WHITEPAPER



# IMPLEMENTING AN EFFECTIVE VEHICLE MAINTENANCE PROGRAM

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# DO YOU HAVE A MAINTENANCE PLAN?




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A truly effective maintenance program is made up of several components. However, the most important component is the company's attitude toward maintenance. If the carrier has a proactive attitude rather than a reactive attitude, developing the program is much easier.

What is meant by "proactive" in this area? Simple. Think in terms of having a "preventive maintenance program" rather than a program of "fixing it when it breaks." A preventive maintenance program starts by performing scheduled inspection and maintenance.

## How do you set up a schedule?

The regulations only require that you have a systematic program and that you follow it (see §396.3). The regulations do not provide the details on what is "systematic" or "adequate." That is left up to the carrier to determine.

It's up to the carrier to define "systematic" and "adequate."

The first step in setting up a maintenance program is deciding how often you want a technician to inspect and service the vehicle. The question then becomes, how often is often enough?

The best way to set up the schedule is to first review what the original equipment manufacturer (OEM) recommends. The recommendation will be based on the type of vehicle, the engine, the driveline, and "average" expected use of the vehicle. The carrier then needs to adjust the recommended inspection and maintenance interval to better fit their operations. Considerations should include:

- Intended use of the vehicle (severe or light duty)
- Performance of this group of vehicles
- History with similar vehicles

While the OEM information provides the "baseline," considering the other factors (intended use, performance of the group, history, etc.) will allow you to modify the schedule to match your operation. If you know the vehicle will be seeing more severe service than the OEM intended, this would necessitate scheduling the vehicle for service more frequently. On the other hand, if the vehicle will see lighter-than-expected service, it might be possible to extend the service schedule.

Tracking the maintenance and on-road performance of the group of vehicles in question, and the maintenance and on-road history of older vehicles that are similar, can also provide guidance on the scheduling. If previous groups of similar vehicles or the group that the vehicle belongs to are seeing problems during maintenance or when on the road, that should be factored in the maintenance scheduling. On the other hand, if routine maintenance is addressing vehicle issues before they lead to problems, then the scheduling is confirmed.

## Mileage, hours, or date standard?

Another consideration is whether you want to base the schedule on time (dates), miles, or hours of operation. Scheduling based on time is the easiest, but many times leads to unnecessary inspections and maintenance. This is due to the vehicle being scheduled into the shop after "x" days or months, regardless of the use. However, if the vehicles see consistent use, then this may make sense.




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Scheduling maintenance based on miles driven may be the most common method.



Scheduling based on miles driven is possibly the most common method used as it does take the use of the vehicle into consideration, and therefore is more efficient in most operating environments. This method works well with vehicles that are operating on the roadway and not spending much time involved in non-driving work. However, this method does not necessarily take issues such as severe duty, excessive idle time, or power take-off (PTO) time into consideration. To compensate for this, carriers that see these issues and use mileage as the measure will shorten the maintenance intervals well below what the OEM recommends.

Another solution for vehicles that see a lot of engine use, but not many miles, (waste trucks, ready-mix trucks, pump trucks, etc.) is to use engine hours, rather than vehicle miles, to trigger maintenance. This compensates for the vehicle working very hard, even though the vehicle is not accumulating many miles per day.

## Checklists

The second step in structuring a compliant maintenance program is developing checklists for the technicians to use while performing the inspection and maintenance. Having checklists for the various activities provides the technicians with guidance when performing the work. If structured well, the checklist will provide the technician with a list of components that need to be checked, what the "cutoff" is for components that suffer wear, what needs to be replaced based on the level of maintenance being conducted, and any special instructions.

A good checklist will also document the condition of the vehicle at the time of the inspection or maintenance. This will provide proof to everyone (such as investigators, auditors, or plaintiffs' attorneys) that you have been active in inspecting and maintaining your vehicle and that you sent it out of the maintenance facility in compliant and safe condition.

