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ZPlus™ Tech Brief #15

Extended Oil Change Intervals

We field a variety of questions from customers at ZPlus™, and one question we are asked frequently is whether we agree with extended oil change intervals. In a manner similar to the ZDDP issue, engine wear due to extended oil change intervals can be hard to detect in the short term. If you seriously evaluate the extended oil change issue, several startling truths emerge. Before we get to the conclusions, we will cover the background on the subject.

Why Change Oil at All?

The base oil used in quality mineral or synthetic oil degrades very slowly in normal use, so why does oil have to be changed at all, you ask? There are two major reasons why oil should not be left in the sump of an engine forever: in general, it is important to dump contaminants which have been deposited in the oil, and the additive package becomes depleted.

When mineral oil is heated, the lighter fractions evaporate which makes the viscosity increase, and some percentage of the molecules degrade into varnishes and sludge. An oil change restores the lubricant with the original desired characteristics. Synthetic oil can be much more resistant to heat-related effects, but its additive package can be depleted just like mineral oil. Once this has happened, the acid control can be depleted, allowing corrosion of engine parts, or the anti-wear additive can lose effectiveness and allow accelerated wear. A fresh oil charge brings these additives back in spec. Whether you are using mineral or synthetic oil, the oil change removes soot, dirt, acids and other contaminants along with the old oil.

For many decades, the generally accepted best practice was to change oil every “3 months or 3000 miles.” For engines made in the days of carburetors and low-grade mineral oil, this recommendation is probably a minimum. For vehicles made in the past few years however, extended oil change intervals are being recommended, in some cases for as long as 15,000 to 20,000 miles.

There is certainly a movement underway, especially among European auto manufacturers, to make engine oil changes a thing of the past. Given the amount of research currently being performed in materials, engine design and oil formulations, a single oil charge for life is a definite possibility at some point in the future. This issue is inextricably bound with the question: how many years or miles constitutes a vehicle’s lifetime? The definition of “lifetime” is different from place to place around the globe. In a country like Japan, lifetime is less than 10 years and 60,000 miles. In Cuba or other developing countries, lifetime is often measured in decades and hundreds of thousands of miles.

There are two main ways to remove debris from engine oil: excellent filtration and replacing the old oil with new clean oil. The Society of Automotive Engineers (SAE) published an excellent paper[1] in which the relationship between fine particulates in oil and engine wear is established. The SAE states there is a steady increase in wear metals and debris as the oil stays in service. The conclusions point to the importance of maintaining good oil filtration, but in addition, changing the oil itself is necessary in order to get rid of liquid contaminants and renew the additive package.

[1] Staley, D.R. (1988) “Correlating Lube Oil Filtration Efficiencies with Engine Wear”. SAE Truck and Bus Meeting and Exposition (Paper 881825).

Are Extended Oil Change Intervals Good For Engines?

Having the oil changed less frequently does keep fuel residue, acid, soot and dirt in circulation for a greater amount of the time, and engine parts are designed to run with new oil. Modern engine combustion chambers are tighter due to improved materials and manufacturing tolerances. Compared to engines of old, there are fewer combustion products of moisture, soot, fuel and acids which get into the oil. Modern fuel management means far less cylinder wash down or fuel contamination of the oil when cold, and less soot under enrichment conditions than with carburetors. Modern synthetic oils degrade much more slowly than did the older mineral oils on which short oil change interval recommendations were made.

All of these technological advances can potentially help a newly designed engine wear more slowly than its 30-year-old counterpart. This slower wear is somewhat negated by the longer oil change recommendation, which keeps the contaminants circulating in the oil instead of removing them.

The use of regular oil tests by truck fleet operators is a good example of how to keep track of when an engine needs fresh oil. This is helpful because these elements are common engine metals which are released into the oil when an engine is experiencing wear. Consumers find oil testing much less viable, because an oil test can cost as much or more than an oil change, so it is just better to change the oil.

Research[2] shows that an engine will contaminate oil with wear metals linearly with the number of miles in service. This means that the longer oil is kept in the sump, the more wear occurs to the engine. There is not a "safe" number of miles below which no wear occurs. Of course, this research was performed using engines with combination full-flow and bypass filters. This system greatly reduces the amount of wear particles in the oil at any given time. On almost all passenger vehicles full-flow filters alone are used.

Can Extended Oil Change Intervals Be Used With Older Vehicles?

The short answer is: no. This is because it is the combination of modern engine and power train control technology in conjunction with modern synthetic oil that has allowed for these longer oil change intervals. This means most, if not all, older vehicles are not appropriate for extended changes. Even those which are can only do so with modern premium synthetic extended change interval oil.

