



Comparison of the District's Fleet Maintenance Practices to Other Organizations

Project #12-15

Prepared by
Office of the Inspector General


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SOUTH FLORIDA WATER MANAGEMENT DISTRICT

MEMORANDUM

TO: Tommy Strowd, Division Director, Operations, Maintenance and Construction

FROM: J. Timothy Beirnes, Inspector General 

DATE: October 4, 2012

SUBJECT: *Report: Comparison of the District's Fleet Maintenance Practices to Other Organizations*
Project No. 12-15

The subject analysis was performed pursuant to our Fiscal Year 2012 annual audit plan. Our objectives focused primarily on determining how the District's fleet maintenance practices compare to other organizations and other governments.

Overall, our comparison disclosed that the District's fleet maintenance practices are comparable to those of other organizations and governments. Service levels and service intervals, in terms of time, mileage, or hours of service, are similar to other organizations. Heavy equipment and heavy trucks maintenance plans generally provide for performing a major overhaul at the mid-point of the useful life. Although such standard is not formalized in the District's Preventive Maintenance Standard Operating Procedures it is the general practice to perform such major overhauls.

Please feel free to call me should you have any questions concerning matters discussed in this report.

c: Governing Board Members
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BACKGROUND

Preventive maintenance (PM) consists of scheduled servicing to prevent potential problems and maximize vehicle availability. Preventive maintenance is used to proactively avoid or reduce vehicle breakdowns and is based on time, mileage, engine hours, or gallons of fuel used. Preventive maintenance actions include vehicle inspections, lubrications, adjustments, cleaning, testing, repair and/or replacement of worn parts.

Vehicle maintenance and repairs can be performed in one of two methods: 1) proactive – scheduled preventive maintenance, and, 2) reactive – unscheduled breakdown maintenance. A scheduled vehicle service consists of preventive maintenance, scheduled component repairs, and driver inspections. Unscheduled breakdown maintenance is most often due to lack of preventive maintenance. Reactive maintenance can be costly and should be minimized by a proactive preventive maintenance program. The objective is to have the majority of vehicle maintenance and repairs scheduled rather than unscheduled.

Effective preventive maintenance programs minimize repair costs and extend the useful life of vehicles and heavy equipment. An economically efficient PM program identifies the most cost efficient interval in which various maintenance items should be addressed. Performing maintenance more frequently than necessary do not necessarily further reduce repairs or further extend useful life. Thus, a cost efficient PM program identifies the balance point between economy and effectiveness in establishing point at which various maintenance procedures should be performed.

To maximize the availability of vehicles, PM services must be performed on a scheduled basis. If preventive maintenance is not performed regularly, vehicle life span will be greatly reduced. Preventive maintenance is as important as driver safety programs. If a vehicle becomes unsafe due to lack of maintenance or repair, the fleet owner can be held liable for negligence. Thus, proper maintenance will also help prevent litigation due to negligence.

An effective PM program consists of the following:

- Checklist of PM service tasks performed.
- Driver written-up inspections and/or complaints.

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- An automotive facility with trained professional automotive technicians – either by internal staff , vendors, or a combination.
 - Scheduling and recordkeeping – preferably electronically.

The PM program depends on the driver for continued success. The vehicle operator is the first line of defense against unexpected breakdowns and repairs. It is important that drivers communicate vehicle problems immediately to fleet management. This allows the vehicle operator to participate in the PM program, thereby proactively reducing breakdowns. The driver should monitor the following vehicle systems:

- Vehicle safety items (e.g., tire pressure and condition, wipers, horn, brakes, steering, etc.)
- Vehicle drivability items (e.g., misfire, rough idle, slipping transmission, etc.)
- Vehicle body (e.g., glass, body damage, cleanliness, etc.)
- Vehicle miscellaneous repair items (e.g., air conditioning, heater, etc.)

Technology provides an effective tool for scheduling, documenting, and monitoring preventive maintenance. Fleet maintenance systems provide the capability to customize maintenance schedules, create and track work orders, track fuel usage, record detail maintenance histories, manage parts inventories, track tire replacement, etc. The District’s SAP system is used for fleet maintenance information.

OBJECTIVE, SCOPE, AND METHODOLOGY

Our objectives focused on comparing the District’s preventive maintenance program to those of other governments and businesses. We focused on determining how maintenance components as well as the maintenance intervals compared. Our methodology entailed researching available public information regarding how companies and other governments maintain their fleets.

MAINTENANCE SERVICE LEVELS

We identified 15 organizations' fleet maintenance plans (mostly governments). The various plans used different nomenclatures and service intervals; however, they all were similar in that they provided for different levels of service at different intervals of time, mileage, or hours of service. Although various names were used to designate the various service levels, a typical PM plan includes three service levels at different intervals, which we can describe as light, medium, and heavy. These service levels are described in detail in the following sections:

Light

Light service is the most frequent and generally includes an oil changes and inspecting fluids, filters and other items. Other names frequently used to describe the light service interval are "A" service, basic, standard, and minor. The light service interval among the plans in our sample ranged from 3 to 6 months or 4,000 to 6,000 miles. In addition to the oil change, the light service interval generally includes inspecting, servicing, adjusting, replacing, or repairing, as needed, the following items:

- All fluid levels
- Tires – pressure, remaining tread, abnormal wear patterns
- Electrical system
- Lubricate chassis and doors, ball joints
- Brakes
- Lights – interior & exterior
- Body damage
- Fire extinguishers
- Seat belts
- Door & window operations
- Mirrors – interior & exterior
- Warning system – switches, gauges, trouble lights
- Windshield wipers
- Comfort systems – A/C & heater

