How to Keep Gas Engines in Good Condition

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Engine Maintenance has been described as the preservation of or restoration to, engines in the field, the basic factors of internal combustion transfer of chemical energy to mechanical energy. These factors are built into the gasoline engine, by your manufacturers, but must be preserved or restored by you.

Aside from clean air, clean gasoline and clean lubricating oil, i. e., the chemicals, these basic factors required to produce mechanical energy, are:

1. Carburetion
2. Compression
3. Ignition

Cleanliness Primary

The clean chemicals plus the three basic factors are equally essential and common to 4 or 2 cycle operation, altho applied in different ways.

Clean air is an abundant commodity on the golf course (it's probably why they are built) but not necessarily at the level of the lawn mower, the sprayer, the aerator or the garden tractor. What your engine needs is a good oil bath air cleaner religiously cleaned and refilled periodically with clean oil to the proper level.

Clean gasoline is a problem. We would prefer a straight run (i.e. non-cracked), lead free fuel of average Baum Test and octane rating supplied by a reliable dealer at frequent intervals. So would your engine, but try and buy it. Most fuels today are cracked, have 3 cc tetra ethyl Lead per gal., are high in gum content and often stored long enough to develop varnish. Your only alternative is a reliable source of non-premium fuel delivered frequently and stored in full clean containers the shortest time practicable. What your engine needs is this fuel filtered through a good sediment bowl type filter religiously cleaned periodically. Storage without draining completely should be for short periods only. Fuel tanks on stand-by equipment should be completely filled at all times. This minimizes oxidation and formation of varnish.

Clean Lubricating Oil of manufacturer's specified viscosity is not such a problem as is fuels. Buy it from a reliable dealer in quart cans. Cover unused portions for minimum periods to prevent contamination with dust or dirt and oxidation which produces sludge.

For 4 cycle operation, check and fill as necessary to specified levels twice per day of operation and drain and refill every 25 hours.

For 2 cycle operation mix fuel and oil 16 to 1 or ½ pt. oil to 1 gal. fuel in small quantities that will be quickly used. Mix in separate clean container and stir thoroughly before each filling of the fuel tank. Completely drain fuel system before indefinite storage. Fuel and oil mixtures for standby equipment should be stored in completely filled air tight containers and poured into the dry fuel tanks as needed.

Failure to observe the foregoing simple maintenance of a supply of clean oil will give your engine the belly ache quicker than most poisons would affect a human one.

Carburetor Maintenance

A mixture of 13 to 15 lbs. of air to one lb. of gasoline is required for satisfactory operation of your engine. The carburetor is the device used to provide this mixture in the form that can be, by means of the Venturi and main jet, easily burned. In addition the carburetor meters the quantity of air necessary to operate the engine at various loads and speeds by means of its throttle plate. It is so designed to provide the small quantities of air and fuel necessary to idle the engine, the idle jet, and it further provides for a rich mixture required to start the engine when cold, the choke.

Maintenance of the carburetor involves restoration of factory-prescribed float levels which due to wear of parts becomes high, elimination of air leaks due to wear of throttle shafts, and cleaning, due to corrosion of die cast parts, lead deposits from the fuel and accumulation of dust and dirt. Periodically inspect carburetors. Study manufacturer's instruction manuals before attempting disassembly, and inspection and cleaning. If the throttle shaft has .010 in. side play replace bushings or throttle shaft as required. Clean by soaking parts in acetone or acetate lacquer thinners or commercial cleaning fluids prescribed by automotive supply houses.

CONNECTICUT SUPTS. STAR AT FLOWER SHOW

Connecticut Assn. of Golf Course Superintendents built this attractive exhibit at the Hartford Flower Show. This was done as a public service, in cooperation with the Hartford Times, sponsors of the show. During the seven days of the show 22 members of the CGCSA took turns at the exhibit counseling hundreds of the 30,000 show visitors on lawn problems. Scale of the exhibit at the Hartford Armory was 1-20. The green was one solid piece of velvet bent 3 ft. by 3½ ft. and was 45 years old. The other turf was Toronto bent. Small trees — birch, oak, cherry and shadbush were forced into foliage and evergreens, such as pitch pine, white pine and hemlock were dug a few days before the show. The Connecticut superintendent's pictorial and educational exhibit was one of the top features of the show. Public demand brought invitation to the superintendents to repeat their exhibit next year.

Adjust float levels as instructed by manufacturer's recommendations. Always use new gaskets in reassembling. Most manufacturers provide repair kits supplying the replacement parts usually required plus gaskets.

Preserving Compression

The Compression factor in both 4 and 2 cycle internal combustion engines is primarily one of accurate bore of the cylinder plus proper fit of the piston and rings. In the 2 cycle engine it also involves main bearing fit and proper seating of reed valves to assure crank case compression.

