



## **SPARK PLUG OPERATION, SELECTION, AND MAINTENANCE**

**Farm Machinery Fact Sheet FM-26**

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Changes in engine design and fuel operating conditions place increased demands on spark plugs and the electrical system. The performance of the spark plug may determine the engine efficiency of the modern engine. Fuel costs have increased six-fold over the past three years. Actual consumer cost of a spark plug is almost the same as it was 15 years ago. Being knowledgeable about spark plug operation, selection, maintenance, serviceability, and engine malfunctions will increase engine performance.

The spark plug provides an electrode gap for the spark that is necessary to ignite the compressed fuel-air mixture of vapor under compression in each cylinder. It must also provide a gas-tight conducting path from the high tension lead wire to the electrode gap.

This energy must provide approximately 20,000 volts without leakage to the ground at about 40 times per second at high engine speeds. The electrode and insulator tip is exposed to extreme temperature change of cool fresh air to approximately 4,000°F and under pressure that could reach 800 lb. per square inch.

Basically, a spark plug consists of three parts: the insulator, electrode, and a threaded metal shell. These parts are assembled together with cement or dry powder to form an operational leak-proof unit.

The insulator tip will determine the heat range of the plug (hot or cold). This part may be cracked, broken, or damaged through abuse in removal or replacement. Normally a hotter plug is used in a cold engine where you have a lot of stop and start driving. A colder range plug is used in a hot engine where you have continuous driving in hot climates or a problem with oil fouling.

Spark plug fouling is due to combustion products which collect on the plug's insulator. These products may cause misfiring at high speeds, thus it is aggravated by rich idle mixtures and excessive oil consumption that may bypass the rings or valve guides.

If plugs run too hot the insulator may be damaged and electrodes will burn away rapidly. In extreme conditions, hot plugs may cause premature burning (pre-ignition) of the air fuel mixture. This reduces power, wastes fuel, and may damage the engine under heavy load. This will often cause excessive burning of the ground.

The optimum heat range of a plug is selected on the basis of engine design and the operating conditions. In general, the plug must be hot enough during operation to prevent fouling and cool enough to avoid pre-ignition and rapid erosion of the electrodes.

A spark plug can be a valuable indicator as to the condition of your engine because the plug extends into the combustion chamber. When removing the plug, inspect it carefully to determine the cause and use mechanical judgment in correcting a malfunction.

### **Spark Plug Conditions**

1. Normal operation will show a light tan or gray color. The gap clearance will be slight with very little deposits on the insulator tip.
2. A plug that indicates replacement will show electrode and ground eroded away. If this condition is general on all plugs in the engine, check for sticking valves, faulty ignition leads, breaker points or weak coil or condenser. These conditions usually mean that the next hotter plug should be used.
3. Oil fouling is indicated by oily, black, sludgy deposit on the plug. A hotter plug would be recommended but will not replace a needed overhaul.
4. Splashed fouling is applied to plugs that have splotchy deposits on the insulator. These deposits have accumulated through misfiring or inefficient operation. Replacement and tuneup would be recommended for proper performance.
5. Core bridging or gap bridging is caused by materials of combustion lodging between electrode and the ground, causing the plug to short out. Excessive deposits are most common when oil control is poor or when stop and start operation is prevalent.
6. Overheating of a plug is characterized by a white or yellow glaze, a burned or blistered insulator nose and badly eroded electrodes. This may be caused by faulty thermostat, correcting engine timing, plug heat range too hot or carburetor set too rich.

### **Service Work on Spark**

1. When removing a spark plug use compressed air to blow out all foreign material around the base.
2. Do not pull on the wire itself but remove from the terminal boot.
3. Use some system to identify the wire with a certain plug. A beginner may want to use a numbered clothespin to clip on the wire.
4. Use a deep well socket with preferably a rubber or magnetic retainer inside.
5. Identify the plug with the correct cylinder.
6. Inspect the plug for cylinder malfunction as explained.
7. Clean the plug in a solvent and dry with compressed air. Be sure to clean the insulator

of paint, carbon, and oxide that forms from fuel additives.

8. If the electrode is rounded off it needs to be filed flat.
9. Remove rust and carbon from the threads with a steel brush.
10. Adjust the gap between the ground and the electrode to proper specifications. This may vary from .022 inch to .040. The gap width should be checked with a round wire-type gauge.

### **Installing Spark Plugs**

1. Be sure cylinder head threads and plug threads are clean and free of dirt.
2. Check gap setting even on new plugs.
3. Always install new gaskets (except on plugs that are tapered and do not require gaskets).
4. Tighten plugs down by hand as tight as possible then retorque with a torque wrench to manufacturer's recommendation. this will vary from 10 ft. lbs. to 35 ft. lbs. on aluminum heads or cast iron heads.
5. Be sure the spark plug cable fits the plug terminal snugly.
6. Most manufacturers recommend checking plugs every 10,000 miles.

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