

50 Causes of OVERHEATING

IT IS always a problem to design an engine which will cool properly under all conditions and still run hot enough for efficiency. Such factors as fan speed, shape and thickness of the radiator core, distance of fan blades from the radiator, pitch of fan blades, etc., are vital. When it is remembered that a production engine must operate in the high heats of the desert as well as it does in Alaska, it is obvious that the general cooling system must be carefully worked out. It is rarely a fault of design when an engine overheats.

In the paragraphs below will be found fifty causes of overheating. The remedies suggested are general, in most instances, and other measures may have to be taken in aggravated cases.

1. **LOOSE FAN BELT:** With the modern V-belt this cause has diminished in the last few years. **REMEDY:** Tighten belt but not too tightly. A V-belt should be just tight enough to "give" one inch when pressed lightly midway between fan and pulley.

2. **OIL ON FAN BELT:** This usually occurs if there is a leak at the gear case cover of the engine. **REMEDY:** Replace fan belt after stopping oil leak.

3. **IMPROPER PITCH OF BLADES:** Usually the result of an accident to the fan. It is very difficult to straighten the fan blades and restore the proper pitch after the blades have been bent. **REMEDY:** Replace fan blade assembly.

4. **LEAKING RADIATOR:** With this goes leaking water jackets, externally. There are some very good sealing compounds for temporary relief which can be used until permanent repairs are made. **REMEDY:** Repair leaks.

5. **CLOGGED RADIATOR CORE:** Due to mud, sand, insects, leaves, etc., embedded in the air passages, preventing the free passage of air through the radiator. **REMEDY:** Use high-pressure stream of water directed through the core from the rear followed by air-pressure, also from the rear.

6. **PAINT ON RADIATOR:** If a heavy paint or enamel is used on the radiator core, it may impair the cooling efficiency of the core. **REMEDY:** Remove the paint and spray with light radiator paint.

7. **AIR PASSAGE UNDER THE HOOD:** Sometimes a particular type of body with a low dash will not allow the free escape of air past the engine and the hot air is retained around the engine. Again, insufficient louvres hold the air within the hood. **REMEDY:** Provide a free passage of air past the engine.

8. **CLOGGED RADIATOR:** Dirt in the water, scale, rust, small pieces of hose and some anti-freeze solutions may clog the water passages. **REMEDY:** Drain cooling system if not badly clogged, running engine to get water warm first. When a cleaning compound is used, follow directions on the package. When it is badly clogged remove the thermostat and reverse flush the radiator, applying a stream of water to lower hose connection and allowing it to discharge through the pump. A board placed against the radiator and tapped lightly, while flushing, will help to loosen the dirt. Sometimes it is so badly clogged that it is advisable to flush the block and radiator separately, using air intermittently. If radiator is still clogged it should be removed and boiled in a compound made for this purpose.

9. **RADIATOR BAFFLE PLATES:** On the inside of a radiator at the upper inlet connection, is a baffle plate which distributes the incoming water across the core and prevents the rushing water from gushing into the filler neck and out the overflow pipe. If this baffle is faulty or lacking, the water level will quickly drop. **REMEDY:** Correct if faulty or install if lacking.

10. **OIL IN WATER:** Will cause emulsion. Due to the wrong lubricant at the water pump or a leaking gasket or internal crack in the water-jacket. A special waterproof pump grease

with a tallow base is recommended. **REMEDY:** Locate cause and repair.

11. **ANTI-FREEZE SOLUTIONS:** Some anti-freeze solutions have a very low boiling point and are poor conductors of heat and poor cooling agents. A great deal of overheating is noticeable on the first warm days of spring as a result of these solutions remaining in the systems. **REMEDY:** Drain off solution, flush out and replace with fresh water.

12. **STUCK THERMOSTAT:** Usually detected by speeding up the engine and feeling the passage of water through the upper hose. If no pressure is felt, it may mean thermostat trouble. **REMEDY:** Test thermostat assembly in bucket of hot water and replace if faulty.

13. **DIRTY CYLINDER BLOCK:** Mud from dirty water or rust as a result of corrosion may fill the lower cavities or coat the walls of the jacket resulting in high local heats. **REMEDY:** Use a reliable radiator cleaner as directed in instructions on package or flush cylinder block or both. Allow water to enter top block connection, discharging through pump. Preferable to have water flow assisted by air injector. Remove water thermostat if necessary.

