

A red Class-8 truck is the central focus, parked in what appears to be a truck stop or maintenance area. The truck's large chrome grille and headlights are prominent. In the foreground, a group of white geese is walking across the asphalt. The background shows other vehicles and industrial structures under a clear sky.

# The First Time Class-8 Lease-Purchase Owner-Op Guide

(by Terry Norris September 2012)

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## Preface (About the Author)

I am by no means a professional book writer, and have no intention on becoming one, but I do know one thing. You can only answer the same question so many times before it just simply becomes easier to write it down. This is how this guide got started. I enjoy helping other truck owners be successful, and I also enjoy solving the problems that others can't. Before ever deciding to become a 'Lease-Purchase Owner-Op', I did a ton of research and asked literally hundreds of other drivers about their success, their lease, and their trucks. Two things became apparent very quickly. First, most were struggling and/or had failed, and second, many times it was because of a bad lease, or maintenance problems that no one could solve in a timely manner. Looking at many different companies and their leases, it was obvious that a large majority, but not all, were actually difficult, if not impossible to complete. Personally, I do not know how the employees of such companies can sleep at night knowing they are raping their drivers for all they are worth, but that is their business.

Working for many years in industrial automation as an engineer, I well know the scale of what can be considered 'Professional' when it comes to service work. With this background, and from seeing and working with literally thousands of large industrial companies, it was very obvious to me that on the side of maintenance, not all, but a large majority of the OEM truck repair shops are absolutely incompetent. Do they know about diesel engines and how to fix a truck? For the most part, yes, but just like the shade tree mechanic down the street, the quality of work, and the correct, proper procedures recommended by the truck component builders themselves are rarely ever taken into consideration, nor followed. To prove it, the next time you are at a repair shop, ask them what the backlash of the rear axle bearings on your truck should be. Maybe, if they are lucky and can answer you, it is almost guaranteed that not a single mechanic in the shop has a dial indicator to actually properly check it as per instructions from the maker, and even if they perhaps do, ask them when the last time their dial indicator, or other precision tools were sent to a lab and calibrated properly. Trucks have evolved into pieces of precision machinery, not some 1930's clunky old engine sitting on a frame. Add EGR and DPF to the equation, and now those same shops are no more than mice stumbling around in the dark looking for that tiny piece of cheese when it comes to actually solving problems. To claim they are a direct representative of the 'Original Equipment Manufacturers', charging an average price of \$120 an hour or more, nothing less than absolute perfection in what they do should be accepted. Unfortunately, this is definitely NOT what you get. It actually saddens me because I have been to most of these manufacturing plants where this stuff comes from, and inside those facilities, precision work and

perfection is expected, and not to be taken lightly. Because there is such a second rate attitude among these so called OEM service facilities, I absolutely set out to understand those precision systems along with EGR and DPF before ever signing a truck lease. I refuse to get caught up in the cycle of spending thousands upon thousands while a mechanic blindly guesses at my problems, relying mostly on some computer diagnostic program to tell him what to do.

I have learned much, so that I can be successful, and as safe as possible in my own truck ownership. Along this journey, it became clear that to help others as well, something had to be done to correct the general plethora of mis-information that is commonly shared among drivers and truck owners. Somebody needs to put some words down to help break the cycle of endless money wasted on overpriced fuel and poor quality service work. Someone needs to help the drivers out here trying to make a living, stay on their feet and be proud of who they are and what they do. That someone is not me, but perhaps the tiny piece of information I have gathered can help. This was my only goal in writing this guide. Hopefully it will help others by providing a basic understanding of several things. Most of these things are undocumented, but understood by many truck owners. Putting the information in a real world, profitable format, helps everyone. I do not take suggestions or ideas lightly, so the things I did write about are actual, profitable things that have been tested, researched, and proven to work. Hopefully it will help you as well, and hopefully you will be able to reduce those unnecessary donations to the already rich oil companies and overpriced repair facilities that you must sometimes rely on to get you going again.

Many thanks to those who have helped me, and also many thanks to the many more who went out of their way to try and knock me down. Learning through adversity makes us stronger, but only if we refuse to give in. Remember this the next time you are facing that impossible situation, and you will somehow come out ahead. Nothing is impossible, it is simply a matter of learning what to do to achieve it. Be safe out there, and God Bless.

## 01 – So You Want to Own a Truck, eh?

This guide is intended to try and knock some sense into the heads of those individuals who find themselves caught up in the cloud of 'Lease Purchase Owner-Op fever'. Sure, those ads and marketing campaigns make it sound wonderful, and the prospect of great freedoms with wads of cash are very inviting, even for those who know absolutely nothing about trucking. I have seen those ads, and the thought of making lots of money alone, dupe most individuals into signing that lease agreement long before they have any clue as to what they are doing. As a comparison, many people visit the casino because, although they know without a doubt, the odds are horribly against them, they still think that somehow they will be that lucky individual who hits the 'Big One'. After all, it is a good argument that maybe your chances are one in ten gazillion, but the casino guarantees a winner, and if you don't play at all, your chances are zero, nada, none. Most individuals long term loose money at the casino, but there are always that few, who find that edge, or trick that makes them come out ahead. Lease Purchase deals are not much different in this regard because without this same 'Edge', you are destined to never see the day where you are holding that now clear truck title, and more importantly, that wad of cash that made it worth your while. That Edge, if you learn and understand it, will not guarantee your success, but can greatly determine your odds. Even if you are already one of the lucky few who are 'Making it', perhaps after reading this, you will be a bit wiser, and wealthier in the future.

Leasing to own a class-8 truck is not something that should be considered at all without some serious wheel time as a company driver. It takes a year or more for most individuals to get good enough at driving professionally to stop making those 'Rookie' mistakes, that would otherwise put them out of business if they owned their truck. This is why most insurance companies want to see 2 years experience from the driver before they will even consider insuring an owner-op truck at a reasonable rate. Unfortunately, trucking companies that offer lease-purchase deals to rookie drivers tend to push this higher cost onto the driver along with all the other things that ensure you are kept in 'Struggle mode'. In 'Struggle mode', you are now at the mercy of the company you are leased onto, where you take all the risk, and they make all the profit. Also in this mode, it ensures them that you will attempt to run twice as hard, eating up your fuel, trying to play catch-up while they profit from it. Most often, you will find that these type of companies tend to push brand new, or low mileage trucks onto its victims, all the while making it sound like 'Cotton Candy' sweet as can be. Nothing can be farther from the truth, and when you hear things like 'You only pay based on your miles', or 'You can turn it back in at the end and start over', you are now dealing with

some really crooked companies that are bent on setting you up for eventual failure. Despite what they advertise, they know exactly what they are doing, and unfortunately, they also know that you do not, and this always works in their favor.

First, before we get into leases and all things good and bad, you need to ask yourself if becoming an owner-op is even your 'cup of tea'. When you look at the trucking industry as a whole, you see that compared to other types of business, even the largest fleets do not do so well compared to other non-trucking companies of the same size. What this means for the individual owner-op is that most of these companies become very creative at finding ways to increase their profits not only from their customers, but by finding ways to pay less or withhold hard earned cash from their drivers. Knowing how to spot these 'hidden losses', as a truck owner is important when considering how much you will end up with at the end of the day. This, combined with the false idea that trucks are rolling ATM machines by law enforcement, D.O.T., truck dealers, and every mechanic with a wrench, makes it seem impossible to turn a profit at all.

So why do professional drivers want to own their own truck?, Most, but not all, when asked, fall into one of 2 categories. The 'Glory seekers', or the 'I'm underpaid, never home on time and getting ripped off seekers'. 'Glory seekers' are easy to spot. Typical cowboy boots, polished chrome, Big honkin' illegal CB, boast about running 700+ miles in a single driving shift, and 'Dodgin' those scales'. Nothing wrong with being proud of your profession, or dreaming that someday they will be driving that chromed-out long nose super-sleeper Pete, but the reality is that these individuals image, attitude, and ego make them prime targets for those lease-purchase slave labor companies. If you fall into the 'Glory seekers' category or have the 'Not my problem, let the mechanic fix it' attitude, then please do yourself a favor and spend more money on better chrome-tipped boots instead of trying to lease-purchase a truck, because even if you become, or are, slightly successful, then your attitude and bad driving habits alone will still cost you most of your paycheck. The second 'I'm Underpaid' group hear the lease-purchase company advertisements like 'More freedom', and 'More pay', as if it were the solution to all their personal financial problems. For these people, nothing can be farther from the truth, because in very short order after they have signed themselves further into that lease-purchase debt, they realize that the problems they have now make all of the personal and financial difficulties they had before seem meaningless. For these type of individuals, usually living 'Paycheck to Paycheck', complete failure will always be lurking around the next corner.

As a company driver, there is the least amount of risk in what you do. You can walk away, quit, argue your pay, complain to your dispatcher, make the company fix that broken A/C, idle your truck, and run all day as fast as the governor in your truck will let you. Managing your income consists of 2 basic things, complaining about more miles when you sit, and running as hard as you can when moving. Managing your expenses consists of weather or not to open a can of tuna or eat at the truck-stop buffet. Managing your downtime consists of arguing with your dispatcher about why you didn't get home on the day you put in for when you had it scheduled more than 2 weeks ago. My point here is simply, that maybe you get paid a bit less, but your responsibilities primarily consist of actually driving the truck, rather than owning one.

As an owner-operator, there will be weeks where you run hard, but will receive no pay. Weeks where you spend most of your time trying to get your truck back rolling again after having a problem and discovering several other issues that end up keeping you down. Weeks where your miles are low due to lack of freight, and if you are lucky, weeks where you roll strong, turn lots of miles at a good profit, and can smile when you do get that settlement sheet. Owning a truck takes a pretty good buffer of cash in the bank to cover the roller-coaster ride of cash flow for both your personal finances and for the truck. When you own a truck, there is the potential to earn quite a bit more than the average company driver, but that will only come from hard work and the willingness to put forth great effort beyond just simply driving. Managing your income, if you are able to book your own freight, is actually a very complex thing where you will balance weight, miles, percentages, and that 'back-haul' that will get you out of that dead zone after the delivery. If you cannot book your own freight, then you will not be able to manage your income at all, but this is not necessarily a bad thing. Sure you can complain to your dispatcher, but the solution is short term at best, so there's no sense in putting any long term effort into it. Personally, as a one truck lease operator, especially for your first truck, I think the latter should be the preferred method. This gives you the time to focus more of your attention on your expenses. Managing expenses is very complex, and the only way to squeeze every drop of income out of your operation is to get very creative on ways to invest, rather than throwing that same money at your problems. Managing your downtime will be determined by how well you keep after maintenance and how thoroughly you inspect your truck regularly. There is nothing worse than being down several days after being towed to the dealer to get a several thousand dollar repair done, when it could have been planned for and performed during an already scheduled home-time.

So who is a good candidate for a successful lease-purchase deal?



Someone who is willing to set their ego, business plan, and ideas aside for a little while and learn what it actually takes. Someone who is willing to wear many different 'Hats' along their journey. Some of the 'Hats' you will need to wear will be as a driver, mechanic, book keeper, negotiator, investor, tax professional, safety inspector, navigator, and maybe even freight broker. If you are not all of these things, there is still hope for you, but you must be willing to learn at least a bit of each if you want to maximize your success and profits. It also takes someone who is willing to make sacrifices when necessary. Everyone understands that your best friend's wedding is important, but if you are at the other end of the country, low on money, and broken down, buying that plane-ticket to go see the wedding may not be such a good idea right now.

So why lease a truck at all? Well, in general, the trucking industry, no matter how you look at it, is a risk based industry. The more financial risk you are willing to take, the more money you will have the potential to make. How much risk you take on will not guarantee you more money, but it does give you the ability to try. The amount of risk you choose should only be based on how much you have learned about those risks. At the very bottom end of the risk scale is the company driver, and at the top, is the owner-operator that has their own authority and their own customers. Many failure stories come from simply the fact that the individual took on too much risk at once without knowing the complexities involved.

The bulk of what will 'Make or Break you' usually isn't based on your income, but rather your expenses and attitude. There are several ways to manage and lower expenses, but truck owners need to take an additional step by converting as many expenses as they can into investments instead. Any expense that can be converted into an investment will yield a profit and put more money in your pocket. One good example of this is tires. Replacing tires is definitely expensive, so most owner-operators try to buy tires that are the least expensive and/or tires that will yield the most amount of life. As long as you are looking at tires as an expense, this logic is true, but if you look at buying tires as an investment, you quickly find that spending more, for fuel efficient tires, will save you several thousands of dollars in fuel over the life of those tires, and give back 4-6 times what you spent in return. There are many stiff-headed individuals that will make claims against this, but the fact is that physics is physics. The lower the rolling resistance the tire has, the more fuel it saves you. This savings is continuous for up to several hundred thousand miles, especially if it is a drive tire, as long as they are maintained properly.

It is pretty clear that when you ask several drivers, most will tell you that

leasing a truck is a dumb idea, given today's fuel prices, and that most end up failing. Many fail because they sign into an 'Impossible lease'. Others fail because they cannot keep their truck out of the repair shop. Some even fail because they are too lazy to keep the truck rolling, but all these things can be avoided with a little bit of education. Attitude is everything, and if you are willing to sacrifice your ego and your long term 'Company' driving habits, then you may just make it through to the end.

Your attitude and ways of thinking are going to have to change. For some people, this is difficult, or even impossible. How much you are willing to change the way you think, and how much of your expenses and problems you are willing to take direct control of, will determine how much money you have. Many owner-operators, even the successful ones, have no idea how much money they miss out on because they refuse to slow down, or they refuse to learn how to work on their truck themselves. This guide is not based on 'Making It'. This guide is based on 'Making It with Absolute Maximum Profit'. The only way you will see maximum profit is to put forth 'Maximum Effort', and 'Maximum Willingness to Learn'. If you are not willing to do this, then don't bother to read the rest of this guide, because I definitely do not want to waste anyone's time.

Before continuing down the road toward that lease-purchased truck, you really need to consider what you are willing to do to get there successfully. If you think that owning a truck will allow you to be home more, choose where you go, and drive whatever speed you want, then let me just pop that bubble of ignorance right now. When you have been down for 9 days, your \$4500 behind, facing a \$7,000 towing and repair bill, taking that load that delivers to downtown New York City on the day of your 15th wedding anniversary may be your only option to start the recovery process from such a hit. No one wants to make those kind of hard choices, but if it comes to getting, or staying, on top of your financial future, then the only right thing to do is take a bite of that big fat s\*\*t sandwich, do your job, and run the load at 54 mph, instead of 70, maximizing your net income by another 27% to help you pull out of this hole.

How will what you do change? Well, basically, you will have to change the way you drive, change the way you manage money, and change the way you keep your truck running. Your driving will have to change from driving for maximum miles, to driving for maximum profit. Managing your money will change from managing YOUR money to managing the money that is yours, your truck's money, and money that is not actually yours, like tax money. Keeping your truck running will change from 'calling breakdown' to opening your hood, and grabbing a wrench to change that sensor that just failed.

Driving for maximum miles is all many drivers ever focus on. When fuel was less than \$3.00 a gallon, driving fast almost always meant maximum pay, even as an owner-op. Now that fuel is \$4.00+ a gallon, fuel alone consists of about 80% of the operating cost for any given truck. This cannot be ignored because you will literally be paying more in fuel in a year than you will be paying toward your truck. Driving for maximum profit is much different from driving for maximum miles. Driving for maximum profit actually consists of managing your time, so that you can drive as slowly and gently as possible, still meeting your deadlines. Many drivers never achieve this. Most that don't will throw you the argument that driving slow eats your clock up, making you lose more miles than the little bit of fuel you save. The irony is that this statement is actually true if you do slow down, but you don't match it with all the other fuel saving techniques that go along with it. Driving gently, like easing up to speed gradually, and letting the speed fall off so that you can get the truck into the right gear for a steep hill will save volumes in fuel AND wear on every part of your truck. These things are the most basic, most profitable things you can do to increase your income.

Managing your personal money, your trucks money, and your tax money is going to be a very necessary thing. It is not only to keep you out of hot water with the IRS, but will help you keep as much as possible in your pocket. Keeping the three separate makes it much easier, and at the very least, I recommend you have more than one bank account, rather than trying to track what is for who with it all jammed in the same place. Even if you hire an accountant to do all the math for you, you will still need to keep these items separate if you want to truly be stable long term in your finances. Just because you might end up with several thousand dollars in the bank this week, doesn't mean you will have several thousand more to pay your taxes with at the end of the year. Separating your money as you get it, is much less painful than trying to separate it when it is time to pay your taxes.

Keeping your truck running is very expensive if you cannot loose that 'Company Driver' attitude that so many are used to. Many lease-purchase owner-ops get caught up in this general attitude that, since they have to pay into a maintenance account, the company they are leasing from should pay for repairs. This is ok I guess if you want to be lazy, like most, and let someone else manage your truck problems, but this is also very costly. The more proactive approach you take toward gathering the proper tools and equipment, and performing as much of the maintenance and repairs as you can, the more you will make in three ways. By saving money on repairs, higher profits from having less downtime, and by being able to predict and prevent failures that you would not otherwise have learned about. Second to that is to try and solve as much of the problem as you can,

eliminating all of the lesser, or easy work, saving time and labor, then to pay someone out of your own pocket, so that you can control when, where, and how much is spent. Your maintenance account, and those who have to 'Approve' it, should be a last resort to just simply going out of business with only a couple of exceptions. Those exceptions are, if you have to use that account to get a substantial discount of things like tires, or in an absolute emergency where you are facing an unexpected towing and/or repair bill, and it will help cover the costs. Don't take the lazy man's approach to keeping your truck on the road. Get some tools, Get dirty, and get it off the side off the road and running, so that you can deliver that load.

## 02 – Getting Ready and Setting up the Business Side of Things

Before jumping off into the deep end, knowing you can drown in financial ruin, you need to prepare for such a thing. Trimming the fat off your personal finances is a good start, and if you are married, your spouse, if not driving with you, will have to deal with the rewards and hardships of your new business as well. It is hard to convince someone sitting at home looking at a bank balance of \$25,000+ that you don't have the money for a new stove for the kitchen. Especially knowing that 15k is to cover your balloon payment, and the rest is this years taxes owed. Writing a \$10,000 check to the I.R.S. for some people is very hard to swallow, but as an owner-operator, it should be considered nothing more than just a function of doing business. If you are even mildly successful, you will need, in addition to your personal checking, a place in your bank to store cash such as the balloon payment and/or tax money. You will also need a separate account to be used for all your business related transactions such as oil changes, etc. This makes it incredibly easy to keep up with expenses. Settlement pay and all tax deductible business expenses go on this single business account making it a simple matter of looking at your bank statement to track your profit/loss and determine how much taxes you owe.

In a nutshell, here is what I recommend to first-timers. 3 bank accounts total. 2 regular checking, and either a money-market, or savings account. The money market account will earn interest, so thats where you keep your savings toward your balloon payment and your tax money. You should only ever use this account for paying the I.R.S. and/or state taxes, or of coarse, your final truck payment. You should carry check cards for both the other 2 accounts, and one of those accounts should be for all personal non-tax deductible transactions such as food, paying your personal bills, and everything else non-business related. The other checking account should be where your settlement income is deposited to and where all your business related transactions occur. You use your business check card for oil changes, washer fluid, etc... You use your personal check card for food, paying your bills, and so forth. If you are married and your spouse is at home, and is used to paying the bills, then no matter what, he/she should not have easy access to the business account despite their protests. It should be in your name only, keeping in mind that all money transferred from the business to your personal account will be taxed. If this sounds difficult, then maybe you should consider not leasing at all because the stability of that truck, and your business, directly determine how much money you do have to spend on that new kitchen stove.

While you are still a company driver, instead of jumping directly into the

deep end of the swimming pool, start at the shallow end and work your way toward your goal. Those individuals who approach this type of business endeavor slowly are usually always successful. Skipping steps will only result in learning things the hard way and can cost you big time. Where you want to begin is to open that money market account and start putting money in it toward your truck. It may take a long time, but do not even think about signing a lease-purchase agreement of any kind until you have saved a minimum of about \$6,000. If saving that kind of money seems like it will take too long, then you are really not prepared at all. Saving this kind of money in a timely fashion will also put you, and your spouse to the test of discipline needed to manage the truck expenses. No one foresees it, but you will absolutely need about that much cash to get yourself up and running smoothly. While you are saving up and building up your 6k, use your company truck to learn how to save fuel by actually tracking your fuel receipts. Learn to drive and shift the truck gently, as if the transmission was getting ready to fall off, and you are on that last drop of fuel. Start performing very thorough inspections as if the truck belonged to you, and more importantly, despite your protests and all logic, learn how to drive at lower speeds. Stopping less, tightly managing your time, and running slower will far outweigh running fast when it comes to making a profit. A wise trucker once told me that the light from a fire-cracker will be very bright, and dies quickly, but a slow burning candle will provide light for a very long time. When you lease-purchase a truck your goals will shift from trying to make the most money every week to trying to save the most, because the money you save will always far outweigh in profit the extra money made by running faster and/or harder.

“So why should I slow down and practice saving fuel as a company driver?...I will end up making less, and my company will be the only one benefiting.” In the short term, that is absolutely correct, but as a trade off, you get to practice becoming successful without any risk whatsoever. Education is never free, but the one thing education gives us is that once you learn something, no one can take it back. It is yours to keep, forever benefiting you. Martial Artists are not any good without much discipline and practice, and as a truck owner, you will fail without practicing until you are very good at saving fuel and reducing wear on your truck.

When you are to the point where you have saved up \$6k plus, your pushing 7+ or even 8+ MPG out of your company truck, you have learned the different systems that need regular maintenance, close inspections have become second nature, and you are running under 60 mph when you have time for it, you will realize without a doubt, that you can drive towards owning a truck successfully. That is when you start shopping around for a good lease-purchase

deal, a truck, and a decent company to sign it onto. This is also when you open that third account for business only transactions in preparation for that dive into the deep end of the swimming pool.

Setting up your business as a first time lease operator will be quite easy. Despite what others recommend, your first year in business is best spent setting yourself up as a 'Sole proprietor', unless you already have your own operating authority. Doing business in this model has no setup fees, you can use your own name as the business name, and your taxes will be very simple. Some argue that setting up an LLC is the way to go to help protect you from liability, but nothing can be further from the truth. As long as you are behind the wheel, or in the truck when something bad happens, that protection does not exist, and even if you hire a driver, these days, most lawyers will push indirect blame on you for any flaw they can find. If after your first year in business, you find you have paid taxes on more than \$90,000, then an LLC or S-Corp may save you some tax money, but until then, it is best to keep things as simple as possible.

Most CPA's, accountants, and tax professionals will probably protest deeply at what I am about to tell you, and I know, that first time owner-ops, when asked, will say they are going to get professional help just because they fear the unknown, but the truth is that as long as you are NOT going to hire another driver and pay them, then you can save a lot of money by doing the small stuff yourself. Sure, you pay someone to do your taxes at the end of the year for about 1/3rd more than you pay someone to do personal taxes, but during the year, if you can add and subtract, there is no need to be paying someone else on a monthly basis. What I am about to tell you comes from many years of working for myself, handling hundreds of thousands of dollars in revenue a year. This method is not only dirt simple, but absolutely works.

Taxes for a business that is deemed 'Sole proprietor' with NO employees, as I said will be very simple. Just look at last years W-2 statement as a company driver, and you will find how much taxes were paid in total for you. If you add them all up, and compare it to your gross, you will find that between your employer and you, there was paid roughly 28% for federal and state taxes combined. Sure, you can hire an accountant that can get it down to the red cent, but there is really no reason to waste your time, or your money paying someone else, especially during that first year.

If you are going to do your own simplified accounting, then here is what I suggest. Get one of those paper-tape printing calculators and a dozen of those big brown sheet sized envelopes. Label one for each month, and each month, put a

copy of your settlement sheets for the month in there, and all business receipts that can be claimed against your taxes in there for that same month as well. Print a one month calendar for that month, and circle each of the days that you were away from home over night, and put that in there. Then from a computer, print the following page for each month to put in the envelope as well...

(Continued on Next Page...)



Monthly Profit / Loss Statement for... Month, Year \_\_\_\_\_

Truck Odometer \_\_\_\_\_ Days Away from Home \_\_\_\_\_

Expense Totals...

Settlement (and Fuel) \_\_\_\_\_

Maintenance & Repairs \_\_\_\_\_

Tools and Equipment \_\_\_\_\_

Scales, Tolls and Fees \_\_\_\_\_

Office & Cleaning Supplies \_\_\_\_\_

Copies, Faxes, Office Fees \_\_\_\_\_

Insurance (Not health) \_\_\_\_\_

Phone & Internet (x 0.7) = \_\_\_\_\_

Travel Expenses \_\_\_\_\_

Equipment Rental \_\_\_\_\_

Total \_\_\_\_\_

---

Expense Income...

Settlement \_\_\_\_\_

Other \_\_\_\_\_

Total \_\_\_\_\_

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Total Income \_\_\_\_\_

Total Expenses \_\_\_\_\_

Net Profit \_\_\_\_\_

After the end of each month, taking about 10 minutes for everything, just add up your total income on your settlement sheets before ANY deductions. Do not include reimbursements. Put this on the sheet as settlement income. Next, add up all your deductions, including fuel, and put that total on the sheet as settlement expense. Next, separate all your receipts into each of the categories listed on the summary sheet. Limit yourself to these categories putting each receipt as best fit. Only having 10 categories makes it easy for a tax preparer, as well as easy to show if you ever do get audited. Add up the receipts with your paper tape calculator for each category, then staple them together with the paper tape printout. Write on the paper tape what category it is, then put the total(s) on your summary sheet where they go. For the phone & Internet fees, take the total from your paper tape, multiply it by 0.7, and put that as your total on the summary. Everyone knows, including the IRS that you make personal phone calls and shop/chat on-line, so claiming 100% of phone and Internet is always a red flag. Just do the right thing, it makes little difference anyways, 70% (0.7) is reasonable for a deduction. Total all your expenses and write that on your summary in both places, then subtract your total income from your total expenses and write the final amount as Net Profit.

If your Net Profit is zero or less (a negative amount), then you don't owe any taxes for that month. If it is above zero (meaning you actually made some money), then that amount is actually how much profit you made, and how much you owe taxes on. To determine your taxes on the money you made, simply multiply that final amount by 0.28 on a calculator. The result is how much you need to put into your money market or savings account to cover your taxes. For example, if your Net was \$3,700 then  $\$3,700 \times 0.28 = \$1,036$  dollars you need to deposit into your money market or tax savings account for this month. That money is not yours. It belongs to someone else, so put it away. The rest is yours to spend, save toward balloon payment, and/or pay bills with. I guess that \$3,700 is a pretty crappy month, so maybe you didn't run the miles that you would have liked to this month, but you did cover all your expenses, and had enough to pay those bills at home. The important thing is that you are now one month closer to owning the truck outright without getting behind. Your tax money is now tucked away into the money market account out of easy reach, and more importantly, it will earn interest (more profit) while it is there waiting to be sent to the I.R.S. Don't try to balance things between months. If a month comes out negative, then consider it zero profit. It will work itself out to your benefit when you have your year end taxes done. If you have made a profit for that month, you will absolutely owe this money at the end of the year so put it away. Many accountants will look at this method and tell you that you are putting more away than necessary. This is true, but this is also how you build up your money toward

that balloon payment, those emergency repairs, and everything else unforeseen. Putting more tax money away than needed into a saving or money market account is absolutely the simplest form of what many like to call 'Cash Building'. Yes, it hurts to put money away and not spend it, but this is the only way you will ensure your long term success and be able to afford that 'balloon payment' without it hurting you in the end. Also, by using this method, at the end of the year you will absolutely not fall short on the money needed to pay taxes. Once you get your year end taxes finished, you will see that you saved a reasonable, but not excess, amount of money above your actual taxes, working itself out nicely.

It should be mentioned that you shouldn't be too concerned with actually sending off quarterly taxes as long as you have the money stored away and earning interest unless you have put away, just for taxes, upwards of \$10,000 for the year so far. Yes, technically you are supposed to, but the bulk of self-employed people (numbering in the millions) do not bother. Quarterly taxes are Voluntary taxes, and if you don't owe upwards of \$10,000+ for the year so far, then it is not a bad idea to just keep earning interest on it. If you find that you are in fact sitting on several thousands of dollars in tax money after several months, then it is a good idea to send some of it to the I.R.S. (with 2% of it going to the state, no matter what state you live in, if you have state taxes) using one of those quarterly vouchers (tax form 500). Don't bother to do any math trying to figure the exact amount, just send 2% to the state using the state's form 500, and the rest to the I.R.S making sure you send each to the correct address, and that your social security number is in the "for" section of your checks. Remember, they already know that small trucking businesses have unpredictable profits, and that Quarterly taxes are voluntary. Any amount at all that you send them will make them happy. Sometime before the month of December is up, make sure ALL of what you have collected is sent using the year end (4<sup>th</sup> quarter) vouchers (usually due by Jan.-15th of the next year). Send it BEFORE the end of the year so that this makes year end taxes dirt simple because it keeps the entire years taxes within that same year. Do not wait until January to pay it all in. This always makes it more difficult to do your year end taxes. Even if you don't think you owe anymore taxes for the year, send it in anyways. If you don't owe it, you will get it back in a month or so, and this always helps avoid an audit.

