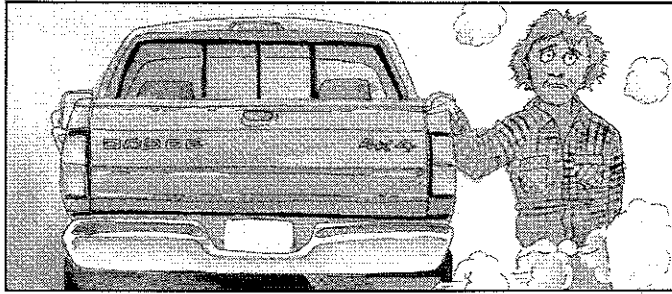


From vRecomming
Issue 65



BACKFIRE

"Backfire" is a forum for corrections, clarifications, and further explanation. Yes, you're reading between the lines correctly. "Backfire" is a column where the editor gets to eat crow.

LUBE OILS

As an ASE (Automotive Service Excellence association) master auto technician with over 20 years experience, it was with great interest that I read your article regarding reduced amounts of zinc and phosphorous in the newly redesigned diesel motor oils. Being the owner of a 1970s era modified muscle car, this is a topic I have been following for quite some time. It seems flat tappet camshaft failures have been occurring at an alarming rate for about four or five years now. This has prompted aftermarket cam manufacturers to investigate the cause. To read more about it, see the enclosed article "When good cams go bad," from Hot Rod Pro magazine.

Perhaps the solution for older diesel engines is an additive that contains zinc and phosphorous. NAPA auto parts stores sell a product manufactured by Lucas called Lucas Zinc Plus. (See enclosed information "Techs edge, Goodyear, NAPA.) The increased amounts of zinc and phosphorous may help extend the longevity of the older diesels. However, it doesn't address the issue of reduced amounts of sulfated ash.

By the way, as with any new product, the counterman at NAPA had no clue what I was talking about when I went to purchase some. Lucky for me the store manager recognized me and went the extra mile by calling Lucas and getting a part number (Lucas 10063). After checking their computer we discovered NAPA stocks it at the warehouse, so we ordered some. Also, while on the phone with Lucas we found out that it's not sold as Lucas Zinc Plus, but as Lucas, engine break-in oil additive. The recommended amount while not breaking in an engine is one ounce per quart of oil.

If you think this might help the readers of TDR, feel free to share this information.

Thanks,
Dan Dondajeski
South Milwaukee, WI

Dan, thank you for sending the information on zinc and phosphorous into the TDR. First I'll make some comments on the TDR's editorial position, then I'll share with the audience my observations on the material that you've submitted.

TDR's editorial position: In our four-part series on lube oils (Issues 54 through 58) we were fortunate to have retired lube oil engineer John Martin write the series for us. With John's

paycheck determined by his own retirement account, his years of industry experience, and his "tell it like it is" style, he proved to be a valuable asset to the TDR audience.

He took the subject of lube oils (kind of like religion for many of us) and allowed us a behind-the-scenes look at the diesel industry's new CJ specification in a way that was insightful, refreshing, honest and without bias. I'm not sure how it could have been done better. As the editor, I'm always on the lookout for writers like John Martin.

Martin's articles are what set the TDR apart from other publications. While the TDR does accept advertisements, and thus it is not a true Consumer Reports or Motorcycle Consumer News, I want the members to know that we are not beholden to the vendors. Long-time TDR members have read about this editorial stance before, but the message does bear repeating for some of our newer audience.

Now, if you carefully read Issue 64 and the "Technical Topics" discussion on fuel additives, you'll see that the TDR's writers and I have to walk a fine line between believing factory or marketing hype and the real world of how things actually work—or don't work.

I'll save you from shuffling through your library; here is the correspondence:

"The preceding gives you the guidelines for fuel additives as set forth by Dodge and Cummins. To the cynic, the fact that there were but few products recommended for use comes as no surprise, 'Did ya think those guys would recommend anything other than their own branded additives?'

"Frankly speaking, no, and (cynic to cynic talking here) why would Dodge or Cummins recommend and test any other manufacturers' additives?

"I see a stand-off here.

"Additionally, inquiring minds want to know more and perhaps learn about their favorite brand. What is an editor to do?"

So, for Issue 64's discussion of fuel additives we found a voice of authority to comment and I'm hopeful that the article served to educate.

Observations on lube oils and additives: In my 16 years of editing the TDR I know enough to know that I don't know. So I forwarded Dan's three articles on the lube oil, additives, zinc and phosphorous on to the TDR's oil guru John Martin.