The documentation will also help you in the future. If on your checklists, you are constantly seeing the same issues, this lets you know that you need to change or improve something. An example would be noticing that many of your vehicles of a certain type are found to be leaking fuel during inspections. This could cause you to take action and replace a potentially faulty part in the fuel system of all similar vehicles.

The process for developing the checklists is similar to the process used to develop the schedule. You first need to consider the OEM's recommendations and the regulations. The OEM and the regulations will provide guidance on components that will need to be checked regularly. Next, you will need to add to the recommended checklists based on your maintenance and violation history with similar vehicles. Finally, you need to listen to your people. They may want more detail on the checklists, or the layout or order of the checklist changed. They may also ask that components you had not considered be added to specific checklists.

As part of this process, you will need to determine the "cutoff point" for any and all components that suffer from wear. There are several ways this can be done. The regulations provide a cutoff point for a lot of components, such as brakes and tires, but you may not want to use these as your cutoffs. The reason being, you want to be proactive and make sure a vehicle is not operating with non-compliant components shortly after leaving the shop. Allowing a tire out the door that is "right at the regulatory limit" means that within a short period you will have a tire out there that is below the legal limit.

You may want to set tighter limits than the regs specify.

Also, the regulations specify the bare minimum, and in some cases the minimum may not be adequate for your operation.

Another method that can be used to determine when a component is due for replacement is your own knowledge and data. By studying the "mean time between failures," or the average age or mileage at which you are seeing a component fail, you can determine a cutoff point. This method is especially effective if the failures (other than the occasional outlier) all occur at roughly the same age or mileage.

Another source of information on appropriate cutoff points is OEM guidance. In many cases, the OEM will provide guidance on when specific components should be removed and replaced, or rebuilt. In some cases, the OEM can provide the "expected component life cycle." This is the age or mileage at which the component can be expected to fail.



**IF YOUR FLEET RUNS IN AREAS THAT HAVE SIGNIFICANT RAINFALL OR SNOW, YOU MAY DECIDE THE REGULATORY MINIMUMS OF 2/32ND OF AN INCH OF TREAD ON DRIVE TIRES AND 4/32ND OF AN INCH OF TREAD ON STEER TIRES IS NOT ADEQUATE.**



**ONCE EVERY 90 DAYS ON PASSENGER-CARRYING VEHICLES YOU MUST INSPECT:**

- PUSHOUT WINDOWS
- EMERGENCY DOORS
- EMERGENCY DOOR MARKING LIGHTS

Finally, in some cases, especially in the case of parts that are prone to failure, it could be advisable to replace the component as soon as it goes out of warranty. There are two reasons for this. In many cases, the warranty is based on the OEM's expected component life cycle. First, in many cases the OEM warrant is based on the component's expected life cycle. Second, should the part fail in the future unexpectedly, the failure will be covered by the warranty on the new part, which can make a huge difference in an on-the-road repair bill.

## Putting it all together

The schedule, combined with the checklists, then forms the basis of the company's "preventive maintenance," or "PM" program. Many carriers, to organize the program, "classify" the scheduled maintenance activities. Here is an example of one such program:

- **PM A SERVICES** (also known as a "maintenance check-out" or "safety inspection") generally consist of a safety check and partial lubrication, as well as checks of key components such as brakes, lights, tire condition and inflation, and fluids. It also includes checking and adjusting high-wear or high-consequence components. Typically, these PM As are scheduled at half of the oil change interval of the vehicle.
- **PM B SERVICES** normally include all PM A items, and also include an oil and filter change, a complete lubrication, and more in-depth checks of the vehicle in general, and in particular the brakes, engine, and driveline. These inspections are normally done at the oil-change interval recommended by the OEM or developed by the carrier. Many companies include downloading the engine's electronic control module (ECM) and addressing any trouble codes, and taking and testing fluid samples as part of a PM B. One consideration with passenger-carrying vehicles is that the pushout windows, emergency doors, and emergency door marking lights must be inspected once every 90 days. If the vehicles will not be undergoing PM Bs within 90 days, then these inspection items will need to be included in the PM A inspections for these vehicles, rather than being included in the PM B service.

