TECHNI/TIPS

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TEN MAINTENANCE STEPS FOR LONG DIESEL LIFE

What makes uniform engines develop individual ailments? Why do some wear out and fail after only a few hundred hours of operation while others last 10 or 20 times as long-even those working just as hard in the same type of equipment? How can owners make sure their equipment won't be one of the short-lived ones?

Engine owners' and manufacturers' research departments have worked together and found positive ways of extending engine life. AU their recommendations can be reduced to 10 maintenance steps which will result in:

1. Increased Equipment Availability
2. Decreased Operating Expense
3. Improved Working Conditions
4. Increased Energy Savings.

THESE TEN STEPS APPLY TO ALL ENGINES.

1. KEEP DIRT OUT OF THE ENGINE

Dirt is the cause of most wear in an engine. Much of it is composed of gritty mineral particles ranging in size from less than 1/10,000 of an inch diameter to grains of coarse sand. The particles are hard enough to penetrate the toughest oil film and grind away the metal.

Valve stems, guides, faces, seats, cylinder and piston wars and piston rings suffer most from dirty intake air. These parts may wear hundreds of times as fast with dirty intake air as with air filtered by a good air cleaner.

When dirt gets into a lubricating oil, it scratches and wears out bearings and shaft journals. A worn out engine is one which has had only an ounce or so worn away from critical bearings or sealing surfaces. Replacement of these worn parts and the time lost may cost thousands of dollars-dollars which would have been saved by keeping out the dirt.

2. MAINTAIN A LUBRICATING FILM ON ALL BEARING SURFACES

Lubricating Oil Performs Four Functions in an Engine:

A. Reduces friction (heat & wear) by providing a slick film between bearing surfaces.
B. Scavenges by picking up carbon and other small particles, and by taking them to the oil filter.
C. Cools pistons, liners and bearings.
D. Completes the seal of rings to pistons and cylinder walls.

There Are Two Broad Classes of Lubrication Failures:

A. Running an engine without oil, results in seizures of pistons or bearings within a few minutes.

B. Poor or marginal lubrication such as low oil pressure, dilution, partially clogged oil passages or improper clearance.

Downtime and overhaul expense for one engine failure may cost as much as 1,000 oil changes.

3. REGULATE THE ENGINE'S FUEL

Fuel must burn readily and completely within the engine. Hard starting, decreased horsepower, smoky exhaust, dilution of oil, excessive wear, and fuel pump and injector troubles are some of the penalties of using poor fuel.

Fuel must be delivered to the combustion chamber at the right time and in condition to burn readily and completely. Fuel injection must occur at precisely the right degree of crankshaft rotation. The complete fuel charge in the injector cup must be delivered to the combustion chamber for every firing stroke. Metered fuel charges must be uniform for all cylinders. Fuel must be injected as a fine spray to mix with the air and bum. The penalties for violations of these requirements are the same as for using poor grade fuel.

Fuel must be delivered to the combustion chamber in the right quantity. The horsepower developed depends on the amount of fuel being burned. Overfueling causes overspeeding and failure of turbochargers and in a naturally-aspirated engine it causes all the troubles associated with smoky exhaust and oil dilution. Underfueling decreases horsepower output.

4. CONTROL OPERATING TEMPERATURES

Combustion temperatures are high enough to melt the engine. Complete failure of the cooling system will ruin the engine within a few minutes. No one purposely operates an engine without water, but many engines are being damaged slowly each day by cooling systems that are only 50% to 75% efficient. Engine coolant temperatures should be maintained at 160°F to 190°F. This ideal narrow temperature range requires that every part of the cooling system be maintained in top condition.

The cooling system must do its best job under the most adverse conditions. As ambient temperatures or engine loads increase, the coolant temperature rises. At the same time, it is expected to do more cooling of oil and iron masses.

When coolant temperature is below 160°F, fuel may not burn readily or produce its fun power. When water temperature exceeds 190°F and the engine is operating under full load, lubricating oil may get so hot and thin that it cannot lubricate effectively.

Every part of the cooling system requires attention. Water jackets lose ability to absorb heat when they become coated with scale, rust or dirt. Water pumps circulate less coolant as impellers wear or as belts slip. Thermostats wear out and fail to control water flow accurately after long periods of service. As radiators and oil coolers get dirty, inside and outside, they lose ability to absorb and radiate heat. Water hoses, gaskets and piping may develop leaks.

5. GUARD AGAINST CORROSION

Many engine owners have been shocked to find water in the crankcase and to learn that it got there through pin - holes or worm holes that started on the water side of the cylinder liners. Often the damage progresses to the point that all cylinder liners and the cylinder block have to be replaced.