Hey John, just how serious is ultra low sulfur diesel fuel, the swine flu (oops, I'm off topic) the concern for the antiwear metals of zinc and phosphorus to Dodge/Cummins Turbo Diesel owners? (Notice the specific direction to the Dodge/Cummins Turbo Diesel reference? I did not want John to go off on a tangent.)

Before we get to John's comments, one should realize that the material Dan forwarded to us is about flat tappet camshaft failures in automotive engines. The conclusion of one of the articles reads, "Modern heavy-duty truck diesel oils with lots of ZDP additives will be marked 'CI-4' or 'CI-4 Plus.' They also easily pass the API Service SL gasoline-engine performance test (but due to the high ZDP content, not the SL chemical composition specs). Such truck oils are an economical and effective solution for flat-tappet longevity, according to many sources."

Okay, John, tell us again how big of a deal is ZDP? John writes:

THE BIG DEAL ABOUT ZDP!

by John Martin

Okay, the question is about the importance of ZDP and your Cummins diesel engine. I am an engineer first, sales guy second, so let me get straight to the bottom line and then I'll give you the background information to keep you entertained.

For your Cummins diesel, just try to utilize API CI-4 or CI-4 Plus oils. If you can't find CI-4 oils, use CJ-4 oils, but be careful to avoid extended oil change intervals.

Now, because inquiring minds want to know, because we all own gasoline engines, because many of us have Hot Rods, and because I like to tell stories, here is the report.

Remember tetra ethyl lead? Tetra ethyl lead (TEL) is still, to this day, the most effective octane booster known to man. Its invention in the 1930s allowed engine builders to go as high as 13:1 compression ratios for better engine efficiency where previously engines would self destruct at compression ratios over 7 to 8:1. TEL had a couple of nasty side effects, though. The use of TEL required formulators to include chlorine or bromine-based lead scavengers in the fuel to remove harmful lead deposits from the engine. Remember how we used to have to change mufflers and tail pipes much more frequently than we do these days with unleaded fuels? Lead scavengers were very corrosive to metals in the exhaust system. TEL is also very harmful to catalytic converters needed to reduce CO and HC exhaust emissions. So, despite its benefits, TEL was phased out in 1971. It has taken us all the years since then to get back up to durable, efficient 10:1 compression ratio engines.

Think of zincdithiophosphate (ZDP) as the TEL of lubricating oils. There has never been a more effective oxidation inhibitor than ZDP. Lube oils can survive without oxidative thickening significantly better than in the days before this breakthrough invention. This invention has been responsible for oils which will perform adequately in highly turbocharged engines which generate operating temperatures previously unheard of. In addition, ZDP has an unusual ability to coat cams and lifters with a sacrificial zinc/phosphorus film which is worn off slowly under extremely high pressures (EP), preventing metal-to-metal contact (which usually means instant destruction) between flat tappet cams and lifters. There is no adequate replacement EP additive for ZDP. ZDP also provides wear protection throughout engines, but equivalent wear protection can be achieved in diesels by assuring that adequate detergent additives are present to neutralize harmful acidic byproducts of combustion.

However, ZDP has some undesirable side effects. When ZDP hits oxidation catalysts and particulate traps at high exhaust temperatures, it decomposes, leaving a thick phosphorus film over the surface of the catalyst or traps. This coating "masks" the surface of the trap, rendering it ineffective. It doesn't do this all at once. Instead it just slowly coats the trap and makes its capacity to perform less over time. No one really knows how quickly ZDP coats emissions control devices, but it requires engine builders and catalyst suppliers to make their devices larger to accommodate this loss of efficiency over time. And larger devices, as you might expect, cost more than smaller devices. Automotive and truck builders are responsible for designing emissions systems which perform adequately over the life of the vehicle at minimum cost. So they convinced oil and additive company researchers to take steps to reduce the amount of ZDP in engine oils. The antioxidant properties of ZDP can be at least partially restored by the use of what are called ashless antioxidants, but they are much more expensive than ZDP.

ZDP reduction started in gasoline engine oils several years ago. Gasoline engine oils used to have zinc and phosphorus levels as high as 0.14% wt. The industry ratcheted zinc and phosphorus levels down over a series of lube oil specs to where it is approximately 0.06% wt. today in America. The next passenger car lube oil spec. (GF-5) retains the 0.06% wt. limit, but the spec will now include a phosphorus retention test because of concerns about overall engine wear. Our EPA really doesn't care how long your engine lives, but just wants flowers growing out of your tailpipes. As you know, diesel engine oil specs have started to ratchet down with API CJ-4.