As a Sole Proprietor, your year end taxes will consist of nothing more than a 1040 long form with the addition of one document. A schedule-C will need to be added to your 1040 showing your gross income and the totals for claimed expenses. This is also where you claim per-diem on all those days you circled on each of the monthly calendars. Be sure those days claimed match your log book as well, and if you have e-logs, make sure you download them and keep a copy of

them as proof. Your road receipts will work as evidence in a pinch, proving you were out as well. Per-diem can only be claimed and deducted against actual income, so if your spouse drives as well, but does not get paid, then your tax preparer will have to get creative with your schedule-c so that you can each claim per-diem separately. This is perfectly legal, but what they will have to do is complete your schedule-c normally to get the total you earned after all deductions for you only. They then take that final amount and divide it by two and enter it back as "Other Expense" above, then re-calculate the schedule-c so that it shows you only earned half. For your spouse, that "Other Expense" amount will be their income on a second schedule-c, and then he/she can claim per-diem against it. In the end, you will have to file joint on your 1040, but this will allow you to legally be able to claim per-diem for each of you separately, which can save you several thousand dollars in taxes. Any tax preparer that can file small business taxes worth their salt can do this for you. It doesn't take a specialist or an accountant to do this and by not deducting your per-diem until the end of the year, it gives you the chance, based on what you sent in, to actually get a tax return, rather than owe more.

No one wants to get audited, but you should always expect it. The reason you should always expect one is that there are too many truck owners that try to cheat. Don't do things to get yourself into hot water with the IRS. Here are some of the bad tax practices I have seen truck owners do that got them in trouble...

- Not being able to prove your tax deductions and/or income (poor accounting).
- Claiming less income than the 1090(s) that were issued to you for the year.
- Not claiming the money earned as interest from your savings or money market account.
- Paying a co-driver as a 1090 employee.
- Claiming lots of unnecessary expenses.
- Claiming fuel or other receipts, when they have already been deducted from your settlements. 'Double-Dipping' fuel receipts is watched for very closely by the I.R.S.
- Claiming more than 70% of your Internet and cell phone bills as business expenses.
- Claiming your I.R.S. taxes as a business expense.
- Using cash instead of bank cards for day to day business.
- Claiming expensive upgrades such as an APU, or an engine overhaul as a single expense instead of depreciating it.
- Owing very large amounts (\$10,000+) when your 1040 is filed.

There are many more red flags, but those should give you an idea. When you look at the big picture, as a lease-purchase owner-op, you will be handling money on a constant basis. Not all of that money is yours to keep, so it is important to keep it separate as much as possible, otherwise you come up short when it is time to hand it off to someone else. The trick is put in your hands, as much of it as possible, and to minimize how much you part with. Spending money on business items for the sole purpose of lowering your taxes should only be done if those items purchased are actually needed, or if that money spent will earn you more profit in the future. It is better to earn \$10 dollars, pay \$3.00 in taxes, and keep \$7.00 for groceries, than to earn \$10 dollars, spend \$10 dollars on tax deductible items, and end up with nothing to show for your efforts. The I.R.S. is not out to 'Get You' unless you do something to show that you are trying to actually cheat. Minor mistakes are common, everyone knows this, so if you do ever end up with a discrepancy, having a bit of money saved away will allow you to deal with it swiftly and professionally. Having your paperwork organized with easy to find totals, if you ever do get audited, it will mean the difference between a pleasant or horrible experience.

### **03 – Buying Options, Avoiding Ripoffs, and Curing Your Ignorance**

Before you even start to look at lease-purchase deals, you need to determine what your final goal really is. If your goal is to own a chromed-out long nose large car, then I hope you got it for free, because these type of trucks top the charts when it comes to operating cost. It is like being the pizza delivery boy delivering pizzas in an F450 pickup. It may look good, but the gas alone to fill it up costs more than you would make in a week delivering those pizzas. Long nose Petes, Long nose KWs, and freight liner classics are the trucks of yesteryear when fuel was 0.80c per gallon. The only operations that can justify such beasts these days is heavy-haul where you actually need a heavy-duty frame and 600+HP. Sure, there are lots of these still on the highways, and sure, some money can be made, but pride and ego make their owners blind to the fact that money is pouring out the stacks at a saddening rate. It is possible to lower operating costs for these beasts, but it takes a ton of very expensive modifications, and even then, they don't do that well. Most people buy cars based on marketing and looks, but smart business owners that need vehicles for their business tend to look at the long term operating cost vs price. This is where your mind should be focused, especially as a first timer. No one can tell you what your final goal should be because everyone is different, so instead, I will tell you what the final goal of this guide is. This guide has a single final goal, and that is to provide you with the ideas needed to lease-purchase a truck not just successfully, but to squeeze every ounce of long term profit from every possible angle to the 157<sup>th</sup> power, regardless of driving experience, color, race, make, model, brand, preference, opinion, or belief. That being said, we will continue down this path by discussing buying a truck outright with cash saved up, financing, or lease-purchasing.

Saving your money up and buying a truck outright, paying cash for it without any financing at all will not ensure your success, but it will however lessen your risk by a slight amount. If you compare it time-wise to a successful lease-purchase, you quickly see that, over time, the lease-purchase is actually a better deal. If Joe Smith saves \$294.87 every week for 3 full years, giving him \$46,000, then buys a \$40,000 used truck, he will spend most of his first year, if successful, trying to earn his 40k back. Thats easily 3.5 (realistically 4.5) years with zero dollars of long term profit. On the other hand, if he saves \$250.00 every week for 24 weeks (just shy of 6 months), giving him that same \$6,000 as a startup cushion and lease-purchases a \$40,000 truck with a 3 year contract, he is now turning a profit right away. He is not actually out any truck cash up front, and he spent the same \$6k getting started. The only risk he has added to himself is

whatever penalties there are for failing the lease. After this same time period of 3.5 years, he is now owning his truck outright, but the difference is that he has 3 years of profit, and his truck to boot. He is also now in a much better position to re-negotiate his position as an owner-op for the company he is leased to.

When you lease-purchase, you are not out the entire amount of the truck at any given moment. You are only “out” that weeks settlement expenses. It is like going to the casino and finding a broken slot machine. You put in ten bucks, and it spits out a hundred. You do this several times and it just keeps spitting out another hundred each time. At any given moment, you are actually only out ten bucks. After a while, several thousands in profit later, it stops and gives you nothing. You have money to blow now, so you try a few more times, then it starts up again only this time giving you random amounts, usually more than you put in, but not always. That is what it is like to lease-purchase a truck successfully. You put in your ten bucks, and you earn something in return.

Financing a truck is similar to lease-purchasing, but not exactly the same. Financing a truck is similar to financing a car. Usually you have to have a decent credit score, work history, and a down payment to boot. The financing of the truck will be done through some bank or lending institution, and the truck title will be re-issued into your name with them being the lien holder. The truck can be depreciated on your taxes because you are the title holder, giving you some tax advantages short term, but when all the depreciation is gone, in the end, long term tax-wise you really will not have gained anything vs a lease. Also, the interest rate and payment schedule will likely be based on your credit score, and can sometimes be to your disadvantage. Registration, taxes, tags and all liability will ultimately be your responsibility as well.

Lease-purchasing is the “poor mans” way to owning your own truck. A lease-purchase is actually nothing more than a rental agreement with the option to purchase the truck at the end, usually by means of a “Balloon”, or final payment. There are some basic laws governing class-8 trucks in this regard to help protect both you, the “Lessee”, and them, the “Lessor”, but that protection is very limited. This leaves the door wide open for some companies to push on its victims some pretty shady deals. What makes things worse, is that there are plenty of underpaid drivers that are unable to spot these bad deals, keeping these shady companies in business. As a result, lease-purchasing in general has earned a bad reputation, but not all companies that offer them are out to get you. Some companies do offer them as a legitimate deal to help both them, and their drivers. It is easy to figure out how the drivers benefit from these deals, when legitimate. For the driver, there is the opportunity for more pay above what the company can offer them, by

operating the truck more efficiently as an individual owner. There is also the glory and freedoms that come with actually owning that truck free and clear at the end.

For the companies that offer good legitimate leases, there are many benefits. One of the biggest is to keep trucks in their fleet past their warranty periods without the added cost of downtime and repairs. The more older trucks they can keep in the fleet, the fewer new trucks they have to buy to replace them. Another, is that they can help keep good, responsible drivers who actually deserve more pay. The company also benefits in several financial ways as well. They no longer have to pay unemployment or employee taxes, they still technically own the truck, so they still get depreciation and any other tax breaks from it. Also, since they still actually own the truck, their risks leasing them are low because they still have some measure of control. Companies that offer bad leases are out to turn a profit from lease-purchase deals at the drivers expense, ensuring they maintain as much of the control as possible.

Spotting bad lease-purchase deals is not easy, but if you do not learn to spot them, and you end up in one, you will not be successful. Here is a list of some of the things you need to avoid the most...

- Any deal where you pay based on the miles driven. These are the worst of them all, but sadly the most inviting to newbies.
- Any lease where the term, interest rate, truck payment, and/or final asking price is not set in stone.
- Any lease that does not have a clearly defined payment schedule.
- Any lease that does not have a total asking price for the truck.
- Any company that does not give 100% of collected fuel surcharge back to its owner-ops, or that does not provide fuel surcharge. This will put you out of business fast.
- Any company that does not offer a fuel surcharge that is fairly close to the current average going rates.
- Any lease that has no defined 'cap' on maintenance or other escrow account withholdings.
- Any lease that does not allow you to pay off the truck early relative to what you owe.
- Any lease where the interest rate is high compared to the interest rates of other sellers.
- Any lease where the asking price, before interest, for the truck is higher than what the truck would sell for in a truck sales magazine.



- Any company that does not allow you to take the lease-purchase agreement to someone else for a second opinion.
- Any lease that forbids you having upgrades or improvements done to the truck to improve its fuel economy and/or lower its operating costs. It is ok for them to have an 'Undo' clause if you fail your lease, but limiting you from improvements is like saying that you aren't allowed to make a bigger profit. This defeats the entire reason for owning the truck in the first place.
- Any lease that limits who does PM and/or repair work to your truck, especially if you are willing to pay for that work yourself out of your own pocket.
- Any lease that has large penalties for missing a truck payment.
- Any lease that has a lot of long term administration fees.
- Any lease that does not guarantee you a free and clear title to your truck at its end, especially if you are willing to make your 'Balloon' payment.
- Any lease that forces you to pay for a truck warranty, or that forces you to have all work done at the company shop. This is typically a scam to keep taking back the money you have earned from them already.
- Stay well away from companies that try to put students or rookie drivers into brand new, or fairly new equipment as lease-purchase operators. These are definitely slave labor companies.
- Run like hell as fast as you can away from companies that push their lease-operators to trade their truck back in and start over at the end of the lease. Not only will you end up perpetually leasing, but you will never have a truck to show for it.
- Stay away from companies that take fuel taxes out of your settlement pay based on 'Average' or 'fleet wide' rates. If you are going to be dumb enough to sign on with a company that makes you pay fuel taxes, then be absolutely sure you only pay fuel tax based on YOUR individual fuel purchases only. If you get really good fuel mileage, and the rest of the fleet does not, then you will end up paying taxes on their bad driving habits.

As you can see, the problem is clearly based on 2 basic things. First, trying to limit how much you are able to make as settlement pay, and second, trying to control when, where, and how you spend your money so that all your cash flow ends up rolling back into their hands. The more you let someone else stick their fingers in your pie, the more sour it will taste. You don't need a babysitter for your money or your truck, and long term, the only way you will be profitable is to have the freedom to push your costs down on your own by being able to repair, modify and tweak on those things that make a difference.

Know who you are buying your truck from. There's nothing worse than finishing your lease-purchase to find out the truck title has a lien against it, or, that they sold your title to someone else. Find out how many long term owner-ops the company has, that have paid off their trucks. Find out where the companies primary focus on profit is. Some companies focus making their profits on the owner-ops themselves by doing things like buying trucks at a fleet discount, then leasing them at full list price and interest to boot. Are they in business to haul freight?, or to sell trucks?

No lease-purchase is any good if your settlement costs are too high. Make sure you know exactly what is going to be removed from your settlement check every week, and make sure you know what it will be reduced to if you do happen to pay off your truck and decide to still haul their freight. The truck lease itself should be a separate agreement from their owner-op program, so look at both carefully. Although not the biggest expense, how much you spend on the truck will heavily determine your success rate. If you sign onto a company to haul dry-van freight (the most competitive freight in the industry), as a solo driver, then you are not likely to be able to afford a truck worth more than \$60,000 without struggling. Dry van freight does not pay well, the margin for profit is low, and as an owner-op you are not likely to make the per-mile income to cover the cost of a new truck. If you plan on lease-purchasing in this market, I recommend that your lease payments be below \$1600 a month. This means you will be in the \$450/week or less payment range, and also likely to be leasing a used truck. Adding another \$100-\$150 per week for all other expenses and you are likely to owe upwards of \$600/week. This is not a bad position to be in as long as you keep your trucks operation costs down.

On the owner-op side of your agreement, you need to pay careful attention to how much you are going to make. One company may offer more per mile than another, but when it all goes through the wash, that company may actually be paying you less. One example of this is that perhaps company A offers \$1.50/mile pay, and company B offers only \$0.90/mile. Company A has a lesser fuel discount program, takes money every week for tags and taxes, and also takes fuel taxes out on the driver. By the time the driver gets his settlement, he is now earning \$0.67/mile after fuel. Company B only offers \$0.90/mile with a fuel surcharge, has a deep discount on fuel, and pays for all tags, fuel taxes, and tolls. When driver B get his settlement at the end of the week, hauling the same miles and freight, he ends up with \$0.83/mile after fuel. My point is that mileage rate alone is not at play here, but rather how much fuel surcharge, fuel discounts, and what is the company willing to cover on secondary expenses. After much comparison, you will find that in the dry-van freight market, the companies that offer less per-

mile pay with lots of secondaries covered such as tags and fuel taxes paid for you is usually the better deal. Long term, companies that pay fuel taxes for you completely are definitely worth a good look at. Maybe the pay per mile is a bit less, but if they pay your fuel taxes without collecting it back from you, it can mean, long term, the money you pocket will be much higher.

One of the easiest ways to determine if you will be ok on the settlement side of things is to see if you will cover all of your costs, including buying fuel, by driving only about 1/3 of the miles that you would normally run in a week. If you can break even, paying your settlement expenses, fuel, escrow deductions, and everything else by only driving 1/3 of your miles, then you will be ok on profitability. If it takes 1/2 or more miles to cover costs including fuel, then you will definitely struggle. Some companies go out of their way to ensure their lease-operators stay in this struggle mode. The reason is that it ensures them you drive like a madman, at your own expense, to try and stay on top. This is the break over point that you really need to stay away from. If you need to drive half of your miles for the week or more to break even then long-term, you will probably fail. There is more than one way to ensure you stay inside this 1/3 safety range, and that is to ensure your operating cost per mile is as low as possible. The number one factor that determines your operating cost per mile is fuel, and it dominates your costs so much (about 80%), that fuel mileage can be used to see if you will be ok. Just take your total fixed settlement expenses and divide them by 100. This would be the absolute minimum fuel mileage needed to be achieved by your truck to break even on your average 2500+ mile week. If you are paying \$650 in total fixed costs per week, then you need to keep the truck fuel economy above 6.5 mpg to break even. Obviously, to make a decent profit, you would need to ensure you get about 1mpg above this minimum, so if you are buying a flying brick, I hope you got it really cheap. There are a thousand ways to calculate your income vs costs, but this dirt dumb method will put you in the ballpark for success without all the headaches.

Many drivers shy away from becoming an owner-op because of high fuel prices. Before the idea of fuel surcharge, when fuel prices went up, the single truck owner-op was the one to usually suffer its effects more than anyone. Now, with the advent of fuel surcharge, higher fuel prices have actually become a blessing to the single truck owner-op, who now stands to gain the most. Fuel surcharge is a per-mile fee that is charged to the customer by trucking companies to help offset the high, and suddenly changing price of fuel. From company to company, this fee is slightly different, but most companies base that fee on either 5.0 or 6.0 mpg, as well as the current 'Going Rate'. This fee is to cover fuel costs, and any decent company will pass this money directly on to you because you are

the one buying the fuel. It is important to find out what mpg rate the company you are leasing with is basing their surcharge on, because this mpg rate is the minimum your truck needs to achieve in fuel economy to stay even in Net income when fuel prices change. If you get a fuel surcharge based on 6 mpg, and your truck actually averages 6 mpg, when fuel prices go up, then your fuel surcharge will go up as well covering the extra money spent on fuel. If after fuel, you were earning 0.75c/mile before, then after the fuel hike, yes you spent more on fuel, but your mileage pay went up to cover it, so now you are still netting 0.75c/mile. If your truck gets less than 6mpg, your pay increase will fall short of what you actually spent, causing you to go from 0.75c/mile to maybe only 0.73c/mile. This is really bad, and can put you out of business if fuel prices go really high. So where is the blessing in all this? If you manage to keep your truck at say 7 or 8 mpg, you will be spending less on fuel than the trucks that get only 6mpg. That same pay increase will now allow you to go from 0.75c/mile to maybe 0.77c/mile or more. The blessing becomes the fact that you can actually profit from fuel price increases, and the higher fuel prices go, the more money you will be able to take home. This is one of the big reasons why the fuel economy of your truck is so important. Having a truck that can touch 8mpg+ can really fatten your wallet, as well as make you smile while everyone else is crying every time fuel prices get really high.

The last factor in deciding your lease-purchase is a warranty. Warranties, most of the time, are actually not worth the paper they are written on when it comes to trucking. A lot of people think that new trucks with new truck warranties will help protect them and lessen their downtime, but thats actually not true. New trucks have as many failures as older trucks, the only difference is that the problems with new trucks are less predictable. The fastest way to fail a lease-purchase is to be sitting still, not hauling any freight, especially if you start adding the high cost of towing and major repairs. Warranties might lessen the repair bill, but generally cause your downtime to increase by quite a bit. For most minor repairs, what hurts you is the waiting for the warranty shop or dealer to get to the problem, make the warranty claim, order the part, and replace the failed component. A \$15 temp sensor now costs you several thousand in lost revenue for the week. Minor, and most medium size repairs are cheaper to deal with by just simply finding and buying the part, then either installing it yourself, or having the local TA or PETRO stick it on for you for a couple hundred bucks, or perhaps for free if you get that PM thats almost due anyways.

Warranties will in fact help protect us from major component failures such as an entire transmission, so if the truck comes with a warranty, yes accept it, but it is definitely not recommended to go out and purchase one. Besides, many times,

like the case of a failed transmission, this gives us the opportunity to go ahead and invest in an upgraded component, like say a 13 or 18 speed to help us save fuel.

## **04 – Determining the Proper Equipment Based on its Intended Use**

What kind of truck to get, and its specifications can mean the difference in several thousands of dollars a year in profit or loss. Pretty much all trucks, when running well, have the potential of making you a profit, but that profit can vary by a large amount, depending on make, model, year, body style, gear ratio, tire spec, weight, and engine efficiency. Because of this, you really need to take some time to decide how much of this potential profit you are willing to sacrifice in exchange for looks, comfort, and style. Pretty much every component on the truck either helps make you money, or costs you money. There is hardly any components that do nothing. Looking at just the operating costs of an efficient class-8 truck that has low maintenance and gets 6.8 mpg, in a year, it will cost roughly \$75,500 to move that truck 120,000 miles. \$8500 will be in PM's, tire, and other wear, if there are no repairs, and \$67,000 spent on fuel. Before you even add in the costs of actually leasing, it is clear that 89% of all your costs will be just in fuel. Even after adding back in the costs of leasing, it still dominates your costs by more than 80%. Since fuel is your number one cost, and since it is likely to keep climbing in price, to stay in business long term, you must now look at everything on the truck with fuel economy in mind.

Looking at things in perspective, the automobile industry, over the past few decades has suffered many gas shortages and price hikes. Each time this happens, car owners switch from buying cars that look good and have lots of horsepower to cars with better fuel economy. The car manufacturers in return, re-design their cars accordingly to meet the changing demand. Auto manufacturers have had lots of practice at this, and since the 70's and 80's, they have gotten very creative at improving fuel mileage by focusing most of their attention on 3 things. Weight, aerodynamics, and engine efficiency. Sadly, because the trucking industry has not had to deal with these problems, aerodynamics has never been taken seriously until recently. Weight and engine efficiency has had most of its focus put toward more horsepower, more speed, and lighter engines so that the trucks can haul more freight, rather than be fuel efficient. Diesel fuel, until very recent years, was so cheap, that no one really cared much about fuel economy. Just a few years ago, the entire trucking industry was slapped in the face with higher fuel costs when other countries started demanding more and more diesel on a global scale. The days of cheap fuel were soon over for us here in the U.S., so the truck manufactures had to think quick to keep up. Adding insult to injury, the E.P.A. and C.A.R.B. at around the same time, started demanding the truck manufactures also add emissions control to all diesel engines. Yet again, automobiles already

had these standards in place for several years, and engine makers have already developed emission systems to go along side their more fuel efficient engines. The days of permanently high fuel prices and cleaner emission standards is still very new to trucking, and the changes have happened so fast, that instead of developing from the ground up, makers of new engines had to resort to stealing the ideas from the auto makers. This has resulted in some more fuel efficient engines, but emission systems, so far have been an absolute nightmare, because development was too rapid industry wide. Many of these systems originally designed for car engines, when put on a diesel, have some serious problems long term, and that has caused trouble for everyone in trucking. It is a fact that high fuel prices and better emission standards are here to stay, and since emissions are so new to trucking, most repair shops, including dealers, just simply do not have a good understanding of what it takes to keep the newer engines healthy. These problems have forced many truck owners to resort to either learning these systems themselves, or to keep older per-emission trucks, modifying them for better fuel economy. If you are going to survive as a one truck lease-purchase owner operator long term, I highly recommend that, instead of dodging these new standards, you should learn to accept them and start looking at owning a truck with the understanding that you will eventually have to learn a thing or two about its emission system for yourself to help reduce downtime and over-priced repair bills.

Previous to your new high fuel and emission standards, the faster you went, and the more freight you moved, the more money you made. Now that fuel is so high, conserving fuel, for most operations, has started to outweigh this simple logic. Companies have resorted to slowing their trucks down, as well as buying more fuel efficient tractors. For most companies, this has helped a lot, so if you are thinking about getting a really fast truck, that is not so fuel efficient, you will definitely be left struggling to keep up with little or no profit. With all this in mind, you now know that you should look closely at aerodynamics, typical fuel economy, emissions, weight, and all the other things that will 'make or break' you.

The weight of a truck is largely determined by its engine, frame, body type, body size, and axle options. The bulk of class-8 trucks on the open road have an engine size of either 13 or 15 Liters. 13 being the lightest, offers the best engine fuel economy, but when you start pushing around 80,000lbs, especially on inclines, drivers tend to complain, as well as push them hard, which works against their increased fuel efficiency. Someone who knows not to push them, and who has lots of patience climbing hills, can benefit quite a lot from the smaller engines. 15L engines are more suited for climbing hills and pushing 80,000lbs all

day, but are less fuel efficient when driven normally. If you do not use the extra horse power and torque the 15L engines have to offer by using a turbo boost gauge to keep boost pressure low (typically under 10lbs pressure), then you can get very close, or sometimes even beat the fuel efficiency of the smaller engines. The difference in fuel savings can be upwards of 1+mpg, and equates to several thousands more in profit every year. The frame of the truck helps us on fuel if it is lightweight and/or short. Heavier frames are great for off road or heavy-haul operations, but for on-highway typical use, the lighter frame is better. Frame length can effect fuel by a lot because it will directly determine the distance between the back of the cab and the front of the trailer. This gap needs to be as close as possible to minimize fuel costs and typically can save or cost you 0.2 - 0.4 mpg.

Aerodynamics technology for trucks is still fairly new, but it has already come a long way. When a truck rolls down the highway, it has to push the air in its path out of its way. Any parts of the truck facing flat into the wind actually hurt the most on fuel because the air doesn't get pushed away, but rather gets packed up in front (like stuffing a pillow). When the truck gets above 45mph, the 'Pillow' of air starts to get very hard to stuff. This costs fuel, slows us down, and makes the engine work harder. Big flat chrome bumpers and grills look pretty, but literally cost thousands in lost profit a year. Big exhaust stacks and air cans mounted on the sides, facing the wind, will cost typically 0.2 - 0.4 mpg as well. Any time you can get these components out of the wind and behind the cab, you are better off. The height of the cab, if incorrect can mean as much as 1 full mpg. When the height of the cab matches the height of the trailer, that is where the best fuel efficiency is seen, because it keeps the nose of the trailer out of the wind. For flatbed and step deck haulers, mid-roof trucks with an adjustable top 'Wing' works very well, because that wing can be set to match the height of the freight. Smaller more aerodynamic bumpers, side skirts, and wheel covers can mean 0.2 – 0.3+ mpg too. Poorly designed side mirrors, nose mirrors, nose guards, and top sun visors can cost you fuel as well, so don't overlook them. After market add-ons like air tabs and mirror covers can help, especially if you are running at higher speeds, so if a truck has these, then you are better off.

The proper drive axle gear ratio for the truck is important to ensure the engine does not have to work harder than necessary to keep you rolling. Sure, the transmission has a part in all this, but the drive axle gear ratio has the final say in fuel consumption when it comes to what speed you will be going most of the time. A ratio of 3.55 is sort of the 'Middle of the road' spec on most trucks these days and is good for cruising speeds in the range of 60-65 mph, with the top end being about 70. A ratio of 3.42, or perhaps 3.36, is more suited for the 70-75+



speed demon super-truckers club, and a ratio of 3.72 is better if you are going to run 58-63 mph. Less common, a gear ratio of say 3.92 is good for a truck that runs below 60, especially if you are going to be doing a lot of hill climbing. No matter what axle gear ratio the truck has, slowing down will always outweigh it as long as you aren't lugging the engine, or using lots of horsepower to maintain your speed. This means, that if you are hell bent on driving like a speed demon, and have accepted the fact that most of your paycheck will be donated to the oil companies because perhaps you feel sorry for them, then you can at least lessen the blow by getting a truck with a lower gear ratio.

Transmissions do not vary greatly these days when it comes to the 'Top' or final gear ratio. Most have a top gear ratio of 0.74, so the big differences lie mainly in the number of gears and whether or not they are manual or auto-shift. The number of gears in the transmission can help give you more options to save fuel or keep speeds up while climbing hills, and an auto-shift helps by maximizing progressive shifting to help save fuel even more. The downside of manual transmissions is that they wear out quicker mechanically vs auto-shifters, and the downside of auto-shifters is that the electronics are expensive to fix, and they cost you extra fuel when running in city environments. Another negative of auto-shifters is that if you are with a carrier that has a student driver training program, and you want to train them using your truck, then they will not be able to learn how to shift a manual transmission.

When it comes to engine emissions, there are several options. NON-EGR, EGR, EGR with DPF, and DEF with DPF. For now (Sept. 2012), there are no restrictions on operating trucks built with or without these systems, but this is going to change very soon. California is soon to require all trucks to meet 2007 emission standards, then shortly after that, the rest of the states will follow. Many people will argue this point, but in all actuality, it is going to happen. The auto industry faced this in the 80's, and now it is truckings turn. What year a truck was built should be considered heavily. Trucks built before 2007 do not have a DPF, so, at some point, this may become a problem. Standards changed again in 2010 forcing the engine makers to re-think EGR, or to abandon it in exchange for what had been used in power plants since the 1960's to control emissions. This technology, otherwise known as Selective Catalytic Reduction (SCR) uses Diesel Exhaust Fluid (DEF). DEF is not cheap, but allows the engine to burn fuel at higher temperatures, making them more fuel efficient. What all this means when looking at fuel efficiency, is that in 2005, early EGR engines lost about 0.3 mpg, 2007 – 2009 engines lost about 0.4 – 0.6 mpg, early 2010 non-DEF engines lost about 0.7 - 1.0 mpg, and engines with DEF only lost about 0.3 mpg, but if you add in the cost of DEF, you end up with the equivalent of a loss of 0.4 mpg,

matching the engines of 2007 in running cost. This may seem really bad, but while this was happening, truck body styles and weights were changing, offsetting much of these losses, so most truck owners, when the trucks were running well, did not notice much difference. When looking at maintenance costs, trucks that use DEF, have the biggest problems and downtime, 2007 – 2009 trucks come in second, 2010 non SCR engines come in 3rd because of improvements, and engines older than 2007 being the lowest in downtime when it comes to emissions problems alone.