14. **CARBON:** Carbon on the walls of a combustion chamber acts as an insulator. The heat is held within the combustion chamber until it finally breaks through the insulation after it has become excessive. **REMEDY:** Remove carbon.

15. **CYLINDER HEAD:** A loose head or faulty gasket will let water seep into the cylinder thereby constantly lowering the water level. A poorly cored head casting may have too much metal between the water and combustion chambers for proper conduction of heat. **REMEDY:** Tighten head or replace gasket or change head.

16. **EXCESSIVE COMPRESSION:** If the compression is high and the fuel used is not intended to restrain knocking, detonation with resulting overheating will take place. **REMEDY:** Use fuel with high anti-knocking rating. If engine still detonates, lower compression by installing an extra head gasket.

17. **STEAM POCKETS:** Bubbles of air or steam often occur in the system, locking the water and preventing circulation. **REMEDY:** Drain cooling system and refill when cool. Make sure that overflow pipe is open.

18. **PISTONS AND PISTON RINGS:** Tight pistons or rings with heavy wall pressure cause friction and break down the oil film. A newly fitted top ring is often starved of oil for many hundreds of miles. These things may cause overheating. **REMEDY:** Replace pistons or rings if too tight or use a special oil which will reach the top rings and lubricate them.

19. **POOR LUBRICATION:** Insufficient or a poor grade of engine oil promotes friction; friction results in heat. If oil does not reach every moving part of an engine sufficiently to reduce friction, overheating will result. **REMEDY:** Add oil or change to an oil which will reach all parts and provide a film of oil under all conditions.

20. **LEAKING PUMP GLAND:** It is often the case that pump glands do not leak except when engine is running. Tightening gland nuts is not always sufficient; usually repacking is necessary. Before repacking make sure that the shaft is not under-size or badly scored. **REMEDY:** Tighten or repack glands as needed. If pump shaft is scored use a plastic packing or replace shaft.

21. **BROKEN WATER PUMP IMPELLER:** Remove the upper radiator hose, start engine and if the pressure is weak, remove pump and check for broken impeller or excessive wear between impeller and pump body. **REMEDY:** Replace and refit impeller.

It Had to Come! A Loose Leaf Flat Rate Book—See Last Page

OVERHEATING

22. **SHEARED IMPELLER KEY OR PIN:** To check, remove upper pump hose, stick a screw driver against impeller to wedge it tightly and have some one turn the engine over by hand slowly. If impeller does not rotate, inspect for sheared key or pin. **REMEDY:** Replace pin or key.

23. **BROKEN PUMP SHAFT:** Sometimes a shaft will shear inside the pump housing. Break, of course, will be apparent upon disassembly of pump. **REMEDY:** Replace shaft.

24. **LEAKING WATER CONNECTIONS:** This trouble is obvious. But note that sometimes leakage only occurs with engine running. **REMEDY:** Stop the leaks, of course. Use graphite paste rather than shellac on hose connections and gaskets. Clean the metal surfaces thoroughly before applying hose.

25. **CLOGGED HOSE:** Rubber deteriorates, especially in the presence of oil or some anti-freeze solutions. Particles of rotted rubber may tear loose or the inside diameter of hose decrease by the swelling of the hose, preventing the free passage of a sufficient amount of water. **REMEDY:** Replace hose.

26. **COLLAPSE OF INTAKE HOSE:** If the pump suction is great or the pump intake hose long or weak, the hose will suck together, shutting off the water supply to the pump. **REMEDY:** Replace hose with stronger hose or one with coiled spring wire woven into it.

27. **CARBURETOR ADJUSTMENT:** Too lean or too rich a mixture causes a slow burning of the fuel charge. A mixture can be too rich and still deliver sufficient power but power will be lost with a lean mixture. **REMEDY:** Readjust carburetor. Check manifold for air leaks.

28. **CARBURETOR CHOKE:** A sticking choke causes an enriched mixture. **REMEDY:** Free up and adjust choke valve.

29. **SPARK PLUGS:** When a spark plug becomes dirty, corroded or broken, a spark of insufficient intensity at the gap will result in lack of power and spasmodic firing. **REMEDY:** Replace plugs.

30. **HIGH TENSION WIRING:** If the insulation on the high tension wires is chafed or broken down to permit leakage of current, insufficient spark intensity results in loss of power. If the engine labors abnormally, heating results. **REMEDY:** Change wiring.

31. **SHORT CIRCUIT IN DISTRIBUTOR:** Caused by oil, water, dirt, rust or a break-down of the electrical resistance of the head and results in misfiring, a wider throttle is required and overheating may follow. **REMEDY:** Clean or replace head.