If you read the oil manufacturer's recommendations for extended change intervals, you will see wording similar to what Mobil put on their Extended Performance Fully Synthetic Oil:[3] *"Excludes severe service applications involving racing and commercial use; frequent towing or hauling; extremely dusty or dirty conditions; or excessive idling. If your vehicle is covered by a warranty, follow the vehicle's oil life sensor or the oil change interval recommended in your owner's manual."* In other words, the vehicle's manufacturer must explicitly suggest an extended oil change interval. Even then the recommendation only applies in the most casual and normal driving conditions. This means you must follow the shorter, non-extended interval if you use the engine in harsh and dusty driving conditions, for short trips, extended idling, sporty driving, towing, mountain driving, etc. This is because the extended change interval can only be considered when an engine has the best control of its mixture, the oil is the least stressed and few contaminants re-introduced to the engine. If any of these conditions are not met, the oil change recommendation is reduced to the more commonly found 3000-6000-mile interval, or whatever is recommended by the vehicle manufacturer.

Older vehicles, especially those with carbureted engines, or early fuel injected engines are far less suited to long change intervals. Many have significant amounts of blow-by contaminating the oil with soot, fuel and moisture which must be periodically removed. In worst cases, the filter can clog from soot and other debris, which will force the by-pass valve to open. This will cause unfiltered oil to circulate to the bearings and other engine parts, which rapidly accelerates wear.

Despite using synthetic oil, which is vastly improved compared to older mineral oils, extended oil change intervals cannot be applied to these older engines. Of course, the reason is the extended change interval which is a product of new engine design in conjunction with new synthetic oil design.

If you want to experiment with lengthening the oil change interval on your older vehicle, then the only way to safely approach it is to perform periodic oil sampling and analysis, so you know when an oil change is needed. If wear metals increase rapidly between tests, an oil change is required. Of course, an oil analysis costs as much or more than an oil change, so while it may be interesting, it is false economy.

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[2] McGeehan, J.A., Chevron Corp, Uncovering the Problems with Extended Oil Drains, Machinery Lubrication magazine, 9/2001.

[3] http://www.mobiloil.com/USA-English/MotorOil/Oils/Mobil_1_Extended_Performance_FAQs.aspx#FAQs2

Are All Oils Suitable for Extended Oil Change Interval Use?

In general, it is best to stick to oils which are specifically formulated for extended duty service. Most of these oils are formulated with synthetic bases which degrade more slowly than do mineral based oils. Also, the additive package is enhanced to remain effective for a longer period of time than will regular oils. Examples of this type of oil are the Mobil Extended Performance Fully Synthetic Oil, Valvoline SynPower XL, Castrol Edge or Amsoil XL Extended Life Synthetic Motor Oil, as well as others which have been specifically formulated for compatibility with extended drain intervals.

Underscoring this point is the successful lawsuit brought against Mercedes-Benz in 2001[4] regarding the use of synthetic or mineral oil for extended oil change intervals. In this case, owners of Mercedes-Benz vehicles equipped with the oil change alert system who used mineral oils and who followed that system were experiencing extensive engine damage and sludging. This underscores the point that the extended oil change interval is the result of modern engine management systems and superior precision of current engines in concert with the superior characteristics of synthetic oil.

What Happens to the Additive Package During Extended Use?

If an oil is rated for extended service, the base stock is usually synthetic and very stable over time. The same cannot be said for the additive package. ZDDP, for example, decomposes as it works, so the active compounds of ZDDP slowly decrease over time and use. Detergents act by binding to polar contaminants like metal and carbon particles, so they can become saturated. When this happens active detergent levels can become too low to be effective. VI (Viscosity Index) extenders are long chain polymers and can be broken down with repeated heat and shear cycling, which leads to a permanent reduction in viscosity. In order to deal with these consequences, the manufacturers of these extended drain interval oils have made adjustments to their formulations. In some cases they boost the available level of an additive, in others they switch to a more long-lasting compound which hopefully serves the same functionality. Whether these extended drain formulations give equivalent protection to the more conventional formulations, despite having been certified by the API, is still open to debate. You have to remember the situation with API oils is just like a graduating class from a school; everyone gets a diploma. But, there is the individual who barely graduated with all Ds for grades, and then there is the class valedictorian. An oil being certified by the API merely means it has passed the minimum specifications for that grade. Within a group of oils which have achieved a certification for a specific grade (such as 10W-30 API SN), there is a huge range in ultimate performance from an oil which barely qualified to one which passed with margin to spare. When considering an extended drain interval, the ultimate performance of an oil becomes much more important than if you are using a normal drain interval. Considering this, the API rating is less indicative of superior extended drain performance than a guarantee of minimum normal drain performance.

What Do Dealers Get From Less Frequent Oil Changes?

