

Head Gaskets, Etc.

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The key is realizing that most head gasket failures are not the fault of the gasket, but are instead the result of another underlying problem. Replacing the gasket may solve the symptom, but it won't cure the problem. We'll describe some of the telltale signs of serious engine problems that can cause head gaskets to fail.

If your engine overheats, waiting until the engine has cooled before adding water will reduce the chance of head warpage.

CAUSES OF OVERHEATING

Overheating can be caused by anything that overburdens or decreases the cooling system's ability to absorb, transport and dissipate heat. The only way to cool an engine is to keep the hot metal in contact with a cooler liquid. And the only way to do this is to keep the coolant in constant circulation. As soon as the circulation is reduced or stops, temperatures rise and the engine overheats.

WHAT TO CHECK TO PREVENT ENGINE OVERHEATING

In order to prevent engine overheating, or to determine the causes of engine overheating, check the following:

- **Thermostat:** Severe overheating may be caused by a defective thermostat or it can damage a good thermostat. The thermostat should be tested and/or replaced before the engine is returned to service — regardless of the cause of overheating.
- **Cooling System Leaks:** Loss of coolant because of a leak is probably the most common cause of overheating. Possible leak points include hoses, the radiator, heater core, water pump, thermostat housing, head gasket, automatic transmission oil cooler, cylinder heads, and block.
- **Fan:** With electric cooling fans, the thermal temperature sensor switch, a relay and/or circuit breaker, or an electric fan can fail. Make sure the fans cycle on when the engine heats up.
- **Water Pump:** A corroded impeller can reduce efficiency of the pump and cause an engine to overheat. Any wobble in the pump shaft or any seepage can require replacement.
- **Belts and Hoses:** Check belt tension and condition. A loose belt that slips may prevent the water pump from circulating coolant fast enough for proper cooling.

- **Radiator:** Clogging and leaks are the most common causes of a radiator's failure to dissipate heat. Internal corrosion and accumulation of deposits can also inhibit circulation and reduce cooling.

Other factors that can contribute to overheating — and head gasket failure — include retarded ignition timing, detonation/pre-ignition, lean air/fuel mixture or an exhaust restriction (a clogged catalytic converter or muffler).

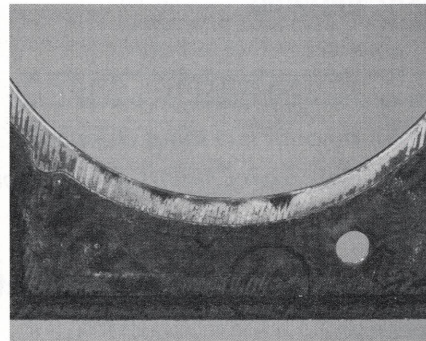
Preignition, which is the other condition that can cause a head gasket to fail, occurs when a point within the combustion chamber gets so hot that it becomes a source of ignition and causes the fuel to ignite before the spark plug fires. This, in turn, may contribute to or cause a detonation problem.

LOCALIZED CRUSHING

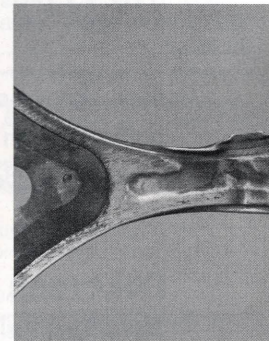
Head gaskets sometimes fail because of localized overheating problems caused by hot spots in the cylinder head or engine block. When a localized hot spot forms, it causes the surrounding metal to swell excessively. This, in turn, can crush the head gasket causing it to leak, erode and/or eventually burn through (the area where the gasket failed will be measurably thinner than the surrounding gasket, which you can measure with a micrometer). Hot spots also create added stress in the head itself, which may cause the head to warp (go out-of-flat) and/or crack.

SO WHAT CAUSES HOT SPOTS?

Engine overheating often caused by air pockets in the cooling system can contribute to hot spots. An overheated engine



Rough surface finishes can allow combustion gases and fluid seepage to occur. (All photos courtesy of Fel-pro, Inc.)



Debris between the gasket matting surface will cause loading.

can cause extreme stress in the cylinder head and lead to gasket failure. The potential for gasket failure due to overheating is increased when there are aluminum cylinder heads because, when heated, aluminum heads expand faster than the aluminum block.

The difference between thermal expansion rates for an aluminum head and the aluminum block can also cause the head to warp. And, the loss of clamping force due to a warped head can cause the head gasket to leak.

DeLorean engines are designed to operate at a coolant temperature range of about 190–200 F. Temperatures within this range are essential for proper emissions control, fuel economy, and performance.