32. **DISTRIBUTOR POINTS:** If the points are not adjusted within very close limits or are not synchronized or do not open and close freely, irregular firing will result in loss of power and overheating. **REMEDY:** Adjust and free up points.

33. **FROZEN DISTRIBUTOR:** A frozen distributor head or automatic advance weights will cause a retarded spark condition. **REMEDY:** Free up and adjust distributor and weights.

34. **IGNITION TIMING:** If the spark is late, the charge will burn later and more slowly. More cylinder surface is exposed, more heat absorbed and overheating may result. If spark is early, detonation will take place, with resulting higher average temperatures. **REMEDY:** Retime ignition in accordance with maker's instructions.

35. **RETARDED SPARK:** It is obvious that an engine run with a retarded spark will heat because of a lag in the burning of the charge. **REMEDY:** Advance spark.

36. **ADVANCE AND RETARD LINKAGE:** If the joints and rods connecting the spark lever to the distributor or magneto are worn, irregular timing may result and overheating is a possibility. **REMEDY:** Readjust or replace linkage.

37. **WORN TIMING GEARS:** Badly worn timing gears act in the same manner as a loose timing chain. It is, of course, not often that a set of gears will wear enough to affect timing. **REMEDY:** Replace gears.

38. **LOOSE TIMING CHAIN:** A loose timing chain causes a lag in the ignition and valve timing with a consequent loss of power and overheating. **REMEDY:** Adjust or replace chain.

39. **VALVE TIMING:** If valve timing is late or early, the loss in power requires a wider throttle, with more fuel burned less effectively and overheating may follow. **REMEDY:** Retime valves in accordance with maker's instructions.

40. **VALVES:** If valves need grinding, loss of power necessitates a wider throttle with consequent greater heat generation and overheating may result. **REMEDY:** Reseat valves.

41. **WARPED VALVES:** If the valve heads do not seat firmly, compression will be weak and engine operation uneven. **REMEDY:** Reseat or replace valves.

42. **STICKING VALVES:** When valve stems are bent or gummy, a slowly returning valve results in loss of power. **REMEDY:** Replace or free up valves. A top cylinder oiler or "break-in" oil also helps to eliminate this trouble.

43. **LOOSE EXHAUST VALVE ADJUSTMENTS:** If the exhaust valves are adjusted too loosely, the valves will not lift high enough to permit the exhaust gas to leave the cylinders rapidly. **REMEDY:** Readjust valves to proper clearance.

44. **TIGHT ADJUSTMENT OF EXHAUST VALVES:** If exhaust valve adjustment is too tight, valves will hold open and overheating may ensue. **REMEDY:** Reseat and readjust valves.

45. **TIGHT INTAKE VALVE ADJUSTMENTS:** If the intake valves hold open, the incoming gases are ignited by the leftover exhaust gases causing loss of power, and may produce overheating. **REMEDY:** Reseat and readjust valves.

46. **VALVE SPRINGS:** Broken or weak valve springs allow the valves to be sucked open at the wrong time and do not cause the valves to be returned to their seats quickly. A fluttering valve destroys good compression. **REMEDY:** Replace valve springs.

47. **MUFFLERS:** When a muffler becomes clogged, heavy back-pressure results. The hot exhaust gases are not carried away and cause overheating of the engine. **REMEDY:** Clean out or replace muffler.

48. **BRAKES:** Dragging brakes cause the engine to labor. **REMEDY:** Free up brakes.

49. **CLUTCH:** A slipping clutch will allow the engine to race and will generate heat from its own friction which will be transmitted to the engine. **REMEDY:** Eliminate cause of slippage.

50. **LOW GEAR OPERATION:** On long or unusually hard pulls in low gear, overheating is common due to the fact that the passage of the cooling air through the radiator is slow because the car is moving forward slowly while the engine is travelling at speeds above normal. **REMEDY:** There isn't any except when a car is used constantly in such service a higher velocity fan can be used at the expense of power and noise.

AIR-COOLED ENGINES

Overheating of an air-cooled engine can usually be traced to the following main troubles: A. Dirt, mud and other foreign matter on the cooling fins. B. Retarded passage of air around cylinders. C. Improper or poor lubricant used. D. Valve timing. E. Spark timing. F. Sticking valves. G. Improper fuel.

Flat Rates Can Spell Profits If You Use Motor's Manual