By recommending extended oil change intervals, a dealer is trading off a certain loss of income performing oil changes for an increase in new vehicle sales. They have always made money on oil changes and they stand to lose some of this income with the extended intervals. Balancing this is the fact the extended oil changes do indeed reduce the total service life of an engine, ultimately resulting in the sale of a new car. After all, these people are in the business of selling new cars, so they are aware of this side of the equation.

What are the Manufacturer's Incentives?

To understand these extended oil change interval recommendations, let's consider the reasons why a manufacturer would suggest it in the first place. After all, the cleaner the oil, the more reliable and long-lived the engine. Wouldn't a manufacturer want to increase the likelihood that an engine would last, at least until it was out of warranty? As it turns out, with current fuel injection, engine manufacturing tolerances and the benefit of modern oil, it is not much of a feat for a modern engine to make it through the warranty period, even with infrequent oil changes and regular mineral oil.

The extended oil change interval originated with vehicles made in Japan, where car ownership conditions are very different than in the U.S.. On average in Japan, cars are discarded in less than 10 years and driven less than 6000 miles per year, so the drivetrain warranties are effectively a lifetime warranty. It is also much more expensive to keep a car for many years in Japan than it is in the U.S.. Inspections called "*shaken*" are required, starting at three years from a new purchase, and every two years afterwards. These inspections can cost as much as $3000, which greatly incentivise

[4] http://www.paed.uscourts.gov/documents/opinions/03D0139P.pdf

people to trade the vehicle in for a new one. Japanese vehicle taxes, or "*zeiken*" are steep, and in most places you must pay a parking fee, or "*shakoshomei*." The Japanese car insurance, called "*hokken*," also costs more on average than in the U.S.. At the end of a car's life the final owner must pay a recycling tax, which gives an additional incentive to trade in a still-running car.[5] In this environment, there is little reason to maintain or change oil in a car in an effort to make it last more than 50,000 to 60,000 miles.

The main reason U.S. car manufacturers are now recommending extended oil change intervals is marketing pressure. Japanese and other car manufacturers are using environmental consciousness as a new marketing tool to take advantage of consumer's increased awareness of the environment, despite the actual negative impact extended oil changes have on the environment. (*You didn't read that last sentence wrong; extended oil changes do indeed have a negative environmental impact which we discuss later.*) U.S. manufacturers have to follow suit or be held at a competitive disadvantage. Also, with the increasing price of engine oil, a longer change interval dangles the promise of the potential savings of half as many oil changes in front of a consumer. These marketing tactics are not in themselves bad, but make no mistake: if not for market pressure, manufacturers would not be advocating extended oil change intervals any more than they would want to offer 100,000-mile warranties.

Ultimately, the most compelling explanation of why manufacturers can even suggest extended oil change intervals is: engine life has increased so much in the last twenty years, they can afford to sacrifice some engine life for the aforementioned reasons without a severe impact on warranty repair costs. Realistically speaking, the average car owner uses a car for basic transportation, and does not expect to own that car forever. Therefore, the compromise in engine life from performing extended oil change intervals may be acceptable.

The situation for performance and classic car owners is different; they place a premium on preserving the life of their precious cars. For them, an extended oil change interval is extreme false economy, especially in the case of classic car owners. Remember that at the time of manufacture of a 1970 car, 100,000 miles was about all anyone expected from an engine. This was due to wear caused by carburetors, relatively crude machining and, by today's standards, poor mineral oils. Although these classic cars can take great advantage of today's superior oils, most still use their original carburetors, and therefore still suffer from raw fuel wash down and poor mixture control. These factors severely compromise lubrication, even when using synthetic oils.

Do Extended Change Intervals Help Consumers?

From a consumer's viewpoint, the most immediate effect of extended oil change intervals is to save trips to the dealer and the cost of the more frequent oil changes. If a consumer drives 15,000 miles a year, and a dealer charges $50 for an oil change, then changing the oil every 15,000 miles saves $200 per year over changing the oil every 3000 miles. Some consumers will also feel happy to have not "wasted resources" with frequent oil changes. From a longer-term perspective, it means the engine will wear more quickly. Most engine systems manufactured these days will give acceptable service for five years or more. Considering that most vehicles are owned for 4 years on average,[6] few new car engines will give trouble in warranty.

The total amount of energy for the manufacturing process and plastic feedstock for a conventional gasoline engine automobile is roughly equivalent to 0.23 gallons of oil per pound of vehicle weight. This means there is an embedded energy cost of 700 gallons of oil to manufacture a relatively small 3000-pound car, and up to 1400 gallons of oil for a large 6000-pound SUV or truck.[7,8] If the engine oil sump holds 4 quarts (1 gallon), it would take 700 oil changes to equal the amount of oil it takes to make one car! Due to the large amount energy needed to process nickel and other metals in the batteries, a Prius hybrid actually uses 818 gallons of oil to manufacture, despite only weighing a bit more than 3000 pounds.