Corrosion is likely to occur in any cooling system where the coolant is not treated to prevent the action. Corrosion may or may not be associated with iron rust; as an example, severe corrosion may take place in a system that is protected against rust.

There are many causes of corrosion-among the most serious are acid, salt or air in the coolant. Corrosion can be controlled or prevented entirely and at very little expense of time or money.

Rust and scale decrease the efficiency of the cooling system by retarding conduction and radiation of heat and flow of the coolant. Rust acts as an insulator against heat conduction and pockets in the system get clogged with rust or scale deposits. Cracked cylinder heads are common results of poor cooling. The same maintenance that prevents corrosion will prevent rusting.

6. LET THE ENGINE BREATHE

The diesel engine requires about 12,500 gallons of air for every gallon of fuel that it burns. For the engine to operate efficiently, it must breathe freely; the intake and exhaust must not be restricted. Valves, pistons and rings must seal properly against compression and combustion pressures.

The amount of fuel which can be burned and the power developed, is as dependent upon air as upon fuel supply. If there is too little air to burn all the fuel, some of the excess fuel will cause a smoky exhaust-a sign of wasted dollars and lost horsepower.

The excess fuel also washes lubricating oil off cylinder walls, resulting in seized pistons and bearing failures. Carboned injector cup spray holes and stuck piston rings are other troubles which result from insufficient air. Dirty air cleaner elements, leaky valves, worn rings, damaged mufflers and air piping that is too small or with sharp bends, are common causes of air restriction.

7. PREVENT OVERSPEEDING

Engines must not be operated beyond the maximum rated rpm for which they were designed. Many diesels are protected against overspeeding during normal operation by governors which are correctly adjusted when they leave the factory. Increased rpm by changing governors, or by allowing a vehicle, on a downgrade, to push the engine beyond its governed rpm, leads to engine damage.

Turbocharger rpm depends upon exhaust temperatures and air density. Overfueling or high altitude operation without derating will cause turbocharger overspeeding and failure. The reasons for failure from overspeeding are due to centrifugal force and inertia.

Overspeeding often causes pistons to strike and break valves. Prints of valves on piston heads is a certain indication that the engine has been overspeeded. Cam lobes, valve seats and faces are also damaged by overspeeding, which prevents tappets or cam followers from following cam lobes. Injectors may stick as a result of overspeeding. When a vehicle going downgrade pushes the engine above governed speed, the governor shuts off all fuel to injectors and deprives them of lubrication.

8. KNOW YOUR ENGINE'S CONDITION

The engine is constantly giving signs of its condition for the operator or the maintenance mechanic to interpret. In many cases, the operator is the first to detect signs of trouble. Unless he reports these conditions to the maintenance department, the faulty conditions may be missed until after real trouble develops. Interpretation of the signs is a very important part of the maintenance mechanic's work. As an example: from low indicated oil pres-sure, he must determine which of the following conditions need correction: a faulty gauge - low oil level - diluted lubricating oil - worn bearings - bearing failure.

It never pays to run an engine until it fails, because one part failure usually ruins other good parts. Some signs of approaching severe failures are:

1. Bearing metal found in the lube oil filter. If this is not found and corrected at the source, it may cause the loss of a crankshaft.

2. Excessive crankcase pressure or blowby indicates conditions that may lead to a stuck piston, broken and ruined cylinder block.

3. Leaks in the intake air system may permit entrance of enough dirt to wear out the engine within a few hours.

9. CORRECT TROUBLES WHILE THEY ARE SMALL

An engine is made of many parts, closely related to many others. Each part has its own function and failure to perform that function places additional strain on other parts. As overloaded parts fail they add to the overload on still others, until by progressive failures the engine will be put out of commission.

Preventive maintenance is a series of simple checking, replacement and repair operations intended to forestall progressive damage. Delaying a maintenance job that needs to be done is a reckless gamble. Very few engine failures occur which are not preceded by warning signs that can be detected by the maintenance mechanic.

10. SCHEDULE & CONTROL YOUR MAINTENANCE

The objective of preventive maintenance is to correct unfavorable conditions that develop during engine usage, before they get serious enough to cause damage. The value of the program is dependent upon meeting the time requirements by adherence to a well-planned schedule.

Preventive maintenance performed on schedule is the easiest, as well as the least expensive type of maintenance. It requires less work and material to prevent failures than to fix them. Maintenance must not be relegated to a position of secondary importance for the sake of a temporary increase in production.

A small amount of paperwork is necessary to control the program. Check sheets are needed to detail the jobs to be done and as a record of what was done. A schedule board is necessary to make best use of time. Summary sheets listing labor and materials are important to control costs. It is important to remember that paperwork is useful only as it reduces work load instead of contributing to it; it needs to be as simple as possible to maintain its effectiveness.

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