

The Right Oil and Filter: And Your Classic or Muscle Car (Part 1)

Your baby is at least 30 years old and you want to pamper it to extend its life. Do you spend up to \$40 a gallon for domestic synthetic, or possibly more for some Euro-exotic oil? And why not Racing Oil, after all baby is “hot!” My intent is to report the most recent research and test and boil it down to what you need to know to extend the life of your Studebaker or any other classic or muscle car.¹

▣ First, Some Basics ▣

▪ **It is all about 1975 and earlier models:**

This paper is intended for 1975 and older keeper, classic, and muscle gasoline and diesel automobiles.² It is fully applicable for most vehicles up to and including at least 1995. However, some of the additives that will be recommended have been known since 1976 to “poison” catalytic converters.³ I take no position on the morality or legality of use of the oils discussed below on post-1975 automobiles.

▪ **What “weight” oil should I use?**

Your automobile owner’s manual probably identified a specific viscosity “weight”, and grade. The viscosity was typically 30 in the 1960s, higher in the 1940-50s, with a lower viscosity for winter. However, most experts recommend that you use the modern Multigrades. For example, 10w-30 is a great replacement for an owner’s manual recommendation for 10 winter, and 30 summer. Some enthusiasts extend the higher and lower viscosities to meet perceived local conditions and driving habits. Living in Texas, I stick to 15w-40 for my SAE 30 recommended 1963.

Bottom line: use a multi-grade that include the recommended winter and summer viscosities.

▪ **What is this about API Oil Grades?**

For North America, the relevant grading scheme is controlled by the API.⁴ For keeper cars relevant to this paper, your owner’s manual will call for something like ML, MS, SA, SB, SC, or SD. Until recently, what grade to use was easy, get what ever was on the retailer’s shelf, as each new grade is better than the earlier grade. Recently, some caution is needed, as additives important to pre-1975 cars have been lowered.

Bottom Line: keep reading, a recommendation is developed below.

▪ **How long between Oil Changes?**

There are two answers for proper Oil Change Interval (OCI). The first is to change oil every 3,000, 5,000, 7,500, 10,000 miles based on the owner’s manual and the vague notion of “extreme use.” The second is change oil when it needs it. The military and commercial operators test oil and change it when it gets close to “worn out.” What is the catch? Including all costs, each test runs at least \$20 each time. It is cheaper to drain the oil every 5,000 miles and take it to the recycler.

Bottom Line: keep reading, a recommendation is developed below.

▪ **What about Oil Filters?**

This article assumes you use high quality full-flow oil filters. Quality does not mean expensive. Top filters frequently cost less than low quality filters.⁵ To determine if the filter is at least “good” check the box for at least 98% single pass efficiency SAE test method. If there are no filtration test data, keep looking. The best filters, like Wix,

and Baldwin are frequently kept behind the service counter. There are web sites for the filter obsessed, but the advice above will get you to the same result. **Bottom line:** buy oil filters with at least 98% single pass efficiency.

▣ Your Car and Modern Oils ▣

▪ **Are modern detergent oils safe?**

Before 1963, the API oil grades (SB and earlier) were non-detergent.⁶ In that era, engines had wider clearances, babbitt journals, and frequently had no oil filters or partial flow filters. Non-detergent oil allowed oil contaminants fall out of suspension and form that layer of gunk you remember at the bottom of the oil pan, and elsewhere on the engine. I remember once a year scraping the gunk off the head of my engine. Detergent additives in oil prevent and remove that gunk by keeping it in suspension until the filter removes it. As far as I am concerned, three cheers for high detergent oils! (If you have a keeper that has always used non-detergent oil, then adding modern oil will start cleaning up all that gunk. There is a possibility that gunk is all that is holding your seals together. Check the oil pan and top of head for a quick evaluation of if previous owners stuck to non-detergent.) **Bottom line:** Use detergent oil. If you have gunk build-up, watch for new leaks and replace oil filter every 500 miles until you see no gunk on the engine.