  Also, with the longevity of long-life oils, many carriers that use them have created two PM Bs: a "dry PM B" and a "wet PM B." A dry PM B involves all of the PM B inspection and maintenance activities, except changing the oil. A wet PM B includes changing the oil. The carriers that do this arrange the schedule to alternate PM Bs (every other PM B is a wet PM B and is done at the oil-change interval). The reason for this is waiting until the next oil

change to conduct the PM B inspection and maintenance activities could be problematic due to the number of miles or hours the vehicles using long-life oil put on between oil changes.

- **PM C SERVICES** calls for both A and B service items and a more extensive service (i.e. alignment, vehicle component replacement, scheduled engine and driveline component inspection or replacement, etc.). Many carriers will also do the DOT annual inspection required by §396.17 as part of the PM C. Normally, C services are scheduled at least annually, due to the annual inspection requirement in §396.17. Carriers based in California, where there is a 90-day inspection requirement in the state law, will normally schedule at least the inspection portion of the C services for every three months.

Companies continue the lettering system based on their needs. Some companies go as far as PM L. The scheduling of these additional PM levels varies by company. As an example, some carriers use PM D to designate a seasonal service (wintering/summerizing) and some use PM K to indicate a scheduled rebuild or replacement of a major component (i.e. engine, transmission, axle).

## Repairs

Another key to having a successful maintenance program is to quickly and efficiently make requested or required repairs. Repairs are necessary in all fleets, no matter how effective your maintenance program is. If you have a solid PM program, repairs should be kept to a minimum. However, when the need for a repair occurs, the repair must be done quickly and efficiently.

Other than being discovered during maintenance, the most common way defects are discovered is by the driver (either as part of an inspection or someone telling him/her). No matter how the defect is discovered by the driver, the key is for the company to have a mechanism that communicates the need for repair to the right people. This can be done by the driver reporting the defect in person, calling the defect in to the company, or reporting it on a driver's vehicle inspection report (DVIR).

Whomever the need for repair is communicated to must then have the ability to see to the repair in a timely manner. Of course, the best option would be to get the vehicle into a company facility (either the company shop or a contracted shop) for the repair. However, this is not always possible. If the defect occurs on the road, this will involve having a list of




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"outside shops" and "road service companies" available to determine where to send the vehicle.

Problems that carriers deal with in this area include the driver not reporting defects when they are discovered ("I'll just wait until I get back to the yard"), someone in the company not forwarding the request to the right people (dispatch is told about a vehicle problem but does not forward the information), and someone deciding that a serious defect is not "bad enough" to require immediate repair.

> A single point of contact is best for defect reporting and repair requests.

To address these problems, it is best to have a "single point of contact" for all defect reporting and repair requests, and to require all defects be reported immediately – no exceptions. This way, the drivers know to immediately report any defects, everyone at the company knows to immediately forward information on defects and who to forward them to, and the person with this responsibility can be trained on a "repair matrix" — knowing where repairs can be done and how to decide when a "minor" defect can be left on the vehicle and when one is serious enough to require immediate repair. This is also the person that would immediately receive all DVIRs reporting a defect.

## Documenting it all

Finally, your maintenance program must document all of these activities. The regulations simply require maintenance records for each vehicle. The maintenance recordkeeping requirements include:

- The "informational record" on a unit, which is to be kept the entire time the vehicle is in service, plus six months after the vehicle leaves service. Identifying information includes:
  - ✓ Fleet number (if assigned one)
  - ✓ Make, model, and year
  - ✓ VIN
  - ✓ Tire size
  - ✓ Owner (if not the carrier)
  - ✓ A maintenance schedule for the unit (the last time it was serviced and when it is next due for service)



- Records of all inspection, maintenance, lubrication, repairs, and upcoming maintenance are to be kept for one year while the unit is in service, and six months after the unit leaves service (so far all this is in §396.3).
- Copies of roadside inspections for the unit (with the carrier official signature) are to be kept for 1 year (§396.9).
- DVIRs are to be retained for 3 months (with either one or three signatures-§396.11 and .13).
- Copies of periodic (annual) inspections are to be kept for 14 months (§396.17).

