

# Water Cooled Engines

By far the majority of cars are equipped with a water-cooled engine where water is pumped around the engine to absorb some of the heat of the engine which is then pumped via a radiator which uses an air interface to lower the temperature of the inner water.

The advantages of water cooling are that water is readily available and cheaply too. And water will readily absorb heat - in fact it will absorb more heat than virtually any other substance.

The disadvantages are greater than the advantages and include the fact that water readily boils, it also freezes and it is well known for causing corrosion.

The disadvantages can be addressed by operating the system under pressure which raises the temperature at which the water boils. A single degree centigrade increase is seen when the system is run at a pressure of only 0.6 lbs/in<sup>2</sup>

Freezing can be adjusted by the addition of an antifreeze compound and additives can be included to deal with the corrosion issues. Finally, a water jacket around an engine acts as a noise insulator and helps to keep the engine noise to more respectful levels. Indeed Porsche who used to run air-cooled engines found that they could only meet the newer stricter noise levels by moving to a water-cooled basis and for enthusiasts, it was seen as the end of the world. I have to admit that there is a certain something about an old air-cooled Porsche on start up which an old friend of mine used to liken to an accident in a saucepan cupboard.

At the recent Concours at Princethorpe there was considerable debate around what pressure cap should be used on the water cooled DAF with much concern being expressed about hoses splitting if the cap value was too high.

It was evident from looking under the various opened bonnets that very different caps were in use which got me thinking about what really was the intended value when DAF built the cars or more likely when Renault built the engines.

The DAF Manual tells us that the radiator cap should be between 10.38 lbs to 12.23 lbs so that gives some scope for adjusting slightly the pressure at which the cooling system will work.

At 10lbs, the cap causes the water to operate at about 116 degrees centigrade and at 13 lbs the temperature would be about 120 degrees centigrade. But these pressures are not excessive and they should not be bursting hoses. Rather that is a failure of the hose and new and better hoses would be more advantageous than trying to reduce the pressure of the system with say a 7lb cap. All it would do is to lower the temperature at which the water would boil and that brings about an added problem of the water boiling away leading to an overheating problem.

If an engine is stressed and has to work extra hard a situation can arise where even the raised temperature that a high value cap permits still allows the water to boil off but this can be overcome by adding a strange product to the coolant water which is sold under the name of "water wetter" and this claims to drop the temperature by a good few degrees and it works by letting the water molecules mix better together. This is a product designed for racing cars where they do generate very high temperature conditions.

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