When it comes to tires, there are lots of debates, opinions, and disagreements, so I will simply stick to the facts. Firstly, when it comes to tire size, larger tires last longer, but smaller tires are more fuel efficient. Comparing costs of longer life vs fuel and shorter life, the smaller, more low profile tires always win by a large margin unless operating on non-paved roads. When it comes to duals vs super-singles, if you take opinion out of the equation, you find that there are now duals on the market that match very closely the fuel efficiency of super-singles. Although there are 70+ mph rated super-singles out there, all of the really high fuel efficient super-singles are designed for 65mph or less, so when you exceed this speed, it wears them out prematurely, usually rounding out the centers or the ends. Trucks that are 2011 and newer require smart-way approved tires, so make sure, if the truck is 2011 or newer, the tires are compliant. The lower the rolling resistance rating a tire has, the more fuel it will save you, so when looking at a truck, find out what kind of tires it has.

Auxiliary equipment like automatic chains, chain boxes, load bar holders, automatic greasers, sliding fifth wheels, air bag dumps, lift axles, and APU's will increase a trucks worth, and make life more comfortable. If you are buying a truck newer than 2007, it is very important to have an APU if you want to stay comfortable in summer and winter. The cost of idling EGR engines over time, far outweigh the cost of a good APU.

Last but not least, is your electrical power requirements. These days, most drivers, especially OTR drivers, need 120v A/C power for running things like laptops, refrigerators, microwaves, etc. The device you need to give you household outlet type power is an inverter. There are 2 types of inverters on the market, and although they both provide power in the form of household outlets, the power provided by each is very different. The 2 types are either 'Modified Sinewave', or 'Pure Sinewave'. Modified Sinewave inverters are what you find in all the truck stops. They are more popular because they are much cheaper to make and therefore cheaper to buy, and they use less power from your truck batteries. Like anything else cheap, they have serious downsides. That power running

through the outlet, and into your expensive laptop is very nasty and noisy. This nasty power has been known to burn out laptop power supplies, cell phone chargers, microwaves, and anything else not designed to be run by this type of power. It is also quite common for them to shorten the reception range of your AM/FM and/or CB radio because of the extra static they produce. It is also not legal to use this type of power for running medical equipment, like a breathing machine, for obvious reasons. If you plan on owning your truck for a long time and need good power, spend the extra money for a Pure Sinewave inverter. Xantrex and Tripp-Lite make really good quality pure Sinewave inverters. Tripp-lite is a common brand of inverter used in ambulances, where the power provided absolutely needs to be pure and reliable. They also make inverter/UPS units, when plugged into a wall outlet, will actually work in reverse to put power back into your truck batteries, not only re-charging them, but conditioning them to make them stronger, extending their lifespan. Inverters are great to have on a truck, but be very careful about how they are installed. The nicer ones require lots of power, heavy wiring, and big fuses. If installed incorrectly, they can catch fire and burn your truck down. RV shops have the most experience with in inverters, and are usually the better choice if you are going to have one inspected and/or installed.

## 05 – Before the Purchase and Pre-Purchase Inspections

Failure story after failure story, it is bad enough to end up in a crappy lease or owner-op agreement, but if you can't keep the truck on the road because it keeps breaking down, you will not only fail, but fail quickly. There seems to be a disease among drivers who decide to lease-purchase a truck. I call it Chronic 'ItsYourFaultatitas'. This disease is first seen in drivers, in its early stages shortly after they graduate truck school. Early symptoms usually start with the sudden lack of being able to do a thorough 112 point inspection. As the disease progresses, a 'Cowboy-ish' attitude starts to appear along side the desire to watch movies like 'Convoy' and 'Smokey and the Bandit', taking them as instructional videos for proper driving methods. During this stage of the disease, further loss of inspection ability is coupled with a paranoia against getting their hands dirty and/or the lack of ability to crawl around and under their truck for any reason. In its more advanced stage, the disease causes the inability to obey basic traffic laws and speed limit regulations, coupled with a 'Get out of my way' attitude. Also in this stage, the driver starts to develop an attitude that leads them to believe that because they are a driver, this further excludes them from any responsibility towards keeping the truck repaired and well maintained. Finally, this disease completely cripples the drivers ability to think clearly, causing them to blame all their problems on bad dispatchers, bad mechanics, crappy trucks, bum deals, and anything else that justifies blaming their problems on someone else.

You can be the best, safest, most knowledgeable driver on the road with umpteen dozen years experience, and yes, that accounts for something, but all that combined, is only a small piece of what it takes to own a truck if you truly want to be successful in this industry. Just about every high-profit single truck owner I have ever met, that has been in business for 10+ years, not only does most of the minor work to their trucks themselves, but can tell you in detail how to perform most of the major repairs the truck is likely to face. This is very telling of the 'Willingness to get dirty' by those who are successful when it becomes necessary to keep their money moving in the right direction. Most say 'Why should I pay a mechanic, when I can do it myself' for a good reason. In the trucking business, this is how you invest in your success. By learning not only how to drive, but how to keep your equipment on the road and profitable. The more you choose to rely on someone else to solve your problems, the more you choose to let your profits slip through your fingers. As a lease-purchase operator, since your profit margin is already low, you absolutely will not be able to afford the losses from letting others solve your truck problems.

I have heard countless horror stories about individuals lease-purchasing

used and sometimes new trucks that are absolute lemons that cannot be kept running enough to even make a paycheck. If you find yourself, or are already in this situation, and you haven't or didn't do ALL of the things to prevent it, then let me just tell you straight up,... IT'S YOUR OWN DAMN FAULT!!!. New, used or otherwise. Do not ignore the things in this guide or pass them off as overkill, because if you do, and you lease-purchase a truck, you will end up standing on the edge of a cliff you do not want to fall off of. Stay away from the edge of that financial cliff. Do things right, even if some of them are difficult to achieve. No one wants to buy a lemon truck with big problems, so instead of crossing your fingers, hoping that the truck goddess of happy settlements has smiled upon your truck, you need to take control by first, narrowing in on the year range, make, and model of a type truck that meets your needs. The next thing you need to do is get off your wallet. Start investing in your new business by buying some of the tools and test equipment you are going to need for the type of truck you have set your sights on. This should be done before you take any further steps toward owning a truck. You are going to be a truck owner, not a truck driver, so start gathering the tools you will need to help you solve the bulk of minor problems you will likely be facing ahead of time. Here are some of the things many owners don't think about, that will help keep your truck away from the end of a tow hook and/or the repair shops...

- A really nice chrome polished tool set from Kobalt or Snap-on for emergency repairs. Chrome-polished tools are high-tolerance tools. They are the least likely to slip on a rusty bolt, and they absolutely will not fail you when you need them the most.
- A good high quality tire gauge for keeping tires at the right pressure. These are your tires now, so take good care of them.
- A nice open-ended filter wrench. Nothing worse than discovering a loose fuel or oil filter and not being able to tighten it. This does happen sometimes after a PM.
- A nice soft-rubber air hose that connects to your glad hands for topping off your tires.
- A good quality 50 or 75 amp battery charger for when you have the truck at home. Conditioning your batteries regularly with a good charger will extend their life greatly.

- A cooling system pressure tester kit (looks like a tiny bicycle tire pump with a radiator cap at the end of the hose). This tool is absolutely necessary if your truck has a newer EGR engine. EGR coolers like to leak, slowly destroying your engine, EGR system, and clogging up your DPF. One of these, used regularly, can save you thousands in downtime and repair bills. You will also need one handy to ensure there is no leaks in the coolant or EGR system when you inspect the truck you are about to buy.
- A 0-60 psi mechanical turbo boost gauge (Auto Meter 3605 Sport-Comp II 2-1/16" 0-60 PSI Mechanical Boost Gauge from Amazon.com is really easy to connect). You will need this to ensure the turbo is operating to specifications when you first get your truck. After that, you will absolutely need this gauge to help you save thousands in fuel as you drive.
- Some good quality jumper cables made for a truck. #4 or #2 gauge wire.
- A good quality first-aid kit. This is not only for you, but could save someone else's life.
- A good tire patch kit made for trucks.
- A nice pair of bolt/lock cutters.
- A mechanics mirror, and a good bright flashlight.
- A tire tread depth gauge. You need this not so much for checking if your tires are legal, but to check the tread depth every time you PM your truck so that tire wear rate can be determined. This helps you plan for tire replacement and also helps you with tire wear issues.
- Some safety glasses for looking upward from the bottom of the truck.
- A couple of 3-foot long wood 4x4's for chocking wheels so you can do an air-brake test, or if you break down on a hill. You can also drive up on them to make it easier to get under your truck when necessary.
- A mini 12-ton jack. Good for many things, but mainly for getting a wheel slightly off the ground to check it for loose hub bearings or worn-out king pins.
- At least 3 really large, thick beach towels. Nothing worse than spinning tires, stuck in the snow and/or ice or muddy parking lot. Rolled up towels under the drive tires will get you unstuck every time. You can also use them for working under your truck, and in a winter emergency, you can use them to keep from freezing to death.
- A few Fleetguard coolant test strips. You need the kind that come with the test result chart. They are about 2 bucks each and can be bought online or at a Detroit or Cummins engine shop.

Much of this stuff can be obtained from Amazon.com pretty cheap. Ok, assuming you have most of this stuff, you have finally settled on a truck. First

thing first, get its VIN number, engine type, model, and mileage from the seller along with what brand, size, and model tires. Look up the tires on Michelin's web site for their rolling resistance. They have all brands and models listed there without bias to their own brand. If the tires have a low rolling resistance, like 120 or less, then you will be ok, but if they are above 130, then they will cost you fuel unnecessarily. If they are really bad, like 160+, then you need to inform the seller that the tires are unacceptable, new, used, or otherwise. Tires this bad will literally cost you several thousands in lost fuel. It would be a much better option to get some worn-out fuel efficient tires, than crappy new ones. If the seller will not negotiate this, then you will need to consider not accepting the truck because you are likely to have to shell out the money for new tires yourself to get the truck's fuel economy up where it should be. Rolling resistance is rolling resistance. Friction is friction, and physics is physics. Bad tires will cost you.

If the truck is used, get off your wallet again and do a Rig-Dig report on it. Read the report looking for signs that may show if it has been abused, wrecked, or poorly maintained. The next thing you should do, if all that is good, is, if you don't have the correct adapter for your coolant leak detection kit, order one online from the maker, or borrow one. Next, go on the Internet and look up ALL of the recalls released for this make and model truck. Then, look up all the recalls released for that year and model engine separately. Print them out, so that you can take them with you when you inspect the truck. Some of these recalls, if not done, could be a serious threat to the safety of you and/or your truck. Call or go to a local dealership with the VIN number and have them give you a repair history and a list of open recalls. If there are open recalls, ask about pricing to get the recalls done. Some recalls have expiration times on them, and if not done during that time, will cost money to have done later. After you have done that, look in the truck papers, magazines, and the Internet for typical prices of trucks that are the same mileage, style, and year range. Write down or print out several examples as proof of the trucks worth, especially if the seller is asking quite a bit more than you see other trucks listed for. When you are ready, set up an appointment to inspect the truck thoroughly yourself for a couple of hours, with access to the underside of the truck (A creeper and a set of ramps under the steer axles is ok). Let them know you are as serious about inspecting the truck as they are at collecting their payments. Plan on getting dirty, because if you are going to buy this truck, then now is the time to get to know very well, the piece of equipment that is going to determine your financial future for the next few years. **DO NOT RELY ON A MECHANIC TO INSPECT YOUR FUTURE! THAT ATTITUDE IS WHY SO MANY FAIL!** It is your future, your safety, your responsibility, and your life. Get a printed copy of a thorough 112 point D.O.T. inspection and some notebook paper to take notes. Any shortcuts or laziness here can cost you big

time. You are also going to need your recall information sheets, a coolant pressure test kit, a tire tread depth gauge, some needle nose pliers, a couple coolant test strips, a watch or stopwatch, a roll of paper towels, cheap rubber mechanics gloves, and a big spray bottle with some dish soap and a bit of water in it for checking air leaks. To start, before opening the hood, go over the exterior noting every scratch, dent, crack, wear mark, imperfection, ding, missing screw, loose rivet, faded area, discolored spot, etc. This may seem a bit on the over-kill side of things, but it is very necessary because it will do 2 things. First, it will be proof of condition at the point of sale, and second, it will put your mind in the right place for inspecting the more serious stuff, making you less likely to miss things. Perform a very serious 112 point inspection of the truck, writing everything down as if you were a D.O.T. officer out for revenge making notation on everything found. Also, here is a list of some checks to perform, that you will need to do in addition to the D.O.T. and your own inspection...

- Check that all the recalls have been performed as best possible, especially if they are safety related.
- Check the tread depth on all the tires and look for variations in tread depth from inner to outer of each tire and from inner to outer on the duals. If the inside tread of the inside tire is more than 2/32 or so less than the outside edge of the outside tire, this is high indication of bad or out of adjusted wheel bearings.
- Check every light and reflector for fading, discoloration, looseness, cuts, and/or missing areas, especially on stickers. If any reflectors or stickers are cracked, scratched, or missing they will need to be replaced. A picky D.O.T. officer can write you up for even the smallest of cuts or discoloration on reflectors and stickers.
- If it is a truck that is California clean-air certified, then make sure the sticker is present as well. This sticker is not supposed to be removed, it is expensive, and can only be obtained from the dealer.
- Check the front bumper for damage and if it folds down (many of the new ones do), make sure the hinges and latches are good. Also, if it has a screen, make sure it is not broken around the mounting screws.
- Make sure the tow hooks are present. Sometimes they are tucked away in a frame holder or in a side box. If they are missing, then they will need to be replaced.
- Check the hood latches, and open the hood. Check it for stability and inspect the springs, latches, and stop straps (or gas shock).
- Check the shop floor, pavement, or ground for any wet or oily spots. Make sure the ground is dry under the truck. Later, after you are done with the inspection, you need to look again to see if there are any leaks.



- Perform a coolant test strip test. Follow the instructions on the card, using your needle-nose pliers to dip the test strip into the coolant from the fill tank. Use your watch to time it according to the instructions. If it fails, or barely passes, then do the test again. Make a note if the coolant needs servicing.
- Check to see what color the coolant is. Red coolant is extended life coolant and lasts about 500k before it needs to be pulled out and an engine flush performed. Green has a short lifespan and lasts about 1 – 1.5 years. Orange is typically DEX. Orange is good coolant, but you cannot mix it with green. This will produce an acid that can quickly destroy your engine. If the truck has 450k+ miles on it, then very soon the coolant will need changing if it has not been already. Always assume it has not been changed, so if it is an older truck, and your coolant test was not good, then you need to have the dealer or the OEM engine shop test the coolant again and give you written results before putting the truck on the road. Your local TA, coolant test strip method during a PM should never be trusted. If the OEM says it is good, and it is actually not, then you can make warranty claims, using your written results if something happens.
- Make sure the engine and coolant is not hot. Pressure testing the coolant while the engine is warm will give bad readings. Check the coolant level, then install your coolant pressure tester making sure it is on tight. Pump it up to about 1 psi higher than the pressure rated on the pressure cap (15 psi + 1 = 16 psi). You need to leave it on for about 30 minutes or so making sure it does not lose any pressure. If it keeps losing pressure, use some soapy water in a spray bottle to verify it is not the cap or tester. If it keeps dropping, then look for coolant leaks, checking the ground under the truck. If there are no external leaks such as the radiator, a hose, or the filter, it is an indication of some real engine problems. It could be a bad EGR cooler, blown head gasket, cracked head, leaking injector cup(s), bad piston sleeves, cracked engine block, etc. As you can see, this simple test is very important. It would not be good climbing Donner Pass for the first time, finding out you have a bad head gasket half way up the mountain. Don't forget to remove the tester before starting the engine.
- Check that the headlight lenses are not frosted out. If they are, especially if it is from the inside, then it is highly likely the bulb dust covers are missing. If the headlight lenses are frosted badly, then they will need replacing along with any missing dust covers. Lazy mechanics and drivers tend to pull the dust covers off during a bulb change, thinking it won't cause any harm, but that's the quickest way to end up with frosted out lenses.

- Check the screen in the front grill to make sure it is secure and all the clips are in place.
- If the truck has more than 300+k miles on it, check to see if the belts look new. If they are old, or slick and shiny from wear, then it is a good idea they be replaced before putting the truck into service. After you have purchased the truck, YOU should perform this replacement if at all possible, keeping the old belts as spares. Let a mechanic show you how if necessary. It is important to know how, because if a belt breaks, it is not likely to be at a truck repair shop, but instead, in the middle of the desert on some lonely highway.
- Check the front of the radiator to see if it is dirty and/or clogged with dust. This will cause the truck to overheat when pulling long hills. If it is dirty, it will need to be steam cleaned.
- Check the frame and suspension components for road salt corrosion. This is a good indicator that the engine wiring harness and plugs could give you trouble in the future. If later, an ECM report shows several communications errors and/or random sensor faults, then the wiring harness may need replacing.
- Check the front hubs for the correct oil level. If it is really low, or the oil is black, then the bearings will need to be inspected carefully, and the oil changed before putting the truck in service. This is nothing to take lightly. A bad steer axle hub bearing can cause a rollover or kill someone. Also check the brake drum, pads, and s-cam area for oily spots. This is an indication the hub seals are leaking.
- Check for rust rings or shiny spots around all of the suspension bolts and brackets. This is an indicator that they can be loose.
- If the truck has front air suspension, then you will want to inspect the air bags closely. When the air bags are up at normal ride height, make sure the truck is not leaning to one side or the other. A leaning truck will have caster alignment problems and cause it to eat tires, have unstable steering, and/or pull to one side going down the road. Bleeding the air system out by working the brake pedal, then shaking the cab of the truck will generally bleed the air bags down. You will usually only find dry-rot or cracks when the air bags are all the way down. Look around the top, where the rubber folds tightly. If the truck has 400k+, and the steer axle air bags are original, then note they will need changing within the next 100k. Steer axle air bags like to fail after about 500k miles.

- If the truck has leaf springs in the front, check the gap between the upper and lower leaf on each side. If there is a gap, then this could be an indication that the leaf springs are starting to get weak. Also, make sure, if there is any gap, that the gap is the same from driver side to passenger side. A big difference between sides can cause excess steer tire wear.
- Check very closely for any kind of leaks around the power steering unit. A leak in the hoses, reservoir, or unit, is grounds for a D.O.T. shutdown, and is a serious safety issue. Remember, this is soon to be YOUR truck, and YOUR problems.
- Carbon monoxide poisoning is a very common thing among trucks. No one wants to drive sleepy all the time. Check very closely for black marks or soot buildup around the exhaust manifold where it meets the block. Also make sure none of the header bolts are broken. Broken header bolts is a sign of bigger problems. They are an indication that the engine block has suffered excess vibration (a bad crank shaft damper), and/or stress from overheating. Engines that snap exhaust manifold bolts will likely cause repeated EGR cooler failures as well.
- Look for black marks or soot buildup around the back of the turbo, its connecting pipes, and the flex pipe going down under the cab, toward the back. Also, if it is an EGR engine, check the piping going from the EGR cooler back around to the intake.
- Give the radiator and fan shroud a good shake. Inspect the radiator mounts and bushings to make sure there is no free-play. If there is free-play, then this could be something that causes a charge air cooler to get cracked. Cracked charge air coolers can cause a lot of fuel mileage, EGR, and/or soot problems with the engine.
- Check to make sure there are no missing bolts in the alternator and air conditioner compressors. A sign of lazy mechanics.
- Check all the mirrors and mounts closely. A loose mirror mount may indicate it has been hit.
- Remove the battery covers. Besides checking all the wiring and posts for corrosion and tightness, check the sides of the batteries. If the sides are bulged out and no longer straight, this is an indication they have been overheated (a condition known as gassing). Overheated, bulged batteries are generally weak and are ready to fail, assuming they are not bad already. Also check to see that all the batteries are the same type, and are close to the same purchase and/or warranty date. This tells you that the batteries are a 'Matched Set'. Unmatched batteries will not last nearly as long as a matched set.

- If there is any air left in the air tanks, bleed them and check for moisture. If any significant amount of water comes out (more than a quick release of moisture), then there is a high possibility that the air dryer or decandent filter is bad. Take note of it and know you will have to, at the very least, have the decandent filter changed.
- Check the rear air bags when they are down all the way for cracks or sign of dry-rot in the rubber around the sides and top. If there is, they will need replacing before the truck is put in service.
- Check closely around the rear brakes and drums for any oil leakage. This is a sign the hub seals are bad and need replacing.
- Look for discoloration around the input shaft of the front differential. This is an indicator that the truck has been driven hard. If so, then the oil in the transmission and differentials needs to be tested for signs of excess wear.
- Make sure the mud flaps and holders are in good shape, and that the reflective D.O.T. stickers are across the tops.
- Check the exhaust piping very well, following it closely. Get under the truck as necessary with your flashlight. Shine the light down every inch, following it all the way to the DPF or muffler, then again out to the stack. You will be looking for several things. Dents, cracks, breaks, holes or gaps, and crushed places. You will also need to inspect for fuel, oil, or grease on or near the piping. Any places where there might be a small hole or even a gap, if the truck has a DPF, can cause huge DPF problems, and very well can also cause the truck to catch fire and burn to the ground if you have to perform a 'Parked Regen'. Diesel fuel is actually pumped directly into the exhaust pipe during a Regen cycle, and ANY gap, crack, or hole in the pipe can turn the truck into a big fireball in a matter of seconds. This inspection needs to be taken very seriously. Crushed sections like a crushed flex pipe, joint, or elbow will cost you lots of money in fuel economy, as well as cause the engine to produce excess soot, which clogs up your DPF and/or muffler further compounding your fuel economy loss and creates lots of EGR problems up on the intake side of the engine. Excess buildup of grease, fuel, or oil near the pipe can also cause a fire, so look closely for this as well.

- After performing the rest of your 112-point inspection noting other things found, and when you finally ready to start the engine, go ahead and start it up, but get out, while the exhaust piping is still cold, and spray the exhaust joints heavily with your soapy water. Look for exhaust leaks, especially around the exhaust manifold where it meets the engine block, the turbo, behind the turbo and down to the flex-pipe. Check the flex pipe under the front of the cab very well, and the flex pipe in the back of the cab going to the stack. Check the connection from the hard pipe to the DPF filter, and all the joints at the DPF itself. If there is no DPF, then check the muffler and joints. Spray everything down liberally, because giving these components a bath will not hurt them.
- Soap spray, and check for leaks in the piping from the turbo to the charge air cooler, especially the rubber boots connecting the pipes together. Also check the EGR pipes and tubes wherever there are joints, and check the boots and joints on the intake side of the engine. Any leaks here will definitely cause the truck to get poor fuel economy, and possibly cause EGR problems.
- Perform a very thorough in-cab inspection checking all the in dash lights, gauges, and indicators.
- Do an actual air brake test. With the engine off, you should lose no more than 3 psi in one minute, and 4 psi in one minute with the brake pedal pushed in hard. Also make sure the warning buzzer works. I have seen trucks parked in the middle of the freeway because the buzzer was disconnected and they didn't notice the engine shutdown alarm. Also, make sure the tractor protection valve closes above 40 psi.
- Check to make sure everything in the interior is working like the radio and bunk controls. Don't forget about the A/C system as well. Make sure it works continuously for 15 minutes or more in the front and in the bunk. It is quite often that A/C problems do not show up until after about 10-15 minutes of run time.
- You should note any damage, dings, scratches, etc. in the interior or any controls not working.
- If the truck has an S-Bar heater, fire it up and make sure it works well. Let it run for about 20 minutes or so.
- If the truck has an APU, then check the oil level before starting it up. Also look to see if the belt looks old and worn, and if the oil and/or air filter is old. If they are, then it is highly recommended that a full PM be done on the APU before putting it into service. You should also check to see that it is running, and that it gets cold / hot.

- Don't forget about doing a full D.O.T. inspection from a printed checklist that includes looking for cracked rims, bad slack adjusters, worn brakes, cracked brakes or drums, lights that don't work, bald tires, etc.

It should take you a couple hours or more to do all of the inspections for the truck. The items listed above, if done well, should seriously help reduce your chances of buying a lemon truck. Do any and all other inspections you can think of, writing down everything.

With your rather large list of issues the truck has, now, away from the truck somewhere, or while enjoying the truck's A/C for a bit, you should go back through your list and mark off every single item that you are willing to accept 'As Is' without it being fixed by the seller. All the rest, and any actual or real maintenance issues with the truck needs to be discussed before even thinking about leasing this truck. You need to sit down with the seller and negotiate how, when, where, and who is going to take care of each of these items. You will need this, your Rig-Dig report, and your list of average price comparisons as leverage to either show what the trucks actual worth is, for negotiating the price and/or getting the problems found taken care of before the truck is put in service. If the seller is asking more than what the truck is worth, then either make them lower the price to what it is worth, or make them fix all the issues with the truck proving it is worth the extra price. Do not be shy about it because somebody is going to have to shell out the money to get the truck right before it is put back into service. If the seller claims you are being 'Picky', then you should consider walking away from the deal. This is your future, your life, and your business, and it should be taken very seriously. Don't let a mechanic or the seller talk down the items you have found, especially if the coolant pressure test keeps failing, or you find something that is going to cost you fuel economy. These are things that can put you out of business fast, or at the very least, cause you to make unnecessary donations to the oil companies on a regular basis. Your focus should be, if you decide to sign your life away to this truck, is to give yourself the absolute best possible chance of being successful without any compromises. If you can't start doing things thoroughly and correctly now, before the purchase, then you should not bother owning a truck because it will come back on you when you are most vulnerable.

## 06 – Things to do Before Moving Freight

Driving your truck, not knowing its condition, affects everyone you are involved with. A truck that breaks down several times hurts you financially, hurts the company you lease from in lost payments and/or assistance with repair bills, and also hurts the company you are hauling freight for in lost deliveries. As a secondary effect, you, and your carrier, quickly get a reputation for being 'Unreliable'. This forces the carrier to give the more sensitive freight to other drivers, further lowering your chances of getting good miles, even after the truck may have been fixed. All trucks break down on occasion, this is understood and unpreventable sometimes. It is the truck that breaks down multiple times, that create the most problems. It is actually better for everyone involved, for a truck to be down for a couple weeks if necessary, getting it reliable gain, than to break down several times for 2 days here and 3 days there. As a lease-purchase operator, yes, you need to get the truck back up and running ASAP, to stay on top of your finances, but you don't need to do so at the cost of reliability. The day you commit yourself to a particular truck, is also the day you need to be prepared to commit some serious time and money 'Proving' and 'Preparing' your new investment for a long term, reliable journey. That time and money you invest now, will be earned back right away, and ends with you sitting behind the wheel of your truck, moving those first few loads, knowing the truck is not going to fail you.

Any lease-purchase agreement worth its salt, if you are buying a used truck, will allow you at least 30 days to get anything and everything repaired on the truck related to its road readiness at the sellers expense, or at a very minimum, assistance with any expensive repairs. This is definitely not enough time to get the bugs worked out if your own ignorance overcomes you, and you start trying to haul freight with the truck right away. All trucks develop minor problems as they are driven, and most trucks that are sold have a large portion of these issues ignored simply because the owner(s) already know it is not going to be their problem once it is sold, or it has simply reached the age where repairs are needed. When you buy a truck, even a new one, you need to well establish that it is capable of being reliable long term. Jumping behind the wheel of a truck you know very little about, especially a used truck, is a very bad business decision. It is like rolling the dice at the casino, hoping you get a seven. Instead of crossing your fingers like all the others that have come before you, gambled, and failed their lease, blaming the lemon truck they must have bought, take the proactive position early on by getting its service items up to date and getting some real proof that the truck is actually ready for use without having multiple problems in its near future.

When you have established that yes, you want this particular truck, and yes, you are absolutely ready to lease-purchase this truck, then you need to once again negotiate with the seller. Discuss with them the fact that you are indeed going to lease-purchase this truck, and that you want it very much, but before you can fully commit your financial future to this piece of equipment, you will need to establish, without doubt, that it is in fact, ready for moving freight in a reliable manner, and that it is able to make you a profit as well. After all, why would someone want to buy into ANY type of business, spending hard earned cash, not knowing if it were reliable OR profitable.