In the 4 cycle engine it also involves proper fit of the valve stems in their guides and proper seating of the intake and exhaust valves on their seats, proper tappet clearance, as well as tight cylinder head gaskets and spark plug gaskets in both cycles.

Preservation of these features, all properly fit by your manufacturer, is primarily accomplished by use of clean chemicals — clean air — clean gasoline — clean oil. Restoration to factory tolerances is major repair and not our topic today.

Assuring Proper Ignition

Ignition in the type of engines we are discussing is usually a high tension magneto, often of the flywheel type. Essential parts are the magnet, the coil consisting of a primary or low tension winding and the secondary or high tension winding, the contact or breaker points and a condenser. Though not a part of the magneto, an essential and vulnerable part of ignition is the spark plug.

Operation involves the buildup and breakdown of a magnetic field in the core of the primary winding by rotation of either the winding or the magnet. Voltage is induced in this winding by this buildup or breakdown of the magnetic field. Tim-

ing is accomplished by the opening of the contact or breaker points which interrupts the flow of current in the primary winding which induces high voltage in the secondary winding causing a spark across the electrodes of the spark plug which fires the combustionable mixture of air and fuel in the engine. The condenser serves to reduce burning at the contact points and intensify the induced voltage in the secondary circuit.

Preservation of the component parts of ignition consists of protection of these parts from dirt, oil and moisture.

Restoration to factory standards involves cleaning and adjustment of moving parts to factory specification. I make no attempt to advise you except that you should consult your operating manuals for specifications and be accurate.

Periodic cleaning of ignition parts, cleaning and adjusting of contact points, checking of the air gap between the magnet and coil core, and cleaning and adjusting of the spark plug is like a shot of vitamins to your engine and cheap insurance for your blood pressure and disposition. Badly burned contact points, suspected condensers or coils should be replaced. These latter parts can be tested at your local garage or service station.

Spark plugs when unduly fouled or burned should be replaced with plugs of the same heat range as supplied by the manufacturer except that in some conditions of excessive operating temperatures a colder plug may be indicated while in some conditions of light loads and much idling a hotter plug may improve operation. Experiment cautiously when you suspect either of these extremes may dictate a change of heat range of the plug.

Second Factors — Cooling, Exhaust

Secondary factors of engine production include: the cooling system and the exhaust system.

On water cooled engines fan belts must be maintained and radiators periodically cleaned of grass clippings and dirt on the outside as well as rust and sediment on the inside.

On air cooled engines periodically remove grass clippings from fans, blower housings and fins or overheating and damage will result.

Exhaust systems are quite simple but do accumulate rust and carbon resulting in back pressure and loss of power.

On two cycle engines, cleaning of the ports and muffler are recommended at 100 hr. intervals by the manufacturers.

Locating the Trouble

Should your engine stop or fail to start why not diagnose the trouble instead of sweating over a starter rope and turning the air blue?

To test compression grasp the starter pulley or shaft and twist rapidly. On two cycle engines a compression point should occur every revolution. On four cycle engines every other revolution.

To test ignition remove the spark plug and hold the spark plug wire ⅛" from the cylinder head. Spin the crankshaft by hand or with the rope. The spark should jump this gap regularly and if it does the ignition is adequate.

To test carburetion pour ½ teaspoon full of gasoline in the spark plug hole, clean and replace the plug, attempt to start the engine. If it fires once or twice and stops, carburetion is the sickness.

Should these tests of these three factors indicate that one or more is faulty, immediate and thorough restoration of this factor is essential.

Your engines are, for economic reasons, not unlimited in power but are usually adequate for the job to which they are applied. Avoid overloading by proper maintenance of the tool whether lawn mower, sprayer, pump or other. Work these tools at the rate for which they are designed. Overloading causes over-straining, and overheating, and shortens the life of your engine out of all proportion to the time saved.

Prior to the war, when suitable fuel was available our engines ran on test at full load with full throttle for 2000 hrs. with only minor adjustments and were still within factory tolerance for wear. Today, however, lead and gum adversely affect valve life and combustion chamber deposits necessitating valve overhauls at from 400 to 600 hr. intervals.

Dirty air or oil can ruin your engine in 120 hours.

I get the impression as I travel the country that operators think engine engineers are dumb. I am constantly asked "why don't they build them this way", or "I had to change this piece or part so it would work". It may be there are some dumb people in a large manufacturing organization, but believe me their work never gets out to the operator except by chance inspection failure.

If these operators would read and study their operating manuals instead of redesigning their engines in accordance with their limited and often incorrect experience, they would profit more. Make sure your operators are supplied with operation and parts manuals and your mechanics with complete repairman's handbooks available at our service outlets. We want you to get what we are endeavoring to build! Horse power hours per dollar.