There is a lot of non-technical buzz in support of extending oil change intervals, and anyone using Google to search the Internet for "*Extended Oil Change Interval*" can see it for themselves. What is disturbing about all of the links and studies we found is they all have ***oil*** life as the focus, not ***vehicle*** life, nor lowest amount of total energy or oil used. This means that those who want to change oil less frequently believe it holds a benefit, whether it be less oil, money or energy used.

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[5] http://www.japaninsurance.net/driving.html#4-a

[6] http://nhts.ornl.gov/tables09/fatcat/2009/vehicle_VEHAGE.html

[7] Keoleian, G., K. Kar, M.M. Manion, and J.W. Bulkley, Industrial Ecology of the Automobile: A Lifecycle Perspective, Warrendale, PA: Society of Automotive Engineers, 1997.

[8] http://www.transportation.anl.gov/pdfs/TA/106.pdf

Most of the discussions center around statements such as, “I want to see how long I can go without changing my oil...,” ”I used Magic brand Synthetic oil and now I can double my oil change interval,” or testimonials like, “I tripled my oil change interval and the car hasn’t blown up yet...,” etc. We have yet to find a serious study which seeks to determine how long the engine lasts in a car when extending oil change intervals. Every car and driving situation is different, but our focus should be not on how long the ***oil*** lasts; we don’t drive oil and the oil is not the capital investment. We drive ***cars***, each of which cost us an average of $15,000-$30,000. At $50 per oil change, we could change oil 300-600 times to equal the cost of the car, and 700-1400 oil changes equal the amount of oil it took to make the car. Our focus should be on how can we minimize the total oil consumption per mile driven with the cost of oil to manufacture the vehicle taken into account.

For those blind optimists reading this who think there is no engine life penalty associated with extended oil change intervals, the best data available disagrees strongly. In a study performed by the Cummins Inc.,[9] engine power tests were performed on engines which had different oil change intervals of 12,000 and 25,000 miles. Diesel road tractor engines have very large sump capacities, and their oil change intervals are naturally longer than for consumer vehicles.

