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TECHNICAL TOPICS

LUBE OIL FOR YOUR ECODIESEL

by Robert Patton and John Martin

Last issue I mentioned that my 2014 Ram 1500 EcoDiesel truck was ordered just after the Ram folks opened the door for business in March. So, like a kid at Christmas time, I had to wait. With a deposit at the dealership, I was committed to the time it would take the complex manufacturing system to build the truck. Again, I was *very* fortunate. Five weeks to the day and my truck was on the road.

The interim five weeks gave me time (too much time?) to plan for ownership. I downloaded the EcoDiesel Owner's Manual (www.ramtrucks.com) to check out the routine maintenance parts that the truck would need.

Based on previous questions that members had about lube oil for the 2014 Ram/Cummins engine (TDR 84, page 67), the first section that I went to for the EcoDiesel was "Maintaining Your Vehicle/ Engine Oil." And, the recommendation:

> Only use ACEA C3 SAE 5W-30 Synthetic Low Ash engine oil meeting Chrysler material standard MS-11106 or Pennzoil Ultra Euro L full synthetic 5W-30 motor oil, which is recommended for all operating temperatures. This engine oil improves low temperature starting and vehicle fuel economy.

Great, I had a feeling I would not be able to bop into Wally World and purchase some MS-11106/Euro L diesel motor oil.

I went shopping. I was correct. There are various Pennzoil "Ultra" oils in different viscosities (all were "Energy Conserving," passenger car motor oils), but no "Euro L" ACEA C3 oils.

Time to investigate. Besides the Pennzoil "Ultra Euro L," which other oil(s) meet Chrysler MS-11106?

Let me save you some time. I was only able to find one other lube oil that met Chrysler MS-11106, Mobil 1 "ESP Formula 5W-30." (Mobil notes that "ESP" means exhaust system protection.) The Mobil 1 folks have a much better web site than Pennzoil. Data from the Mobil 1 web site tells us about their ESP Formula and, thus, what is special about Chrysler MS-11106. Quoting from Mobil's web site:

"Mobil 1 ESP Formula 5W-30 is made with a proprietary blend of leading edge components formulated to be fully compatible with the latest diesel particulate filters (DPFs) and gasoline catalytic converters (CATs). ***(Editor's note, blah, blah, blah.)*** Mobil 1 ESP Formula 5W-30 has been designed to help deliver outstanding performance and protection in conjunction with fuel economy benefits. Key features and potential benefits include:

Features	Advantages and Potential Benefits
Low Ash Content	Helps to reduce particulate build up in diesel particulate filters
Low Sulphur and Phosphorous content	Helps to reduce poisoning of gasoline catalytic converters
Active cleaning agents	Helps to reduce deposits and sludge build up to enable long and clean engine life
Outstanding thermal and oxidation stability	Helps to reduce oil aging, allowing extended drain interval protection
Low oil consumption	Less hydrocarbon pollution
Enhanced frictional properties	Aids fuel economy
Excellent low temperature capabilities	Quick cold weather starting and ultra fast protection. Helps to extend engine life.

Further, while tooling around at Mobil's web site, I found a break-out chart showing all of their oils and the oils' properties. In an effort to find one that might be at Wally World or the local Pep-Zone store, I noted their Mobil 1 "Extended Performance" 5W-30 had a nominal Phosphorus level (PPM) of 800 and Zinc level of 900 which matched their ESP oil. Also, I printed the product data sheet for the Extended Performance oil and compared it to the ESP. It looks comparable to me. But, wait, their "Extended Performance" is a passenger car motor oil (PCMO), not a diesel oil. Put this oil back on the shelf. More on diesel oils and PCMOs later.

Dang, I'm not a lube oil engineer; I'm just trying to…

What am I trying to do?

I know, I don't want to be *told* what product has to be used on the truck. Granted, there are two choices, but at $9.06 for the Pennzoil and $11.95 for the Mobil ESP, well you can understand my quest for options, even if the price of the quest will outweigh the price of several oil changes.

Did I mention that, thus far, I've only found one source for the oil filter, Mopar 68229402 at $49.95. Now, you can really sense my building frustration.

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What Ya Gonna Do?

Okay, it has been established that I do not want to be told what to do. This is nothing new, I've spent lots of money testing oils and we published the results of "who has the best diesel lube oil" back in our Issue 76 magazine. Lets put some dollars and cents to this project. It is also time to call in the expert, our lube oil guru, John Martin, to help with the article.