This is another area where the regulations provide the bare minimum. You need detailed records of all work done on the vehicles, whether it is inspections, maintenance, or repairs. To gather the information in a usable manner, as well as PM checklists, many companies use standardized repair orders (ROs). In more sophisticated systems, this information is then entered into a database so trends can be easily tracked.

Whether you use paper or electronic records to store the information, you want accurate and complete inspection, maintenance, and repair records so you can mine the data. The mining will allow you to determine what your maintenance costs are, make sound decisions when it comes to updating the inspection and maintenance program (scheduling, checklists, cutoffs, etc.), and make sound decisions when it comes to future vehicle purchases.

## Is it adequate?

When deciding if the maintenance program is adequate, "the proof is in the pudding." During the audit or investigation, the official will:

- Look at the carrier's roadside inspection history;
- Track defects noted on roadside inspection reports and driver inspection reports to verify that they were repaired;
- Verify that the company is completing required inspections in time (such as the passenger-vehicle exit inspections and annual inspections); and

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- Verify that the company is doing the maintenance and inspections the company told the auditor it does. In other words, if the company said the maintenance program is doing a maintenance inspection monthly and a full service/inspection every 90 days, that is what the auditor will expect to see in the maintenance records.

As these are the issues that auditors and investigators look into, they are issues that you should be constantly watching as well. If you want to be more proactive, watch these other in-depth data points to ensure the maintenance program is effective:

- **Vehicle violations discovered during roadside.** This is also reflected in the carrier's Vehicle Maintenance BASIC score in the CSA program. If the program is effective, violations being discovered during a roadside inspection should be the exception, not the rule.
- **The number of unscheduled repairs conducted on the road or in the shop.** Unscheduled repairs should be the exception, not the rule, when it comes to maintenance activities.
- **Defects being discovered during maintenance inspections.** If serious defects are being discovered during maintenance inspections, you should revisit your PM practices. If the PM schedules and cutoffs are accurate, the technicians should be replacing many components before they become defective.

## Don't lose focus

Once the maintenance program is established, if the tracking shows that the program is operating effectively, work on continuous improvement. This can be done by watching for problems as you monitor your PM checklist and ROs and your roadside inspection results.

> Frequent roadside violations, unscheduled repairs and defects during inspections are a sign that your maintenance program needs work.

On the other hand, if you are getting a lot of vehicle violations at the roadside, a lot of unscheduled repairs, and/or a lot of defects during maintenance inspections, this information is trying to tell you to "go back to square one" (establishing a maintenance schedule) and work forward from there to figure out where your program is failing you.

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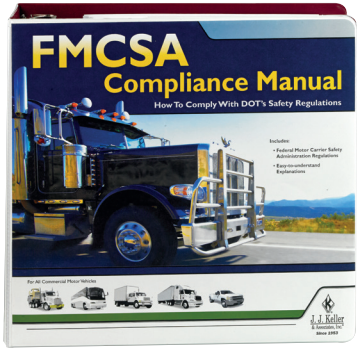
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Tom Bray is a Senior Business Advisor at J. J. Keller & Associates, Inc. He specializes in motor carrier safety and operations management. In addition to the many publications he supports at J. J. Keller, Tom has been a frequent contributor to industry publications and websites, including Heavy Duty Trucking, truckinginfo.com, Transport Topics, Fleet Maintenance and Work Truck, among others. He has authored whitepapers and presented webinars on a number of key transportation subjects. He is also a frequent speaker at transport safety seminars and conferences on topics such as hours of service, vehicle maintenance, cargo security, and driver fatigue. Prior to joining J. J. Keller, Tom worked in the trucking industry for 22 years, with responsibility for DOT compliance, policy development, driver human resources, driver training, training program development, CDL testing, claims management, and accident and injury prevention. Tom is active in the Wisconsin Motor Carriers' Council of Safety Supervisors and the Wisconsin Motor Carriers' Safety Director/Supervisor Development Committee.

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