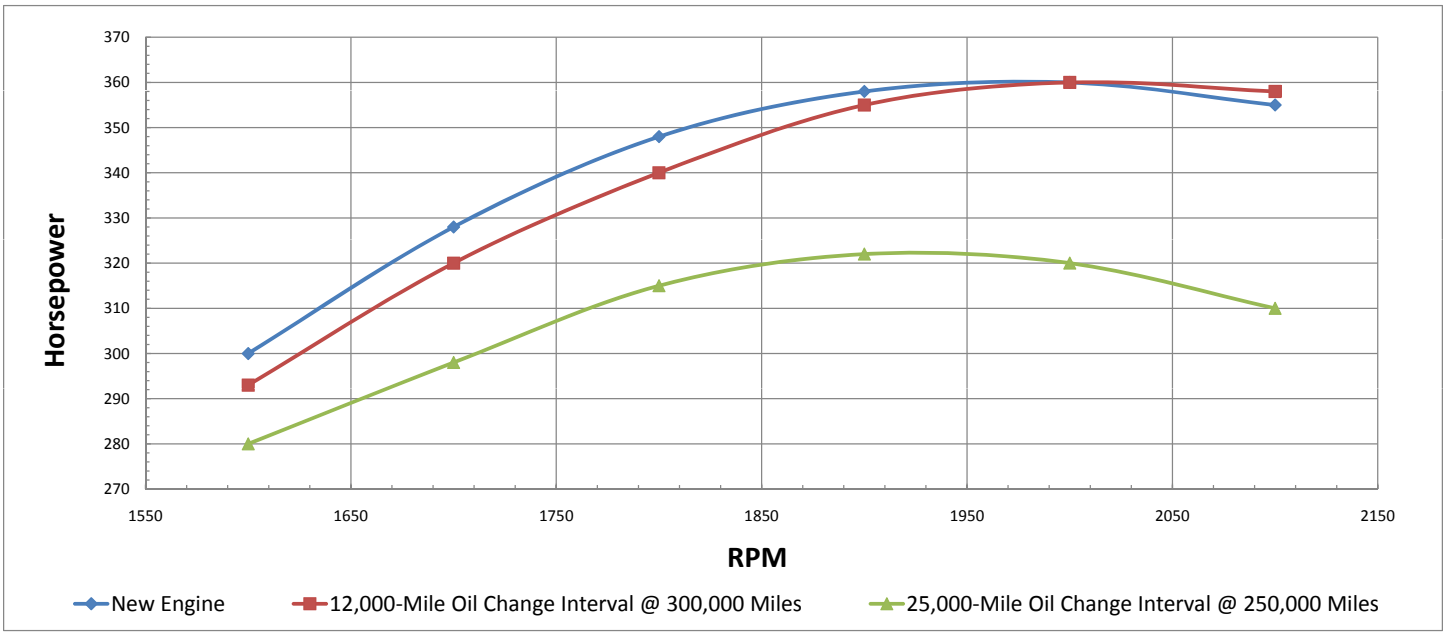

figure 1 - Engine Power Loss as a Function of Oil Change Interval

Figure 1 graphically illustrates how after 300,000 miles with regular 12,000-mile oil changes there is a small 2% average across the board power lost due to wear, indeed, the overall parasitic friction loss is lower which raises the available power at high rpms. When the oil change interval is raised to 25,000 miles, even at a lower total accumulated mileage of 250,000, the power loss at all engine speeds due to engine wear is dramatically higher, averaging over 10%!

A Million Mile Comparison

In order to get an idea of how the total amount of oil used in a vehicle’s lifetime works out for different oil change intervals, let’s compare two different oil change strategies; every 3000 miles and every 15,000 miles. In both cases we will use a car which takes 700 gallons of oil to manufacture and has a 1-gallon oil change. In our example, we will aggregate the results of 66 average Americans driving 15,000 miles per year, to get a total of a million miles driven in each case. We will hypothesize that the group which changes their oil every 15,000 miles will get an engine life of 150,000 miles before the car needs replacement, and the group changing oil every 3000 miles can go 300,000 miles before the engine fails. With a modern vehicle, 300,000 miles is not an unrealistic engine life expectancy, given proper maintenance.

The 15,000-mile oil change strategy works out to use 6.66 cars and 66 1-gallon oil changes to drive a million miles. The oil used to make the cars and change the oil for a million miles in this case, totals 4728 gallons.

[9] McGeehan, J.A., Chevron Corp, Uncovering the Problems with Extended Oil Drains, Machinery Lubrication magazine, 9/2001.

The 3000-mile oil change group ends up using up 3.33 cars and 333 1-gallon oil changes in the same million miles, totaling 2664 gallons of oil, only 56% as much as the 15,000-mile oil change group. This saves almost enough energy to replace these 3.33 cars.

Alright, you say, but what if the 15,000-mile oil change engine lasts the same 300,000 miles as the 3000-mile oil change group? All research we have seen and done says this is not the case. Indeed in our experience changing the oil at greater than 10,000 miles usually results in an engine life of less than 200,000 miles. Hypothetically the 15,000 mile oil change group would save about 270 gallons of oil, merely 38% of what it takes to make one new car. As a matter of fact, the break-even point between the two strategies would occur if the 15,000-mile oil change cars lasted over 274,000 miles, or 91% as long as did the 3000-mile group, which is also highly unlikely. A summary of this concept is presented in figure 2.

		3000-Mile Oil Change Interval						15,000 mile oil change interval				
Vehicle Type		# of Oil Changes	Total Oil Changed	# of Veh. Made	Total Oil to Make Vehicles	Total Oil in 1M Miles		# of Oil Changes	Total Oil Changed	# of Veh. Made	Total Oil to Make Vehicles	Total Oil in 1M Miles
3000 lb. Gas Non-Hybrid		333	333 (4-qt. sump)	3.3	2331	**2664**		66	66 (4-qt. sump)	6.7	4662	**4728**
3000 lb. Gas Hybrid		333	333 (4-qt. sump)	3.3	2724	**3057**		66	66 (4-qt. sump)	6.7	5448	**5514**
6000 lb. Gas SUV		333	416 (5-qt. sump)	3.3	4662	**5078**		66	83 (5-qt. sump)	6.7	6660	**9407**

figure 2 - Total Oil Used in a Million Miles of Driving for Different Oil Change Intervals

If the oil is changed more often, the overall cost is higher because you are buying more oil. As the oil is changed less infrequently, the engine life is shortened, and the replacement vehicle costs make the total cost of ownership higher. There is an oil change interval somewhere in the middle which represents the minimum cost to the owner.

To determine the interval which results in the lowest cost would require extensive testing and modelling of the variables involved. The optimum interval is affected by engine type, engine load, driving style, climatic conditions, air-borne dirt, fuel contaminants, oil quality and others. This may be one of the reasons there have been few studies to definitively pin down a lowest cost oil change interval. If there has been such a study, the results would not apply to all cars and driving styles. The best we can hope to do is follow the manufacturer's oil change interval recommendations, and hope they have done due diligence in developing that recommendation.

After extensive searching of tribological research documents, we uncovered an excellent study conducted to determine the total cost and oil consumption effects of the oil change interval on marine ship engines.[10] The data is very clear and unequivocal on the subject of engine life as a function of oil changes; there is indeed an engine life penalty associated with extending the oil change interval. The focus of that study was to determine the lowest cost per hour of engine operation, which is similar to what most car drivers want; the lowest per-mile operating cost.

