Fault diagnosis at a glance: Spark plug conditions

**Normal**
- Insulator nose from grayish to gray-yellow to fawn brown colour. Engine is OK, heat range possibly too high.
- In normal operation.
- Cause: Thermal overload due to auto-ignition. Combustion residue in combustion chamber, defective valves, defective ignition distributor and poor fuel grade.
- Effect: Misfiring, poor starting performance.
- Remedy: New spark plugs.

**Carbon-fouled**
- Insulator nose, electrodes and sparkling shell covered with shiny soot or carbon deposits.
- Cause: Incorrect mixture setting (carburettor, injection). Mixture too rich, air cleaner severely fouled, insulator nose tip spongy, soft and possibly due to deposits. Insulator nose may crack due to thermal overload.
- Effect: Misfiring particularly during acceleration or ignition voltage no longer sufficient for large electrode gap. Poor starting performance.
- Remedy: New spark plugs.

**Oil-fouled**
- Insulator nose, electrodes and sparkling shell covered with sticky soot or carbon deposits.
- Cause: Too much oil in combustion chamber. Oil level too high, heavily worn piston rings. Aggressive fuel and oil additives. Too much oil-in-mixture.
- Effect: Misfiring, poor starting performance.
- Remedy: Overhaul engine, correct fuel/oil mixture, new spark plugs.

**Severe centre electrode wear**
- Cause: Spark plug replacement interval not complied with.
- Effect: Misfiring, particularly during acceleration or ignition voltage no longer sufficient for large electrode gap. Poor starting performance.
- Remedy: New spark plugs.

**Heavy lead deposits**
- In places, thick brownish yellow glaze on insulator nose which may also have a greenish tinge.
- Cause: Fuel additives containing lead. Glaze develops under heavy engine load after lengthy part load operation.
- Effect: With heavy loading, coating becomes conductive and causes misfiring.
- Remedy: New spark plugs, cleaning has no effect.

**Ash-fouling**
- Thick ash coating from oil and fuel additives on insulator nose. In scavenging area (already critical) and on ground electrode. Loose to spongy, soft soot deposits.
- Cause: Alloying constituents, particularly from oil, may deposit such ash in the combustion chamber and on the sparking face.
- Effect: Can lead to auto-ignition with loss of power and engine damage.
- Remedy: Repair engine. New spark plugs, possibly use different oil.

**Partially melted centre electrode**
- Centre electrode partially melted, blistered, spongy, soft insulator nose tip.
- Cause: Thermal overload due to auto-ignition, e.g. excessively advanced ignition timing, combustion residue in combustion chamber, defective valves, defective ignition distributor and poor fuel grade. Heat range possibly too low.
- Effect: Misfiring, loss of power (engine damage).
- Remedy: Check engine, ignition and mixture formation. New spark plugs with correct heat range.

**Melted centre electrode**
- Centre electrode melted, ground electrode also severely corrupted.
- Cause: Thermal overload due to auto-ignition, e.g. excessively advanced ignition timing, combustion residue in combustion chamber, defective valves, defective ignition distributor and poor fuel grade.
- Effect: Misfiring, loss of power possibly engine damage. Overheated centre electrode may cause insulator nose to crack.
- Remedy: Check engine, ignition and mixture formation. New spark plugs.

**Melted electrodes**
- Cauliflower-like appearance of electrodes. Possibly precipitation of natural salt originating from the spark plug.
- Cause: Thermal overload due to auto-ignition, e.g. excessively advanced ignition timing, combustion residue in combustion chamber, defective valves, defective ignition distributor and poor fuel grade.
- Effect: Loss of power prior to total failure (engine damage).
- Remedy: Check engine, ignition and mixture formation. New spark plugs.

**Ferrocene**
- Insulator nose, electrodes and part of the sparking shell coated with milky orange adherent deposits.
- Cause: Fuel additive containing iron. The deposits occur after a few thousand kilometres in normal operation.
- Effect: The coating containing iron is electrically conductive and causes misfiring.
- Remedy: New spark plugs, cleaning has no effect.

**Severe ground electrode wear**
- Cause: Aggressive fuel and oil additives. Unfavorable flow conditions in combustion chamber, possibly due to deposits, engine knocking, too thermal overload.
- Effect: Misfiring, particularly during acceleration (ignition voltage no longer sufficient for large electrode gap). Poor starting performance.
- Remedy: New spark plugs.

**Cracking of insulator nose**
- Cause: Mechanical damage due to impact, striking or pressure on the centre electrode resulting from incorrect handling. In marginal cases – especially after excessively long use – the insulator nose may crack due to deposits between the centre electrode and insulator nose, and due to corrosion of the centre electrode.
- Effect: Misfiring, sparkover at points not reliably supplied with fresh mixture.
- Remedy: New spark plugs.