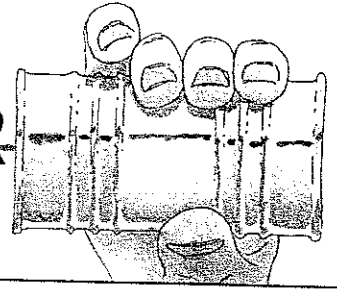


# MEMBER 2 MEMBER



*I think you will agree with me when I categorize Turbo Diesel owners as independent people who are not afraid to try something new. You are an ingenious membership who reinvents and improves a product to make it better serve your needs. You show a strong willingness to share your "Shadetree Solutions." With your input each quarter, we publish the "Member2Member" exchange to give you a forum to tell other members how you solved a problem.*

*In the last issue of the TDR we examined the changes in lube oil as we move from API classification CI+4 to CJ-4. To write the article we contracted with a "hired gun," John Martin, formerly of Lubrizol Corporation with 25 years of service.*

*For those not familiar with Lubrizol, it is one of a handful of companies that make and sell the additive package that goes into the finished product, the one-gallon lube oil jug.*

*More on Martin's credentials: He holds several patents and has published many industry-related technical articles. He is a past Chairman of the Cleveland Section of the Society of Automotive Engineers (SAE) and both a Recognized Associate and a Silver Spark Plug (their highest honor) of the Technology and Maintenance Council of the American Trucking Associations. He is a recognized lubrication consultant to both the racing (NASCAR and NHRA) and trucking industries.*

*In this issue we are fortunate to have John's article that debunks many of the myths about lube oils. This article is sure to hold your attention.*

## DEBUNKING LUBE OIL MYTHS (Don't Believe Everything You Hear)

In this issue of the TDR I will initiate TDR readers into the mysteries of the lube oil industry and, along the way, debunk a few lube oil myths.

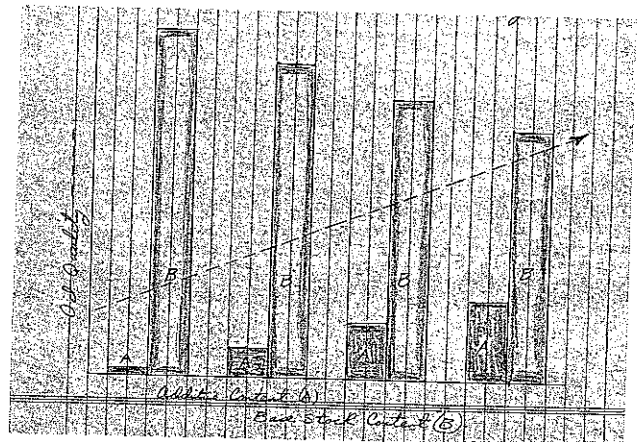
### Oil As A Commodity (A Little Lube Oil History)

Years ago (time frame 1920s-1940s) lube oils consisted of mostly base stocks and a little additive chemistry (2 – 3%). In those days most major oil companies, when looking to improve lube oil quality, generally tried to improve base stock quality first. Additive chemicals made a much smaller contribution to overall lube oil performance than they do today.

Back then Pennsylvania crudes were preferred because their composition made them inherently better performers at higher temperatures and loads. Refiners with poorer performing base stocks focused their research and development efforts on trying to make their base stocks perform more like Pennsylvania stocks.

Most major oil companies had their own R&D labs so they could maintain a competitive performance advantage by developing proprietary additives and more highly refined base stocks. Now perhaps you can understand a Grandfather's steadfast insistence on a Quaker State or Pennzoil brand lube oil as the marketing of these brands implied superiority. Specialty chemical companies, like Lubrizol, were often in direct competition with oil company R&D labs. Engine oils were a highly profitable, growth industry.

From the 50's through today oil refiners constantly improved base stock quality by either removing or modifying undesirable base stock components. Some base stocks ceased to be used for engine oils because their quality was too low, and it was too expensive to upgrade them. In addition to high temperature performance, today's base stocks are highly refined to optimize low temperature flow, fuel economy, and to minimize oil consumption. Pennsylvania base stocks no longer perform significantly better than other base stocks. At the same time additive chemistry has improved by leaps and bounds, and additive content in the oil has increased ten-fold (see Figure 1).



After examining Figure 1 you might conclude that increasing oil quality came about because additive content was increased. This is only partially true. Although additive content and quality are now the most significant contributors to lube oil performance, highly refined base stocks are an integral part of the equation. Higher performance base stocks require a little less additive to correct performance deficiencies, but the base stocks are looking more and more alike.

