



# As the Oil Hits the Pan

## Fleet Maintenance White Paper

*This white-paper is the third (3) of eight (8) segments of the essential principles of the Preventative Maintenance Process enabling organizational success. The Preventative Maintenance Process is the most widely used fleet maintenance process in the transportation and service sectors.*

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## MCB Fleet Management

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## ***As the Oil Hits the Pan***

When my stomach and tastebuds send me in the direction of the nearest Wendy's I expect that 'Single' to have the same fresh taste with or without fries no matter what my current zip-code happens to be.

The purpose of this white paper is to seize the mind of the President/CEO and give him/her the tools required to effectively evaluate the

health of the organizations preventative maintenance process. The success of how well this process is executed directly correlates to the high cost drivers of fuel, tires, maintenance, and service. Fortunately for all sectors, public & private, the oil companies have invested a significant portion of their profits into R&D. This is due much in part by the independents driving the competition (pun intended) within the industry. This white paper will highlight the prevalent opportunities and pitfalls pertaining to the potential savings with extending PMI, oil drain, and grease intervals, as well as the advantage of a rigorous PMI inspection process. Each one of these duty cycles must be vigilantly analyzed in regards to the operational demands placed on the asset over the span of the respective maintenance interval. When freight levels drop, profit margins get as thin as hot oil and the quandary to cut expenses reaches the maintenance processes, several quintessential mistakes often occur. Extending the PMI interval, oil drain, and grease without increasing the quality of the oil and lubricants is the first error that commonly takes place. The primary misconception

*Increasing the PMI frequency without the proper inspection process and/or the quality lubricants to support the extended interval in most cases will increase maintenance cost and the breakdown frequency.*

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is that grease is grease and oil is oil. Even with the oil rating and certification process in place in order to meet governmental emission standards there are significant differences in the blend packages and they have in fact drastically improved over the past few years. In short, if they hadn't auto manufacturers would not have extended oil drains (change) intervals on cars and light duty trucks from the staple of 3,000 miles or three (3) months which held for many years, to 7,500 miles and three (3) months. Do you know why three (3) month factor comes into play?

The oil's primary purpose is lubrication, however, it has several other functions such as a detergent to remove contaminants in order to extend the life of the oil as well as the life of the engine. The last function is to move the contaminants to the filter and they also have improved due to the Gulf War. Furthermore, higher quality fuel will provide better combustion thus emitting fewer contaminants passed the rings into the oil. What becomes obvious at this point is the better the engine is operating the longer the oil will perform as designed. One side note, anytime an engine overheats for whatever reason it's imperative the oil be changed due to damage the extreme heat imparts on the blend package. "As the oil hits the pan" the technician should check the magnetic drain plug for metal particles, check the oil condition as well as looking and feeling the oil for contamination such as moisture, anti-freeze, and smelling for a burnt or other unusual odors. These steps

*When an engine overheats it's imperative the oil should always be changed prior to the unit being put back in-service.*

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should also be followed when pulling the dipstick. It should also be noted that oil samples should be pulled midway through the draining processes to obtain the most accurate reading. Oil sample is a valuable tool for predicting internal engine problems as well mitigating catastrophic failures that will significantly escalate expense and service failures. You wouldn't go through all the rigmarole for your annual physical and not do blood work? That would be like getting a half of a physical. Oil sampling will provide the fleet manager information to make key lifecycle decisions and can be negotiated free of charge if you are maximizing your spend with a single source vendor. However, the firm testing the oil must be completed by a third-party vendor. You wouldn't want your oil vendor grading their own homework. In some larger fleets an on-site oil analysis machine has become a cost effective tool in preventing catastrophic engine failures and the ROI is returned in very short order.

Grease has two (2) primary components, the oil and the thickener. While the primary objective of the oil is to lubricate, the thickener is designed to absorb shock. The manufacturers use a multitude of ingredients in a variety of applications as well as grades. From this we can easily ascertain that grease is not just grease. Does your duty cycle require airing up the tires and/or lubricating certain components between oil drains, or can you hit the fifth wheel and tires at the fuel island or safety lane? Perfectly good commercial truck tires lose 2 to 4 psi per month and will need aired up if the PMI interval is extended or you will be defeating the whole

*The oil must be changed every three(3) months due to condensation.*

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objective. Moreover, in case you're wondering, yes they do make grease especially designed for fifth (5th.) wheels and are imperative in heavy drop & hook operations. Insufficient grease on fifth wheels will cause premature wear on front tires, steering components, and a preponderance of other issues. It must also be noted that kingpins and spring shackles (If designed to be lubricated.) cannot be properly lubricated without elevating the unit to release the load on these components. The oil must be changed every three (3) months due to condensation. Since the crankcase must have air, the potential for condensation exists. Oil and water do not mix therefore the moisture in the oil impedes the aforementioned various tasks the blend package is attempting to accomplish. Let's see how we can apply this knowledge to the actual inspection process.

