EGT's across the whole rpm range. You'll have the same power, but lower EGT's.

The cracks in your head are caused by a combination of high EGT's and high water temps. Basically when the motor has gotten good and hot in the past, the coolant starts to experience localized boiling in the area around the pre-combustion chambers and the exhaust valves. When the localized boiling happens, these areas of the head can super heat as there is nothing to cool them down (vapor barrier). The localized super heating of the metal stresses the head and leads to the cracking.

Lomoski

Lon

Lomoski

Joined: Nov 25, 2017
Messages: 215
Location: Canada

Sep 30, 2018

Thread starter

#10

GTSSportCoupe said: 

I have a EGT probe both pre and post turbo. Oddly enough, I only see about 100F difference on the 2LTE. I've heard of up to 300F difference on other motors (1HDT) though. This must have to do with how well the turbine flows on the given motor? Generally the most accurate reading is pre turbo. Try to put it directly in the exhaust stream where all the runners meet.

[Click to expand...](#)

Amazing. You're a wealth of knowledge. I'm going to out my egt sensor pre turbo in the header, now that I have it out installing the probe should be a breeze. I had one on my delica and it changed my driving style as well.

I'm going to order that boost controller today, am I correct in thinking I just plumb it in between the turbo and wastegate? Is that everything I need to install it in that one?

I'll do some research on the intercooler. The top mount intercoolers have never really made much sense to me. There's so much heat up there vs the front of a truck. I have also considered water/methanol injection post turbo. Have you noticed much of an improvement with yours?

Thanks again!

GTS

GTSSportCoupe

2LTE abuser

Joined: Mar 23, 2012

Messages: 6,441

Location:

Victoria, BC, Canada

Sep 30, 2018

#11

Lomoski said: 

Amazing. You're a wealth of knowledge. I'm going to out my egt sensor pre turbo in the header, now that I have it out installing the probe should be a breeze. I had one on my delica and it changed my driving style as well.

I'm going to order that boost controller today, am I correct in thinking I just

[Click to expand...](#)

Yes you're right about the manual boost controller. It's a super easy install.

My experience with water/meth injection is mixed. In a nutshell, I'd avoid it if I were you. My meth/water injection system has not impacted EGT levels in any noticeable way, so I don't think it's really been better for the engine. It does however make a LOT more power. However with the 1KZTE, you don't need more power. With the 2LTE, I'm at the limits of the injection pump, so I used the methanol as additional fuel to make more power. The 1KZTE has a much more capable injection pump, so it's easy to get as much fuel as you want

with that motor. Also, I've found that my meth/water injection system works best in the cool months of the year. In summer, the methanol pre-ignites and gives bad engine knock. So I have to run way more water in the mix. Water into a diesel creates sulfuric/nitric acid which is what causes the pitting in the cylinders/head when a cracked head is run for a while on these motors. When I took my motor apart after running the system for a few years, I discovered most of my water/meth mix had been entering one cylinder (3) of my motor due to my nozzle placement. It had caused some minor pitting in they cylinder head. I've since moved the nozzle back to right after the turbo to get the meth/water to mix better and enter the engine more evenly. I am running a fairly big nozzle for the size of the motor, and might benefit going to a smaller one.... I ran some cheap oil at one point also, and got the engine good and hot while towing. I had the meth/water on while it was hot. Because it was mostly entering cylinder three, it actually caused a cylinder wash effect and caused my rings to come into contact with they cylinder wall. This spelt the end for my original short block! In installed a new short block earlier this year (with partial rebuild). So yah, just avoid meth/water injection. There is way more to it than most people realize!

Lomoski

Lon

Lomoski

Joined: Nov 25, 2017

Messages: 215

Location: Canada

Sep 30, 2018

Thread starter

#12

GTSSportCoupe said: 

Yes you're right about the manual boost controller. It's a super easy install.

My experience with water/meth injection is mixed. In a nutshell, I'd avoid it if I were you. My meth/water injection system has not impacted EGT levels in any noticeable way, so I don't think it's really been better for the engine. It does

[Click to expand...](#)

That's great feedback. I'm not sure how the intake manifold is on the 2lte but it would make sense on the 1kz-te that cylinder 3 would get the bulk of the spray. The I take is basically shortest to cylinder 3 on the 1kz-te with 1 and 2 being quite far away. I won't bother with

water injection.

I'll order that boost controller and some high temp sylicon hose as well. You wouldn't happen to know what size hose off hand?

I rebuilt my fan clutch with 10k. It's timed as far as I can and is just barely opening at the right time. Might be time to order a new one. There seems like there is a few different model numbers for the blue aisin fan clutch.

Cheers!

Lon

Lomoski

Joined: Nov 25, 2017
Messages: 215
Location: Canada

Sep 30, 2018

Thread starter

#13

Also, where and how did you mount your boost and egt gauges?

GTS

GTSSportCoupe

2LTE abuser

Joined: Mar 23, 2012
Messages: 6,441
Location:
Victoria, BC, Canada

Sep 30, 2018

#14

Sorry, don't know the hose size off hand.

