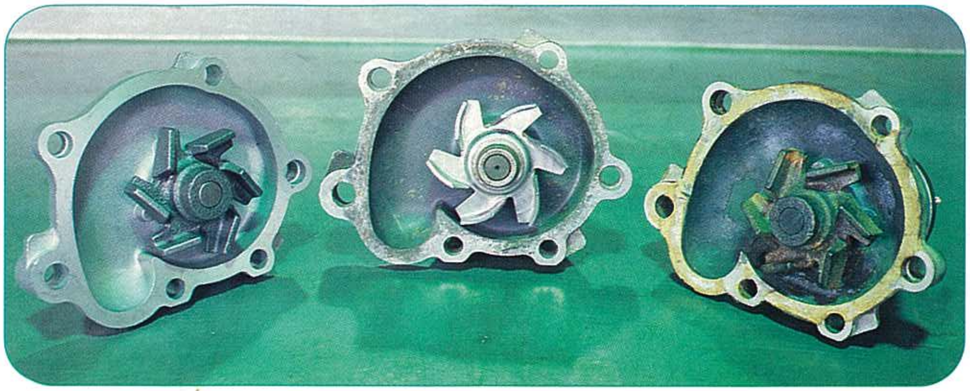
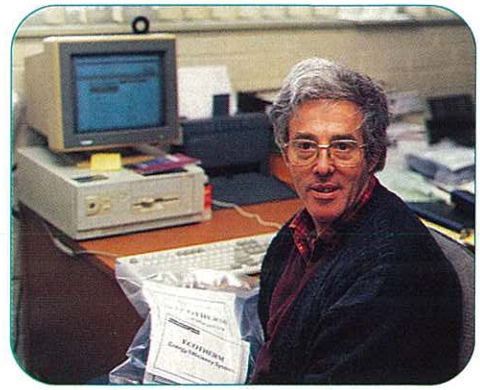
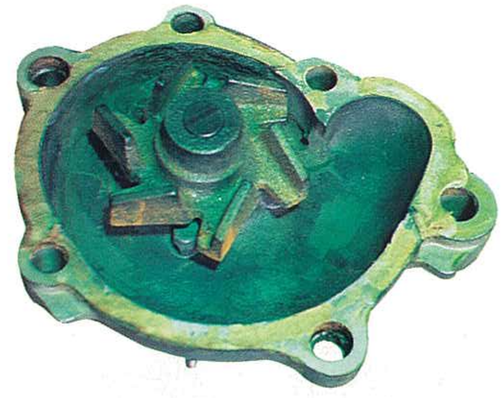


L to R: a) New replacement pump is deficient in design, the impellers of which are prone to creating cavitation.
b) Old Toyota pump shows quality design and workmanship where blades cut cleanly through coolant.
c) Replacement aftermarket pump caused cavitation and failed in a short time.



John Bennet.



Would you believe this pump is only a couple of months old? The coolant system was treated with the correct products, however, because of poor design and resultant cavitation problems, it resulted in cavitation erosion — hence a large hole to right of impeller.

How many engines could this pump destroy before the problem was diagnosed? A common complaint with poorly designed pumps is materials used.

its job, otherwise the hoses may burst, welsh plugs pop and radiators blow at the seams. What has to be done to stop this is prevent excessive pressure rise within the cooling system.

Causes of pressure rise

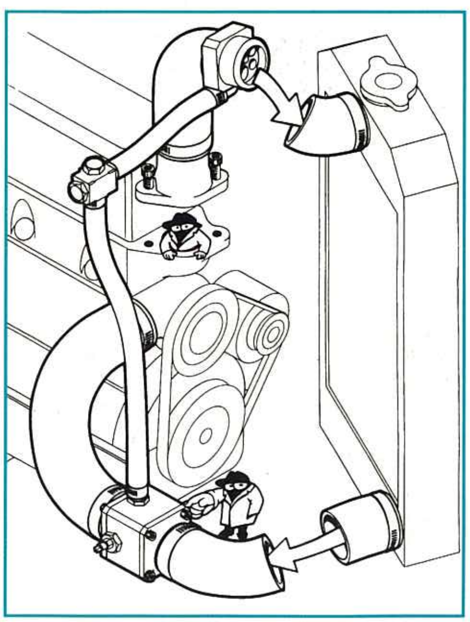
Pressure in a closed cooling system can be attributed to four main factors; a) the natural expansion of coolant as its temperature rises to operating temperature (in a properly designed system this is accommodated by a header tank), b) as coolant is drawn through the pump, cavitation results, c) localised boiling (for example around the exhaust valves) occurs sometimes even before the thermostat opens and d) trapped steam that collects in the cylinder head passages.

Steam bubbles generated by a combination of pump cavitation and localised boiling naturally migrate to the surface of the coolant and, as the coolant passes through the cylinder head, these steam bubbles collect under the ceiling of the coolant passages. If the front of the head is sufficiently higher than the rear, the steam will run along the ceiling and out through the thermostat housing.

Many cars have little or no rise from the back to the front of the head so unless the steam is flushed away by extremely good coolant flow large steam pockets form on the ceiling at the rear of the cylinder head. The result is increased temperatures around the pockets which will potentially distort the area around the exhaust valve, cause corrosion and eventually the cylinder head will fail.

Bennet benefits

The John Bennet-designed Ecotherm Energy Efficiency System has been developed to minimise cooling problems by radically changing the way a cooling system operates.



In a typical cooling system, a thermostat is mounted in the front of the cylinder head. The thermostat opens and closes according to the temperature of the coolant surrounding it, only allowing a small amount of coolant to flow through the engine's standard bypass system back to the pump. This restricted flow promotes cavitation in the pump and reduces flushing through the engine.

The Ecotherm system removes this restriction by shifting the thermostat into the bottom radiator hose and providing a full flow external bypass. This bypass takes coolant from the top of the engine through the new lower thermostat housing and into the coolant pump allowing for generous coolant circulation even with a fully closed thermostat.

Wasted energy

A cold engine is provided more fuel when cold via a choke, then as it warms up it burns fuel more efficiently and requires less to make the same power. So, if the engine is operating at its ideal temperature it will use the least amount of fuel for the greatest power output.

Because of the extremely high temperatures created by combustion, coolant is heated to the point where the thermostat is forced open. This allows the pump to push it out of the cylinder head(s) and into the radiator. As the hot coolant enters the radiator it transfers some of its heat into the air rushing through the radiator. Once relatively cold, it is drawn from the bottom of the radiator through the pump and into the engine.

This is where the wasted energy comes into the equation. The radiator has been heated by burning fuel, and as air blows through the radiator, energy (in the form of heat) is being lost into the air. The temperature of the coolant in the bottom of the radiator is in no way controlled, so the coolant entering the engine can be (and often is) just above the surrounding air temperature.

An engine which runs efficiently at ►