First, the dollars and cents. Being the frugal type, I noted that the EcoDiesel engine holds 10.5 quarts, so let's call it 11. I went to my local Ram dealer and purchased the Pennzoil that is recommended for the truck:

Oil: Pennzoil Euro L 11 x $9.20	$101.20
Filter: Mopar 68229402	49.95
	$151.15

And, you thought an oil and filter change for the HD Cummins engine was expensive. (Just wait until you price the Mopar 8/9 speed ZF transmission fluid, 68218925SS at $43.25/quart.)

With the lube oil in hand, I went shopping for the factory recommended alternative. The Mobil 1 ESP oil was $11.99 at O'Reilly Auto Parts. It had to be special ordered, you won't find it on their shelf.

Next, I went shopping for some alternative oils. I kept in mind the 5W (low teperature) viscosity recommendation. I settled on two inexpensive US diesel-spec motor oils, samples 4 and 5. Sample 4 was a 10W product, (the Shell Rotella T5 partial synthetic); and a 5W product (the Shell Rotella T6 full synthetic). Go ahead, call me cheap.

John Martin did some shopping. He went in search of some European diesel-spec motor oils of the 5W variety. He found samples 6 and 7, two oils that met a Daimler Benz/European C5 criteria. Neither of us could find any other oils that met the ACEA C3 or Chrysler MS11106. Here are the results.

Table 1

	Visosity	Brand	Specification	$/Quart
1	5W 30	Factory fill	EURO C3	0
2	5W 30	Pennzoil Ultra	EURO C3	$9.30
3	5W 30	Mobil ESP	EURO C3	$11.95
4	10W 30	Shell Rotella	API DIESEL CJ	$5.00
5	5W 40	Shell Rotella	API DIESEL CJ	$5.00
6	5W 40	Mobil ESP	DB 229.5 EURO C5	$9.59
7	5W 40	Pennzoil Ultra	DB 229.5 EURO C5	$8.99

From the shopping spree you can see where this is going. I had already purchased several Fleetguard CC2543 oil analysis kits. The oils were sent for evaluation and the following table shows the results:

Table 2

Sample #	Viscosity @ 100°	TBN	Magnesium	Calcium	Phosphorous	Zinc	Boron	Molybdenum
1	12.8	4.89	4	1909	668	805	0	0
2	11.8	5.03	8	1426	536	648	68	0
3	11.9	4.42	3	1090	719	843	229	87
4	11.7	7.94	7	2381	1015	1207	19	0
5	14.0	8.87	1179	850	1046	1249	66	61
6	13.0	7.23	713	1040	682	789	206	85
7	13.4	9.44	12	2635	832	1011	67	0

Great, table 1 represents about $70 in lube oils and table 2 represents $175 in lube oil analysis kits. Add in the cost to run around town shopping and I'm into this project for $250. Now, I don't know diddly about lube oils, so I'll turn this article over to the TDR's John Martin.

Robert Patton
TDR Staff

V M MOTORI LUBE OIL RECOMMENDATIONS

by John Martin

Our fearless editor, Robert, opened a real can of worms when he purchased a new Ram pickup powered by the VM Motori V6 diesel engine. The factory Owner's Manual only has one oil listed (Pennzoil) and Robert was able to find only one other oil that met the Chrysler MS-11106 specification. What's a shadetree, elcheapo mechanic to do?

Isn't it great that Chrysler has dictated a lube performance category the oil has to meet? Robert, a guy who changes his own oil, immediately went looking for some MS-11106 oil in the recommended SAE 5W30 grade. Several parts stores and Wally World, had none in stock. A few stores offered to special order it for him.

These oils are very hard to find in stores. However, most stores have a plethora of SAE 5W30 grade oils on their shelves. Beware, don't use passenger car motor oils (PCMOs) in diesel engines for at least two reasons.

First, and the most obvious, diesels need higher levels of detergents and dispersants to handle higher combustion temperatures and soot loading of the oil.

Second, and the reason Editor Patton has his underwear all wadded-up, all passenger car oils that say "energy conserving" (EC oils) contain friction modifiers to improve fuel economy. Many diesel engines can't tolerate friction modified oils. (Think "more slicker.")