Although the actual results and recommendations of this marine engine study cannot be directly applied to your or my car engine, we believe the general findings can apply. Keep in mind, commercial engines like those found in large ships or over-the-road tractors are much more rugged and have much larger oil sumps than do passenger vehicles after compensating for displacement. The reason for this is, of course, to dilute the contaminants in the oil as well as allow for more residence time in the sump to cool off and drop its sediment load. This means the findings of this study regarding the effects of oil change interval on engine life are magnified for a passenger car with a much smaller oil sump. In order to apply the findings, we have developed the graph in figure 3 illustrating the findings of the study, but one in which the actual numbers are normalized to the minimum cost operating point. In other words, the study concluded the minimum operating cost was 1.62EUR/hour when the oil was changed at the 775 hour intervals, but for our purposes this point will be a cost factor of 1 for an oil change interval of 1.

Referring to figure 3, changing the oil at the manufacturer's recommended normal interval results in a relative cost factor to operate of 1.

[10] H. Kaleli, E. Yildirim, *Determination of Oil Drain Period in Naval Ship Diesel Engine*, Tribology in industry, Volume 30, No. 3&4, 2008. pp 21-30.

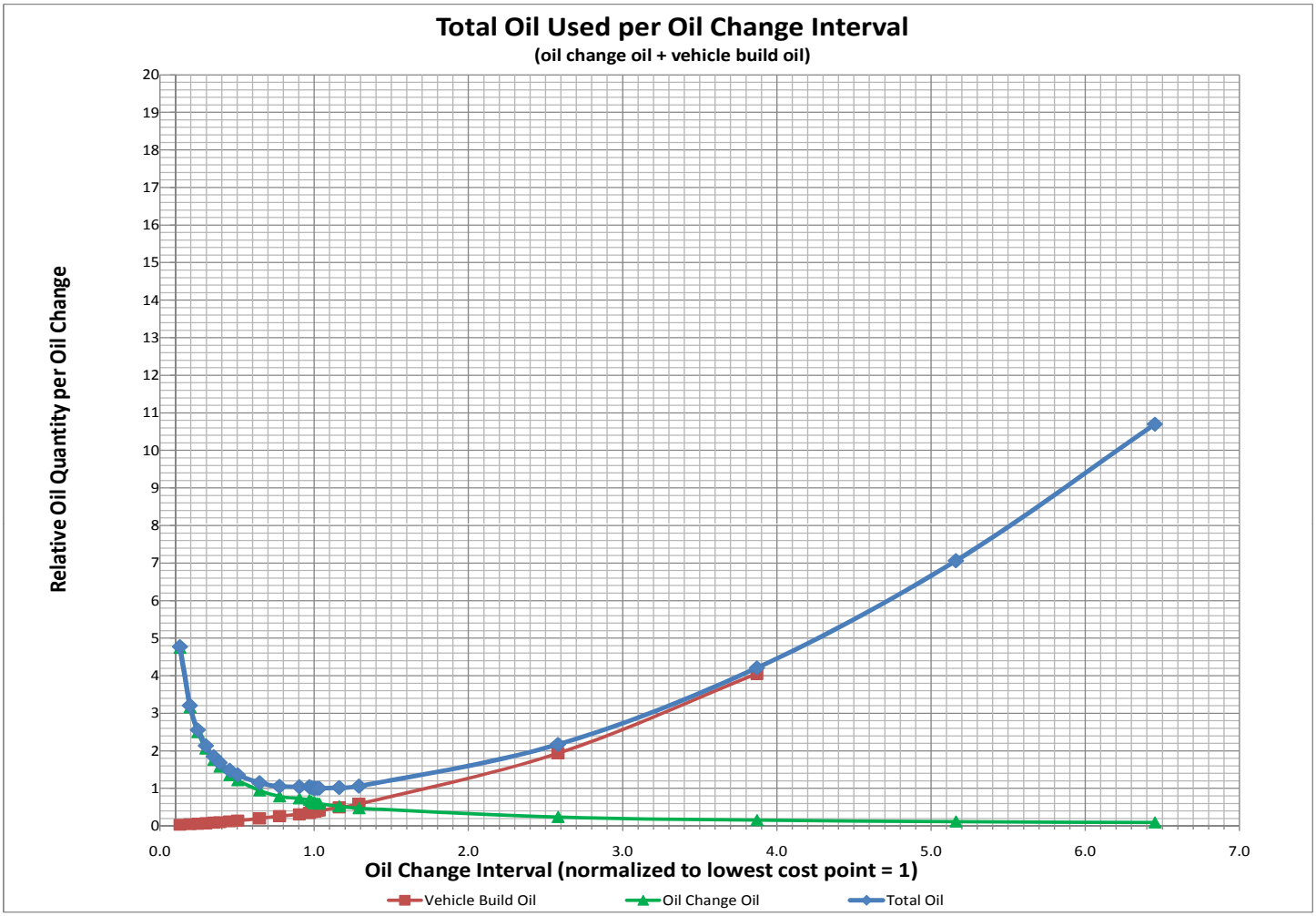

figure 3 - Total Oil Used Per Oil Change Interval as a Function of Oil Change Interval