▪ **I store my keeper for weeks, and/or drive short trips, and/or have to use gasoline with Ethanol in it, how do I protect against water and acid damage?**

In three words, Total Base Number (TBN).⁷ TBN is a measure of how many additives are left. This is also a measure of how well your engine is protected against water and other corrosives, including ethanol, that accumulate from storage and short drives that do not heat up the oil enough to boil off the water and ethanol.

Bottom line: look for the highest TBN, recommend “10” or greater.

▪ **What is this about Cam and Lifter Wear?**

The vade mecum for this topic is the venerable 1977 SAE Journal paper titled “Cam and Lifter Wear as Affected by Engine Oil ZDP Concentration and Type.”⁸ It is the most often quoted source.^{9 10} Zinc, in the form of ZDP¹¹ of more than 0.12% (1200 ppm) is optimal for older engines with flat tappet cams.^{12 13} There are other wear mitigation additives. However, they do not have the decades of research and

use that makes me feel comfortable.

Bottom Line: use oils that have at least 0.12% zinc content.

▪ **What is this about Diesel Grade Oils?**

As fuel efficiency and anti-pollution requirements increased, diesel oil has improved over the years to meet the challenge. The happy coincidence is that this has raised detergency, anti-rust (TBN) and anti-wear (ZDP) additives. This peaked with API Grades CI-4 and CI-4Plus. This is excellent news for anyone with a keeper car. With the new CJ-4, these additives have been reduced.^{14 15} Using Product Data Sheets (PDS) or Virgin Oil Analysis (VOA), you should attempt to identify CI-4 or CI-4plus oils that have not been modified. As these are low volume, auto parts and Big Box stores rarely carry them, but rural and commercial distributors do. Before buying, do your own research to ensure that the formulation has not changed. With the very high TBN and detergency, you probably could have 10,000 mile OCI (change the filter at 5,000), but I do

<p>What to Look for in your Oil Zinc \geq 0.12 % TBN \geq 10 Detergency (Calcium) \geq 0.18%</p> <p>What to look for in your Filter Single pass efficiency \geq 98%</p>

not recommend it.

Bottom line: CI-4 oils are an excellent choice.

▪ **What about Extended Performance/High Mileage Oils?**

These add some “seal conditioners” and anti-smoke additives but the eight I have researched do not have reasonable levels of anti-wear additives.

Bottom Line: avoid.

▪ **What about Racing Oils?**

These are intended to protect during conditions that normally destroy engines. Not surprisingly, the PDS I find show the highest levels of anti-wear additives (ZDP). However, these oils are intended to be dumped at the end of each race. I do not know how they would stand up to 3,000 miles of stop and go driving. Also, wow! are they expensive!

Bottom line: I will not pay that much money.

▪ **What about synthetic?**

Full disclosure, I am a major synthetic oil fan. I only use synthetics in engines, transmissions, brakes, tractors, greases, differentials, power steering, turbo chargers, etc. My only exception is in the Studebaker 289 engine. The thinner oil is likely to run even faster out of my engine seals. Until I get the time and money to fix the seals, I will use non-synthetic oil, aka “dino.”

Bottom line, use conventional oil until you fix your oil leaks.

▪ **What about Oil Additives?**

I have seen no independent evidence that any oil additive is needed. In fact, with the WWW information explosion, you will find documentation on most additives, including video streams showing how much harm they do. Especially damaging is anything that “fixes” your engine by thickening the oil (viscosity improver). There are two possible exceptions. The first is “seal conditioner.” I have tested them on the hydraulics of my 30 year old tractor, and my Studebaker 289. It is not clear that this stuff works. The second is a hyper-load of ZDP to boost zinc-deficient oils. As long as oils are available that meet the minimum need, there is no advantage to add these. **Bottom line: buy the right oil, do not use additives.**

▪ **What about engine break-in?**

This is well documented elsewhere. I have no recommendations beyond using high zinc content.