Remember early on in this guide, I highly recommended you gather \$6,000 in cash to get on your feet reliably. **NOW IS THE TIME TO START SPENDING SOME OF THIS MONEY!** From here on out, you need to take a proactive approach toward keeping your truck in good condition. Never wait for something to go wrong. This will put you in the shops, and possibly out of business. Instead, become very proactive by spending money on preventing problems, rather than spending money on fixing things after they break. As a start, establish with the seller that you want to have the truck made ready for testing, and that you will pay to have it sent to the nearest dealer or engine shop with a Dyno to have the truck Dyno-tested and, if the truck is used, have a full ECM report done to establish its lifetime fuel mileage, abuse report, Regen history, etc. If the seller cannot accommodate you, then your only choice is to do these things on your own after signing the lease-purchase agreement. If so, then you need to ensure you have a grace period to cancel the lease with no penalties if you decide you do not like the truck. If there is simply no possible way to have the truck sent, or possibly towed, to a shop with a Dyno, and an ECM report obtained before committing yourself long term, then just walk away from the deal. There is no excuse for them to try and rope you into something knowing you are going in blindfolded, especially if you are willing to pay out of your own pocket for having the tests and reports done. The preferred method is to have the seller work with you and send the truck off to prove it is worth what they are asking for it. Second option is to get 'Temporary insurance' and take it down there yourself. Third option is to sign the lease, but only if there is an opt-out grace period. Last option is to have the truck towed. No matter how, get the truck to a shop with a Dyno, before putting it into service.

You need to start by playing the role of 'Coordinator', so knuckle down and start making phone calls, getting the seller, the shop, and possibly a towing company, set up to get the truck verification process started. The seller needs to be prepared to pay for anything actually found wrong, as well as aware of when and where you take the truck. The shop is going to need to know exactly what tests



you need performed so they can make time for you and set up an appointment, and if you have to get the truck towed, the towing company needs to know about it. You need to be prepared to take the time to be there, and be prepared to pay everyone as necessary. Get some ball-park estimates on the costs from everyone that is going to need to get paid, letting them know what you need done.

The shop that is going to do the work for you is going to need to know exactly what you need done, and in what order, so that you don't waste money having to test things multiple times. Here is a list of what you want done in the correct order. Be sure to have fixed anything found wrong before going to the next item down the list.

- A thorough inspection that includes checking for any fluid and possible exhaust leaks or restrictions, checking the drive line, and checking the air system along with a D.O.T. That includes an inspection report and new stickers.
- A full fifth wheel inspection (includes using a test kingpin to verify the backlash is within tolerance).
- A fault code report inactive and active for the entire truck including the cabin controller, HVAC, and ABS systems along with a full ECM report including a driver abuse history, a DPF Regen history, Fault code history, lifetime and trip Fuel mileage report, trip statistics, driving statistics, idle time, and a connection history report showing how often the ECM has been accessed by a computer. You also need the calibration information and a printout of all parameters and settings.
- (Assuming the ECM report was good and you still want the truck) If the lifetime fuel mileage is below 6.8 mpg, or there is more than 400k miles on the truck: A charge air cooler test with an actual and accurate '2 minute Leak Rate'. Not just a pass/fail test.
- If the steer axle hub oil is very low, or looks bad: A steer axle wheel bearing and king pin inspection.
- An oil sample taken and sent to a lab for comprehensive analysis.
- The most comprehensive Dynamometer test they have to offer with detailed reports.

If you are going to keep the truck, after all tests and repairs, they will also need to...

- (If the truck has 250k+ miles) Perform an 'Overhead set and engine brake adjustment'.

- (If the truck has 350k+ miles and has EGR) Replacement of the following items...
  - Intake manifold pressure sensor.
  - Exhaust manifold back pressure sensor.
  - EGR differential pressure sensor.
- (If the DPF history looks poor) Replacement of the after-treatment injector, and a forced Regen performed to verify the DPF was corrected.

Assuming you still have your own inspection report, having the shop do their own inspection will get you a second opinion and allow you to discuss the things you found as well. Any items found will need to be fixed by someone before putting the truck on the Dyno, especially if it is something that will effect the test results.

A fifth wheel inspection needs to be done by the shop so that liability does not fall directly on you if the fifth wheel fails. This is cheap insurance, as well as something that absolutely should be taken seriously for the safety of yourself, the motoring public, the equipment, and the freight.

The fault code history and ECM report is very important. It will reveal much about the truck. The lifetime mpg rate will reveal how healthy the truck has been long term when compared with what speeds it has been driven. Abuse history will tell you how many times the engine has been overheated, or been abused in other ways, the idle time will tell you how much the engine has been idled. A very high idle time on the engine (like say 40%+) is not good, and actually can lower the trucks worth by quite a lot. A high idle time on an EGR engine also means that the EGR will likely need lots of servicing before the truck can be expected to be reliable again. How many times a computer has been connected, will give you clues toward how many times it has been in a shop for problems. If this number is high, then the engine should be inspected closely for components that have been replaced to see what caused the repeated failures. Use statistics will tell what rpm range the truck has spent most of its life in, letting you know how fast it has been driven most of the time. This is good to know, because if you decide to raise the governed speed of the truck, and you suddenly allow the truck to run at a faster speed, then that shift in speed will likely cause engine or drive train issues during the 'Break-in' period of the new speed such as premature seal failures, increased oil consumption, or minor EGR or turbo issues. If the truck has a DPF, then the DPF history is very important. It will reveal how healthy the DPF is currently, as well as how healthy the Regen system is. If the DPF history shows a steady or erratic climb in hpa (back pressure rating), then

this is a sign that you will have trouble in the near future. The hpa of a brand new DPF is typically 1.0, a healthy DPF is usually under 3.0, and a bad DPF will have erratic readings upwards of 5.0+. If this is the case, then the after-treatment injector will need replacing and a 'Forced Regen' performed to see if the hpa comes back to a normal level. You cannot afford to play around with this.

Replacing the after-treatment injector is a very necessary and regular thing to do to keep a DPF system healthy, and is also the most likely cause of DPF problems, unnecessary Parked Regens, and fuel economy loss when it comes to the DPF.

Replacing it is easy to do, because it is simply attached to your exhaust piping, located right behind the turbo, with a couple of screws and hoses. Many owner-ops learn to change this part themselves, because it is a component that starts getting clogged up about every 180-200k miles, and causes fuel mileage to start dropping. Don't forget to look for HVAC, cabin controller, and ABS system faults too. Faults here can reveal the truck might have a bad A/C sensor or two, or a bad ABS sensor on one of the axles.

A charge air cooler, otherwise known as the 'Air to Air Unit' is simply a radiator for air instead of water or oil. It cools the air from your turbocharger (making it more dense) before it gets sent to the intake of your engine. A leak in this 'Air Radiator' cannot usually be seen, but it can definitely be felt, not by your hands, but by your wallet. Even a small leak can cost you lots of money in fuel mileage loss, and can cause lots of soot problems. If there are any indications of low fuel mileage, and/or soot problems, this is definitely a good place to start checking. The engine manufacturers actually allow a certain amount of leaking or 'Air loss', before it is considered bad, but even very small leaks will cost you fuel. To test it, a 'CAC test kit' is put on it (about 200 dollars at Amazon.com), then you inflate it to 30 psi like you would a tire, then watch to see if the pressure drops for 2 minutes. Any loss of more than about 15 psi in 2 minutes, and it is no good. At that rate of loss or more, it is actually cheaper to replace the whole thing, than to keep running the truck at the lower fuel mileage rate. If it does leak, be sure to use soapy water on the test kit, gauge, and hoses, to make sure it is in fact the unit. Charge air coolers typically like to start leaking at around 400-600k+ miles on most trucks, so keep that in mind when your truck is having other tests done with regards to power, fuel mileage, soot, or turbo issues. Please, whatever you do, if there is a leak, **REPLACE THE UNIT!** Do not get it fixed. Fixing it only works as a temporary solution, and you will need to get it constantly checked afterwards, costing you extra downtime and money. If the welds are cracked down the sides, then the engine mounts and radiator mounts need a close inspection for cracking in the rubber joints, and the engine crank shaft damper will likely need replacing along with it.

An oil sample taken from the engine, when sent to an actual laboratory for comprehensive testing, and not one of those stupid instant check machines, will reveal the actual health of not only how well the engine is running, but the health of all the components inside the engine, and how well the oil is protecting everything. After you get the result sheet back, it will have several sets of numbers on it revealing much. To start, look at how much fuel has gotten into the oil. Any amount at all is a bad sign, and should be taken very seriously. It is an indication that the fuel pressure is low, or that the injectors are going bad. Look for signs of coolant (glycol) next. Any coolant in the oil means either a leaky EGR cooler, or a more serious problems like blown gaskets, bad injector cups, worn or corroded piston sleeves, or a cracked head. Fuel, and coolant also destroys the oil's ability to protect the engine, so chromium (piston sleeve wear), and iron (overall wear) numbers will be higher than normal. The Base number (TBN), is how much of the original additives in the oil, from when it was new, that protect the engine, are left. A TBN, or Base, below 2.5 is an indicator that the oil is in need of replacing. Silica (road salt and/or dirt) will destroy a diesel engine very quickly, or at the very least, cause the engine to wear out long before its expected lifespan. Any significant amount of it is an indication that the air intake piping and/or air filter is not keeping the dirt out. Lead and copper, if abnormally high, indicate a bearing could be failing inside the engine. This could definitely shut you down with huge repair bills, so it should be watched closely. The amount of iron in the sample is a good indicator of how long the oil has been in the engine (if all else is ok). Just multiply the amount by 1,000 and you will end up with an estimate of how long the oil has been in there. An iron of 15.0 would indicate the oil has been in the engine roughly 15,000 miles.

Dyno, or otherwise known as Dynamometer testing, is a test performed by a truck shop to verify that all the systems on the truck are, not only operating within factory specifications, but how healthy they are. What they actually do to perform this test, is to put the truck on a set of rollers, tie and chain it down, hook up a bunch of external sensors (if done right), and load test the truck to full capacity at several different speeds. Most shops offer different levels of testing, and if so, you need to get the most comprehensive and thorough tests they have to offer. Usually, you will have to set up an appointment with the shop to get it done as well. You need to be present when the test is done so that you can watch them do it, and watch for anything unusual that the mechanic might miss such as black or white smoke, unusual vibrations, wobbly rims or tires, or a noisy drive-line. The test results will reveal many things that are important like the rpm range at different gears with the most fuel savings and torque. Also, very important, is the amount of horsepower the engine can apply to the ground. Typical results for this is to see, at the very minimum, 80% of the engines rated horsepower applied to

the ground. Anything less than this will reveal there are some problems somewhere. What you would like to see is better than 85%, because the drive line of even a healthy truck will typically consume that last 15% of horsepower your engine is producing as harmonics and/or heat loss.

If you are going to keep the truck, after all tests and repairs, then, before you put the truck into service, you will need to get some other items taken care of to get the truck's fuel economy up as high as possible and the engine running smoothly. If your truck has more than 250k miles on it, what you want to have the shop do, is an 'Overhead set'. This is simply a re-adjustment of the intake and exhaust valves to maximize fuel economy. The engine makers recommend this be done at 500k miles, but that's way too long, and way too much money wasted in fuel loss to even consider. Letting it go that long could potentially cost you as much as a half mile per gallon on some engines. Also, when this is done, your engine will run much smoother, and your 'Jake Brake' will get stronger, allowing you to go down hills in a higher gear more often.

The next thing you want to do is, if your truck has 300-350k or more miles on it, and it is an EGR engine, is to replace a couple sensors that directly effect fuel economy as they age and/or get dirty with soot. I have seen trucks go from 5 or 6 mpg to 7 and 8+ mpg instantly after replacing these sensors. I have also seen shops chase performance, EGR, and turbo problems, costing owner-ops several thousands in repairs and several repeat visits to the shops, sometimes putting them out of business, all because these sensors are not reading correctly, yet they pass a sensor test every time. The two main culprits are the intake manifold pressure sensor, which indirectly controls the turbo boost pressure, and the EGR differential pressure sensor, which indirectly controls your EGR valve. These sensors can lower the fuel economy of trucks by as much as 2+ miles per gallon before they start to show any signs of failure. If they are old, just replace them. Believe me when I say it is cheap to do compared to the consequences. These sensors are very easy to replace and I recommend highly that you learn how to replace them yourself, along with most of the other engine sensors. Replacing the sensors related to your problems should also be done, if possible, as a final step before facing a potential visit to the dealer or engine shop, when you know you are facing several days of down time.

Replacement of the after-treatment injector, and a forced Regen performed, is the best thing you can do to prevent DPF shutdown or engine derate problems. If your DPF history report looks pretty good, then don't bother spending the money replacing it, unless it has more than 400k miles on the truck. If it is still good after that many miles, then by now, it is likely lowering the

truck's fuel economy by quite a bit during passive Regen cycles, so replacing the injector is a good investment and cheap insurance against DPF problems.

As you can see, when all of these tests are performed, you will now have the actual condition of the truck, its expected fuel mileage, and either a good start on what needs work, or the test results proving it is in fact a reliable truck. When the work is all done from the shop, all repairs made, then you are ready for the final steps in getting the truck prepared for road use.

After your lease-purchase, and the paperwork is done, you need to yet again, spend some money, and take the truck down to a lube shop (TA, PETRO, SPEEDCO, etc.), and get a full PM on the truck with greasing, AND, if the truck has 250k or more miles, have the oil changed in all 3 gearboxes (Transmission and both rear axles) with some good synthetic gearbox oil. This will flush out condensation buildup and help extend the life of the axle and shaft seals. Make sure you don't forget to change your HVAC and engine air filters if they are not new. The air filter can affect fuel economy by a lot if it is plugged up.

The brand of oil you use in your engine is actually very important. Unfortunately, advertising, opinion, truckers stories, price, and ten thousand other non-factual, non-scientific, senseless reasons, is how most people, and unfortunately, most mechanics, choose their brand of oil. This is actually perfectly ok to do as long as you stick with the top, most popular brands. They all work well, and they all will protect your engine. So why is the brand very important? The biggest reason, is that it is actually harmful to change brands. What happens when you change brands of oil, is that the wear patterns on all the components that need oil in your engine will change. This causes accelerated wear to your engine until the new patterns set in. Also, because these patterns change, your engine will use oil at a higher rate until it settles in again. It is enough of a change that your engine could suddenly need a gallon of oil every 5,000 miles, where before, it didn't need any at all. After maybe 40,000 miles, the new patterns will set in and your engine should stop using oil so much, going back to the way it was. My point here, is that you have just signed the lease to a truck, so whatever brand you choose, you should stick with it.

If you are actually not sure, then perhaps some education will help. The HFRR rating of an oil is its rating on how well it protects metal parts as they rub together tightly. CJ-4 (you see this on the bottom of the label), is a compliance rating that has to do with the amount of ash that is left behind after the oil is burnt, and Zinc, is an additive in oil that coats parts to keep them from touching each other when there is very low pressure available. There are many more ratings and

compounds, but these three are very distinct, when comparing oils in a scientific manner. The top 3, most common brands of oil you see at truck stops is Delo 400, Mobil Delvac, and Shell Rotella. All have a good ash rating at about 1.3-1.35%. The ash rating is important because, if it is too high, and your truck has a DPF, then it will eventually get clogged with ash and have to be removed for cleaning, as ash cannot be burned off. Rotella-T is the only oil of these with Zinc. This gives it better protection than the other oils on engines with low oil pressure like a Cummins, but the Anti-wear (HFRR) rating is not so good (1.20). Of the other two, Delo has a far superior Anti-wear (HFRR) rating at 0.04, and Delvac is listed at 0.25, and both of these oils are designed to protect engines with higher oil pressures like Detroit, Cat, and Mercedes. It seems clear, when looking at just the science behind these oils, that in fact, the (usually cheaper) Delo-400 is in fact a better oil on higher pressure engines, and that Rotella-T is better for lower pressure engines. Other Non-synthetic oils that you typically see in truck stops, such as Kendall, Valvoline, etc. fall short compared to these 3. Hopefully, this bit of technical info will open your eyes a bit when it comes to choosing an oil. To further research this, just look up 'Bob The Oil Guy' on the web, and you will see.

Now, finally, your truck should be ready for freight again in a profitable and reliable condition. The efforts put in here, at the beginning of your long prosperous journey will in fact pay off, and it will tell everyone around you, that you mean business, and are not about to settle for anything less from anyone else as well. When you are sitting behind the wheel, going down the road in the truck you now own, you will also know that it is not likely to fail you when you need it the most.

## 07 – Learning to Drive Again, as a Truck Owner

If you had the choice of driving 70 mph all week, getting 3100 miles, earning \$2100 net, or saving fuel by driving 55 mph, but only getting 2300 miles, but you earned the same \$2100 net because you saved fuel, all other circumstances the same, which would you do? Can you drive 55 mph for an entire week, eating up your 70 hour clock, knowing you will get less miles, but earn the same pay?

No matter how you look at it, you have earned \$2100 in net profit after all expenses at the end of the week. Most drivers focus on that extra 800 miles, and if given a choice, knowing without any doubt, the pay will be the same, would still choose driving the higher speed because they have been brainwashed into thinking that eating their hours up by driving slow, and that less miles this week, are bad for you, or just simply, they are not capable of driving that slow knowing they can go faster. Every single driver that is asked this, that chooses more miles, is a driver that is very ignorant. Fortunately, ignorance can be cured, so let's cure this one right now. First, the higher speed puts you, your truck, and the safety of everything involved at higher risk. Second, you put unnecessary wear on your truck. Third, the extra speed increases your stress and makes you more tired. Fourth, you have 800 unnecessary miles to your truck's odometer, decreasing its worth that much faster. Fifth, 800 more miles of tire wear. The list of reasons goes on in favor of saving the fuel, but is there any legitimate reasons for going the extra 800 miles, given all other circumstances are the same? Actually not, so instead of slapping the argument of not being able to drive slower, just because they can't, maybe those drivers should stop for a moment and think really hard about their own stubbornness, and how to overcome it for the benefit of themselves, and for everyone around them.

Speed, driving, and driving style, are probably some of the most argued subjects among truck drivers when it comes to trying to save fuel and lower maintenance costs. There is probably as many opinions about driving style out there, as there are drivers, because what works for one person, may not work for another. As sure as the words written on this page, there are, and will, be people that will disagree whole heartedly with everything written in this chapter, and this guide for that matter. Asking someone to change their driving style is like asking a smoker to change brands of cigarettes. The longer they smoke their favorite brand, the more distasteful the other brands become, therefore the more difficult it is to change. Also, just like the smoker, change takes the will power to overcome your own stubbornness, the willingness to try something new, and to have the patience to re-train your habits. Since this guide is all about maximizing profit in



every possible way achievable long term, it would be wrong not to put focus on the very thing that determines every bit of your profits and operating costs. That thing is YOU, the person controlling the truck. You control the speed, the gear (hopefully), the fuel being consumed, and everything else related to profit and loss, while moving down the road as you drive. The driver, and their driving style absolutely has the biggest factor behind fuel economy as well.

As a company driver, since the driver simply gets paid by the mile, with no costs per mile, to maximize your pay, you simply maximize your miles. It is pretty easy to do. Just push the fuel pedal as hard as you can, go as fast as you can without getting a speeding ticket, go around anyone in your way, and stop only when you absolutely have to. Pretty simple if you ask me, but that is also the problem. It is like that favorite brand of cigarette, only it seems like all the other drivers are smokin' that brand too. Company driver and owner-op alike, the longer a driver drives this way, the harder it is to convince them to change, especially owner-ops. I see many owner-ops drive this way all the time, and they are successful, so why should they change? The more miles, the more income, hard to argue that, but the truth is that they are only looking at half the picture. With half a picture, you might be staring at some really nice looking butt cheeks, but the other half of that same picture may reveal those 'Butt Cheeks' are in fact the bottom of a very ugly, deformed person's chin. My point here is that yes, that may be working for you, but no, you are actually not maximizing your income at all. When you own your truck, you pay for all the things that make it move. Fuel, oil, tires, filters, PM's, engine wear, component wear, and repairs, just to name a few. The faster you go, the faster you have to pay for these things, and the higher the rate they wear out, or consume per mile. If you total all of your per mile operating costs (not looking at fixed costs), with today's prices, fuel consumes 80%, and maintenance is the other 20%.

If you take fuel out of the equation, you are left with all of the maintenance costs. Let's look at this first. All of the secondary costs, such as engine and component wear, oil breakdown, tire wear, wear from vibration and all the other things that happen as you are moving, they are all based on, not the speed, but rather the torque (power) needed to keep you moving. If you change your driving habits to reduce the torque used, without really slowing down, to let's say between  $\frac{1}{2}$  and  $\frac{2}{3}$ , tire wear alone is decreased by 35%. Transmission and rear axle temperatures go down by more than 40%. Vibration is sometimes reduced by as much as 70%. Most of the internal engine temps are reduced by 30-50%. The overall engine temp stays the same, but the coolant doesn't have to work nearly as hard, and your engine fan comes on much less (saving you additional fuel). This easily adds up to in two ways. Reduced costs by up to 60%

of the 20% you were talking about, so now you have reduced your operating costs from that 20% to 12% with regards to maintenance alone. Now if you go back and look at the fuel used, just from using less torque (still regardless of speed), you see that fuel is reduced by just about the same  $1/2 - 2/3$  you backed off from, plus an additional savings because you produce less heat, less friction, and less on time for the engine fan. Your fuel cost is reduced from 80% all the way down to as much as 38%. Add the total savings from backing off on torque (regardless of speed) by roughly half, and you end up reducing your total long term costs per mile down to only 48% of what it was. Thats huge! All these numbers are very real, and have been proven. It is science and physics, not speculation. With this reduction in torque usage, you can easily see 0.20 cents a per mile increase in pay (up to \$500 more in your pocket for a 2500 mile week). So go ahead, Mr. Super-Trucker, stomp that pedal to the floor, go around me, and race your buddies down the freeway, and up that hill. I'll see you at the other end, at that same truck stop, bragging to your friends how you flew past me, while I sit quietly, counting my money.

Speed alone, and reducing it, does not actually save you that much, when your truck is governed, or the cruise is set all the time. The problem when a truck's governed speed is turned down, is that most drivers will push the truck harder, using more torque, trying to make up for the loss in speed. This is also true for many owner-ops that try to slow down to save fuel. Not thinking about it, they tend to use a lot more torque to try and maintain the lower speed. Climbing hills, accelerating from a stop light, or getting onto the freeway become much harder, consuming more torque than needed. An example of this, is that a truck moving 75 mph with the cruise control on. When it gets to a steep hill, it will use max torque all the way up the hill, then crest the hill at say, 63 mph, then continue on. This same truck, same hill, cruise set at 63 mph, will drop in speed to 51 mph as it crests the hill, still using max torque to get there. The difference is that at the lower speed, max torque is applied for a longer period of time, causing it to actually burn more fuel up the hill, than when the truck that was going faster. Going down the hill, and on flat ground, when going faster, the truck will use more fuel than if it were going slower. This 'Give and Take' difference is why not much is gained overall. Lets now take a look at this same truck, same hill, moving at 75 mph, no cruise, the driver uses the fuel pedal to only apply 50% torque to climb the hill. From 75, the truck will slow all the way down to about 43 mph as it crests. The driver also probably had to gear down once as well, just before the crest. The truck's operating cost per mile is reduced by almost 60%. 48% in fuel, and 12% in wear and tear. What did you loose time-wise? Well, if climbing at full torque, it took 5 minutes to blast up the hill, 75-63 is an average of 69 mph, and at half torque, 75-43 is an average of 59 mph. This means you slowed down,

purposefully, by 10 mph (15%), but almost doubled your fuel mileage during the pull up the hill, costing you half as much to climb that hill.

On typically flat ground, physics dictates that for every 1 mph slower you go in your truck, you save about 0.1 mpg, depending on your truck, your weight, the wind, and the road. Also, maintenance costs go down by about 0.5% for every 1 mph you slow down. This is because the overall torque needed to keep you moving is reduced. This definitely gives you reason to slow down when you have the time for it, and if you combine slowing down with limiting torque on hills, even small hills, it will start to far outweigh, in reduced costs the extra money gained by running faster. This savings can only be achieved by those individuals willing to sacrifice their driving habits, their ego, and the amount of extra time they have on their deliveries. If done right, what they gain in return, is less downtime in repairs, less stress because they are driving slower, safer driving habits, and, oh yeah, between \$200 and \$800 more in your pocket at the end of the week (as a solo driver), even though you ran less miles.

In your truck, torque is what you need to micro-manage while going down the road, if you want to maximize profits. Torque comes from horsepower, and horsepower comes from fuel and air. Fuel is controlled directly by your foot on the fuel pedal, but the air going into your engine is controlled by the turbo. The turbo is not connected to your fuel pedal, but you have the ability to speed it up and slow it down by accelerating and decelerating. Your foot has control of both, and the fuel part is easy enough to figure out (the further down, the more fuel), but without some kind of visual aid, you are guessing at best, when it comes to the air. As I have mentioned several times in this guide already, a turbo boost gauge will take the guess work away and let you see what you are doing. By controlling turbo boost pressure, you can directly control horsepower and therefore torque. It baffles me as to why every single truck on the road does not have one of these gauges in the dash. Some trucks do in fact have them, but most these days do not. Installing a mechanical type is dirt easy because all you have to do is connect it to a spare port on the intake manifold, run the hose over to the gauge, and connect it. A brass fitting or 2 from Home Depot may be needed to adapt the end that goes to the intake. A mounting bracket for it can be purchased from an auto parts store if one does not come with it, or if it does not fit into the dash somewhere.

Before continuing, I would like to explain why I push so hard for drivers to use a turbo boost gauge to help them save fuel, and to kill the ignorance behind those drivers that claim they can save fuel just as well without one. First of all, even the very best drivers out there, with no gauge, will only get to within about 8% of the fuel savings that a similar driver can achieve with one. Even if you take

this percentage to an un-achievable extreme, and say that your super-human abilities get you to within a very impossible 1%, that 1%, for a solo driver in one year equates to about \$1000 in wasted money on fuel. Realistically, 8% means you loose somewhere in the area of \$6000 - \$8000. That very well can be the difference in spending \$68k in fuel this year, rather than \$76k.

Driving, using a turbo boost gauge is not difficult. If you push your fuel pedal all the way to the floor on an open stretch of road, it is likely to read upwards of 30+ psi, letting you know what it shows at full torque. How you drive to save torque with it, is to limit how much boost pressure your turbo is producing. The more you limit it, the less torque you are using to get and/or keep your truck moving. As a starter, if you have just installed one, or have one, but have not been using it, watch the road obviously, but keep an eye on it trying to not let it get above half of what it can reach maximum, or roughly 15 psi. This reading will not always follow how far you press the fuel pedal, so you have to pay attention to it. Do this in each gear whenever you accelerate from a stop, or when getting onto the highway, and of coarse, while climbing a hill. If you are limiting your boost, and the truck slows down, then let it slow down, choosing a lower gear. This will help you keep your truck in the most fuel saving gear while climbing those hills. The more you do this, the better you will get at driving the truck at maximum fuel savings. Eventually, you will want to work on using even less boost, limiting it as much as you can for any given situation, including keeping it down when cruising on flat ground. I know drivers that will not let their boost get above 10 psi, even with heavy loads. This is a very good place to be, especially when climbing steep hills in lower gears. The fuel savings is enormous. This one little gauge, if used right, will help your shifting, help your truck last longer, show you the proper gear to be in when climbing hills and going down the road, and save you a ton of money.

The very day you start using a turbo boost gauge, if done right, is also the day your settlement checks will increase, compared to those weeks that you ran those same number of miles. In very short order, you will also see that, you are able to make even more money by slowing down, using your boost gauge, and driving more gently overall.

How do you slow down if your deliveries are tight? By better time management. Learn to pickup your loads earlier if you can, and to stop much less during your trip. When you are using a lot less fuel, you will not need to stop as much to fill up. Use rest areas to take short breaks instead of using truck stops that waste your time getting into and out of. Planning your trips better and slowing down will absolutely earn you more money. Make the most efficient use of your

70 hour clock as well, but not by speeding up. Things like combining your post inspection with your fuel stops will help your 70 hour clock. There is no law stating the post inspection has to be at the very end of your shift. Take the time and use a little bit of math to figure out how slow you can go to get there on time, then stick to that speed. After a couple weeks of driving to maximize savings, rather than miles, you will get better at it, and it will become easier. After a month or two of driving slower and more gently, you will not even want to drive fast any more. You will feel better over all, have less stress, less back pain, and your body will be subject to much less wear from the road, just like your engine will be from using less torque. Anyone in doubt of this needs to challenge this before discrediting it. Try it for 2 full weeks, then compare those two settlement checks with two that have same miles on them in previous weeks. Then find two weeks from before that you made the same money, and look at how many more miles you had to go to get that same pay. It will become obvious. Using less torque, and minimizing your overall speed absolutely earns you more money.