If you order a new viscous fan clutch, make sure you only buy OEM. The aftermarket ones suck in my experience.

I bought a dual boost/egt gauge in one, and just attached it to the side of my temp gauge pod (just to the left of the gauge cluster hood). It's not pretty. I put it there so it's easy to see without taking my eyes off the road. Other's have mounted them in the single DIN location below their stereo. Or they've removed the compass/temp gauge and installed their gauges there. Just do a search, as the heavy duty 70 series are the same inside, so there are lots of gauge mount examples out there. My truck is really not that pretty...LOL. Function

over form.

Max EGT and Boost while towing my camper trailer this summer. Shows my ugly gauge mount, haha.

Lomoski

Lon

Lomoski

Joined: Nov 25, 2017
Messages: 215
Location: Canada

Sep 30, 2018

Thread starter

#15

GTSSportCoupe said: 

Sorry, don't know the hose size off hand.

If you order a new viscous fan clutch, make sure you only buy OEM. The aftermarket ones suck in my experience.

[Click to expand...](#)

I'll definitely buy an aisin oem blue fan clutch. Just need to figure out what model number.

My truck doesn't have that fancy gauge cluster on the middle of the dash. There's a cover over a hole, but no gauge cluster. I've got a double din stereo with gps in place. I'll do some research and see if there's a pod, I've got separate boost and egt gauges.

Thanks for all the help.

Lon

Lomoski

Joined: Nov 25, 2017
Messages: 215
Location: Canada

Sep 30, 2018

Thread starter

#16

Well, as it turns out my turbo is in need of replacement as well. There's more than a few mm of lateral play in the shaft. Looks like it's been rubbing the housing at times as well.

GTS

GTSSportCoupe

2LTE abuser

Joined: Mar 23, 2012
Messages: 6,441
Location:
Victoria, BC, Canada

Oct 1, 2018

#17

Lomoski said: ⤴

Well, as it turns out my turbo is in need of replacement as well. There's more than a few mm of lateral play in the shaft. Looks like it's been rubbing the housing at times as well.

That sucks! I bought a Chinese knock-off CHRA for my CT20A, and it has stood up very well so far... I think they're better than they used to be. Might be an economical option for you.

Oct 2, 2018

#18

D

Dougal

Joined: Jun 10, 2007
 Messages: 5,396
 Location: Kiwiland

The failing turbo may have contributed to your head crack. Regardless, the JDM 1KZ motors here in NZ seemed to stop cracking heads around 2000. I don't know if they revised the head design, but they don't seem to give any trouble from then on.

[@GTSSportCoupe](#) If 900F if your max EGT then I'd be concerned it's in a cold spot.

Oct 2, 2018

#19

GTS

GTSSportCoupe

2LTE abuser

Joined: Mar 23, 2012
 Messages: 6,441
 Location: Victoria, BC, Canada

Dougal said: [↑](#)

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[@GTSSportCoupe](#) If 900F if your max EGT then I'd be concerned it's in a cold spot.

Looking at the EPC, it looks like the early 1kzte head is part # 11101-69125. The replacement is part # 11101-69128. It seems the later head came out around 1999. I wonder if Toyota made some changes to the design? Also, did Toyota intercool the motor around 2000? I wonder if that also impacted the life of the cylinder head?

I have two pyro probes. One in the manifold right before the turbo, and the other is in the dump pipe about one inch from the turbine outlet (centered). My max EGT is pretty low. I'm at the limits of the fueling (2LTE IP has a 10mm plunger). However, power is excellent, and economy is much better than stock (more complete burn with more available oxygen?). I still get pretty high coolant temps on hills while towing in summer, so I'm fine with the low EGT's at least. I'm able to pull my 16' camping trailer up a 6% grade at 100km/h (total vehicle+trailer weight = 3900kg), not sure how much power that translates to. I estimate I'm around 140-150hp at the flywheel. My intercooler is what dropped the EGT's so dramatically. After I first installed I thought I'd broken my pyrometer somehow, as the EGT's

were so much lower. Adding as much fuel as I can, they're still low. Before the intercooler I could hit 1100F post turbine on small hills with an empty truck!

Last edited: Oct 2, 2018

D

Dougal

Joined: Jun 10, 2007
Messages: 5,396
Location: Kiwiland

Oct 2, 2018

#20

GTSSportCoupe said: ↑

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[Click to expand...](#)

My concern with your EGT is it might not be a true measurement as those temps are too low to spool most turbos. All my diesels run about 400C (750F) at cruise. How long is the probe and where is it located?

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But the problem is, to get that much power from an engine that size you need an A/F ratio that is far too low to deliver EGT that cool.

A 2.4L, 8V diesel with 20psi boost, 80% effective intercooling, IDI (300g/kwh) and 18:1 A/F will produce around that amount of power from about 3,500rpm with a good turbo. But EGT will be near 700°C (1300F).

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Jun 30, 2020
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