CHECK FOR WARPAGE

If a head gasket fails as a result of engine overheating, the face of the cylinder head and block deck should be checked for warpage. If warpage has occurred, the cylinder head and block should be resurfaced to restore flatness prior to replacing the head gasket. Otherwise, the new head gasket will be unevenly loaded and will probably leak or fail. Aluminum cylinder heads may have to be straightened prior to re-machining.

THINGS TO LOOK FOR: CARBON TRACKS

Carbon tracks are black deposits that may indicate that the gasket is not properly seated. If the gasket is in its proper position, there will be a thin, well defined line of carbon around the opening on the block, and another on the head. If there are carbon deposits on the gasket armor, or the line of carbon on the head or block is fuzzy, leakage may be a problem.

RUST

Corrosion at the coolant ports on a head gasket is a sure sign of cooling system neglect. Anti-freeze contains various corrosion inhibiting additives, but over time the additives are depleted and must be replenished by changing the coolant. Neglecting

this vital bit of preventive maintenance can lead to serious corrosion problems within the engine and cooling system.

You'll probably discover additional problems elsewhere in the cooling system such as corrosion or clogging in the radiator and heater core. Aluminum thermostat and water pump housings are also very vulnerable to this type of internal corrosion. Even hoses can fail from the inside out because of electrolytic corrosion!

If you also find brittle, discolored and/or charred valve cover, oil pan, intake or timing cover gaskets, you can bet overheating was the culprit. Chances are you'll find other heat-related damage in the engine, so be sure to check the head for warpage, the cylinders for possible scuffing damage, and the valve stems and guides for scuffing or sticking.

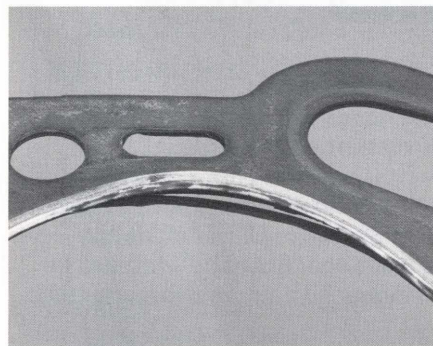
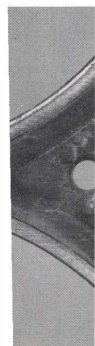
DENTED ARMOR AND/OR BLOWOUT

The cause here is abnormal combustion. Detonation (also called 'spark knock') is an erratic form of combustion that occurs when excessive heat and pressure in the combustion chamber cause the air/fuel mixture to auto ignite. This produces multiple flame fronts within the combustion chamber instead of a single flame kernel. When these multiple flames collide, they do so with explosive force that produce a sudden rise in cylinder pressure accompanied by a sharp metallic pinging or knocking noise. The hammer-like shock waves created by detonation subject the head gasket, piston, rings, spark plug and rod bearings to severe overloading.

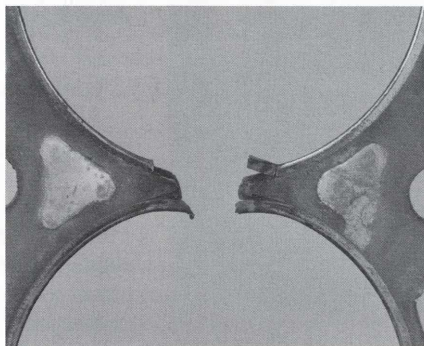
Mild occasional detonation can occur in almost any engine and usually causes no harm. But prolonged or heavy detonation can be very damaging. So if there's audible knocking or pinging when accelerating or lugging the engine, detonation may be a problem.

The causes of detonation include carbon buildup in the combustion chambers (which raises compression beyond the fuel's octane rating).

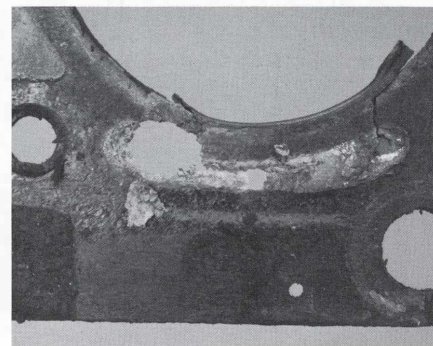
Contributing factors also include over-advanced ignition timing, a lean fuel mixture and engine overheating. Removing carbon deposits from the engine and checking out the other possible causes can help prevent a repeat failure. ☞



Detonation / pre-ignition can indent and crack the combustion sealing armors.



Hot spots within the cooling system can cause complete burn-through of the gasket webbing.



Abusive engine operating conditions can cause gasket deterioration.