Changing the oil twice as often (at one half the recommended miles) results in a cost factor per mile of 1.4. Changing the oil five times as often (at one fifth the recommended miles) results in a cost factor per mile of 3.1. Conversely, changing the oil on an extended oil change interval of twice as long as the normal interval, results in a cost factor per mile of 1.65. Changing it at five times as long as the normal interval results in a cost factor per mile of 6.8. The factor which makes extended oil changes so much more expensive is more frequent engine (or vehicle) replacement, whereas the cost factor behind more frequent oil changes is mostly the cost of oil. What the chart does not show is the hassle of getting a new car, rebuilding the engine, or the energy required to recycle the metal and other components. It also doesn't give any insight into the environmental effect of either the manufacturing or disposal of the vehicles.

Do Extended Change Intervals Help the Environment?

A true environmentalist should be concerned with the oil change interval which represents the minimum amount of energy (and oil) used in the life-cycle of the vehicle. It may seem on first consideration to be the same interval as the lowest cost, but there are other factors which change the equation. Remember, when either the oil or the car is at end-of-life, it really isn't the end of the line for them. From an energy standpoint, oil effectively performs its lubrication duties with virtually zero energy loss, indeed 90% of the energy value of the oil is recovered after recycling. However, recycling a vehicle back into raw materials takes on average 46% of the energy it took to make the original virgin materials.[11] So let's plug these numbers into the complete life cycle of a car and see how this changes things. The energy used as a function of oil change interval is shown in figure 4.

[11] Morris, Jeffrey, *Recycling versus incineration: an energy conservation analysis*, Sound Resource Management Group, Inc., I19 Pine Street, Suite 203, Seattle, WA 98101. U.S.A..