There are several different types' of maintenance processes however the "preventative maintenance" process is the most widely accepted, easiest to implement, and renders the greatest return on investment (ROI). *Preventative maintenance is maximizing the efficiency and return on investment of an asset.* The recommendation is to develop a preventative maintenance process that includes a step-by-step inspection process with a designated section and flow. In most cases the process is based on an inspection sheet and the mechanic's interpretation of what he/she deems important. This is placing the organization at unnecessary financial and legal risk as well as sending the wrong message to the mechanics and/or vendors. The PMI process is essential to capturing the maximum ROI & asset utilization, as well as ensuring the asset value does not end

*One(1) out of every three (3) parts is changed in error.*

upside down on the books. Additionally, in an attempt to protect their intellectual capital, manufacturers do not openly communicate in explicit detail how the various systems function. In short, they hide behind a self-generated proprietary curtain by only giving a description on how the systems are designed to operate rather than an explicit explanation which perpetuates one (1) out of three (3) parts changed in error and a whole preponderance of other issues. Therefore, it is imperative that what is known/learned be effectively communicated, inspected and maintained through the PMI process. This is where the rigorous PMI process comes into the equation. So about that Wendy's single, shouldn't the PMI on your assets have the same consistency as a hamburger? Here's how you can get that Biggie Size PMI.

### ***The Filter***

Here are the essential elements to a rigorous PMI process:

- The first step in a effective Preventative Maintenance Inspection is real time fuel & oil data into the system that is generating the PMI compliance.
- The next step is to determine the frequency that matches the operational demands for the type of asset with respect to its current lifecycle. During the last several years there have been tremendous improvement in all types of lubricants as well as chemical repair products. Additionally, due to stringent emission standards manufacturers are encouraging the uses of additives. Increasing the PMI frequency without the proper inspection process and/or the quality lubricants to support the extended

*Due to manufacturers only giving a vague description of how systems operate it is imperative that knowledge known/ learned be communicated!*

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interval will increase maintenance cost and the breakdown frequency.

Additionally, once a good process is in place and the proper lubricants are determined the PMI can be extended as long as there is a method to air up the tires and grease certain critical components between service intervals.

- For the PMI process to be effective and capture the maximum life of both the asset as well as the component, a PMI must be completed, the potential breakdown and safety items must be repaired and the maintenance items required to be repaired or replaced in the future must be documented. In many cases there is no manual or electronic method for capturing or documenting open repairs, (Open Job Bucket) so either everything is fixed (prematurely in some cases) or its let go with no method of documenting the open repair. This will perpetuate DVIR's and road-calls. The open job bucket or deferred bucket as its sometimes referred provides a method for follow-up on emergency repairs, enables the maximum life of critical high cost components as well as method to calculate the condition of the overall fleet. Without an Open Job Bucket, in most cases will cause unnecessary on-road vendor repairs which will come at a price (66%) higher than in-house or scheduled vendor maintenance.
- Once the process is in place in order for it continue to be successful someone must be responsible for updating and communicating the knowledge acquired across the organization (Internally & Externally) from experience, premature failures, and/or the manufacturer. As such when an extremely difficult fault-code rears its ugly head that can take several hours or days to troubleshoot you can't afford to pay another technician to diagnose the same fault-code a day, week or month later. And I promise you, it will happen!

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- Each technician, whether internal or the external vendor should be certified in step-by-step process and held accountable to the methods and time to complete the inspection. This is also an excellent method of training new technicians. The use of entry level technicians, if trained properly and possess a teachable spirit for the preventative maintenance inspection (PMI) will free-up qualified technicians for skilled tasks.
- Everyone including the supervisor/manager must learn to follow step-by-step inspection process. This will give manager an idea of the technician's capacity to follow instructions when it comes to a detailed/methodical troubleshooting process set-forth by the respective manufacturer. If they won't follow the PMI process they certainly won't follow the manufacturer's repair manual and you will end up with yet another contributor to the one (1) out of three (3) parts changed in error predicament. Whether the inspections are completed internally or externally it must focus on all the known issues, weak points, and industry best practices. Even with all these challenges and it can be achieved with a step-by-step PMI, accurate data, and properly scheduled maintenance intervals, which will lead to greater asset utilization, driver morale and retention. However, this all must be coordinated through operations in order to move the commodity profitably.