As an example of this energy conserving/more-slickeryness think back to the late 1990s. The guys and gals with motorcycles were all up in arms because they would change their oil and shortly thereafter, the clutch would slip. Disclosure statement: this was happening to those bikes where the engine and wet clutches of the transmission share the same lube oil sump. The problem, the automotive oil specifications had changed and the oils were now branded with the American Petroleum Institute stamp of "Energy Conserving." No longer could our two-wheeled buddies bop into Wally World for a can of oil and they are paying a higher price for what used to be the standard product offering. Geez, that's an obvious rip-off.

Here's another friction modifier story for you. Molybdenum disulfide is a useful solid friction modifier, but the sulfur in the compound causes deterioration of yellow metal (brass, copper) parts. Diesels often use yellow metal bushings in their engines. Additionally, passenger car motor oils (PCMO) often use glycerol monooleate (GMO) or calcium oleate friction modifiers to reduce the coefficient of friction of oils, but they can produce side effects such as slow lockup of wet clutches (the motorcycle example) or sliding of roller cam followers. A sliding roller cam follower soon causes a catastrophic failure! There are other good reasons, but just take my word for it, don't use PCMOs in your diesel engine.

Robert took a sample of the oil in his pickup (labeled "Sample 1"), and he purchased several 5W30 oils. He sent these oils in for analysis and then sent the results to me to interpret. The oil identifications and performance categories are shown in Table 1. The analytical data is shown in Table 2.

The results are very interesting. Robert's Factory Fill oil and the Pennzoil Ultra Euro oils (samples 1 and 2) have very low total base numbers (TBN) for diesel oils. Likewise the Mobil 1 ESP oil (sample 3). This means less detergent than optimum which should translate into shorter oil change intervals. These are light duty Diesel oils. They also have low levels of phosphorous and zinc (ZDP) which indicates the amount of extreme pressure (EP) and antioxidant protection. All this is done supposedly to optimize catalytic converter and particulate filter life. The Shell Rotella T5 partial synthetic (Item 4, SAE 10W30 grade) and Shell Rotella T6 full synthetic (Item 5, SAE 5W40 grade) had detergent, dispersant, phosphorus, and zinc levels like I would expect from a heavy-duty diesel engine oil.

So Sherlock Martin got to work. I was able to locate a Mobil 1 ESP 5W40 oil (sample 6) and a Pennzoil Ultra Euro 5W40 oil (sample 7) in two different parts stores that had Daimler-Benz sheet 229.5 claims on their containers. This meant they were genuine heavy duty diesel engine oils. Mercedes doesn't screw around with low-quality oils, and they often recommend them by brand name.

Robert looked at the performance claims on his Pennzoil Ultra Euro 5W30 (samples 1 and 2) and the Mobil 1 ESP (sample 3) and found that they both claimed ACEA C-3 performance. ACEA (Association des Constructeurs Europeans) is a European trade association much like our API, but in Europe more power rests with the vehicle manufacturer than with the oil company. The C-3 performance category is relatively new, and it emphasizes catalyst protection and fuel economy over engine durability.

Comparing the C-3 oil test requirements (samples 1, 2, 3) to the Daimler-Benz Sheet 229.5 test requirements (samples 6, 7), I determined that the Sheet 229.5 spec oils offer better oxidative stability, but most other oil performance parameters were roughly equivalent between the two specifications. Evidently Fiat chose to emphasize catalyst durability at the expense of total engine and/or oil life. Or, perhaps, Fiat figured if they utilized lower sulfated ash (SA) oils with reduced phosphorus levels, they could build vehicles with smaller catalytic converters and particulate traps that would still make it through the warranty period without plugging. This would actually be a significant cost savings for Fiat since less platinum and/or palladium would be needed, and these materials currently cost more than gold.

I also noticed something interesting about the two Shell Rotella oils. Comparing boron, calcium, magnesium, and molybdenum values shows these oils contain chemical packages from different additive manufacturers. This doesn't surprise me at all. Big oil companies often ask two or more additive manufacturers for their recommendations and supporting test results to meet that performance category. If both suppliers can meet the performance criteria, they award the contract to the lowest bidder. So, if your father had good luck with one brand of oil, you need to remember that the formulation has probably changed several times since your dad's day.