▪ **Should I look for the API Seal?**

BEWARE the FAKE API seal. How can you trust a company that fakes a certification label? **Bottom line, only use oils with the Official API seal as shown in the reference.**¹⁶

Bringing It All Together

- ✓ Use CI-4 and CI-4Plus oils (see box for a partial list as of August 2007)¹⁷. Avoid any oil with “CJ-4” on the label. You can use Synthetic oils, if your engine is “tight enough”.
- ✓ Use only high quality oil filters with Single pass efficiency $\geq 98\%$
- ✓ Change your oil and filter (OCI) every 5,000 miles. Take your oil and filters to the recyclers!
- ✓ Do not use High Performance/Extended Life oils unless they meet the criteria in the box above.
- ✓ If you must use non-detergent oil, get one with zinc $>0.12\%$, they do exist!
- ✓ Avoid the unnecessary costs of Racing Oils, and Oil Additives.
- ✓ Only buy oils with legitimate API certification seals.

Is there more I can read?

I have attempted to keep this specific to 1970s and earlier keeper, classic, and muscle cars. The best on-line source that does not get obsessive-compulsive is the Oil Bible.¹⁸ Also, do not miss the excellent LN Engineering article on this topic.¹⁹ If there is adequate interest, I will prepare Part 2 on how to correctly estimate how much additive it takes to get your current oil to the recommended levels.

Recommendations.

This is a rapidly moving field. Brands are added, removed, and changed without notice. There are many people who are many people who, on their own nickel, pay for testing of these new or re-formulated products. For this reason, the original table has been replaced by a web file that will be aperiodically updated as new data is found. The two files are found at

<http://systems-engineering-associates.com/avocation>

Click on “oil filter” or “Oil Study Update”

¹ Please download and study the references. I welcome discussion based on facts.

² November 1999 issue of "Car and Driver", "Searching for the right motor oil for 'keeper cars'"

³ SAE Paper 760562, The Effects of Phosphorus-Containing Engine Oil Additives on Exhaust Oxidation Catalyst Degradation, J. F. Caracciolo, J. A. Spearot

⁴ API engine Oil reference.

<http://www.api.org/certifications/engineoil/categories/upload/EngineOilGuide2006.pdf>

⁵ I use Wix or NAPA Gold, which are identical except logo. Cheapest source: <http://fleetfilter.com>.

⁶ http://en.wikipedia.org/wiki/Motor_oil, a great introduction

⁷ <http://www.bikalabs.com/helpcentre/glossary/tbn-total-base-number>

⁸ SAE 770087, Cam and Lifter Wear as Affected By Engine Oil Zdp Concentration and Type 02/01/1977 Author(s): Loren G. Pless, John J. Rodgers 2.

⁹ SAE 2004-01-2986 : How Much Zdp Is Enough? Author(s): Michael L. McMillan, Robert M. Olree

¹⁰ SAE 831760 : Effect of Engine Oil Zinc Dithiophosphate (Zdp) Additive Type on Cam and Lifter Wear in Taxi Service, Donald J. Smolenski, Richard H. Kabel 3.

¹¹ ZDP is also known as ZDDP, ZnDTP, or ZDTP.

http://en.wikipedia.org/wiki/Zinc_dialkyldithiophosphate

¹² Hot Rod Magazine.

http://www.hotrod.com/techarticles/engine/flat_tappet_cam_tech

¹³ Indiana Chevelles

<http://www.indianachevelles.com/newsletter/July07Newsletter/page2.htm>

¹⁴ OverDrive Feature Article, October 2004 Oil Over Again , Tim Barton, <http://www.etrucker.com/apps/news/article.asp?id=45118>

¹⁵ OverDrive Article, February 2007 Side by Side: CJ-4 vs. CI-4/CI-4 PLUS oil, Tom Jackson

<http://www.etrucker.com/apps/news/article.asp?id=58010>

¹⁶ API Oil Grades Reference Card.

http://new.api.org/certifications/engineoil/categories/upload/ShelfCard_English.pdf

¹⁷ Turbo Diesel Magazine test,

http://www.turbodieselregister.com/TDR57_Oil.pdf

¹⁸ http://www.carbibles.com/engineoil_bible.html

¹⁹ <http://www.lnengineering.com/oil.html>