In the late 60's the Environmental Protection Agency (EPA) regulated significantly reduced emissions for automotive exhaust. Prior to this time engine oil consumption was a major contributor to hydrocarbon (HC) emissions. Engines were completely redesigned and built to more exacting tolerances to reduce HC emissions. Engine oil consumption was reduced by roughly a factor of 10, but oil change intervals weren't changed appreciably.

At the same time the content of additive package in the finished lube oil had increased from approximately 2% to 15%. Engine oils still required tremendous R&D investments, but the market for base stocks (which is, after all, what the large oil companies are selling to the public) began to slow. Today, engine lube oil sales are growing at a rate of only 1% per year in North America. That's why oil marketers are dead-set against extended oil change intervals!

Major oil refiners began to put more dollars into their exploration and production research budgets and less money in additive package R&D. Smaller oil companies quickly learned to submit their base stocks to specialty chemical companies and ask them to develop complete additive packages to provide a desired oil performance. When the major oil companies noticed this, they followed suit and slashed their R&D budgets. There are currently only two or three major oil companies who perform substantial R&D and develop their own proprietary additive packages. And, they will often purchase additives if they are cheaper or better performers than their own in-house chemistry. Most lube oil chemistry is now developed and produced by only four additive companies. Today additives make up about 20-25% of the contents inside the oil container.

The design of virtually all of today's engine oils follows a pattern:

- The oil marketer tells more than one additive company which base stocks to utilize and what performance level they wish to achieve.
- The additive companies then develop additives, formulate oils, and test them to demonstrate that they meet the desired performance requirements.
- Those additive companies who manage to meet all the requirements are invited to bid for the business.
- The lowest bid gets the business!

### I've Seen a Few Things

To be competitive in the marketplace, while providing shareholders with adequate profit returns, oil companies no longer set performance goals significantly higher than their competitors—that costs money! Yet at the same time oil performance minimums generally increase each time a new spec is issued. Consequently, there is less and less difference between an engine oil that barely passes all the tests and one designed to pass by a significant margin. Therefore, oils meeting a given performance spec (example: API CI+4) are approaching commodity status. Of course their marketing departments would have you believe otherwise. And, remember, I was in this business for over 30 years, so I have seen a few things.

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*Consequently, there is less and less difference between an engine oil that barely passes all the tests and one designed to pass by a significant margin.*

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### Let's Debunk a Few Myths!

1. *My Dad (or remember old Granddad) used Brand X, and if it was good enough for him, it's good enough for me.*  
Meadow muffins! Chances are the Brand X oil formulation and additive supplier have changed seventeen times since your Dad's days. The people who designed your Dad's oil are probably retired.
2. *Brand A is better than Brand B*  
Oils which meet the latest API performance specs (example: API CI+4) are very similar in performance and much improved compared to previous spec oils (API CH-4). Big differences in performance between major brands simply don't exist anymore. But, be careful...Is CJ-4 better than CI+4? Better review my article in Issue 54 for that discussion.
3. *I switched from Brand A to Brand B, and now my engine uses oil.*  
I doubt it! Oils are tested to make sure they can be mixed with other oils without problems. Chemistries are not that drastically different these days. If you noticed a difference when switching oil brands, be certain that:
  - a. You are comparing oils which both meet the same performance and viscosity specifications.
  - b. You didn't already have excessive oil consumption, but simply hadn't noticed it prior to switching oils. When you try something new, you become more aware of performance.
4. *Sludge caused my engine to run poorly or slowly.*  
Watch out for advertising gimmicks! Think about it. What exactly can sludge do to hurt engine performance? The only thing I know of is to stop up an oil passage. If it does that, catastrophic engine failure is the likely result, not running more slowly.
5. *Thick oil is better for your engine than thin oil.*  
Yes, I too, remember the 60s commercials with Andy Granatelli trying to hold onto a screwdriver with STP on it. But, you must remember that was a marketing gimmick. You must also remember that was 40 years ago. Modern engines are manufactured to much more exacting tolerances than ever before. You can run very thin oil and get better fuel economy as long as you can maintain 15 – 20 psi idle oil pressure. Oil starvation at idle is a very real problem. I have some NASCAR engines running at 850 horsepower on 10W30 oils. Restrictor plate engines (450 horsepower) use even thinner oils.
6. *The more frequently I change oil, the longer my engine will live.*  
This was probably true in 1965, but it isn't true today. Today's oils can be run much farther without damaging the engine. You must remember that auto manufacturers recommend relatively short intervals because they are afraid owners might miss an occasional oil change.