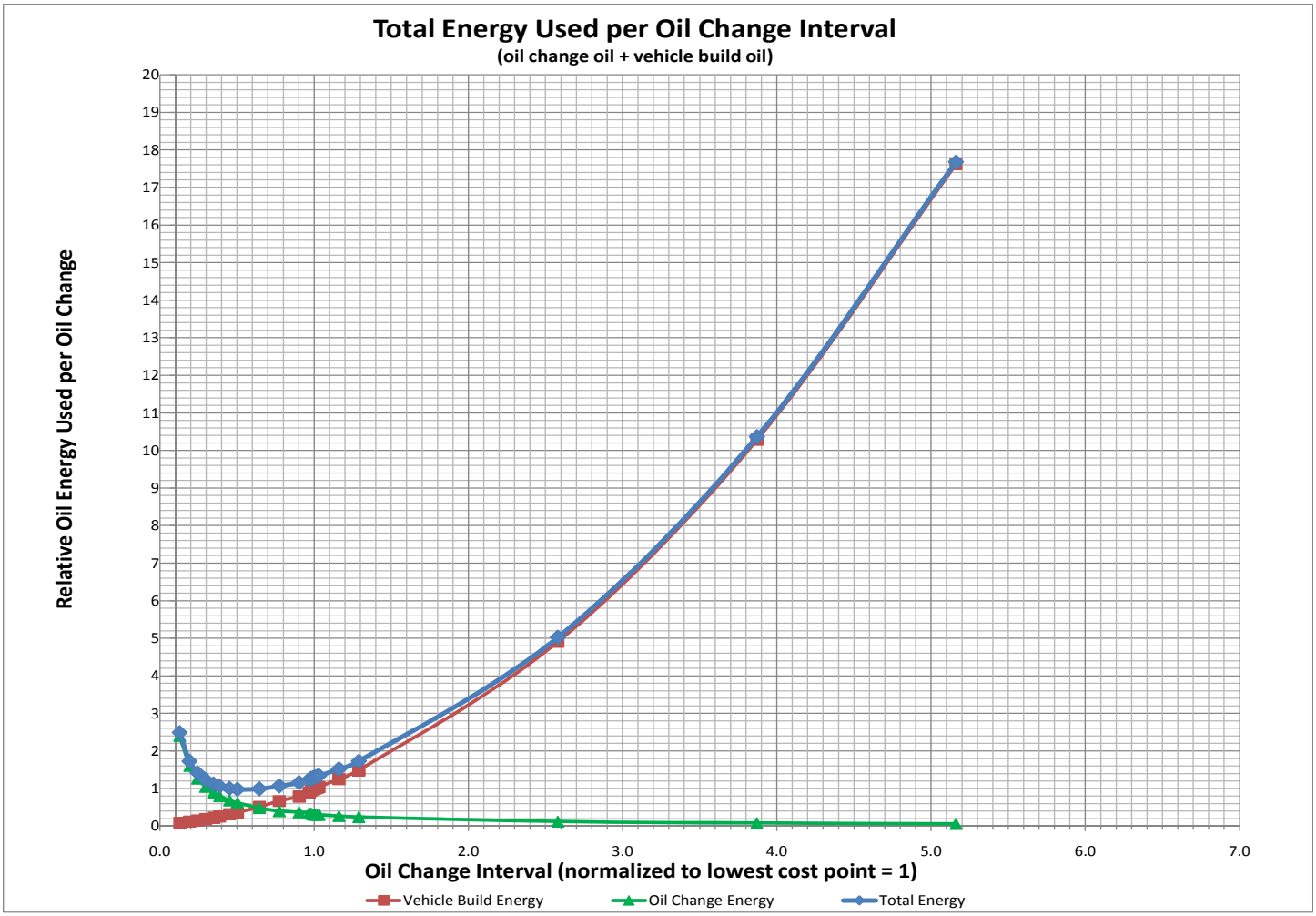

figure 4 - Total Energy Used Per Oil Change Interval as a Function of Oil Change Interval

From figure 4 we see the oil change interval which uses the least amount of energy occurs at approximately one half of the manufacturer's suggested interval. Even changing your oil five times more than recommended only raises the total energy used per oil change by a factor of 1.7. On the other hand, changing oil at an interval five times longer than recommended uses 17 times as much total energy per oil change. From an oil usage perspective and given the extreme amount of energy which is used in manufacturing a new vehicle, it wastes oil to change the oil at longer than the manufacturer's recommended normal change interval.

As a matter of fact, the minimum energy usage is reached at one half of the minimum cost oil change interval. At this point, the cost to the vehicle owner is only 1.35 times the lowest cost. It is clear to see from the graphs in figures 2 and 3, the best returns on engine life, cost savings and total energy used occur at or at less than the manufacturers suggested normal change interval.

After reviewing the data, it appears people who flock to the extended oil change interval have indeed been mislead. But those of us who are in the business of maintaining engines have suspected this all along, it just took some real-world data to bring the facts to light.

The bottom line is: it is your money and you make your own choice. Replace your oil at the suggested normal interval or more frequently, otherwise you will replace your engine or car more frequently and contribute to ruining the environment.

In all seriousness, given the relatively poor quality of many other car systems compared to the engine, a reduction in engine life may not be the final reason for discarding the vehicle. On the other hand, someone who is considering keeping a car for an indefinite period or who owns a classic car will want to question the logic of less frequent oil changes.

Conclusion

There will be those people who think, "*of course ZPlus™ would advocate frequent oil changes because it would just help them sell more ZDDPlus™*." The truth is we advocate the correct oil change interval. In fact, we developed ZDDPlus™ in order to get the protection of ZDDP at a price less than boutique oil, so we certainly do not advocate wasting money on too-frequent oil changes.

In 1987 GM published a blanket oil change interval recommendation for all 1987 Buick engines. In this they stated a normal change interval of 3000 miles. An allowance was made to extend this to 7500 miles ***if*** the driving conditions are light, just as the current extended oil change recommendations state. We tend to replace the oil in our 1985-1987 Buick Turbo Regals on an average of every 3000-4500 miles. We feel comfortable doing this because the Turbo Regal has modern electronic fuel injection, and because of the superiority of modern oil compared to that available at the time. We have also verified with our own instrumentation that the combination of modern synthetic and the proper level of ZDDP has keep wear at bay in our cars, even at one and a half times the manufacturer's recommended normal interval of 3000 miles. Of course, if we drive a car hard, the oil change is done at or before the manufacturer's normal recommendation of 3000 miles anyway.

If you own a post-1996 car and your vehicle's manufacturer has made recommendations which include extended oil change intervals, with all of the caveats we have discussed it is probably safe to do so, but only if you plan to own the car for a few years.

If your newer car either does or does not come with an extended oil change recommendation, and you plan to own it indefinitely, then it is not financially prudent to adopt an extended oil change schedule. If you own a classic vehicle for which extended oil change recommendations were never made, especially if it is carbureted, think twice before hopping on the extended oil change bandwagon. Chances are good that you will be rewarded with less than optimum engine life and higher overall costs.

With all of this in mind, exactly how often should you change you oil? We would guess about every 3 months or 3000 miles, unless you want your car to last longer, then change it as often as it looks, smells or feels dirty to you. If you want to play with extended oil change intervals, at least be honest with yourself that the reason you are doing so is because of the hassle and short-term cost of oil changes, not the long-term cost or benefit.