Another interesting observation is that the Pennzoil Ultra Euro oils utilize base stocks made from natural gas. This is a relatively new technique which produces very high quality (like a synthetic) low sulfur base stocks. As long as natural gas prices remain depressed this technique makes good economic sense to those companies heavily invested in natural gas as Shell is. (Shell also owns both Quaker State and Pennzoil.)

So, if your father had good luck with one brand of oil, you need to remember that the formulation has probably changed several times since your dad's day.

What Should You Do

Okay, so what are you readers supposed to do for oil if you own one of the new VM Motori V6 engines? As I mentioned, if you go to any oil marketer's shelves, you will see a plethora of SAE 5W30 oils, but all of them Robert and I found were passenger car engine oils. Remember, SAE 5W30 is only a viscosity grade, not a performance specification. Stay away from PCMOs!

Robert and I only sampled four heavy duty diesel oils of lower viscosity (to improve fuel economy) than the typical SAE 15W40 grade. No doubt there are many, many more lower viscosity-type diesel oils on the market, we only tested four of them to see how they would match up to the European ACEA C-3 category. As you know, these oils were samples 4, 5, 6, and 7.

These oils would protect your VM diesel very adequately, although your fuel economy might be 1-2% less than with the recommended 5W30 grade oils. I'm betting you, like most truck operators I know, can't even repeatedly measure the fuel economy difference between these oils.

Catalytic converter and particulate trap life might be slightly adversely affected, but all of the field test data I've seen suggests that the differences are too slight to measure. I call this "environmental politics." Our environmental do gooders just want to force their theories on us in the form of regulations—don't bother them with facts or data!

So, if absolutely maintaining warranty coverage without question is your biggest concern, take your Ram pickup to the dealer to have the oil changed, or order the Pennzoil Ultra Euro or Mobil 1 ESP in the 5W30 grade if you change your own oil. Choose the one that costs you less.

If you're not inclined to do either of the above, buy one of the four diesel oils listed in our test for your truck. The Mobil and Pennzoil 5W40 grade oils (samples 6 and 7) would be the least risky oils as regards warranty coverage, because they are modern European diesel engine oils. If your dealer gives you any crap, have him contact me for a little Lube Oil 101 education about what diesel engine oil specs really mean.

However, I feel the best oils for your engine's ultimate durability would be the two Shell products (samples 4 and 5). I prefer the 10W30 version because I know and like the additive chemistry utilized. The 5W40 full synthetic would also do a good job of protecting your diesel engine's durability. However, catalytic converter and/or particulate trap might be shorted a little.

Now, if you'll pull out your TDR 76, pages 52-56, you can see where Editor Patton sampled another 5W-type oil (a Mobil1 synthetic diesel oil). In the Issue 76 article I didn't really care for its make-up.

Viscosity – 14.1
TBN – 8.84
Magnesium – 777
Calcium – 1050
Phosphorous – 975
Zinc- 1110
Boron – 82
Molybdenum – 0

My comment: "This Mobil product looks like a consumer-type diesel oil. Big truck fleets wouldn't use this product." At the time, the price per quart was about $6.50. However, it fits right in with the Euro-specification stuff (samples 1, 2, 3) that we've uncovered for this article.

Looking further at Issue 76's oils (2.5 years ago) and this test, the only oil in both tests that had a 5W-type viscosity characteristic was the Sample 5/Shell Rotella 5W40 synthetic. For the record the Shell formula has not really changed.

	THEN	NOW
Viscosity	14.3	14.0
TBN	9.22	8.87
Magnesium	1119	1179
Calcium	770	850
Phosphorus	994	1046
Zinc	1171	1249
Boron	60	66
Molybdenum	58	61

Now, let's get back to the VM Motori diesel engine and my closing statements. This is my big concern, please don't use just *any* SAE 5W30 engine oils, because you saw them all over the parts house or Wally World's shelves. (Again, a rather intimidating array of choices for any lube purchaser, including me.) Most likely they'll say "for gasoline engines" on the front of the container. *Please* don't use gasoline engine oils in your diesel engines. (I promise an update on PCMOs and diesel-specific oils in the next issue.)

John Martin
TDR Writer

P.S. I don't want to think about this VM Motori engine and the lube oil that will go into it five-or-so years from now. You know how the scenario plays out: truck's out of warranty and has had three different owners. Billy Bob pulls into Lousy Larry's Lube Oil Emporium. Larry gives the engine a $19.95 oil change.

Well…I guess new and fresh oil is better than no oil? Geez.

Confused yet?