Why is the step-by-step process so critical? Without it invariably five (5) technicians will render five (5) completely different PMI's and relying on that one (1) individual's knowledge and experience. With a step-by-step process you can use the collective knowledge of all your technicians as well as manufacturer's recommendations & industry best-practices. Additionally, it gives a technician a specific step or section to return to if pulled off the job or if the inspection is transferred to another technician during a shift change.

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Defects discovered through the lifecycle of the asset type, year, & model are easily noted and added to the process can be readily communicated. When you utilize the collective knowledge of the entire group you will build camaraderie, pride and morale which not readily available from ANY supplier. Moreover, in today's high-competitive industry, in a litigation crazed society it provides the organization with a method of accountability as well mitigating potential litigation. Lastly, it will give the manager a job time-standard to hold the technician accountable. In short, a rigorous PMI that includes a defined processes and section/flow procedures will "**Filter**" out many of the manufacturers deficiencies and mechanics human error.

### ***The Magnetic Plug (Methodical Flow & Step-by-Step Inspection)***

Unequivocally with a methodical flow and step-by-step inspection process in place the brand & model of the asset does NOT come into question. If the technician is following the flow he/she will inspect the component when they come to it. As such, the alternator, turbo, starter etc... can be on either side of the engine. The same is true for a trailer or any other type of rolling stock. Following the flow and step-by-step process increases productivity and is imperative to the success of the maintenance process, as well as the organization. Each section of the step-by-step inspection process accompanied by a flow diagram for that respective section and follow a sequence similar to this:

- Drive-test that will include the functionality of all drive components and accessories.
- Engine section that will include both an hands-on visual inspection and an electrical and electronic diagnostic sections. (The engine section is

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completed second to determine at the earliest possible point if the unit will require being placed out of service.)

- Methodical hands-on inspection process working from the firewall forward across front of the engine working back to the other firewall. **If you didn't touch it, you didn't inspect it.**
- The electrical system portion of the diagnostic testing of the engine section should be written in a methodical manner that a failed reading will negatively impact the outcome of the preceding tests, therefore this is the only time during the course of the PMI a repair should be made.
- Tire Section which places the unit off the ground for the undercarriage section.
  - This enables a good tire, undercarriage, and suspension inspection and wear-pattern identification, as well a proper lubrication. *Note, in most cases a vehicle can't be properly lubricated without being suspended (Jack-stands) and the load off the suspension.*
- Undercarriage - In order to meet EPA regulations that frame rails are loaded with equipment that requires inspection on a regular basis to ensure proper operation and potential damage due to road debris.
- Cab & Body - The crux of this section is to ensure regulatory compliance items are all in place and not expired an/or operating properly.
- Appearance to include touch-up - Public and regulatory image as well as driver pride all stem from the equipment appearance.

In most cases a vehicle can't be properly lubricated without being suspended and the load off the suspension.

Upon completion of the inspection the scheduled, safety, and potential breakdown repairs should be made prior to placing the unit back in service. Failure to complete this important step will be defeating the maintenance process. Repairs should not be made during the inspection process except as previously mentioned during the electrical section.

Including the technicians in the development of the PMI process will give

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them a sense of value & ownership to the process. Technicians must succumb to the paranoia of documenting future repairs in the open job bucket.

Specific benefits of the PMI process include the following:

- Breakdowns prevented, service delays, increased asset utilization and morale.
- Consistent method of capturing required repairs for warranty tracking.
- Quintessential mistake is deferring required scheduled maintenance in order to meet budgetary goals, driver mileage or customer expectations. In short, you will be defeating the maintenance pyramid and escalating costs at a rate of approximately sixty-six (66) percent not to mention other non-quantifiable costs and service indices.
- Oil Sampling- equivalent to getting blood work done during your annual physical. Very valuable tool in the lifecycle analysis process.
- Managerial & leadership skills - In the realm of fleet maintenance most supervisors, managers, and directors come from within the ranks. As such, having a strong technical acumen renders them weak in managerial & leadership skills. The process will render the structure for them to develop these skills.
- Tracking of certifications, licenses and training data
- Proper Asset Operation and Utilization
- Lifecycle management from planning and scheduling
- Equipment specification - A solid PMI process will highlight any deficiencies or opportunities in the equipment specification process.

Repairs made during the PMI decreases maintenance, breakdowns, and positively impacts service, costs, productivity, and safety. In short, the PMI inspection process must be as fast and efficient as NASA car pitstop in order to return the asset and the driver back to service generating revenue.

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The step-by step process will capture (Much like the **Magnetic Plug** captures particles in the oil.) a good portion, if not all the defects that exist at the time of the inspection. Moreover, if you do in fact extended the PMI and oil drain intervals doesn't it make common sense to be more aggressive with the inspection process?