Finally, there will still be those individuals who will protest everything above based on their claims that, if they run faster, and deliver early, they will have more hours for the week, and/or be able to get another load in for the week, earning them more money. This is actually a very good argument, so lets take a good look at it, and try to prove it right. If you take some extreme cases, 55 mph vs say, 70 mph. From 55 to 70 is a 21% increase in speed. This means your miles and your gross income will increase by 21% too. Unfortunately, you do not put gross pay in your pockets. You put net pay in your pockets, so you will have to figure out if actual net pay goes up. If you only use fuel mileage loss at the base 0.1 mpg rate, assuming you are saving torque and driving right at both speeds, you end up losing about 1.5 mpg from the increased speed alone. If your truck gets 6.8 mpg at 70 (being generous), then you would get 8.3 at 55 mph. 8.3 to 6.8 mpg at \$4.00 per gallon is a loss of 19% in fuel. A gross increase of 21%, and an expense increase of 19%, looking only at fuel, makes your net increase by 2% from going faster. Now if you consider maintenance, 55 to 70 is an increase in costs of about 7.5%. This makes your total net from going faster an actual loss of about 5.5%. Do you see a pattern here? It becomes very clear that even if you are good at saving fuel, and even if you squeeze every last ounce of income out of your week, all that extra effort and headache will, at best, keep us teeter-tottering within a couple of percent, usually to your disadvantage, actually getting us no further ahead for your extra efforts. As fuel prices keep increasing, fuel surcharge or not, the savings from slowing down, even a little, will keep pushing us toward saving vs going faster. Instead of asking what happened to your pay, when fuel goes even higher, start now, by slowing down, using less torque, and getting a boost gauge, so that you are well prepared for the day fuel spikes past \$5 a gallon.

Stop making donations to the oil companies by chasing the mile, and start chasing the dollar instead. Slowing down to a minimum speed, limiting turbo boost, and planning your trip better so that you can still get your freight delivered on time, keeping your truck rolling, will indeed make you more money.

## 08 – Managing Fuel and Fuel Economy

As of September 2012, fuel prices have been bouncing around \$4.10 - \$4.30 a gallon. This price range dictates that it now dominates about 80% of most trucks operating costs. Since it is clearly the biggest single cost associated with being an owner-op, it needs to be your number one priority to get, and keep it as low as possible. To lower your fuel costs, you need to attack it from two different directions. First, is to use as little as possible, and second, is to buy it as cheaply as you can.

Purchasing fuel at its lowest price is no easy task, and depending on your owner-op agreement, it can be downright challenging. There are several fuel discount programs out there, so the company you are leased on to should have one in place. If they do not, then someone needs to tell them to wake up and stop sniffing diesel fumes. If they do, but you do not benefit from it, then it is your own damn fault for leasing on to a crappy company. Worst case, you can sign up to a discount program for individual owner-ops. This will at least get you the cash price wherever you fuel. Assuming you are part of a discount program, the cheapest fuel will generally be at the truck stops that are part of that particular program. This is a good place to start when planning the fuel stops for your trip. After that, finding the lowest prices on fuel needs to be looked at in one of two ways, depending on your owner-op agreement. If you have a really good owner-op agreement, and they are paying your IFTA (state to state fuel taxes) for you completely, without collecting it from you in any way, then within your discount network, what you want to look for is the truck stops with the lowest cash pump prices. You should keep an eye out for exceptions to this method, but they will be hard to spot, like maybe a casino truck stop that offers really cheap fuel to lure in gambling truckers. If you do in fact have to pay your own fuel taxes, then the lowest pump price can be very deceiving. Some states have much higher fuel taxes than others. Generally, since the state has higher fuel taxes, the pump price will be lower. When you add up what you paid at the pump and the taxes you pay later, the price of that fuel can be much higher than you could have gotten it somewhere else. The state of Indiana is a good example of this, where pump prices are usually lower than surrounding states, but the fuel taxes are much higher. When you add it up, it is almost always cheaper to fuel in one of its surrounding states. So how do you manage this confusing mess? By tracking fuel prices and state tax rates together. Pay attention to your fuel taxes, and what you are having to pay. Many companies that take out fuel taxes from their owner-ops will use averages, instead of tracking and separating each individual drivers taxes. This is actually a very bad thing. If you are doing all the things right to save fuel, and you get your fuel mileage up high, your individual fuel taxes will be much

lower. This gives you the ability to save money in both directions, but if your company uses averages, instead of it benefiting you, it ends up benefiting those drivers that get crappy fuel mileage instead. Also, you will be paying taxes on fuel you didn't use. Please, if you haven't lease-purchased a truck yet, try to avoid all this headache by finding a company that simply pays IFTA for you. Worst case, if you are caught up in this mess already, you are paying based on averages, and you are getting really good fuel mileage, then start paying your own IFTA. It will be worth the extra effort in the end. To prove it, download an IFTA form and fill it out for a single quarter you have already paid fuel taxes on, then compare it to what was taken from your settlements for the same quarter. If it is a big difference, you will see how much money you are losing.

Fuel price, is actually not the biggest thing that hurts you when it comes to overall fuel cost. Sure, this is where the money goes, but how much of it that goes there is based on fuel economy (miles per gallon). If you are in any kind of a decent owner-op program, you will get fuel surcharge, and as fuel price goes up and down, the surcharge should correct for it. On the other hand, if the fuel economy of your truck changes, it either helps, or hurts you directly because there is nothing compensating for it. Any changes in fuel economy, even very small ones, makes a large difference in how much money you keep. Assuming your driving style is good, managing fuel economy itself, as an owner-op, consists of doing two things on a constant basis. Fixing any drop in the fuel economy you already have, and making improvements to push it upwards. Letting either one go for very long, costs you a lot of money.

Keeping after the things that make your fuel economy fall off, mainly consists of keeping after the maintenance of your truck. Things that will lower fuel economy short term, are things like the air breather filter element, and the amount of air in your tires. Diesel engines need lots of air to burn fuel efficiently, and any restriction in the air system, like that dirty filter, costs you fuel.

All tires have rolling resistance to the pavement. The tire temperature and air pressure inside the tire directly effect this rolling resistance and therefore fuel economy. Fuel efficient tires with very low rolling resistance (less than 110) will save you a lot of fuel, but only if the tires are inflated in a way that takes advantage of this extra efficiency. The more air pressure a tire has, the more efficient it will become. A tire rated for 120 psi, when inflated this high will achieve its maximum fuel efficiency, but it is also likely to 'Crown' in the center a bit. This can cause excess tire wear, so the trick is to keep the pressure as high as possible without it crowning too much. Replacing tires has a big effect on fuel economy as well. For steer tires, the effect is generally not noticeable, but for



drive tires, you can lose as much as a half mile per gallon when going from worn out tires to a new ones. As tires wear down, they become more and more fuel efficient. This means that the longer you keep your tires, and the more worn out they become, the more money you make off of them. It is actually very wasteful to replace drive tires before they are worn completely down, unless traction becomes a problem. Most lug style drive tires will not develop any noticeable traction problems until the tread gets less than 7/32. This is pretty thin, and if you have taken good care of your tires, reduced your torque usage, and maintained the trucks alignment, this is usually about 400,000 miles of life. Keeping your tires this long, and inflated properly, will earn you 4 to 6 times more money back in fuel savings than you paid for them initially. This easily justifies the cost of buying the most fuel efficient tires on the market, regardless of price.

There are many owner operators that claim, as your truck gets older, it will simply lose fuel economy because of age. This is actually true if you don't do all the things to keep it up. That's why it is also important to go ahead and do all those things to maximize its efficiency when you get your truck, before moving freight with it. Think about this. Someone buying a used truck that the fuel mileage has already dropped off because of dirty sensors and a leaky charge air cooler, may start driving it, getting 6.9 mpg, thinking to themselves that the truck is doing well. They drive the truck for a year, not knowing it is actually capable of 7.8 mpg. That person, from sheer lack of actually knowing, will spend about \$8500 more in fuel than necessary just in that first year, and it is highly likely they never find out about the loss until a few years later, when the excess soot buildup finally causes some serious long term EGR and DPF problems. Even worse, perhaps the EGR and DPF problems are solved, and no one ever checks to see if there is a problem with the cooler, or sensor, because, after all it is getting 6.8. Another year, and you can guess what will happen again, on top of the continued fuel loss.

As your truck gets older, there are several things that will cause it to lose fuel economy that need occasional adjusting, testing, checking, and/or cleaning, or if you think that your fuel economy is down. Here is a list of likely culprits...

- Intake related...
  - Dirty air filter – Replacement
  - The charge air cooler – An actual leak rate test needs to be performed
  - Weak Air-to-Air boots or clamps – Replacement

- Mechanical...
  - Tire pressure – Add air / check for leaks
  - A poorly-greased truck
  - A poorly-greased fifth wheel
  - A loose body panel that catches the wind
  - Fuel Leaks – Check for wet spots
  - Air leaks / compressor being overworked – Fix the leaks
  - Sticky brakes – Treadle valve / slack adjusters
  - Clutch slipping – Worn out / bad throw-out bearing
  
- Engine...
  - Engine Overhead Set out of adjustment.
  - Weak injectors – Revealed by oil sampling / cylinder cutout tests
  - Weak fuel pump / Fuel pressure regulator – Fuel pressure test
  - Fuel filter clogging – Replace / check for asphaltene and/or algae buildup in tanks
  - Turbo problems – Sticky Actuator / Low air supply / rebuild / replacement
  - Stuck or cycling engine fan -
    - Keeping the radiator very clean
    - HVAC filters kept clean
    - Keeping the rubber guards and flaps around your radiator in good shape
    - High engine temps – Clean radiator
    - Bad A/C high pressure sensor
    - Stuck solenoid
    - Low air pressure supply to fan / turbo
  
- Exhaust related...
  - A crushed section of exhaust pipe
  - Excess soot in muffler – Replacement
  - Excess soot in piping – Cleaning

- EGR related...
  - Intake manifold pressure sensor – Visual inspection for soot buildup / replacement
  - Intake manifold temp sensor – Visual inspection for soot buildup / cleaned
  - EGR temperature sensor – Visual inspection for soot buildup / cleaned
  - EGR mixing tube / venturi pipe – Visual inspection for soot buildup / cleaned
  - Exhaust manifold back pressure sensor – Visual inspection for soot buildup / replaced
  - EGR differential pressure sensor – Gets clogged with soot / replaced
  - Dirty after-treatment injector
  - Clogged DOC – Removed and cleaned
  - DPF dirty – Replace after-treatment injector and forced Regen
  - Leaking fuel line for and/or leaking after-treatment injector. - wet spots / charring / burn marks
  - Sticky EGR valve – Cleaning / Replacement
  
- Excess heat or vibration in -
  - Engine
  - Transmission
  - Driveline
  - Rear axles
  - Tires

When a truck gets 800k+ miles on it, fuel lines themselves will start internally deteriorating, causing fuel pressure loss and economy issues, so it is not a bad idea to plan on replacing them all at once, as your truck approaches this. Also, not mentioned, is alignment. Many drivers and even mechanics think that alignment effects fuel economy, but in fact, it really generally does not unless it is extremely bad, causing tires to scrub hard against the pavement. The same goes for off-tracking trailers as well.

Fuel economy can change with the seasons because many fuel suppliers will change the fuel blend so that it doesn't gel in the winter. Fuel mileage will usually be lower in winter than summer, especially if you fuel up north a lot. Colder air is actually more dense as well making your truck work harder to push it aside going down the road. Driving fast in colder weather can impact fuel economy by as much as a half mile per gallon in the extreme cold. Putting fuel additives in your fuel to improve fuel economy does actually work, but the cost of

every single additive out there far outweighs the slight benefit they provide if your truck is already running fairly well. Their claims of 'Free mpg', and things like 8% improvements are actually based on mechanical NON-ECM engines that are already running horribly bad. When you look at the hard evidence backing their claims, this quickly becomes apparent. EGR engines regulate how hot the fuel actually burns as well, so any additive that claims to be a cetane booster, when put in, will be compensated for by the EGR system as well, further reducing the effects it might have had. Fuel additives that claim to be 'Injector cleaners', used on a regular basis, can in fact help keep your injectors cleaner, but if your injectors are dirty already, these additives are not going to reverse the problem by any measurable amount. Also, most injector cleaners are very abrasive to the engine and fuel system components, causing excess wear. As of September 2012, there is only one actual injector cleaner product on the market that passes HFRR testing, and slightly helps to keep injectors clean. That product is 'Diesel Kleen'. If used about once a month, it will actually help a bit, but using it more often doesn't seem to improve its effects.

Asphaltene is a black, gritty substance that gets in your tanks, plugging up fuel filters and injectors. Fleetguard makes a product called 'Asphaltene Conditioner' that is pretty good at reversing asphaltene buildup problems if you get them. Many mechanics mistake this as 'soot', but it is actually a by-product of bio-diesel after it has started to separate under extreme pressures. This is actually a common problem with Cummins engines because the fuel rail pressure is so high, so it is a good idea to keep a close eye out for it if you own an ISX. Finally, there is algae. Yes, there can be life forms growing in your fuel system. Algae, if it gets into your fuel tanks, can be a very serious problem, not only plugging up filters and costing you fuel economy, but can kill injectors fast, putting you in the shop for some expensive repairs. Algae can get into your fuel tanks very easily if there is moisture. Trucks that sit for days on end with low fuel tanks are at the most risk. Second, is drivers that do not keep their fuel tanks full on a regular basis. Condensation builds up on the inside walls of the fuel tanks whenever the air temperature around them changes, and they are not full. Once algae gets in, it will spread rapidly causing big problems. Topping off regularly and having a good fuel-water separator helps a lot to prevent it. If it gets in, it will be a black substance that clogs your fuel filter, but instead of it being gritty, it will be very slimy and nasty. Fuel additives like 'Bio-Bor' are very good at getting it out, but will not cure bad injectors.

Before leaving the subject of fuel additives, it is probably worth mentioning some of the urban legends that float around out there when it comes to saving fuel. Adding gasoline, alcohol, and/or methanol to your fuel actually

lowers fuel economy because they all actually contain less energy per gallon than diesel. Putting motor oil in your tanks does not improve, or hurt your fuel economy, but can be very bad if the oil is not CJ-4 compliant, and you have a DPF. You will end up with ash problems. Dirty motor oil has abrasive wear metals in it that cause excess engine wear. Kerosene is sometimes used to keep diesel from gelling and/or is used to circumvent paying fuel taxes. This is in fact true, but it is very abrasive and causes excess wear. It actually isn't bad as a 'Roll your own' anti-gel product if it is first mixed with a good ash-less 2-cycle engine oil mixed at 128:1, to make it less abrasive. Some of the anti-gel products on the truck stop shelves are nothing more than this anyways. Water/methanol injection does not help fuel economy in commercial trucks because the charge air cooler is big enough to cool the air without further assistance. Lastly, 'ash-less 2-cycle engine oil' itself is actually a product that can slightly improve fuel economy as well as reduce the abrasive effects of ULSD fuel. The proper mix ratio for a class-8 truck is the problem. The proper mix ratio, after digging very hard to get the scientific answer, and not some salesman's recommendation, is 200:1. At this ratio, the combined benefit of both lowering component wear and the slight fuel economy increase, is about 3% at best. Mixing it 128:1 or 148:1 will not improve its effects, and for a truck that has two 100 gallon tanks, this is about 1 whole gallon of 2 cycle oil per full fill up. Weighing costs, the 2 cycle oil would have to be sold at less than \$6 for a gallon just to break even, so, there again, yes it helps, but no, it is not worth the cost of the product.

All in all, if you want to inch up your fuel economy in a manner that is actually profitable, first and foremost, make sure your truck is running as efficiently as possible. Then, after that, any investment you make that can actually earn you more than you spend, will have to come from doing one or more of the following...

- Better aerodynamics
  - Aerodynamic mirrors
  - Air tabs
  - Drive wheel covers
  - Narrow cut mud flaps that stay out of the wind
  - Side panels that reduce turbulence
  - More aerodynamic bumpers
  - Removing passenger side nose mirror
  - Using smaller, more aerodynamic nose mirrors
  - Using thinner, shorter C.B. Or other radio antennas

- Removing any components directly in the wind, like stacks, bug guards, sun visors, and air cans
- Decrease rolling resistance
  - Better, more fuel efficient tires
  - Lift axles
  - Removing your forward axle if you only haul light loads
- Reduce friction
  - Low viscosity synthetic oil combined with a by-pass filter
  - 'MICROBLUE' coated engine, transmission, and axle components
- Improve airflow into the engine
  - Better air intake filters
  - Calibrating your turbo using engine software
  - A bigger turbo
  - After market charge air coolers
  - After market intake manifolds that improve air flow
  - An EGR delete
- Improve exhaust flow
  - Better muffler (for non DPF engines)
  - An exhaust wrap and turbo 'sock'
  - Weed-burner type exhaust
- Reduce drive-line loss
  - Thinner, better quality oil in your transmission and drive axles
  - Using a single drive axle
  - Better gear ratio in rear axle
  - Better transmission
  - Better drive-line bearings
- Reduction in engine fan usage
  - A variable speed engine fan
  - Waterless, more efficient coolant
  - Higher temperature thermostat with temp sensor modification (coupled with waterless coolant)

The ECM in your engine can be re-programmed to improve fuel economy as well. There is programming available from the engine makers that improve things slightly, and there is after-market programming. If you get after-market programming done, you had best be prepared to carry a spare ECM so that you can change it out before any trips to a repair shop. Repair shops are required by EPA law to program it back the way it was, so switching it out will be your only protection against having to pay to have the re-programming done again.

Do you still think owning a truck is easy? Can you now see why so many owner-ops fail? Do you still think throwing your truck at a mechanic is going to solve your problems? Are you sure you want to lease-purchase a truck, knowing all this extra effort will be needed to be really successful? Before continuing on, I highly suggest that you consider again, what it takes to earn that extra money associated with owning a truck. That money is out there,... waiting quietly for you to go and get it, but it will definitely not be handed to you. Much of it comes in the form of pushing the way you think and drive into a new direction. A direction that moves you away from the pack, away from the bulls\*\*t, and toward becoming a more successful person, making you feel better, and your wallet fatter. The day you decide that it is ok to let all the other trucks pass you on the road while you inch up that hill, or roll across those open prairies, showing off how much fuel they can waste as they go by, is also the day that you have decided that peer pressure, ego, and the opinion of others, is no longer going to get in the way of your success. If you are going to be out there,... away from your home, your family, your children, and all the things that matter, then please, make it worth every last red cent. Anything less, and you are just cheating yourself.

## 09 – Anti-Idling Methods and APU's

Before discussing reasons not to idle a truck, it might be a good idea instead, to discuss when and why you should actually do so. Some people are of the opinion that idling a truck at all, for any reason, is a bad thing. When it is cold outside, warming your engine up slowly before putting it under a load is always a good idea. Rapid expansion of exhaust components, including your turbo or EGR cooler, is never good. It can cause mechanical stress and cracking. On really cold days, it can take as long as 30 minutes, which gives you plenty of time to plan your trip, or get caught up on logs, paperwork, etc. Is it worth the half gallon of fuel? Definitely. When you are pulling a heavy load, or climbing a hill, everything on the exhaust side of the engine heats up quite a lot, like the turbo, exhaust manifold, piping, EGR cooler, and anything else mounted to the exhaust system or engine block. When your engine is running, the coolant wicks away the heat, keeping everything from overheating. If you have just climbed a hill, or are using a lot of torque against a strong headwind or slight incline, and you are heavy, some of these components, like the turbo, and exhaust manifold, can easily get upwards of 800+ degrees. If you shut your engine off when the components are this hot, the coolant will stop flowing, and the extra heat has no where to go. That heat will bleed back into the engine block possibly causing the engine and turbo to overheat even though it is switched off. Most often, your turbo is the one to suffer the most from this. The oil that keeps the blades spinning carbonizes inside the bearing, shortening its life considerably. How you prevent this, is that when you have to stop at the top of a hill, or pull off when the engine has been working hard, is to let the truck idle for a minimum of 3 to 5 minutes. This keeps the coolant flowing and allows the turbo, EGR cooler, and exhaust manifold temperatures to balance back out again. Drivers of newer trucks have gotten so used to shutting off their engines as soon as they stop, that several of the turbo manufacturers now list this as one of the biggest causes of premature turbo failure. This is also one of the theories sometimes used for repeated EGR cooler failures. An example of this overheating problem can be seen quite often in the newer DD15 Detroit engines. The starter is located on the exhaust side of the engine near these components, and it is not uncommon for the starter to get hot enough to overheat after the engine has already been shut down, causing the truck not to want to start sometimes for 30 minutes up to as much as 2 hours. I have seen many drivers stuck at fuel islands with a Cascadia that will not start, giving no indication as to why. Half an hour later, when the tow truck arrives, it starts right up again, making a liar out of the driver and wasting a service call. Ironically, many Detroit dealers and mechanics will refuse to believe that this is the cause, and, quite often, the truck ends up in the shop several times before the starter gets replaced and the problem gets solved. What does all this mean to an owner-op?



Well, if your truck is very hot, or overheated, let it idle for at least 5 minutes so that the temperatures can balance out. If not, you may just end up regretting it later.

No one wants to be uncomfortable, but at the same time, I would hope that no one wants to donate hundreds of dollars of their settlement pay every week to the foreign oil companies either. If your truck isn't equipped with some form of anti-idling equipment, this creates a rather large problem. The problem is that in order to be comfortable while parked, quite often, you have to idle. I know that studies say that it costs about 1 gallon of fuel an hour to idle, so for a solo driver, that's roughly \$40.00 every time they take their 10 hour break if they have to idle. Easily, in one week, it that can add up to \$370 if you need a 34 hour break as well. So by the end of the month, just for your comfort, you easily will spend \$1400. That amount of money is an insanely expensive way to be comfortable. When looking at this with a business point of view, fuel itself should always be an investment, not an expense. When you buy fuel for your truck, it should be an investment put forth to make the truck move, earning you revenue. Idling for comfort, no matter how you look at it, is an expense. Since it is an expense, then the only thing you can do is try to get it as low as possible so that large portions of your paycheck are not donated to some already rich oil company.

There are many ways to achieve this. The first is to re-train yourself, and your body, to tolerate a wider range of temperatures as much as you can within reason. The more you push yourself toward relaxing or sleeping in semi-hot or cold environments, the more your body will adjust. After that, the next thing you can do, is to minimize the amount of fuel needed to get you comfortable again. Ideally, some sort of APU should solve the problem, but if you don't have one at all, then perhaps there are other things you can do to at least minimize the time you do have to idle. One good way to minimize idling, especially on hot days, is to think ahead when you park your truck. Taking a few extra minutes to look around the truck stop parking lot, when there is extra spaces, you will usually find the spaces furthest away from the C-store are usually out on the edge of the paved areas. Nosing in toward a grassy or shaded area will definitely help. The edges of a parking lot are much cooler in the summer than the center, near the C-store. Also, when the sun goes down, it will be the first areas to cool off. This will help reduce the fuel needed by allowing you to shut your truck off sooner. Also, on almost all trucks, if you open the hood, the inside of your cab will cool off, and stay cooler much better. The heat from your engine has no where to go when the hood is down, pushing it straight toward your cab and down under the truck. Opening your hood for the first hour or two of your rest break can help tons, especially if you want to shut off your engine later.

If you are one of those individuals who has to idle constantly, then consider this. Reducing your idling by only 25% can easily increase your income by about \$350 a month. Cutting it by 50% easily could mean \$600 a month more in your pocket. That's a lot of money, especially if you add it up for the year. There is no excuse whatsoever for idling a truck just because the sound helps you sleep. Go get a mini sound effects player. If you need power, because you need a medical device to sleep, then you could get a suitcase size generator. Even an expensive one that runs ultra quiet will pay for itself in no time. I have seen drivers use those tiny generators to run cheap portable air conditioners they place in the driver window while they park. It is a pretty clever alternative, and will reduce idling costs about 90%, considering they use only about 1/10th the fuel. I actually met one driver, with a Volvo truck who bought from Northern Tool, a tiny ultra quiet water pump engine, pulleys, and a car alternator, then mounted it in the space under the passenger steps. The point is that no matter how, figure out how to get as comfortable as possible without idling that truck, even if the solution is temporary. The money you save will put you much closer to affording an APU.

## 10 – All Things Maintenance

A class-8 truck, like any other man made industrial equipment, is not alive. Trucks cannot heal themselves from the every day wear you put them through as you operate them. The more often you operate, the faster you go, and the harder you push your truck, the faster you will push every single system and component towards its inevitable failure. Everything on the truck, if operated long enough, is going to fail. As a business owner and owner-op, your truck is the tool that you use to pry your profit from the hands of those willing to pay you for using it. How much profit you can keep will always depend on how much it costs you to operate that tool. Since it cannot heal itself, someone will have to step in and 'heal', or maintain everything so that it lasts as long, or runs as efficiently possible, keeping costs at their lowest.

For you to stay in business, and to maximize your profits, someone is going to have to perform the tasks of maintenance, repair, and component replacement for every part of your truck. Hopefully by now, no matter what truck you are driving, you are able to perform some of these tasks, such as checking your oil level, topping off your windshield washer or radiator fluid, and checking your tire pressure. None of those things are actually part of operating and/or driving your truck, so when you do them, YOU are performing the tasks of a mechanic. If you are able to perform these tasks in a skillful way, such as knowing when and how much oil to add, even if these things are the only things you know how to do, then by all definition of the words, you are in fact already a 'skilled mechanic'. Knowing how to check your oil and top off your fluids already saves you a lot of money. One of the main reasons you would not want to pay someone else to do these things, is that if you do them yourself, you know they are done right. After all, it is you that it effects the most. Another reason is that paying someone else just to check your oil level at a truck repair shop would likely cost you fifty bucks or more. It is also likely to cost you the time needed to go out of your way to get there, as well as the wait for another mechanic to take the time for you. All in all, to be blunt about it, it is just plain wasteful to have someone else do things for you, if it is going to cost you more in downtime and/or money than simply doing it yourself.

Whenever you learn to do something related to maintenance to your truck, it will save you time and money. Actually performing the task yourself will generally save you the absolute most, but even if you decide to pay someone else, knowing the details of how and what should be done will always make a big difference on how much money you part with. To put the 'knowing' part into perspective, as an example, just look at tire replacement. Buying tires quite often

comes with free mounting. With the proper tools and know how, you could mount them yourself, but why would you? Its free!... Sure, you accept the free mounting, but knowing the proper method to mounting a tire makes the big difference. You should never assume that someone else, certified or not, is going to do the job the right way. It is quite often that mechanics will skip minor details, but for you, the truck owner, they are important. When a truck tire is brand new, there is always a mark on the tire, usually a painted dot, or a stripe, that indicates its alignment on the rim with reference to the valve stem. Aligning this mark to your valve stem helps ensure the tire is balanced and that it doesn't produce excess vibration while you drive. Another important step is to make sure, as the tire seals to the rim, the 'rim alignment groove' is even all the way around. This rim alignment groove can be seen very close to, but just above the edge of the rim on the sidewall. It is a visual aide that helps prevent the tire from possibly ending up egg-shaped on the rim. An egg-shaped tire, especially a drive tire, can cause a bunch of excess wear and odd tire wear patterns for the entire set of all 8 drives, costing you wasted money on alignment, shocks, and/or at the least, new tires. So yes, you got the free mounting, but now looking at those very new, very expensive tires on your truck, you see now that they are mounted improperly. After the mechanic and/or his boss argues with you, telling you it doesn't matter, you correct them by not only refusing to pay, but to make them re-mount the tires with a suggestion of them calling the tire manufacturer for proper instructions on how to do their jobs.

That example alone should tell you that, for those people who choose to lease, own, and operate a truck for a living with the 'let the shop fix it, I don't want to become a mechanic' attitude, are those same individuals who are, through their pride, ego, and attitude, too stubborn to realize that at some point, all those miles and dollars earned, was just to benefit everyone but themselves. Once you step away from the company driver scene and into the realm of truck ownership, you will need to make a decision. The decision will be to use your skills, your truck, and your money to try to satisfy your pride, ego, and personal opinions, OR to overcome your pride, ego, attitude, and your personal opinions, deciding not to be lazy and become open to the idea that true success will take the efforts of eventually learning everything there is to know about the truck you now own. The more you choose to learn, and the more you choose to take the proactive approach with, the fatter your wallet will become, and the more pride you will have knowing that your extra efforts are what make you successful.