In an engine using roller cam followers, little harm is done (if sufficient detergency is present!) because there is no sliding contact between the cam and the cam follower requiring protection. Since many automotive engine designers utilize roller followers to reduce friction (better fuel economy), the only harm done in late-model engines was increased ring and cylinder wear, and low tension rings (again for better fuel economy), and frequent trade cycles meant most drivers never noticed the differences. However, a tremendous amount of damage was done to those of us using older (or high performance) engine designs with flat tappet cams. In fact, warranties of single cam lobe failures in high performance engines were a significant contributor to Crane Cams' recent decision to exit the performance cam industry.

Until diesels started using catalytic converters and particulate traps, there was no pressure to reduce ZDP levels in diesel engine oils. In fact, high pressure diesel fuel injection systems were starting to place high pressure loads on some of the injection system valve train. That's why diesel oils are still a good choice for people to use in engines with flat tappet camshafts. The new API CJ-4 spec requires a maximum of 0.1% wt. phosphorus, but that is still significantly higher than automotive engine oil requirements. Your Cummins diesel engine's valve train will be adequately protected with API CJ-4 specification oils, but I will get a little nervous if the next diesel engine oil specification calls for a further reduction in the amount of ZDP. Supplemental ZDP additives are also a good choice, but they are very expensive, and I worry a lot about "overdosing" your oil. What if you ruin your catalytic converter or particulate trap and have to purchase a new one? Those things are very expensive—that's why people out there are stealing them. Racing oils utilize increased ZDP levels, and I think you can understand why.

Until diesels started using catalytic converters and particulate traps, there was no pressure to reduce ZDP levels in diesel engine oils.

Some high performance camshaft manufacturers have resorted to "Parkerizing" their new flat tappet cam lobes to reduce warranty claims, but that is a relatively expensive process. In my own case I prefer hydraulic or mechanical roller cams since they've come a long way in the last few years. For your 5.9-liter Cummins diesel, just try to utilize API CI-4 or CI-4 Plus oils. If you can't find CI-4 oils, use CJ-4 oils, but be careful to avoid extended oil change intervals. For your 6.7-liter engine, stick with the CJ-4 oils and closely monitor your oil change intervals.

John Martin
TDR Writer



2009 TDR Calendar contestant
Phillip Brand of New Jersey.

TRUCK ACCESSORIES—OIL SYSTEM COUNTER-POINT

It has often been pointed out that a magazine should serve to enlighten and entertain. This is exemplified each evening as you likely turn to your newspaper's editorial and point/counter-point sections before reading the rest of the news.

To do some point/counter-point you may wish to refer back to last issue's "Product Showcase" article (page 112) about an oil bypass system. Wait... I can save you the trouble of reaching into your TDR archives. The article discussed adding a pair of oil by-pass filters to the truck's engine to trap contaminants that full-flow filters can't remove. Going hand-in-hand with the additional filters is the use of synthetic oil and extended oil drain intervals. Engine longevity is the goal. The price of the kit was approximately \$350 plus the labor to install the kit.

My counter-point story on this accessory goes like this: The truck was a new '99 2500 Turbo Diesel. In my zeal to do right I added an oil by-pass system to the engine. The kit's contents were of excellent quality.

My workmanship wasn't. Actually, workmanship is not the correct word. The system did not leak and the installation was easy.

But, the installation was stupid. How so? I chose to plumb the oil return to a hole that I drilled into the side of the 24-valve engine's valve cover. One year later, an engineering-type guy (Mark Chapple of TST Products) pointed out that "should the oil return line have a leak the oil would find its way to the exhaust manifold and that I should have an evacuation plan, because the fire under the hood would quickly engulf the entire truck."

Thanks, Mark. Rather than reinstall the system to the engine, I chose to uncomplicate my life and remove it from the truck.

Be careful in your installation of accessories.

Counter Point—Dumbed-Out?

This example goes hand-in-hand with the fact that we all have the best of intentions when we modify, accessorize, and maintain our trucks.

You can debate the cost of the oil bypass system against the sales brochure's projection of longer engine life. But, be brutally honest here, will you be the owner when the end-of-life cycle is established? That's what I thought; you will have traded or sold the truck. Did the next owner see the benefit? Probably not as the engine or truck was "dumbed out" (you know: wrecked, overheated, broken in a non-lubricant manner) prior to the end-of-life.

With my counter-point comments you can correctly assume that I don't have this accessory on my current '07.5 truck nor did I install one on my last truck, an '03 model. This is not to say that oil bypass, synthetic lubricants and/or extended oil drain intervals are not for you. Regardless, we've provided an enlightening and entertaining perspective that made you think. That is what the TDR is all about.

Robert Patton
TDR Staff