Oil companies recommend short drains because they make money every time you change oil. Oil companies are in the business of moving crude oil. The more gasoline and lube oil base stocks they sell, the more money they make. We wouldn't want them to starve!

7. *I should change oil every 3000 miles.*

See debunked myth number six. This is one of the biggest myths out there! Ideally, oil should be changed when it needs to be changed, based on oil analysis. Many large truck fleets use oil analysis and achieve oil change intervals of 35-40 thousand miles. All bets are off if you have dirt ingestion, a coolant leak, or fuel dilution, but oil analysis reveals these things to fleet operators. Unfortunately, most light-duty vehicle owners don't perform oil analysis. So, what should you do to make sure you aren't leaving money on the table?

First, I would change oil according to operating time, not mileage. In today's engines, corrosive wear caused by the acidic by-products of combustion mixing with water vapor is much more harmful than abrasive wear. Stop-and-go driving keeps the engine oil from getting sufficiently hot to drive off acids and water vapor. The toughest service out there is garbage haulers, taxis, and urban buses, and they change oil as frequently as once per month. If your service is typical, you should be able to go four months before needing an oil change. If you're hauling heavy loads or towing a trailer, you should change oil every three months. This assumes you are operating the vehicle daily. If it sits a lot, you might be able to stretch your oil changes a little further. Of course, changing your oil more frequently won't hurt anything; it just costs you more money and gives the oil companies more profit.

8. *Synthetics are better than mineral oils*

The main reason oil is changed is to get rid of harmful contaminants (particularly the harmful byproducts of combustion) and to replenish spent additives (if you have no other problems such as coolant leaks). Axles and transmissions have no harmful byproducts of combustion to deplete additives, so their oil changes can be much longer and synthetics make more sense in those applications. However, if you must change oil to remove contaminants anyway, synthetics will cost you more money at each oil change for little or no benefit.

Synthetics make sense for engine oils only if you have some special requirements such as extremely low or extremely high operating temperatures. Of course, racers tend to utilize synthetics because they offer reduced friction, and racers want every last available horsepower. (Did you ever notice a racer saying he had enough power?)

I hope this brief but succinct article helps everyone to better understand engine oils and dispels some of the mysteries surrounding them.

John Martin  
TDR Writer

*Editor's Thoughts: In January of '05 there was an article on lube oils in Trailer Life magazine by Bruce W. Smith. A part of the article was a table with nine different oils for gasoline engines and four different oils for diesel engines. These unused oils were sent out for lube oil analysis. From previous TDR article research I had gathered lube oil analysis for two additional diesel oils: Cummins mineral-based Premium Blue and Cummins semi-synthetic Premium Blue 2000.*

*When new lube oil is analyzed you can get a good idea of the quality of the additive package that, as learned from Martin's experience, makes up 20-25% of the lube oil blend. Maintaining viscosity at higher temperatures, maintaining high alkalinity and protecting against wear with the right blend of calcium, magnesium, molybdenum, zinc, and phosphorus are important lube oil attributes. Readings for calcium and magnesium are a way to measure detergent content. Nitrogen levels give an indication of dispersant content. Zinc and phosphorous levels are an indicator of valve train anti wear performance. Some oils use Molybdenum and Boron, and some oils do not. I penciled-in the Cummins oil results to the bottom of the Trailer Life grid.*

*I was greatly disappointed to see that Wal-Mart Super Tech 15W40 Diesel oil stood toe-to-toe with other very respected brand names.*

*Why disappointment? Well, reconsider what John Martin said, "Consequently there is less and less difference between engine oil that barely passes the API certification test and one that is designed to pass by a significant margin. Therefore, oils meeting a given performance spec (example API CI+4) are approaching commodity status."*

*For all of my vehicle ownership years (let's see that is about 36 years) had I been duped? Had I fallen for the marketing hype? Or, as we know, the focus on lube oil base stock versus the importance of the additive package changed over the years. Is this a good excuse? I do not want to believe that lube oil is just a commodity. Yet the Trailer Life grid does not lie. The lube oil brands that they tested: Wal-Mart Super Tech, Castrol RX Super, Shell Rotella T, and Chevron Delo 400. And, as noted, I penciled-in the two Cummins oils.*

*Where does this leave us? I know that talking about lube oil is like discussing religion...you can talk until you are blue in the face, but you are not going to change what a person believes. The late article assignment to John Martin did not allow John and me to do our very own TDR "Blind Sampling from the Bottle" grid. Currently I am purchasing brand name and premium brand oils and I will be sending them out for oil analysis. The follow-up data will be in the next TDR magazine. The results will be interesting. Stay tuned...*

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