Based on first hand experience working with OEM's, before detailing everything out, it would probably be appropriate to explain how manufacturers come up with that all important list of things to do your truck. The truck manufacturers, believe it or not, want you to be as successful as possible with

their products. The reason for this is that if you are successful, you will continue to buy new trucks, or replace your old worn out trucks with their products instead of someone else's. This being the case, there is actually long term cost analysis involved with each and every system and component that is likely to be replaced or repaired on your truck during its expected lifetime. What they in fact do, is weigh the downtime and cost of performing maintenance to a particular item vs prolonging its life. An example of this might be how often to change the engine oil. The engine on your truck needs fresh, clean oil to prolong its life, but the process of changing this oil is not cheap. Cost analysis will dictate that at some interval, it will in fact, become more expensive to change the oil than it will be to let the components wear a bit between changes. Again, just for example purposes, so you get a grasp on the concept, lets say that with parts, labor, and downtime, it costs \$300 for an oil change, and \$20,000 for an engine rebuild. Also for this example, lets say that the engine will likely need a rebuild at 1.3 million miles when the oil is replaced every 15k miles, 1.0 million miles when the oil is replaced every 25k miles, and 0.7 million miles when the oil is replaced every 50k miles. Comparing 15k, 25k, and 50k change intervals with these examples will reveal that at 15k, you would spend 0.045999 cents per mile, at 25k, you would spend 0.032 cents per mile, and at 50k, you would spend 0.0345. Comparing the cheapest interval of 25k to the one that makes the engine last the longest, reveals that you actually waste an extra \$14,000 in that first million miles and \$18,000+, almost enough to pay for 2 rebuilds by the time you get to 1.3 million. Waiting until 50k to save money on oil changes costs an extra \$2,500 per million from premature wear. Again, that was just an example to reveal the concept that at some point the replacement is inevitable, so what needs to be found is the optimum balance between maintaining something vs prolonging its life span.

The interval for every single item recommended in the maintenance schedule for your truck is based on saving you the most money and not actually based on 'making it last forever'. Knowing this now, if you plan on altering or ignoring anything recommended, long term, it will likely cost you a lot more money than just doing it when it says to. Any mechanic, certified or not, that tells you to alter what the manufacturer has in actual writing, had better have some concrete cost analysis backing their words, otherwise it needs to be taken as opinionated horse-poop. There seems to be a rapidly growing disease in the world of truck mechanics called 'I know more than you do'. It is sad actually, because to profess that the written recommendations are incorrect, is to profess that their opinion carries more weight than all the time and money the manufacturer has spent researching those items. This alone is proof that for every million miles of trucking, comes a million pounds of bulls\*\*. Ignore the bull, and get the correct

information for every one of the systems and components on your particular truck. That information is out there, and is provided in great detail from the maker of every part installed.

Your truck is going to break. Parts are going to fail, fluids are going to need changing, and things will get dirty and out of calibration. This is a fact, so there are 2 ways to approach them. The first, is to be reactive and wait until the point of failure, then do something about it. The second is to be proactive and catch and/or monitor things so that you can plan for them. To keep costs as low as possible, there are some items on your truck that will only need replacing as a reaction to their failure, and some parts of your truck that you will need to be proactive towards, replacing them before the actual point of breakage.

A good example of a reactive maintenance item is your windshield. Your windshield is definitely going to get damaged, usually by a rock flying off of another vehicle. Being proactive and replacing it in anticipation of it getting hit is definitely pointless. The best, and cheapest thing to do is to only replace it when it breaks, or is no longer legal.

A good example of being proactive is to monitor the tread depth of your tires so that you can predict and plan for their replacement, as well as keeping an eye out for bearing or alignment issues. Just like taking the wrong approach in the case of the windshield, waiting for failure, then reacting to an item that you should be proactive toward can be very costly, or even cost your, or someone else's life. If it moves, rolls, wiggles, flaps, bounces, or it provides, senses, or uses electricity, or it otherwise needs fluid, then you will need to maintain it in a proactive way to minimize costs and unexpected visits to a repair shop. This is also how you prevent those otherwise unpredictable failures.

Preventative maintenance is proactive maintenance. Every brand and model truck has a detailed PM schedule recommended by the manufacturer. Usually, a generalized version of it can be found in the owners manual for the truck, but a more detailed version, usually referred to as a service schedule, can be found in the service manual or book. The service schedule will be very detailed, giving recommendations at different mileage intervals such as what to do or check every 25k, 50k, 100k, 150k, 300k, and 500k miles. This is the schedule I was referring to above, that you should not alter or skip steps for without solid proof and that the altered step will not cost you in some unexpected way. Adding your own steps and items to this schedule is definitely recommended when there is solid evidence that more should be done, especially if you want to prevent unpredictable failures.

I highly recommend that you get copies of the full service schedule for your truck and make your own PM checklist from it. Next, add to that list, as part of the oil change interval, all 112 points used during a D.O.T. Inspection. This puts you in the habit of keeping your truck legal, as well as giving you the confidence of knowing the exact condition of your truck when you are faced with an inspection. After that, talk to mechanics and other drivers with your model truck and/or engine to see if there are items you can add to your list to watch out for, especially if you hear about a problem that occurs frequently or occurs to many trucks. Ask how to properly check and/or predict those kinds of problems from the people you learned them from, as well as from your local dealer or engine shop. Add to the top of your PM checklist, a place to record the mileage, engine hours, and the date performed.

Each item listed should contain the type of inspection performed, its actual current condition (after any adjustments or repairs if performed), and notes where you can write down part numbers and/or what was done if a change was made. PM checklist records done in this way are your only 'proof of care' if a warranty or other claim needs to be made on your behalf. Also, D.O.T. requires your carrier to have a clear record of maintenance for your truck, so if they get audited, you will be prepared. A 'jaw-dropping professionally impressive' set of reports proves that you mean business and cannot be disputed by anyone.

Build a detailed PM checklist of your own, make multiple copies of it, and go through it every time you have a PM done, such as when you get an oil change. Your PM checklist should include everything from the lowest interval to the highest. If it is formatted well, it will probably take you about an hour to complete, and for those times that you feel lazy about it, just remind yourself that part of owning a truck involves doing things other than just driving.

I have created a pretty good PM checklist that I use for my 2011 Prostar / Cummins ISX, based on the actual service schedule and other info gathered. Some of the extra items added to my particular checklist are based on first hand experience backed by failure analysis. I also added some common things to check for based on the experience of a carrier that has several hundred of these trucks. Keep in mind that every truck is different, and so is the type of operation you use them for, so if you are going to use the list I have here, then please customize it to your truck and operation using the correct information.

(Continued on next page...)

**Custom PM Service Schedule for 2011 International Prostarsar with Cummins  
ISX CM781  
(Terry Norris Sept. 2012)**

Date: \_\_\_\_\_ Driver: \_\_\_\_\_  
Shop: \_\_\_\_\_  
Odo: \_\_\_\_\_ Eng. Hours: \_\_\_\_\_  
Vin#: \_\_\_\_\_

\*\*\* Condition: Reefers to the condition of an item AFTER the inspection and/or maintenance of an item has been performed, and is listed as 4. being in a Good or New like condition, 3. being in a stable, operable state, but not new, 2. being in a condition that will need attention by the next inspection interval, and 1. being non functional, and/or in a state of immediate repair. \*\*\*

**25k Mileage interval...**

- 1 **Engine Oil and Filter Replacement**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 2 **Fuel Filter Replacement**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 3 **Hood Latches**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 4 **Grill, Radiator, Oil Cooler, Charge Air Cooler (Debris / Leaks)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 5 **Coolant Level**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 6 **Antifreeze Concentration and Freeze Level (SCA / Freeze)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_



- 7 **Radiator Pressure Cap (Tightness)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 8 **Intake Air filter (Inspection / Replacement)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 9 **Air Intake Piping (Looseness)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 10 **A/C and Alternator Mounting**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 11 **Fire Extinguisher / Safety Triangles (Present / Charged / Undamaged)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 12 **Batteries (Corrosion / Tight)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 13 **Alternator (Correct Voltage at Idle and at 1500 RPM / Charging Rate)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 14 **All Exterior Lights and Signals**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 15 **Forward Cab and Sleeper Heater (Functioning)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 16 **HVAC System Check (Operational Test)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_

- 17 **Accessory Operation (Radio / Interior Lights / etc.)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 18 **Clutch Pedal (Proper Adjustment)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 19 **Clutch Fan Assembly (Operation / Air Leaks / Looseness)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 20 **Belts (Inspection and Belt Tension)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 21 **Fluid Leaks**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 22 **Exhaust and EGR Piping (Check for Leaks)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 23 **Exhaust Flex Pipes (Leaks / Slippage)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 24 **Electrical (Visual Wiring Inspection)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 25 **Engine and Radiator Mounts (Bracket and Bushing Wear Inspection)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 26 **Front Wheel Bearing and Lube Level (Lube Level / Metal Shaving on Magnetic cap)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_

- 27 **Power Steering (Fluid Level / Leaks)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 28 **Steer Axle Kingpins, Bushings, and Linkage (Excess Play)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 29 **All Permits, Tags and Stickers Present and up to Date**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 30 **Doors and Windows**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 31 **Windshield (Damage)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 32 **Mirrors**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 33 **Horn (City / Highway)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 34 **Windshield Washer and Wipers (Fluid level / Operating / Blade Condition)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 35 **Oil Pressure Test (at Idle and at 1500 RPM)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 36 **Air Governor Cut in/out Pressures**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_

- 37 **Instrument Panel Gauges and Lights**  
Action:  Visual Inspection Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 38 **Air Brake Test**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 39 **Low Air Warning Buzzer (Sound and Lights)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 40 **Parking Brake (Tug Test)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 41 **Gear Shift (Proper Operation / Linkage Tight)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 42 **Clutch Break (Working)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 43 **Cab Mounts and Shocks (Visual Inspection)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 44 **Airbag Inspection (Dry Rot / Damage / Slippage)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 45 **Rim or Tire Sidewall Damage**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 46 **Tire Tread Depth and Wear**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_

- 47 **Drain Moisture from Air Tanks**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 48 **Pig Tail and Glad Hand Inspection (Emergency, Service, and Electrical Lines /Seals)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 49 **5<sup>th</sup> Wheel Inspection and Grease**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 50 **Wheel Seals (Check for Leaks)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 51 **Slack Adjusters (Loose / Correct Angle of Arm)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 52 **Alignment and Axle Assemblies / U-bolts (Visual Inspection for Slippage)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 53 **Axle Spring Side slippage**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 54 **Brake Pads and Drums (Inspection for Cracks / Slippage / Excess Gap)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 55 **Tractor Greasing (31 Grease Points)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_

56 **Lube Level (Transmission and Rear Axles)**

Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement

Performed By:  Driver  Shop Notes: \_\_\_\_\_

Condition:  4  3  2  1 \_\_\_\_\_

57 **Drive Line U-Joints and Yokes (Excess Play)**

Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement

Performed By:  Driver  Shop Notes: \_\_\_\_\_

Condition:  4  3  2  1 \_\_\_\_\_

58 **Frame (Corrosion / Distortion)**

Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement

Performed By:  Driver  Shop Notes: \_\_\_\_\_

Condition:  4  3  2  1 \_\_\_\_\_

## 50k Mileage Interval...

### All 25k Mileage Items

#### 59 **Cooling Fan Belt Tensioner (Belt Tension)**

Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement

Performed By:  Driver  Shop Notes: \_\_\_\_\_

Condition:  4  3  2  1 \_\_\_\_\_

#### 60 **Air Intake, EGR Piping, and Exhaust System (Soapy Water Leak Detection)**

Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement

Performed By:  Driver  Shop Notes: \_\_\_\_\_

Condition:  4  3  2  1 \_\_\_\_\_

#### 61 **Air Compressor Air Cleaner Element**

Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement

Performed By:  Driver  Shop Notes: \_\_\_\_\_

Condition:  4  3  2  1 \_\_\_\_\_

#### 62 **Engine Wiring Harness (Tightness / Rub Wear)**

Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement

Performed By:  Driver  Shop Notes: \_\_\_\_\_

Condition:  4  3  2  1 \_\_\_\_\_

#### 63 **Air Cleaner Restrictions (Element / Hood Scoop)**

Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement

Performed By:  Driver  Shop Notes: \_\_\_\_\_

Condition:  4  3  2  1 \_\_\_\_\_

#### 64 **Air Compressor Discharge Lines (Soot Clogging / Overheating)**

Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement

Performed By:  Driver  Shop Notes: \_\_\_\_\_

Condition:  4  3  2  1 \_\_\_\_\_

#### 65 **HVAC Filter Replacement**

Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement

Performed By:  Driver  Shop Notes: \_\_\_\_\_

Condition:  4  3  2  1 \_\_\_\_\_

#### 66 **Bypass Oil Filter Replacement (Optional)**

Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement

Performed By:  Driver  Shop Notes: \_\_\_\_\_

Condition:  4  3  2  1 \_\_\_\_\_

## 125k Mileage interval...

### All 25k, and 50k Mileage Items

#### 67 **Front Airbag Leveling Valve (Inspection / Replace)**

Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement

Performed By:  Driver  Shop Notes: \_\_\_\_\_

Condition:  4  3  2  1 \_\_\_\_\_

#### 68 **Coolant System pressure Test**

Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement

Performed By:  Driver  Shop Notes: \_\_\_\_\_

Condition:  4  3  2  1 \_\_\_\_\_

#### 69 **Engine Mounting Bolts**

Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement

Performed By:  Driver  Shop Notes: \_\_\_\_\_

Condition:  4  3  2  1 \_\_\_\_\_

#### 70 **Cold Starting Aid**

Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement

Performed By:  Driver  Shop Notes: \_\_\_\_\_

Condition:  4  3  2  1 \_\_\_\_\_

#### 71 **Vibration Damper (Visual Inspection / Leaks / Cracks / Bulging)**

Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement

Performed By:  Driver  Shop Notes: \_\_\_\_\_

Condition:  4  3  2  1 \_\_\_\_\_

#### 72 **Crank Case Breather Element (Replace)**

Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement

Performed By:  Driver  Shop Notes: \_\_\_\_\_

Condition:  4  3  2  1 \_\_\_\_\_

#### 73 **Coolant Filter (Replace)**

Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement

Performed By:  Driver  Shop Notes: \_\_\_\_\_

Condition:  4  3  2  1 \_\_\_\_\_



## 250k Mileage interval...

### All 25k, 50k, and 125k Mileage Items

#### 74 **Cooling System (Flush)**

Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement

Performed By:  Driver  Shop Notes: \_\_\_\_\_

Condition:  4  3  2  1 \_\_\_\_\_

#### 75 **Charge Air Cooler Pressure Test**

Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement

Performed By:  Driver  Shop Notes: \_\_\_\_\_

Condition:  4  3  2  1 \_\_\_\_\_

#### 76 **Front Axle Wheel Bearing Service and Oil Change**

Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement

Performed By:  Driver  Shop Notes: \_\_\_\_\_

Condition:  4  3  2  1 \_\_\_\_\_

#### 77 **Transmission and Rear Axle Oil Change**

Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement

Performed By:  Driver  Shop Notes: \_\_\_\_\_

Condition:  4  3  2  1 \_\_\_\_\_

#### 78 **Power Steering Fluid Change**

Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement

Performed By:  Driver  Shop Notes: \_\_\_\_\_

Condition:  4  3  2  1 \_\_\_\_\_

#### 79 **Air Dryer Desiccant Filter (Replace)**

Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement

Performed By:  Driver  Shop Notes: \_\_\_\_\_

Condition:  4  3  2  1 \_\_\_\_\_

#### 80 **Seat Slide Adjusters (Lube)**

Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement

Performed By:  Driver  Shop Notes: \_\_\_\_\_

Condition:  4  3  2  1 \_\_\_\_\_

#### 81 **Aftertreatment Injector (Replace)**

Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement

Performed By:  Driver  Shop Notes: \_\_\_\_\_

Condition:  4  3  2  1 \_\_\_\_\_

#### 82 **Engine Intake Manifold and Exhaust Pressure Sensors (Cleaning / Replace)**

Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement

Performed By:  Driver  Shop Notes: \_\_\_\_\_

Condition:  4  3  2  1 \_\_\_\_\_

- 83 **EGR Differential Pressure Sensor (Removal and Inspection / Replace)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 84 **EGR Mixing (Venturi) Pipe (Removal and Cleaned)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 85 **Cab Airbags (Replace)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 86 **Front and Rear Shocks (Replace)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 87 **Overhead Set / Engine Brake Adjustment**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 88 **5<sup>th</sup> Wheel Backlash (Measurement / Adjustment)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_

## 500k Mileage interval...

### All 25k, 50k, 125k, and 250k Mileage Items

#### 89 **EGR Valve (Removal, Cleaning, and Inspection / Replace)**

Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement

Performed By:  Driver  Shop Notes: \_\_\_\_\_

Condition:  4  3  2  1 \_\_\_\_\_

#### 90 **Cab Airbag Leveling Valve (Replace)**

Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement

Performed By:  Driver  Shop Notes: \_\_\_\_\_

Condition:  4  3  2  1 \_\_\_\_\_

#### 91 **Fan Hub, Belt Driven (Removal and Inspection / Replacement)**

Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement

Performed By:  Driver  Shop Notes: \_\_\_\_\_

Condition:  4  3  2  1 \_\_\_\_\_

#### 92 **Crankshaft Damper (Replace)**

Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement

Performed By:  Driver  Shop Notes: \_\_\_\_\_

Condition:  4  3  2  1 \_\_\_\_\_

#### 93 **Power Steering Unit (Filter Change)**

Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement

Performed By:  Driver  Shop Notes: \_\_\_\_\_

Condition:  4  3  2  1 \_\_\_\_\_

## Other – As Needed...

- 94 **DOC and DPF Removal and Cleaning**  
**(Reason: Excess Ash Buildup / Face Plugged by an EGR Cooler Failure)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 95 **EGR Cooler Replacement (Reason: EGR Cooler Leak Test Fails)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 96 **Turbocharger Calibration Program**  
**(Reason: Engine sensor, Charge Air Cooler, EGR Valve, or Turbocharger is Replaced)**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 97 **Forced Regen Program**  
**(Reason: Aftertreatment Injector Replacement / DOC and/or DPF was Cleaned or Replaced).**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_
- 98 **DPF Recalibration Program (Reason: Replacement of the DPF).**  
Action:  Visual Inspection  Test  Adjustment(s)  Removal / Replacement  
Performed By:  Driver  Shop Notes: \_\_\_\_\_  
Condition:  4  3  2  1 \_\_\_\_\_

## PM schedule detail...

- 1 **Engine Oil and Filter Replacement** – Cummins recommends Shell Rotella-T every 25k miles with filter Fleetguard LF9080 combo through-flow / bypass filter for EGR Engines.
- 2 **Fuel Filter Replacement** – every 25k.
- 3 **Hood Latches** – Check to ensure the screws do not come loose and rubber straps are not cracked.
- 4 **Grill, Radiator, Oil Cooler, Charge Air Cooler (Debris / Leaks)** – Restrictions in airflow to the front of the truck increase the fan cycle time, costing fuel.
- 5 **Coolant Level** – Coolant level is dependent on the temperature of the coolant. If coolant level starts to drop slowly, then perform a radiator leak pressure test to find the problem. If there are no external leaks, then engine oil will need to be tested for coolant. The EGR cooler will need to be tested for leaks as well.
- 6 **Antifreeze Concentration and Freeze Level (SCA / Freeze)** – The acidic level of the coolant, if left unchecked, can destroy the engine rapidly.
- 7 **Radiator Pressure Cap (Tightness)** – A loose pressure cap can fall off due to vibration as well as lower the boiling point of the coolant causing the engine to overheat at much lower temperatures.
- 8 **Intake Air Filter (Inspection / Replacement)** – The intake air filter directly effects fuel economy. Keeping it clean and/or replacing it regularly is less expensive than the extra fuel needed to overcome the losses in engine efficiency and horsepower.
- 9 **Air Intake Piping (Looseness)** – Any gap in the intake piping before the turbocharger will allow dirt into the engine causing rapid cylinder wear and premature engine failure.
- 10 **A/C and Alternator Mounting** – Engine and belt vibration can cause these components to become loose.
- 11 **Fire Extinguisher / Safety Triangles (Present / Charged / Undamaged)** – D.O.T. Requirement. Safety related.
- 12 **Batteries (Corrosion / Tight)** – Loose battery cables can cause hard starting and/or a fire. Axle grease can be used on the terminals to prevent corrosion.
- 13 **Alternator (Correct Voltage at Idle and at 1500 RPM / Charging Rate)** – The voltage should be below 14.5v and above 13.6 for proper battery charging.
- 14 **All Exterior Lights and Signals** – System check.
- 15 **Forward Cab and Sleeper Heater (Functioning)** – System check

- 16 **HVAC System Check (Operational Test)** – System check
- 17 **Accessory Operation (Radio / Interior Lights / etc.)** - System check
- 18 **Clutch Pedal (Proper Adjustment)** – Can cause shifting problems
- 19 **Clutch Fan Assembly (Operation / Air Leaks / Looseness)** – system check / air leaks indirectly cause fuel economy loss.
- 20 **Belts (Inspection and Belt Tension)** – If the belt starts to look polished and/or shiny it is an indication of excess wear.
- 21 **Fluid Leaks** – System check
- 22 **Exhaust and EGR Piping (Check for Leaks)** – Safety related / Fire hazard / Can cause DPF problems
- 23 **Exhaust Flex Pipes (Leaks / Slippage)** – Safety related / Fire hazard / Can cause DPF problems
- 24 **Electrical (Visual Wiring Inspection)** – Look for places the wiring might get rubbed against by the frame / check connections for signs of weather intrusion.
- 25 **Engine and Radiator Mounts (Bracket and Bushing Wear Inspection)** – Bad bushings causes charge air and radiator problems.
- 26 **Front Wheel Bearing and Lube Level (Lube Level / Metal Shaving on Magnetic Cap)** – Excess metal shavings on the magnetic caps is an indication of bearing failure and should be addressed immediately.
- 27 **Power Steering (Fluid Level / Leaks)** – Safety check
- 28 **Steer Axle Kingpins, Bushings, and Linkage (Excess Play)** – Safety check
- 29 **All Permits, Tags and Stickers Present and Up to Date** – Compliance check
- 30 **Doors and Windows** – Safety check
- 31 **Windshield (Damage)** – Safety and compliance check.
- 32 **Mirrors** – Safety and compliance check.
- 33 **Horn (City / Highway)** – Safety and compliance check.
- 34 **Windshield Washer and Wipers (Fluid level / Operating / Blade Condition)** – Safety and compliance check.
- 35 **Oil pressure Test (at Idle and at 1500 RPM)** – A drop in oil pressure after an oil change may indicate a bad or defective oil filter.

- 36 **Air Governor Cut in/out Pressures** – Safety and compliance check.
- 37 **Instrument Panel Gauges and Lights** – Safety and compliance check.
- 38 **Air Brake Test** – Safety and compliance check.
- 39 **Low Air Warning Buzzer (Sound and Lights)** – Safety and compliance check. If an engine shutdown alarm activates, you want to hear as well as see the alarm so that you have time to pull over as soon as it happens.
- 40 **Parking Brake (Tug Test)** – Safety and compliance check.
- 41 **Gear Shift (Proper Operation / Linkage Tight)** – Safety and compliance check.
- 42 **Clutch Break (Working)** – Safety and compliance check. A worn clutch brake makes shifting very difficult.
- 43 **Cab Mounts and Shocks (Visual Inspection)** – Safety check. Bad cab mounts and/or shocks add unnecessary stress on all cab components and wiring.
- 44 **Airbag Inspection (Dry Rot / Damage / Slippage)** – Safety and compliance check.
- 45 **Rim or Tire Sidewall Damage** – Safety and compliance check.
- 46 **Tire Tread Depth and Wear** – Safety and compliance check.
- 47 **Drain Moisture from Air Tanks** – Excess moisture is an indication the Decedent filter or air dryer is malfunctioning.
- 48 **Pig Tail and Glad Hand Inspection (Emergency, Service, and Electrical Lines / Seals)** – Safety and compliance check.
- 49 **5<sup>th</sup> Wheel Inspection and Grease** – Safety and compliance check.
- 50 **Wheel Seals (Check for Leaks)** – Safety and compliance check.
- 51 **Slack Adjusters (Loose / Correct Angle of Arm)** – Safety and compliance check.
- 52 **Alignment and Axle Assemblies / U-bolts (Visual Inspection for Slippage)** – Safety and compliance check.
- 53 **Axle Spring Side Slippage** – An indication that the rear axle alignment is incorrect or has slipped.
- 54 **Brake Pads and Drums (Inspection for Cracks / Slippage / Excess Gap)** – Safety and compliance check.
- 55 **Tractor Greasing (31 Grease Points)** – Prolongs the life of critical components.

- 56 **Lube Level (Transmission and Rear Axles)** Low lube levels will cause overheating / damage.
- 57 **Drive Line U-Joints and Yokes (Excess Play)** – Safety and compliance check.
- 58 **Frame (Corrosion / Distortion)** – Safety and compliance check.
- 59 **Cooling Fan Belt Tensioner (Belt Tension)** – the belt tensioner weakens over time.
- 60 **Air Intake, EGR Piping, and Exhaust System (Soapy Water Leak Detection)** – Safety check / Fuel economy loss check.
- 61 **Air Compressor Air Cleaner Element** – Some engines do not have a compressor air cleaner element because it is coupled with the engine intake system.
- 62 **Engine Wiring Harness (Tightness / Rub Wear)** – Safety check.
- 63 **Air Cleaner Restrictions (Element / Hood Scoop)** – Restrictions cause fuel economy loss.
- 64 **Air Compressor Discharge Lines (Soot Clogging / Overheating)** – Soot gets into the air system sometimes via the EGR piping if the compressor is attached to the engine intake manifold.
- 65 **HVAC Filter Replacement** – Restricted airflow to your A/C system can cause it to freeze and/or fail.
- 66 **Bypass Oil Filter Replacement (Optional)** – Some kind of after market bypass oil filter is recommended to keep soot levels down and extend engine life, especially on EGR engines.
- 67 **Front Airbag Leveling Valve (Inspection / Replace)** – Plastic leveling valves wear out easily and fail often.
- 68 **Coolant System Pressure Test** – Test for external and internal coolant leaks.
- 69 **Engine Mounting Bolts** – Engine mounting bolts can come loose because of excess vibration.
- 70 **Cold Starting Aid** – Safety check.
- 71 **Vibration Damper (Visual Inspection / Leaks / Cracks / Bulging)** – A bad vibration damper can cause many vibration related problems.
- 72 **Crank Case Breather Element (Replace)** – On EGR engines, the crank case filter gets clogged with soot from the oil.
- 73 **Coolant Filter (Replace)** – Keeps the coolant clean and the rust from building up in your radiator.
- 74 **Cooling System (Flush)** – Removes deposits.
- 75 **Charge Air Cooler Pressure Test** – Fuel economy loss check.



- 76 **Front Axle Wheel Bearing Service and Oil Change** – Reduces steering axle tire wear / Safety check.
- 77 **Transmission and Rear Axle Oil Change** – Recommended at 250k miles on OTR operations, or at 500k miles on local or LTL operations.
- 78 **Power Steering Fluid Change** – Keeps seals and components from failing prematurely.
- 79 **Air Dryer Desiccant Filter (Replace)** – This filter keeps your air system dry.
- 80 **Seat Slide Adjusters (Lube)** – Prevent those annoying squeaks.
- 81 **Aftertreatment Injector (Replace)** – Cummins recommends it be inspected. Every one I have seen was already bad enough to cause fuel economy loss. Just replace it.
- 82 **Engine Intake Manifold and Exhaust Pressure Sensors (Cleaning / Replace)** – Causes fuel economy loss. Most of the time, they just need to be removed and cleaned, especially the intake sensor. It gets layered with soot passing through from the EGR piping.
- 83 **EGR Differential Pressure Sensor (Removal and Inspection / Replace)** - Gets layered with soot passing through from the EGR piping. The crossover tubes need checked as well.
- 84 **EGR Mixing (Venturi) Pipe (Removal and Cleaned)** – Fuel economy loss / Turbo operational issues. Clean with dry brush or 'Carb and Choke' cleaner NOT 'Brake cleaner'.
- 85 **Cab Airbags (Replace)** – The internal shocks go bad.
- 86 **Front and Rear Shocks (Replace)** – They get weak long before showing any signs of failure.
- 87 **Overhead Set / Engine Brake Adjustment** – Cummins recommends this be done at 500k, but their study did not include the loss in fuel economy at \$4.00+ a gallon.
- 88 **5<sup>th</sup> Wheel Backlash (Measurement / Adjustment)** – Safety.
- 89 **EGR Valve (Removal, Cleaning, and Inspection / Replace)** – Turbo operation issues / fuel economy loss.
- 90 **Cab Airbag Leveling Valve (Replace)** – Plastic valves leak and/or fail easily.
- 91 **Fan Hub, Belt Driven (Removal and Inspection / Replacement)** – Can cause excess belt wear / fuel economy or fan problems.
- 92 **Crankshaft Damper (Replace)** – Causes excess vibration. They tend to dry up by the time they get 500k miles on them.
- 93 **Power Steering Unit (Filter Change).**

94 **DOC and DPF Removal and Cleaning (Reason: Excess Ash Buildup / Face Plugged by an EGR Cooler Failure)** – Ash buildup comes from non compliant fuel or oil additives. Face plugging is the result of a leaking EGR cooler.