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- Battery – terminals, water level
 - Cooling system – hoses, fan shroud, belts, overflow tank, radiator
 - Belts, hoses, & wiring conditions
 - Tire rotation
 - Exhaust system

Medium

Medium service is less frequent and generally includes all the light services plus changing the transmission fluid. Other names frequently used to describe the medium service interval are “B” service, intermediate, and extended. The medium service interval among the plans in our sample ranged from 24 to 36 months and 24,000 to 36,000 miles. Typically, the medium service level is a multiple of the light service interval so that both service levels can be performed concurrently; thereby, eliminating the need to schedule a separate service appointment. The medium interval service includes all the light service and inspection items plus additional items. In addition to changing the transmission fluid and filter, a typical medium interval usually entails inspecting, servicing, adjusting, replacing, or repairing, as needed, the following items:

- Detailed brake inspection, including rotors, pads, calipers, linings, drums, master cylinder
- Transmission shifting
- Wheel balance
- Air conditioning
- Check charging system
- PVC valve
- Change fuel filter
- Acceleration, steering, tracking
- Wheel bearings, drive shaft, U joints, tie rods
- Shocks, springs, lubricate linkages
- Change air filter
- Frontend alignment

Heavy

Heavy service is the least frequent and generally includes all the light and medium services plus additional services. Other names frequently used to describe the heavy service interval are “C” service, major, and extended plus. The heavy service interval among the plans reviewed ranged from 48 to 60 months or 60,000 to 100,000 miles. Typically, the heavy service level is a multiple of the light and medium service intervals so that all three service levels can be performed concurrently; thereby, eliminating the need to schedule a separate service appointment. The heavy interval service typically includes all the light and medium services and inspections, plus the following additional items:

- Replace drive belts
- Flush radiator & replace hoses
- Clean fuel injector and throttle system
- Replace spark plugs and wires
- Repack wheel bearings
- Change rear axle lubricant

COMPARISON TO OTHER ORGANIZATIONS

The District’s Preventive Maintenance Standard Operating Procedures (SOP) are comparable to those of other organizations’. The SOP provides for three levels of service for light vehicles. These service intervals are within the range of others in terms of time and mileage.

Service intervals are based on time or mileage. The District’s fuel system provides the capability to monitor each vehicle’s mileage. The odometer readings are captured through the District’s fuel system every time a vehicle is refueled. The user is required to input the current mileage at the gas pump as part of the authorization process. Accuracy of the odometer input data is validated by monitoring the fuel economy miles per gallon. Odometer readings can also be verified at time of service.

Inspection checklists vary somewhat among organization but overall a majority of the items are similar among the various organizations’ preventive maintenance plans we

reviewed. The District’s vehicle inspection checklists for the various service intervals are similar to those of other organizations.

HEAVY EQUIPMENT

Heavy equipment service intervals vary depending on the type of equipment. Most organizations’ preventive maintenance plans for heavy equipment and other off-road equipment typically follow the manufacturer’s recommended maintenance schedule. Heavy equipment maintenance intervals are usually specified in terms of time or operating hours. Common maintenance intervals for heavy equipment are shown in the following table:

<u>Service Level</u>	<u>Time</u>	<u>Hours</u>
Light	2 - 3 Months	50-100
Medium	6 - 12 Months	250-500
Heavy	36 – 48 Months	1000-1500

Maintenance plans include inspecting, servicing, adjusting, replacing, or repairing various items. The Appendix includes a list of items typically included on heavy equipment checklists.

Heavy equipment useful lives generally range from 15 to 20 years, or 5,000 to 10,000 operating hours. Useful lives vary depending on equipment type and the severity of conditions in which they are used. As a general trend, the larger the piece of equipment the longer the useful life. It is usually cost efficient to perform a major overhaul at about the mid-point of the useful life of heavy equipment. We found that most organizations’ preventative maintenance plans provide for such major overhauls at the mid-point of the useful life. The same trend generally applies to heavy trucks such as dump trucks and semi-tractors. Larger items may even be overhauled more than once during its useful life.

The District’s Preventive Maintenance SOP for heavy equipment is comparable to other organization. Although the District’s practice is to overhaul heavy equipment one or more times during its useful life, this is not formalized in the SOP.

CONSIDERATIONS

1. Consider incorporating guidelines in the SOP regarding heavy equipment major overhauls.

APPENDIX

Typical Heavy Equipment Inspection Checklist

<u>Power Unit</u>
Wiper blades (wear)
Window glass and mirrors (clean, unbroken, adjusted)
Cab/Doors (Scratches & dents)
Front & rear lights (Clean, working, incl. headlights, tail lights, signals, stop, backup)
Reflectors
Suspension
Tires
Tire pressure
Wheel, rims, lugs
Battery
Exhaust system
Air lines
Light lines
Fifth wheel
Couplings
Tie-downs
Rear-end protection
<u>Engine Compartment</u>
Oil & filter (usually change)
Coolant level
Belts
Grease
Brake fluid level
Windshield washer fluid level
Power steering fluid level
Transmission fluid level
Hydraulic fluid level

<u>In Cab</u>
Gauges, warning indicators
Windshield wipers, washers
Horn
Heater and defroster
Clutch
Steering
Service brakes
Parking brake
Emergency brakes
Safety equipment (triangles, fire extinguisher, first aid kit, seat belts, spare fuses)
<u>Interior</u>
Motor (engine, windshield wipers, heater, defroster, air conditioner, etc.)
Horn
Radio (transmit/receive)
Safety equipment
Parking brake
Back-up buzzer/beeper
Maps
Flashlights
Water tank
Pump operation
Power generator