### ***The New Drop - (After-Treatment Systems)***

After treatment systems have unequivocally become the Achilles Heal for all fleets and a leading contender for high cost, load & service delays, and asset downtime. As such, it is imperative the After Treatment system inspection must be included in the PMI and as aggressive and proactive as any other system. However there is much more to the root cause to this escalating issue. In short, if the combustion temperature drops below the optimum point soot is being emitted and collected in the diesel particulate filter. If the temperature exceeds the threshold a poisonous gas is emitted the SCR system must contend with. *(If you would like further explanation on After-Treatment systems send me an email and I will respond with a copy of an article I wrote on this subject for Transport Topics.)*

Much in the same manner as our human bodies function, if we eat right, exercise, and get enough sleep they perform well. If the engine is functioning, maintained, and operated properly the After-Treatment System can perform as designed, however, the root cause of many of today's After-Treatment issues are not the system themselves but upstream componentry that is struggling to survive in the high

If it drops below that point soot is being emitted and collected in the diesel particulate filter. If the temperature exceeds the threshold a poisonous gas is emitted the SCR system must contend with.

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temperature and pressure environment in which they are being subjected. The driver must be trained to proactively communicate all issues including the After-Treatment System. The use of poor quality Fuel or Diesel Exhaust Fluid (DEF) will perpetuate additional maintenance and shorten the life of the diesel particulate filter (DPF), injectors, SCR doser and many other components.

Here are a few recommendations that will mitigate these issues:

1. Update the PMI process to include the After Treatment Systems.
2. Proactively service the DPF & 7<sup>th</sup> injector & doser.
3. Train the technicians in methodical troubleshooting methods that defines the root cause.
4. Proper operation – Train the operator to recognize & communicate the problem when its in the infancy stage.
5. Regular monitoring of Fuel and DEF quality in the storage tanks and respective vehicle tanks.
6. Increase warranty monitoring and negotiation.

*The driver must be trained to proactively communicate After Treatment System issues.*

The preventative maintenance process should focus on the entire vehicle including the electronic control system as well as the after treatment system. Like any other system if you reactively maintain it, it will increase cost and be out of service longer, and the after treatment systems are no different. Additionally, technological advancements have perpetuated the need for scheduled maintenance on injectors, turbos, SCR doser, DPF, EGR systems and the associated componentry. In doing so this will reduce your maintenance cost as well improve your service to your customers.

### ***The Final Drop***

The final drop of oil in the process and most important factor is the operator. It has been proven the operator can have as much as 35%

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impact on fuel economy, consequently that same impact plays a factor in the combustion process as well as maintenance & tire cost. You can have the best maintenance process in the business, however, if the driver is not in the game your fighting a very difficult battle. If they have a teachable spirit, are trained in the basics, and understand how the maintenance process will make them safe as well as successful team member 80% will comply. No matter what level individual you're hiring, you should be hiring an individual with a teachable-spirit and this docility should extend to drivers as well. As previously mentioned, the only manner to overcome this significant challenge is with training which will identify the 20% that will not comply. Low cost and high quality maintenance are not mutually exclusive. Having the proper grade of lubricants, and rigorous PMI process, mechanics and drivers with a teachable spirit, low cost and high quality maintenance can be attained and the oil drain intervals can safely be extended.

*Low Cost & High Quality Maintenance are Not Mutually Exclusive.*

*Low cost and high quality maintenance are not mutually exclusive!*

### ***The Dipstick***

So what did all that do for you? We all know you can't manage what you can measure. So much like the dipstick is used to determine the level, quality, and condition of the oil, having the aforementioned processes in place will enable you to determine the level, quality, and condition of your mechanics, vendors, operations, and drivers. As such, you can now measure the health of the preventive maintenance process with key performance indicators (KPI's) and how, when, where the oil needs to hit the pan.

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The next section of the white paper will offer the key steps in building your internal and external repair network which is the critical element in maintaining and improving your CSA score as well as decreasing on-road breakdowns and variable expense.

### ***MCB Fleet Management Consulting***

MCB Consulting was formed after a very successful career of twenty-five (25) years with UPS (United Parcel Service) which included the development and implementation of UPS Fleet Professional Service consulting subsidiary. Through the implementation of cost effective fleet asset and leadership processes, it is our goal to make the global marketplace a safer place to live and do business. We will accomplish this by lowering your operating cost, reducing capital and aftermarket procurement expense, increasing efficiencies, improving fuel mileage, lowering vehicle emissions, and training your team to sustain these results in order to improve the environment in which we live.



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