95 **EGR Cooler Replacement (Reason: EGR Cooler Leak Test Fails)** – EGR cooler replacement should include an oil engine change, replacement of the intake manifold pressure sensor, replacement of the EGR differential pressure sensor, and cleaning of the EGR mixing (Venturi) pipe. Quite often these things are not done, but should be.

96 **Turbocharger Calibration Program (Reason: Engine Sensor, Charge Air Cooler, EGR Valve, or Turbocharger is Replaced)** – Can cause a great deal of fuel economy and/or horsepower losses.

97 **Forced Regen Program (Reason: Aftertreatment Injector Replacement / DOC and/or DPF was Cleaned or Replaced)** – A test result of higher than 2.5 is an indication of continued Regen problems. A test result of 2.5 or less is good. A test result of less than 2.0 is great.

98 **DPF Recalibration Program (Reason: Replacement of the DPF)** – Replacing the DPF with a new one without running the recalibration program can put the engine into derate after 250 engine run hours. This is a safety feature in the ECM to prevent DPF tampering.

## 11 – Understanding Your EGR and DPF as a Truck Owner

If you have a truck that is newer than 2004, then the engine is most likely to be an EGR engine. Exhaust Gas Recirculation (EGR) is a fancy technical term used to describe the fact that some of the engine exhaust gas is returned back into the intake. To put this into perspective along with its effects, let's imagine for a moment that you are an athlete well trained in running marathons. One day, the California Resources Board (CARB) and the EPA decide they no longer like marathon runners because they breathe up too much oxygen and fart too much during races. To stop them from using up all the oxygen, they decide to make a law limiting the amount of fresh air all younger athletes are allowed to breathe. Now, for all new athletes, when they are in California, they must breathe through a paper bag with a small hole in the end of it at all times. Breathing through a paper bag with a tiny hole, definitely limits your oxygen intake, and trying to run a marathon like that will seriously slow you down, hopefully making you fart less as well. EGR to a diesel engine is what the 'Paper Bag' is to the athlete. It limits the amount of oxygen to the engine by starving it of clean air, making it re-breathe already used up air from the exhaust. The result is that the fuel cannot burn as hot, making it produce less harmful exhaust gases.

Now that you know what EGR actually does, why would it be so important for an owner-op to know about it, its parts, and its technical details? Isn't that what a mechanic is for? Theoretically yes, that is what a mechanic is for, and theoretically yes, they are supposed to fully understand these systems and their effects, but realistically, when your truck ends up in a repair shop over these kinds of problems, the mechanic is only there to solve the problem that got you there, getting your truck back on the road.

If you are very lucky, the mechanic will find the problem and correct it, but most of the time, what happens is that the truck ends up in the shop over and over, costing you thousands and thousands in repair bills, and thousands upon thousands in lost pay from all the downtime. The only way to prevent this is to either get really lucky and not have any problems (possible but highly unlikely), or to take a proactive stand to prevent it. This guide is not written to help you rely on luck. It is written to help you hang onto every last red cent that you work so hard for, instead of giving it away to some overpriced, under-qualified, repair shop unable to care about helping you be successful in what you do.

The sad thing is that most shops do actually care, but either don't know how, don't have time, don't get paid enough for, and/or are just too expensive to take that extra effort. I highly recommend that you get directly involved, even if

you have someone else do the work for you. The ideal thing to do, is learn how to do the easier things yourself, saving you literally thousands. Only pay someone to do the things that you cannot do yourself when it comes to repairs, or component replacement. The key to all of this, especially if you will need a shop to perform any EGR or DPF related work for you, is to know enough to be able to direct them toward finding and solving the actual problem(s). Also, you need to know enough to direct them toward continuing past the problem, performing relevant maintenance, so that repeat visits are prevented.

Everyone benefits from shared knowledge, so if you do find yourself in a shop, getting repairs or service work done, EGR or not, knowing enough to oversee and discuss what the shop has to do for you will always have a huge impact on how well things go. After all, YOU ARE PAYING THEM, not the other way around.

The purpose of EGR itself, no matter what type or brand of diesel engine, is there to make the fuel burn at sort of a 'sweet spot' temperature to minimize harmful exhaust gases, while still providing as much energy as possible. The exhaust gas temperature (EGT) should be 570 degrees Fahrenheit give or take about 50 degrees when this is happening. The Engine's computer (ECM) monitors the exhaust via a temp. sensor, making changes, opening or closing a valve that controls how much exhaust gas is sent back around to the intake. This valve is called the EGR valve.

When the EGR valve is closed all the way, the engine will run on pure clean air provided by the turbo, and when it is open all the way, the engine will be re-breathing, depending on your engine, up to about 40% of exhaust instead of clean air. This mixture of clean and dirty air needs to be pretty accurate for your truck to get good fuel economy, so if something isn't operating quite right, then your wallet is the first thing to suffer, long before any actual faults occur. To sum it up, your EGR valve controls the dirty air, and your turbo controls the clean air going into your engine. If either system is leaking, restricted, or otherwise not working properly, fuel economy goes down, and if it gets bad enough, it could shut you down with a fault.

Starting with the clean air side of things, clean air is sucked in through the engine air filter, then gets pressurized up to 30+ PSI by the turbo, where it also gets very hot and expands due to the heat. That pressurized, hot, expanded air is then sent through the air radiator (called a charge air cooler), cooling it off again, making it less expanded, then onward past the EGR mixing tube, where it mixes with dirty air, then into the engine.

The ECM precisely controls this clean air system by altering the speed of the turbo, changing the air pressure. The air pressure itself is determined by several sensors that the ECM monitors. Some engines have more sensors than others, so I will just include them all. To pre-determine the oxygen content of the air, the ECM needs to know the current altitude, humidity, and temperature. This mini 3-sensor weather station can tell if you are on the beach, or if you are climbing Veil Pass. After all, the air is pretty thin at 12,000 feet. There is another temp sensor, just to verify that the 'weather station' is accurately mounted right at the turbo intake pipe.

All those sensors are just to tell the ECM what the air quality is. From there, the ECM keeps an eye on the turbo itself through the use of a speed sensor (mounted on the turbo, having a slightly-thick green wire), just to make sure the turbo doesn't spin too fast.

The ECM also uses 2 sensors mounted right where the air goes into the engine on the intake manifold, after the clean/dirty mixer pipe. They are air pressure, and temperature. These 2 are the most important for determining the correct pressure, and the rest are just compensation for climbing hills to help fuel economy slightly.

The air sensor on the intake manifold is referred to as the 'MAP sensor' or 'Intake Manifold Pressure Sensor'. This sensor is in the path of both the clean and dirty air exposing it to soot on a constant basis. It is going to get dirty, start reading incorrectly, and will eventually fail, even on trucks that never idle, where soot problems are less. It is very easy to remove and clean (or replace if needed), so I recommend that you learn to do it yourself. I have seen service shops rebuild and/or replace entire turbos, spending thousands of dollars, trying to fix turbo-related fuel economy problems, never solving them, all because that sensor, along with others, are simply dirty.

If you are ever faced with EGR related problems (Not DPF problems), where the turbo starts to act up as well, this could be a clean air related issue, but since the ECM relies on both clean and dirty air system to operate correctly, both should be looked at. Preventative maintenance to both these systems will almost always prevent major shutdown issues, so if you find, suddenly you are faced with one related directly to EGR, and you have to shut the truck down anyways, just go through both the entire systems as thoroughly as possible. If you are not afraid to get dirty (and you shouldn't be if you want to be profitable), then start by getting the engine codes if possible to verify it is in fact EGR related. Most trucks

have a way to display fault codes in some form or another, so make some phone calls or look on the Internet on how to do this. It usually involves turning the ignition switch and holding some buttons, writing down flash codes, then looking them up in some manual or reference guide.

Call a repair shop familiar with your model truck, and verify your codes, getting some basic opinion as well. Turbo actuator, turbo speed, and/or intake sensor errors are definitely clean air related. No matter what kind of EGR codes you get, the first thing you want to do is go through the basics as much as possible before resorting to putting it in a shop. This saves you a lot of money and reduces the possibilities of the problem greatly. Next, if you have to go to a shop, have them perform the things you cannot do yourself as either a start, or as an addition to what needs to be done. Remember, you are paying them, make them work for their money in a way that ensures you get the most bang out of your dollars spent, so that your overall profitability, and fuel economy stays as high as possible.

To troubleshoot and/or PM the clean air side of the system, start by doing the obvious. Replace the air cleaner for the engine if it is old, and check the piping between it, and the turbo for any cracks, gaps, and loose clamps or boots. If the engine will run at all, use a soapy water spray on all the intake piping, the turbo, the EGR piping, etc. looking for leaks while the truck is running. This helps eliminate the obvious like worn charge air cooler boots, and loose pipe connections.

The next thing you can do, if you can do it yourself, will cost you no money, is to remove the EGR mixing pipe and ensure it is not partially clogged with soot. As soot builds up in this pipe, your fuel economy indirectly goes down. The ECM will try to overcome this restriction by increasing exhaust back-pressure using the turbo. It is fairly easy to remove on most trucks, so doing this yourself will save you a lot of money. Removing the boot coming from the charge air cooler and looking down into it will fool you because it will look clean. You usually have to remove the whole thing to actually see the soot inside it. If it is dirty with soot, then just clean it out with a dry brush, like a tooth brush or a brush for cleaning cups when you wash dishes. Chemicals or sprays should be avoided, because they will usually turn this pipe into a soot magnet afterwards. Next cheapest thing is to just go ahead and pull and replace the the 'Intake Manifold Pressure Sensor', keeping the old one. It is dirt cheap compared to the other parts of the clean air system and a hundred bucks later, you will not only eliminate it from the equation, but ensure it is not costing you fuel economy from incorrect readings. If replacing it does nothing, clean up the old one using a dry toothbrush, and keep it as a spare for testing.

Really, the only thing left in the clean air side of things is the charge air cooler, and the turbo itself. If it has been more than 200k miles since the charge air cooler has been tested, while the truck is down, definitely test it for leaks actually determining its 'leak rate', instead of just doing a pass/fail test. The leak rate should not be worse than 15 PSI of loss in two minutes. If it is, then it is costing you fuel economy, and if it is really bad, then it is a good bet that it was the initial cause of your EGR problems, but I wouldn't stop there.

The turbo can sometimes has actuator or bearing problems itself, but it can also have a seal problem that causes the clean air side of things to have lower than normal pressure, causing fuel economy loss, and/or occasional crank case pressure faults. This seal problem can be tested by doing a crank case pressure test. Excess crank case pressure in the engine is usually only caused by 2 things, a faulty turbo with bad seals, or excess cylinder wear. Too much crank case pressure from excess cylinder wear is always coupled with how much oil your engine consumes. If you have high oil consumption, like say you have to put in a gallon of oil every 6 or 8 thousand miles, then it is probably not the turbo, but if you get high crank case pressure, and no oil consumption, the turbo is a good place to point your finger. That pretty much sums up what can be done to ensure the clean air side of your engine is able to operate properly, so the next thing related to EGR is to look at the dirty air side of the system.

The Dirty air side of the system, otherwise known as the EGR system, is a system that will always require some routine maintenance if you want to keep your truck at its highest fuel efficiency and ensure it does not have EGR problems. It is a good idea to understand this side of the system well, so that you can keep an eye on, and prevent problems before they shut you down.

As the engine runs and produces exhaust, the exhaust flows from the engine block through the exhaust manifold, then branches off into two directions. Most of the exhaust flows into the back of the turbo, keeping it spinning, then out, past a short section of pipe where the dosing (after-treatment) injector is located, then down to your DPF. If your truck has no no DPF, then there will be no after-treatment injector, or DPF, but instead, an actual muffler. From there it goes out to the stack. Back at the exhaust manifold, where the exhaust goes two directions, the gas that isn't flowing into the back of the turbo, passes through several EGR components.

Which device it passes through first, second etc. may be different on different trucks, but they all have the same basic components. The exhaust gas is

570 degrees plus, and is too hot to send back into the intake of the engine, so it is pushed through a small radiator called the EGR cooler to cool it off to about 200 degrees Fahrenheit. After that, it passes through the EGR valve, so that the ECM can control how much gets sent to the intake. After the EGR valve, it passes through a pipe that goes around the engine back to the intake, and along this pipe are 2 sensors. One is a temperature sensor, letting the ECM know that the gas isn't too hot for the intake, and the other is a sensor that detects how fast the gas is moving through the pipe. That sensor is called the 'EGR differential Pressure Sensor'. This sensor is what the ECM uses to control the EGR valve to help get the desired clean to dirty air mixture. From there, the gas flows into the EGR mixing pipe, then the mixed clean and dirty air that goes into the engine.

The 'Dirty Air' (EGR) side of the system is just that. It is very hot and contains soot, possibly coolant, already burnt fuel, soot, carbon dioxide, soot, NOX gases, and more soot. Soot is the killer of the entire EGR and intake system. Second to that is the possibility of coolant. Yes, coolant. Those hot gases are cooled off by the EGR cooler, which uses coolant from the radiator to do its job. If there is any kind of leak in the EGR cooler, then coolant ends up in the dirty air system clogging and sticking to everything, gumming it up and making it a soot magnet. Coolant also ends up in your cylinders where it gets pushed past the piston rings getting it into your oil, destroying the oil's ability to lubricate your engine. An EGR cooler leak can destroy a lot of components fast, and can cause really big problems with every single exhaust related component including the turbo, all the sensors, the EGR valve, and the DPF.

The signs of an EGR cooler leak are white smoke out the stack, a drop in coolant level where you can find no leaks, and/or failing a radiator pressure test where there is no leaks found. If the leak is small, then you can use 'Valvoline ZEREX Super Sealer for HD Applications ' to stop it, and is actually recommended by the engine makers for EGR cooler leaks. Using the super sealer is ok as long as you keep a close eye on your coolant levels to make sure it actually stopped the leak. If it is a bad leak (you are going through a gallon or more of coolant in a month), then get it fixed right away. That much coolant can kill your DPF, EGR valve, or turbo very quickly. A total EGR cooler failure with a massive leak can actually hydra-lock your engine, so if your EGR cooler starts leaking, Personally, I would just replace it.

Soot is the slow silent killer of EGR system components. No matter how you drive your truck, soot will build up in all the EGR components making them operate incorrectly, eventually causing them to fail. Idling an EGR truck can



accelerate this process greatly, so if you have to idle a lot, consider getting an APU.

Isn't the DPF supposed to take care of the soot? Can't I just do a Parked Regen to fix it? NO, you cannot do a Parked Regen to fix your soot problems, because NO, the DPF does not filter the exhaust sent to your EGR system. The act of mixing clean air with dirty air itself produces soot. That soot is carried by the exhaust gases from your exhaust manifold directly into your EGR cooler, EGR valve, Differential Pressure Sensor, Mixing Pipe, the Intake Manifold Pressure Sensor, and the cylinders. It deposits slowly over time, clogging them up, causing delayed readings, and eventually false readings and/or a stuck EGR valve. How fast this happens is relevant to the year of your truck, how much you idle your truck, how healthy the engine and intake system itself is, and how hard you try to push your truck up hills in the wrong gear. For most 2005 – 2008 trucks, the symptoms of soot related problems usually start at around 450+k miles. On 2009 - 2011 engines that do not use Diesel Exhaust Fluid, the symptoms usually start showing up at around 250-300k miles because they use more EGR than previous year model trucks, because of newer emission standards.

How does an EGR cooler get damaged and start leaking coolant? Well actually the EGR cooler itself has no moving parts. This means there is nothing to wear out, so how does it break? By excess coolant pressure, corrosion from the coolant itself, or mechanical stress. Excess coolant pressure can damage it easily. If your radiator pressure cap goes bad, and it allows too much pressure to build up in the radiator, then very easily, it can crack the EGR cooler causing it to fail. A pressure cap is ten bucks, so I recommend just replacing it at the first sign of an EGR cooler failure, or if the EGR cooler actually gets replaced, just as a safety measure. Corrosion from the coolant is less likely, but possible. Regular testing of the PH balance of the coolant will usually catch this long before damage is done. A radiator flush and the coolant replaced at 400 – 500k miles is not just a suggestion, but very important to help keep the corrosive properties down. Lastly, and usually the most likely cause of an EGR cooler failure is mechanical stress. Some coolers are pretty delicate in their design, so excess stress can kill one fast. Excess stress can come from several sources, so all must be looked at when replacing a cooler. Excess vibration from the crank shaft damper is one source. They start to go bad at roughly 500k miles, so there again, preventative maintenance can stop this from being the source.

Any time the coolant or engine overheats, it can cause excess stress in the form of rapid expansion to the cooler. This can come from actual overheating issues, or also from simply turning the engine off before letting the heat settle

down after a long hill climb, as discussed in the chapter 'Anti-Idling Methods and APU's'. If your EGR cooler is mounted directly to the engine block (most are), then any stress to the engine block itself, like rapid heating or cooling can cause the EGR cooler to crack under stress as well. The exhaust side of diesel engine blocks actually warp and distort slightly, settling over time. Most of this settling happens within the first 200k miles of the engine's life, but can happen again if the trucks operation is changed drastically. One example of this is a truck that has had its first 200+k miles spent governed at 63 mph, then suddenly it gets changed to 75 mph. The extra strain the engine is put through after suddenly changing its speed can, in fact, cause the engine components, including the block to have to 'settle' again. The engine is made of metal, not stone. Things settle, warp, and distort over time. The best way to avoid EGR cooler problems related to stress, is just simply to drive the truck in a reasonable manner, rather than to push it to its limits all the time.

Why do EGR valves fail? Heat and/or soot mostly, but they can also fail from road salt intrusion. On many of the earlier EGR engines, and even on a few new ones, the exhaust gas from the manifold is sent into the EGR valve before it is cooled by the EGR cooler. This means that the EGR valve suffers the full 570+ degree heat from the exhaust. Poor design if you ask me, but I am not an engine maker. The engines where the heat is this high going into the EGR valve, generally suffer regular EGR valve failure problems, especially if they are driven hard. If you have one of these engines where the EGR valve is BEFORE the EGR cooler, then at first sign of EGR problems, have this valve re-tested, removed and cleaned, and/or replaced. The lifespan is usually about 200-400k miles. Secondly, on engines where the EGR valve is AFTER the EGR cooler, the exhaust gas temperature is only about 200 degrees or so. The biggest killer for EGR valves of this type of setup is actually soot and/or road salt intrusion. Soot will build up in the valve, eventually clogging it and making it stick. The problems with clogging and sticking are usually problems that produce no fault codes for the engine, unless they become very bad. What happens long before the fault codes, is that you get fuel economy loss, and/or turbo actuator problems. The turbo actuator problems are usually a ghost of the real problem, which is improper clean/dirty air mixture. Also, the turbo may get a symptom known as 'Turbo Coughing', where the turbo hesitates or spins up erratically. EGR valves that are sticky, can usually be cleaned instead of replaced, if done properly. Using chemicals to clean them is not a good idea, so a dry toothbrush, there again can solve some otherwise, pretty expensive problems. If you are unsure of your EGR and/or turbo problems, I recommend doing things from the cheapest and easiest, working toward the more expensive. The EGR differential pressure sensor, and the EGR mixing tube are going to get just as dirty, so start there. Replace the EGR differential pressure

sensor and clean the EGR mixing pipe, and the EGR temperature sensor before even considering replacing the EGR valve. The next step is to clean the EGR valve to see if the problem changes or goes away. Replacing the EGR valve should only be done if it is actually the only thing left to blame for problems in the dirty side of the system (keeping in mind the clean air side). They are usually \$800+ dollars or more to completely replace.

So how can you prevent and/or predict EGR related failures? By performing preventative maintenance on the EGR components. Unfortunately, since no one wants to be bothered by pulling parts off your engine just to clean them, most will argue that you shouldn't bother until you get an actual problem. It is those same 'Most' that end up in the shop with several thousands in lost profit by being down and paying a shop to maybe, if they are lucky, find the problem. Learn to remove and clean the EGR and Clean air sensors, learn to remove, clean, and re-install your EGR valve. Learn how to replace the After-treatment injector yourself. Learn to remove and clean your EGR mixing pipe. All of these things combined, can be done in a few hours saving you literally thousands in prevented downtime and repair costs. Take your truck to a repair shop for things like an EGR cooler leak or turbo failure, Not for the minor things you can do yourself, especially if those things have to be done regularly. To put it all together, based on experience helping many truck owners improving their fuel economy and/or solving EGR problems that the shops just couldn't fix, you should perform what I call an 'EGR Tuneup' at regular intervals (every 250k miles), or if you start to see the symptoms of an EGR problem. This 'EGR Tuneup' should consist of the following...

- Remove, Clean, and Inspect These Components...
  - Intake Manifold Pressure Sensor.
  - Intake Manifold Temperature Sensor.
  - Gas Recirculation Temperature Sensor (EGR temperature sensor).
  - Exhaust Manifold Back Pressure Sensor.
  - EGR Valve.
  - EGR Mixing Pipe (Venturi Pipe).
  
- Perform These Tests...
  - A coolant pressure test, checking for EGR cooler leaks.
  - An oil analysis checking for excess soot and coolant intrusion.
  - Charge Air Cooler Leak Test.

- Intake, Exhaust, and EGR Piping Leak Test (spray joints with soapy water during idling while pipes are not yet hot).
- Check turbo actuator for correct travel distance.
- Remove the exhaust pipe from front of the DPF, rev the engine, and check for excess soot from the engine during high idle and/or acceleration.
- A forced Regen verifying the temperatures and hpa readings.
- Replace These Components...
  - EGR Differential Pressure Sensor.
  - Clean or Replace the After-treatment Injector (If you have a DPF).

What about the possibilities of removing or disabling the EGR? Well, it is illegal, and the EPA and/or CARB can fine you or shut you down. At some point, just like on cars, emission testing will get popular, as it will become another means of collecting money from the trucking industry. Keeping that in mind, the answer is Yes, but with possible consequences. Disabling your EGR on the newer engines can be done in 2 ways. Each of these two ways comes with its own set of complications and risks. Disabling it can be done by means of an 'EGR Delete', or by defeating it yourself.

An 'EGR Delete' can be performed by a non-OEM shop costing you in the \$8,000 - \$15,000 price range. An EGR delete is the proper way to completely remove the EGR and DPF systems. Cover plates are installed where the components used to be, a muffler replaces the DPF, and the ECM is reprogrammed. The benefit is generally longer engine life, improved fuel mileage (by up to 1 mpg on some engines), and no more EGR related downtime, maintenance, or repairs. One of the downsides is that if the EPA or CARB sees that this has been done, you will face huge fines and be shut down until it is put back to OEM standards. Another downside is that you will never be able to take your truck to a dealer or OEM engine shop again. They are required by law to flash your ECM back to the factory settings, rendering the engine inoperable without the EGR components. Despite these downsides, there are many who take the risk and have it done, but those are generally truck owners that had multiple EGR related failures with no solution. Understanding your EGR system well will avoid this completely, so the choice is really a matter of education.

Defeating your EGR yourself can improve your fuel economy almost as much as an EGR Delete, and has much lower EPA and CARB consequences because it can be undone very easily. It usually involves performing some voodoo

engine sequence along with disconnecting your EGR valve and/or some sensor(s). The benefit is improved engine life and fuel economy, amusing it does not cause your DPF to malfunction or stop its ability to Regen. If your truck does not have a DPF, or it does not effect your Regen or DPF system, then defeating it is definitely a viable option, but not without taking a few other serious precautions. Knowing how the ECM is going to react and monitoring your exhaust temperatures while driving is the key to actually getting the benefits without risking a serious turbo or EGR cooler failure. With the EGR disabled, that 570 degree 'sweet spot' exhaust temperature is no longer maintained. The engine will run on only clean air, allowing the fuel to burn very hot, improving its efficiency and reducing soot. Exhaust temps can easily reach 1300+ degrees, especially if you are climbing a hill. These much higher exhaust temps will have to be monitored while driving to prevent excess heat buildup on your EGR cooler and your turbo. It is not a difficult thing to do at all, but will require you to install a 'Pyro' gauge in your dash. I recommend putting the sensor right on the outside of exhaust manifold, near the turbo using a pipe or hose clamp rather than actually drilling a hole into your exhaust and putting it inside. What needs to be monitored is the heat buildup, not the actual exhaust temp. Just as a reference, Holset turbo specs say that the newer VGT turbochargers can withstand exhaust temps of 1350 Fahrenheit for a period of up to 3 minutes. This means that the casing and/or your exhaust manifold can get to roughly 850 degrees without damaging the turbo. The next thing you will need to know is how the ECM is going to react to all this. First, the ECM is going to complain by turning on your engine warning light. With the warning light on all the time, you will have to keep a close eye on your fluid levels and other things to ensure you don't get an unexpected engine shutdown alarm. Assuming your engine is not already derated by the disconnected components, since your exhaust temps can get so much higher, you need to know that your ECM will limit your torque if you try to climb a hill with your foot all the way on the floor and the exhaust gets upwards of 1400 degrees. This is to protect your turbo, and is counterproductive to saving you fuel. That is another reason why you need to keep your manifold temp below 800 degrees yourself, so that you do not run into this problem.

Summing it up, Disconnecting your EGR will cost you the price of a Pyro gauge for monitoring the temp of the exhaust manifold. It will also force you to drive up hills in the correct gear for maximum fuel efficiency, keeping exhaust temps to a minimum. On really long gradual hills, you may on occasion, need to down shift a gear and use a higher rpm if your Pyro gauge reaches 800. Always, before shutting off your engine, you will need to glance at your Pyro gauge to ensure your manifold temp is below 500 degrees (400 is recommended). If it is not, then you will have to idle a few minutes to let it cool. This protects your

turbo bearings and protects your EGR cooler. Like I say, not impossible to live with, but sometimes annoying. Is it worth it? Personally, I think so because even without the EGR disconnected, you should be driving efficiently and allowing your engine to cool before shutting it down anyways. It is up to you to decide, it is your truck.

If your truck is 2007 or newer, it has a Diesel Particulate Filter (DPF), a Diesel Oxidation Catalyst (DOC), and a Dosing Injector (After-treatment Injector). All of it combined is referred to as the Exhaust Aftertreatment System. This system is in place to further reduce emissions and to catch all the soot produced by an EGR engine. The After-treatment system itself is NOT part of the EGR system, so this means that DPF and/or Regen alarms will usually only occur if the DPF system itself is unable to function properly due to, a problem within itself, coolant intrusion from a bad EGR cooler or a cracked head, or if it has been disabled by the ECM because of a safety related engine issue like excess engine temp, excess oil temp, excess fuel temperatures, or bad DPF sensor readings. Other EGR or engine related issues will not generally cause Regen problems if the After-treatment system is able to function normally. Excess soot caused by an engine problem can cause the DPF to clog up, but only if the problem is fairly significant. If you, or the repair shop suspects this, then it can easily be checked by simply disconnecting the exhaust pipe from the DPF and looking to see how much black smoke comes out when the engine is revved up high. A small to medium puff of soot is normal when the fuel pedal is pressed suddenly, but constant, or large amounts of soot can in fact cause problems. An oil sample from the engine can also reveal excess soot problems as well, so it is a good idea to do an oil analysis, checking for excess soot and coolant intrusion, when trying to solve DPF issues.

The DPF itself is only part of that 'can' that looks like a big muffler under your truck. The front part of that can is actually the DOC. The DPF is nothing more than a ceramic 'soot catcher'. Yes, it is made of ceramic similar to the honeycomb of a bee hive. Smacking the outside of it with a hammer, or if road debris hits it, then it will crack that rather expensive, difficult to manufacture honeycomb brick. Attached to each end of it are 2 small stainless tubes going to a sensor known as the DPF Differential Pressure Sensor. That sensor tells the ECM how clogged up this soot catcher is. Also, there are 2 or sometimes 3 Temperature sensors to monitor how hot the exhaust is going in and out.

The Diesel Oxidation Catalyst (DOC) is attached to the front of the DPF inside the exhaust can. It is the diesel engine equivalent to a Catalytic Converter on a car. It converts harmful exhaust gases into less harmful ones and has an

optimum or 'sweet spot' temperature that makes it work efficiently. Any more than 50 degrees above or below 570 Fahrenheit, and it doesn't function well, so this is exactly why the EGR system on your engine tries to regulate the exhaust temperature at 570 degrees. A temperature sensor is usually mounted on it (sometimes also used as the DPF inlet temp sensor) to let the ECM know if the EGR system is doing its job. A Regen cycle does not remove the soot from your DOC, so if your DPF ever has to be removed and cleaned, then the DOC needs to be removed and cleaned as well so that it doesn't create a loss in fuel economy or get packed with soot.

The After-treatment Injector is mounted directly behind the turbo and is really the only active component in the After-treatment System. It isn't like the engine injectors, but rather more similar to the spray nozzle of a hair spray can. During a Regen cycle it activates, spraying fuel into the exhaust pipe as a fine mist. If everything is working properly, the fuel will ignite at the DPF and not inside the pipe, burning out the trapped soot that has accumulated. The soot is converted into Carbon Dioxide and gets pushed out the exhaust stack. This injector is the key to keeping the after-treatment system functioning properly, but unfortunately, it is exposed to all the soot and other bad things that can end up in your exhaust. It is not uncommon for this injector to start clogging up at around the 250-300k mileage on many trucks. After that, it is just a matter of time before you start to see those proverbial Regen Lights in your dash. Some of the engine makers suggest cleaning it every 200k miles, and this is good advice, but cleaning them involves shutting the truck down, draining the coolant, removing it, replacing the gasket(s), and if you are lucky, getting it clean enough to last another 200k miles. For a couple hundred bucks, I have always just recommended replacing them. Removing it and replacing it is actually not difficult. There is a small coolant line that connects to it, so if you are going to tackle replacing it yourself, you will need a couple 5 gallon buckets to drain your coolant into first. Since it will be replaced more than once during the trucks lifespan, I recommend some high temperature anti-seize on the screws and fittings as well.

What exactly is a 'Regen'? A Regen cycle is a cleaning cycle performed on your DPF to get rid of the excess soot that builds up in it. There are actually 3 basic types of Regens. They are Passive, Active, and Forced. A passive Regen is performed by your truck about every 350 – 400 miles depending on the make and model truck you have, whenever you are driving. There is usually no indication whatsoever that it is happening, and if you are not one to idle your truck very much, this passive Regen should be enough to always keep your DPF cleaned. If you ever get a 'Parked Regen' light on your dash, and you don't idle your truck much, then it is a definite sign that it is time to take a close look or perhaps

replace your after-treatment Injector. If that looks good, or is new, then you need to find out why the passive Regen cycle is being interrupted and/or delayed by your ECM. Not taking an active approach to this will definitely cause your truck to end up in a Derate, or worse, an engine shutdown, putting you in a shop for major repairs before it is over with. If you do idle your truck a lot, then an occasional Parked Regen light might be ok. In either case, I recommend holding off on actually doing a Parked Regen unless you have driven about 300 miles and it has not gone out. Your only short term solution if you are getting Parked Regen alarms that do not go away after you start driving, or if they return frequently, is to actually perform a Parked Regen, but to right away, have your after-treatment injector inspected and/or replaced as soon as you can. Shutting your truck down for this costs downtime, so to prevent repeating failures, you should do an 'EGR Tuneup' just to ensure you have all the basics covered. Since you now know that your truck will do a 'Passive Regen' every 350 miles or so, getting a Derate or DPF warning every 350 miles will clearly indicate there is a problem in your After-treatment system.

A 'Parked Regen' is the truck's way of forcing you to manually Regen your after-treatment system to clean it because the Passive Regen is unable to keep up. If your Injector is good, and there are no cracks or gaps in the exhaust system, then a Passive Regen is more than enough to keep the system clean. This means that Parked Regen warnings or requests are actually your first sign that things aren't quite right. Also this means that you are losing fuel economy from the restriction of soot in your DPF. A Parked Regen will usually take 20+ minutes to complete, even on a healthy DPF system. The reason is that the truck needs to raise the temperature of the DPF to above 500 degrees before fuel injection can take place. Then, it usually takes another 10 minutes of spraying fuel into the DPF to get it clean, raising its temperature above 1,000 degrees Fahrenheit. How long it takes to perform this Regen is totally dependent on how fast it can get the DPF to reach these temperatures. If your truck takes more than 1 hour, then there is definitely something wrong.

A 'Forced Regen' can be done by the driver on some trucks, but not always. This type of Regen is a last resort effort to remove soot from the DPF when there are other things wrong. If your engine has disabled the Regen system because of another fault (like excess fuel temperature), then a Forced Regen may get you rolling again temporarily, but your problems will likely return in 300-400 miles when the Passive Regen fails again. It is quite often that repair shops will blame your truck problems on just simply the fact that your truck needed a 'Forced Regen'. NOTHING CAN BE FURTHER FROM THE TRUTH!. Don't be fooled by this. You ARE going to end up in the shop again in a very short order.



If a Forced Regen has to be performed, then something else is very wrong. The entire EGR and DPF system will need a thorough looking at, starting with the after-treatment injector and/or EGR cooler. Your DPF can in fact get clogged with ash itself, but that usually takes 800+k miles or more to happen. Removing the DPF itself and having it cleaned should be as a last resort item only after performing a Forced Regen using a new injector. Simply removing the DPF can cause it to crack its ceramic interior, costing you thousands for a new one.

Problems with SCR/DEF (Diesel Exhaust Fluid) systems are many.

Personally, I have never owned a truck with one of these systems, so I cannot elaborate on them much. I do know that the fluid itself likes to crystallize and clog up the components, so keeping the DEF tank full, keeping the cap clean, and having the filters and/or injector cleaned regularly is probably a good idea. Using some common sense, thinking pro-actively will help you stay on top of these types of systems so they do not fail you when you need them the most. Understanding them thoroughly will definitely save you thousands upon thousands in repair bills and down time. Stay well informed, and get the correct information for your particular truck. Your extra efforts will be always rewarded in the money you save.

## 12 – Those Round Rubbery Things (Tires)

Lets face it. Without those round rubbery things filled with air, your truck cannot haul freight. They are also the most abused and beat-up on components while your truck is in motion, suffering the full effects of the road and the weight of your truck. It is actually a wonder that they last as long as they do. The compounds used in truck tires are expensive, and in higher demand worldwide than ever. This is driving the price up for tires just like fuel. Because of these higher prices, and because they directly effect fuel costs, to get the most 'Bounce for your Buck', much has to be considered when dealing with them. On a business standpoint, tires should always be looked at as an investment, not an expense. To keep your truck operating, you must spend money on tires. Many will argue that because of this, tires are actually an expense instead of an investment. That same 'Many' are also only looking at a small piece of the so called 'Big Picture'. Just like with the broken slot machine in chapter three, you aren't going to get your hundred bucks unless you stick that ten dollar bill in first. Of coarse, since that slot machine only gives money back if you use a ten, putting in a five dollar bill is definitely an expense, yielding no money in return. Tires are just like this. Spend a little, and get nothing back, but spend a little more, and make some money in return. To get that return you need to do two things. Make that investment work for you, and squeeze that investment for all it is worth.

To move freight and make money, you are going to buy fuel, that is a given fact. Like with the example slot machine, If you spend ten bucks on an item, and it saves you a hundred bucks in fuel by the time that ten dollar item wears out, you have still made a \$90 profit. Good quality fuel saving tires are just like this. By the time you wear out and have to replace those fuel saving tires, the money earned is huge. To show how huge it is, lets look at some numbers. When your truck is due for a new set of 8 drive tires, you will spend the money for new ones. Lets get really ridiculous and look at the extreme worst case scenario. Your buddy at the tire shop can get you a set of cheap recaps for \$100 each. 800 dollars spent, those tires last you 300,000 miles because you take really good care of them. The tire shop around the corner has the newest fuel saving tires, but they are not even on sale this week. The asking price is \$700 each! Ouch! For \$5,600 bucks you can have them put on. You decide to try out this investment strategy, and buy the expensive tires costing you \$4800 bucks more than what the recaps would have been. Instantly, you loose 0.5 mpg because replacing those very thin worn out tires with new ones, regardless of brand or recap, is going to have its effect. Several thousand miles later, you never see the difference in fuel savings vs the last set of recaps you had whenever you fuel, thinking to yourself you must have gotten ripped off. Finally, 300,000 miles later, hell bent on proving that

expensive tires are a joke, you do the long term math, only to find out that you only saved 0.3 mpg on average vs the recaps. No wonder you never saw it. It is a ridiculously small amount that can hardly be seen from one fill-up to the next. Doing some more math reveals the truth though. 0.3 mpg over 300,000 miles was a savings of 2,380 gallons of fuel. 2,380 gallons times \$3.80 per gallon ( after fuel discounts) is a savings of \$9,084. That means that during those 300,000 miles, you pocketed \$9,084 more than if you had bought those recaps. \$9,084 - \$4800 is a profit of \$4,244 bucks above what you spent. Was it worth the \$4800? Definitely! In reality, the fuel savings over the life of good low rolling resistance tires vs cheap ones is actually much higher, and can be as much as 0.5 - 0.7+ mpg resulting in some much more serious fuel savings.

You are only going to get a significant fuel savings from low rolling resistance tires if you do 3 things though. First, you need to keep the tire pressure as high as possible at all times without exceeding its limits, or causing too much edge or center wear. Second, is to drive in a manner where the lower rolling resistance from those tires isn't overcome by excess speed and aerodynamic drag. Above 65mph, aerodynamic drag on your truck will start to far outweigh rolling resistance. Sure rolling resistance still helps at higher speeds, but as your speed increases, so does rolling resistance, diminishing the effects of the more expensive fuel saving tires. At some point (70+ mph), along with speed, the wind drag on the truck will outweigh it so much, that you may never see, or be able to measure the advantages the tire is giving you. This means that keeping your speed down will definitely help those expensive tires yield a profit, regardless of any of the other benefits from slowing down.

The third thing you must do to get the full benefit of fuel saving tires, is to prolong their life to their maximum extent. This means that you will want to keep the alignment of the truck in very good condition, as well as invest in products that help extend tire life. On the steering axle, installing 'Centramatic' wheel balancers and using 'TRU-BALANCE' centering sleeves for the rims will help reduce 'Cupping' of the tires as they wear down. On the drive axles, at the very least, you should install 'Cats Eyes' or 'Crossfires'. What they will do for the drives is that they will ensure tire wear is extremely even across each set, further reducing rolling resistance and wear. They also make it very easy to keep an eye on tire pressure.

How long should your tires last? For steer tires, 120k miles should be a minimum before running off to an alignment shop. Even if your truck alignment is absolutely perfect, the inside edge of your steer tires is going to start cupping after about 150+k miles, especially on the drivers side. This is simply due to the

fact that you make right turns tighter than you make left turns. It does not matter what wear pattern has started to set in, if your steer tires have more than 150k miles on them, your steering alignment is good. Drive tires should last a minimum of 300k if both axles are drive axles. If your rear alignment is really good, and you drive with minimal boost pressure, you might get 450+k out of them. Most owner-ops that run their drive tires all the way down to the minimums will claim that they don't see any noticeable traction loss until the tires get below 7/32 tread. You are the owner of that truck, so you will have to decide for yourself what is safest. Just keep in mind that changing tires out, especially drive tires, before they are worn down to a minimum will cost you big time in fuel savings. I replaced my last set of drives when they reached 427,000 miles on them. They still had 6/32 tread on them, but winter was approaching, so I decided to play it safe. Despite the facts, the irony is that many of the larger fleets will never see the benefits of fuel efficient tires, nor the benefits of running drive tires down to their minimums because their drivers have no idea, nor incentive on taking advantage of their benefits. Proof of this can be seen by simply inspecting the lugs on a typical company truck. When you see that every fourth or fifth lug is worn unusually low compared to the rest of the tire, it is a clear indication that the driver's right foot is usually planted hard to the floor everywhere they go.

To find out your tires actual rolling resistance, simply go to the website for Michelin tires. They have set out to standardize the unit of measure for rolling resistance for all brands of tires, not just their own. This means that all the popular brands and sizes of tires are listed accurately without bias to their own brand. There is also a 'Tire Rolling Resistance Calculator' that you can use to get a ballpark fuel savings to help you buy new tires.

Upon replacing tires, always get a matched set. If you mix brands and/or tread depth, power will not be divided equally and the tires will fight each other going down the road. What will happen is that the tires with the LEAST amount of traction will always end up with the MOST amount of power, wearing them out prematurely. If a single tire gets damaged beyond repair, then replace it with the closest thing available, and with a matching tread depth. It is actually more cost effective to buy a new tire and grind it down to the proper depth than to leave it on as new, so if you can get a close match slightly above in depth, have it ground down to match. This will ensure maximum life and fuel efficiency for the whole set. Whenever getting tires replaced, inspect the new tires closely before accepting that the work is done. Repeating what I mentioned in the maintenance chapter, when a truck tire is brand new, there is always a mark on the tire, usually a painted dot, or a stripe, that indicates its alignment on the rim with reference to the valve stem. Aligning this mark to your valve stem helps ensure the tire is

balanced and that it doesn't produce excess vibration while you drive. Another important step is to make sure, as the tire seals to the rim, the 'rim alignment groove' is even all the way around. This rim alignment groove can be seen very close to, but just above the edge of the rim on the sidewall. It prevents the tire from possibly ending up egg-shaped. An egg-shaped tire, especially a drive tire, can cause a bunch of excess wear and odd tire wear patterns for the entire set of all 8 drives, costing you wasted money on alignment, shocks, and/or at the least, new tires. Also, make sure that you actually watch them torque your lugs. It is your life and safety, take it seriously.

If you are getting premature tire wear for some reason, don't automatically assume that it is just simply an alignment issue. The first thing you want to do is find out what kind of wear it is. Many times it is bearings or king pins and not just simply an adjustment somewhere. The best approach is to not actually rotate the tires until after the problem is found and fixed. On the other side of the coin, don't automatically assume that an unusual tire wear pattern is an actual problem at all. Like stated above, If your steer tires have 150,000 miles on them already, and you suddenly start getting edge wear, then there is no need to panic at all. Just rotate the tire, and try to get some more life out of it before replacing it. No need to go running off to an alignment shop. Same goes for the drives. If after 300,000 miles, you start to get inside edge wear on the inside tire, don't assume it is a bearing problem. Your axles are going to flex going down the road. The inside edges of the tires are going to show it after 300k. Again, no need to go poking around inside your axles to try and stop it.

Some wear is simply a result of how you drive. If you use excess torque, especially when tires are new, then some pretty random, unusual lug pattern wear will start to set in place, and if it is significant, it will remain there the rest of the tires life. I have actually seen trucks with chunks of rubber flying away from brand new tires while climbing steep grades because the driver simply refuses to back off the torque. Modern trucks are precision pieces of equipment, not the beasts of yesteryear. Treat them as such, and you will have much less problems. Tires these days aren't much different. They need to be taken care of, and if you do so, then they will reward you. Driving your truck hard will only cost you in the end, so whenever facing that steep climb, just simply back off of it a bit and let the other trucks go around you. Let it cost them, not you. This is how you will come out ahead because real success is not measured by being the first to the top of the hill in this industry, it is measured by how many deliveries you can make safely, and profitably. You will far exceed those speed demons while they are in the shop getting repairs and new tires, and you are still out making deliveries.

## 13 – Keeping Your Electrical Systems Healthy

If oil is considered the lifeblood of your engine, then the electrical system would be considered its nervous system. Your truck cannot operate correctly without the correct electrical impulses going into and out from the ECM or other components. It is just as important as the oil itself, but unfortunately, it is usually one of the most neglected systems on the truck. The biggest killers of electrical systems on trucks is corrosion and vibration. Corrosion is going to happen to every single wire that has exposure to the outside air, and to every single wire that has been covered by a protective conduit where water and/or salt can get into and accumulate. Any time a wire is added, removed, or replaced, this must be kept in mind. If any changes are made to your wiring, D.O.T. requirements dictate that all wiring on trucks (not considered part of your C.B. radio antennae) needs to be protected by a second outer jacket or coating, and must be fused properly. This means that if you, or someone else, adds some lights to your truck, you must not only fuse it correctly, but you must cover the wires with a conduit or wrap as well. To prevent corrosion, you need to ensure that water cannot get to or accumulate inside not only the connectors, but inside the protective conduit as well. Battery terminals and exposed grounding terminals on your truck should be covered with a thick grease or a bit of tar-like roofing compound to keep moisture and salt off of them. Any time a connector is removed from a component or sensor, it is always a good idea to give the inside of the connector a light dusting of white lithium grease. White lithium grease is designed specifically to protect electrical components from moisture and corrosion. Any time a wire has to be spliced, tapped, or otherwise repaired, then it needs to be covered with shrink tubing to seal it from the outside air. Shrink tubing is some pretty cool stuff that looks like a rubber jacket, but shrinks tightly onto wires when heated slightly (like the heat from a cigarette lighter). Most truck stops have it in the electrical section near the connectors and wires, so grab some any time you plan on connecting or splicing a wire. Vinyl and/or Teflon Electrical tape is not very good at protecting wiring from the elements and will not only deteriorate in the heat and weather, but will come unraveled in the rain very quickly. In an emergency, or for short term connections it is ok, but wiring protected with electrical tape alone should not be left unchecked for very long. There is some really good quality electrical tape available (usually at Home Depot or an electrical supply house) that is very thick, very rubbery, and is designed for long term use. It is called 'Self fusing silicone rubber Electrical Tape'. I have never seen it in a truck stop, so the next time your out at the hardware store, you might want to grab a roll or two for your truck, just in case of an emergency electrical repair. If you are going to splice a wire with a crimp type connector, then you should pack the inside of the crimp connector with some good quality silicone sealer first. This keeps road salt and air from getting

inside the connector. Any time you are going to connect a screw-on type connector or through-hole type connector that you may need to remove again later (like an antennae connector), then pack the connector with some Vaseline petroleum jelly instead. Petroleum jelly will harden slightly, keeping moisture and air out, but not so much that the connector cannot be removed again. It actually works better than Lithium grease on large connectors because it is much thicker.

Like everything else on a truck, the wiring is exposed to constant vibration. This isn't a problem for the wires themselves, but more for connectors and control boards. Checking electrical connectors for tightness should be done very regularly.

Vibration and motion may not be so good for your connectors but it actually helps batteries. Lead-acid batteries actually perform better when the acid gets regularly 'stirred up' by the motion of a vehicle. Did you know there are 3 basic types of batteries for trucks? There are starting batteries, deep-cycle batteries, and hybrid batteries. Most trucks you see have starting batteries. These type of batteries are designed to provide a lot of power all at once in quick, short bursts. Most of the time they are rated more for their 'Cold Cranking Amps', rather than for their 'Amp Hours'.

All lead-acid batteries lose the amount of power available as they get colder, so starting batteries with really high 'Cold Cranking Amps' will help get your truck started in below freezing temperatures. The downside of these batteries is that they are not designed to provide constant power. The more powerful the cold cranking amps that a battery has, the thinner the lead plates are inside the battery. They make the plates thin so that more of them can be placed inside. The more plates, the more cold cranking amps. Because they are so thin, it is easy for them to overheat internally when there is a slow, constant drain on them. This means that when your truck is turned off and you are using power from them to run an inverter or anything else that needs a significant amount of constant power, you are likely shortening the useful life of those batteries. It should also be noted that most starting batteries will only tolerate being completely discharged a few times before being irreversibly damaged.

Deep-cycle batteries are designed to provide power on a more constant basis. The lead plates inside these batteries are thick, keeping them from overheating, but because of this, they have a lot less cold cranking amps. This means they will make starting your truck a bit harder, especially in colder weather. You can certainly use deep-cycle batteries in your truck if you need more constant power, but you might need to do a couple of things to ensure you do not

have problems. It is possible you may need to add an extra battery to overcome the lower cranking amps, and/or you might also need to replace your starter with an after market 'Geared Starter'. Geared starters require a lot less cold cranking amps to get your truck started. Denso makes some pretty good after-market gear reduction starters for class-8 trucks, so if your starter ever does go out, it wouldn't be a bad idea to get one of these vs another OEM.

Hybrid batteries come in a few different flavors. They are an attempt to get the best of both high 'Cold Cranking amps' and still provide a decent amount of continuous power without overheating. Sometimes these type of batteries are referred to as Gel-cell, Nickel-Cadmium, or Glass-Matt (AGM) batteries. Gel-cells are pretty good batteries for extreme environments and off-road use, as the liquid inside is fixed in place. One of the problems with gel-cells though, is they can be damaged very easily from constant charge/discharge, or from overcharging. If your alternator produces a slightly high voltage, then it is likely that gel-cell batteries will have a short lifespan in your truck. Nickel-Cadmium batteries are more like Deep cycle batteries except they offer more charge/discharge cycles before they go bad. The downside of them is that they consume a lot of excess energy while charging, costing you fuel. Glass-Matt, otherwise known as AGM batteries, are usually much more expensive. With their higher price, comes some pretty good benefits though. They are tough, like gel-cells, but they charge more like starting batteries, as well as providing the ability of constant power. They are actually about 25% more energy efficient than any other type of truck battery, actually assisting you in saving fuel as well. These type of batteries are definitely the way to go if you plan on installing any type of sizable inverter because they will pay for themselves long term both in lifespan and energy savings.

No matter what type of batteries your truck has, to be cost effective long term, you need to always ensure that the batteries are not only of the same type, and capacity, but also close to the same age. Keeping your batteries as a 'Matched Set' as much as possible will increase their lifespan greatly. As a comparison to this analogy, think about your truck engine for a moment. What do you think would happen if each cylinder of your truck engine was a different size and/or type. Your engine would not only run very rough, but the cylinders doing the most work will always cause you the biggest problems. Truck batteries need to be the same capacity, type and roughly the same age to ensure they perform together as a group. Buying used batteries, and/or mis-matching them will only result in more battery problems long term, costing you unnecessarily.

Ensure your alternator is big enough for the job. Most newer trucks need



about 75-85 amps to run, with about 110 amps if the air conditioner is running full blast in both the cab and the sleeper. This doesn't leave much room for accessories like refrigerators or microwaves if your alternator is only rated for 140 amps. Also, as your alternator heats up because of a heavy load, it becomes less efficient, costing you fuel unnecessarily. If you plan on installing a large inverter (more than 800 watts), then you need to heavily consider installing a larger alternator to go with it. One of the better brands of larger alternators out there is Lease-Neville. They make some pretty tough high capacity alternators for trucks, and are not hard to get. A 225 amp alternator is adequate for running a small microwave along with the truck, as long as you turn OFF your A/C while using it. If you plan on installing larger than a 250 amp alternator, then it is likely you will have to change the wiring from it to your batteries to accommodate the higher capacity.

What should you do if you accidentally drained your batteries and your truck will not start? If you have an APU, try starting it up first, then let it charge your batteries for about 15 minutes before trying to start the truck. If you do not have an APU, then you will need a jump start. If your truck is cranking, but not enough to start, then some jumper cables from another truck might get it going, but if it will not crank over at all, then using jumper cables from another truck to get it started is going to take a while. Unlike a car, the truck batteries themselves are going to consume a lot of amps from the jumper cables, making less power available to actually start the truck. It is not uncommon to have to charge the batteries first, taking up to an hour or more before you can even attempt to start the truck reliably. Getting a road call service truck out to start your truck is expensive, but they usually are equipped with a jump start box that will send as much as 24-Volts to your truck to overcome the dead batteries and give enough power to start the truck at the same time. You should be aware that most of the newer trucks cannot take this higher voltage for very long, as it might damage the ECM or other components, so the service person needs to be careful. It is actually better to recharge the batteries of the truck for a while before trying to crank it up right away no matter what method you use. If your truck has enough power to run the electronics, but just does not have enough to crank, I have seen where pull-starting it can work as well. Pull starting it involves another truck pulling you with a strap, then you engage the clutch to turn over the engine. This does work, but only if your batteries have enough life left in them to allow the ECM to operate.

RV and Marine dealers and stores are some of the best, most informative places to go for any kind of electrical needs your truck may encounter. These are definitely the places to take your truck to have after-market items installed such as

inverters or extra batteries. Most of the dealers and repair shops for trucks come up short at best, when it comes to installing these type of things. Spend your money wisely, and keep your electrical system safe and compliant. Keep your batteries in good condition, and replace them together, not one at a time. Make sure any Inverters and/or lighting gets installed professionally with lots of protection and large enough wiring. It will always be to your benefit in the long term to not take any shortcuts when it comes to wiring.

## 14 – Conclusion

Owning a truck is a mindset. Successful Owner-Ops are that way because they are willing to make those extra efforts to earn that extra pay, take that extra opportunity, and to take on that extra responsibility to ensure the success of their business. Individually, many do not agree on how to go about being successful, but that is mainly because the trucking industry is a vast career with many areas of profit and success. No one wants to be a failure in what they do, and will fight tooth and nail to prevent it the best they know how, but many of the drivers out on the roads stop short when it comes to maximizing the profits and success in what they do. Everyone has their comfort zone, or comfort layer they are willing to operate inside. Some are satisfied with simply making their truck payments and covering their bills at home, others are not satisfied with anything less than their own authority and fleet of trucks. Whatever you do, and however far you are willing to go will ultimately be up to you. Hopefully, the information in this guide will help you as much as possible in whatever you decide toward owning a truck. I know already that some will take this information and pick it apart, disagreeing with it, saying that some or all of it is unnecessary and pointless, and that's ok. There are many who are successful at owning trucks who do none of the things suggested in this guide, and for those, that's their comfort zone. There are others who will still say that owning a truck is impossible, and for them, perhaps it is. Someone is going to order those on-line items from the Internet, someone is going to need bread for their grocery store, and someone will need that 45,000lbs of plastic beads for their factory. Because of this, Someone ELSE is going to have to get behind the wheel of a truck and take those goods to their destination. Where there is demand, there is opportunity. That opportunity is the very thing that pushed you toward driving a truck to begin with. Take as much of that opportunity as you care to grasp onto and go with it. Success isn't measured by how much of that opportunity you grab hold of, but rather how well you take advantage of the piece of it you did decide to take. Keep things within the scope of your own perspective. Don't try to take too much of the opportunities out there, or you will find yourself spread too thin, making you miserable and unprofitable. Instead, take the smaller opportunities and maximize what you can get out of them. This will far outweigh in profit and satisfaction, making you proud of who you are and what you do. Learn everything you can from your way of 'Making It', and push it to its limits. Don't get stuck thinking that things are static in trucking either. This is a changing industry, so learn to change with it as it grows and becomes more efficient. Technology will continue to push this industry toward maximum efficiency, especially now that higher energy costs are here to stay. Learn to work with this technology, not against it. Use it to your advantage, and operate your business through management of your truck and management of your driving

habits to stay ahead of the crowd, making your career easier giving you breathing room to grow. Take what others have to say and use only those portions that apply to you, helping you be more successful. Do things in a manner that is correct as much as possible. This will always benefit you in the end because shortcuts will typically cause more problems than they solve. Invest in yourself and buy the right tools for your trade and for the job at hand. Spending money on the correct tool and for the correct parts will not only get you going again reliably, but make you wiser and more knowledgeable in the future toward solving other problems. When things do not go smoothly, or when your truck decides to show that it is going to break down, finish delivering that load if there is any way possible first, keeping the customer happy, then shut down and fix the issue before taking on more freight. Try to solve problems yourself as much as possible. If you cannot, then talk to others first, before just simply throwing a problem at some overpaid service facility. If there is one thing in plentiful supply out here, it is the willingness for others to try and help you if you have a problem. Especially a truck problem. Making phone calls, getting information, and planning what to do next will benefit you the most. In the end, how much you know about what you do, what you know about your truck, and what you know about managing it all, will make the difference in how happy you are and how much money you keep. Be a proud truck owner that does things the safest, most correct way, keeping profitability in mind. Always drive in the safest way possible, showing others the professionalism expected of you. If you have to ask yourself if something is safe, then it probably is not. If it is not safe, then just don't do it. Find another solution, or just simply refuse to do it all together. There are enough statistics and bad reputations out there against truckers already. Don't feed that bad information horse with more bad things. Be the one driver in the crowd that is driving responsibly, showing all the other idiots that you actually take pride in what you do by being safe, coupled with driving to saving fuel. No ones life or career is worth that 10 minutes you gained from speeding all day. Just slow down, save fuel, manage your time well, and long term, you will be rewarded very well for it. As they say,...'Be Safe, and Keep the rubber Side Down'.