Cooling Revisited

The topic of engine cooling seems to be always coming up among people who really drive old cars. A question on this subject asked on the PAS website message board (accessible to all PAS members via **www.pierce-arrow.org**) in June ultimately stimulated about forty responses and comments by mid-August. Much of the advice and suggestions repeats information that has appeared in past – sometimes long past – issues of the PASB, but some of it is new. Members concerned with the mechanics and operation of their Pierce vehicles are again urged to visit the message board from time to time and read the comments of particular interest to them. The indexing system makes it easy to select what is of interest and ignore the rest.

The main elements of the advice about cooling in the recent message board conversation are summarized below. Thanks to all the PAS members who contributed to that discussion. More details are available on the message board and in past PASBs.

1. Water is a better coolant than an antifreeze mix.
2. If you don't use an antifreeze that contains a rust inhibitor, consider using a coolant additive (such as Pencool) designed for use in trucks, or a rust inhibitor added to your water.
3. Be sure the water pump packing or seal is not letting air into the system, which allows the fluid to foam, greatly reducing cooling ability. Keep the water pump well greased with waterproof grease, or (even better) have the packing replaced with two modern seals.
4. Use a laser temperature gauge to measure temperatures around the engine. Point it down the radiator filler to get a good reading on the coolant temperature at the top of the radiator tank, which is where the coolant is probably hottest. The coolant temperature should normally be in no higher than 170 degrees.
5. Be sure radiator louvers are opening wide. Prop them open if the thermostat doesn't open them wide. (In southern climates they can be propped open permanently.)
6. Reverse flushing the radiator should get rust flakes out of the core. A strainer or filter in the upper radiator hose will keep them out. Commercial filters (Gano) are available, but one can be made from stainless steel mesh (cone shaped, point up) or a piece of panty hose.
7. The lower radiator hose should have a stainless steel spring or a section of pipe in it to keep it from collapsing under the suction of the water pump.
8. Clean out water pump grease in the radiator by putting in some dishwasher detergent (e.g. Cascade), driving the car for an hour, and then flushing until you can't smell the detergent.
9. Be sure the timing is set correctly. Spark timing retarded too far will almost always cause serious overheating.
10. One member reported a dramatic temperature drop when he switched to "old-style" regular fuel without any ethanol.
11. One member recommends a rust remover product available at www/ safestrustremover.com, though he hasn.t yet tried it on a radiator.
12. The water jacket cover on the engine should have a baffle plate inside to distribute the cooling water to the cylinder sides. If this is badly rusted or missing it should certainly be replaced.

ANTIFREEZE IN 2010

by Derek J. Harris

The following item is an escerpt from an article that appeared in the May/June 2010 issue of The Flying Lady, the magazine of the Rolls-Royce Owner's Club. The full article was reprinted in the August 2010 BULLETIN of the Classic Car Club. (The omitted parts of the article deal mostly with personal experiences.) This appears here with permission of the author.

I originally wrote about this subject in 1997 and it appeared in RREC Bulletin 222/55 in May/June 1997 and is reprinted in RREC Technical Manual No. 5/163. Recently on the website for Enthusiasts of Rolls-Royce and Bentley Motor Cars (www.rrbew.co.uk) I was very concerned to read this warning:

> *This is a dire warning concerning the change of formulae in various antifreeze products. Manufacturers have quietly moved to the new Organic Acid Technology (OAT) from the old Inorganic Additive Technology (IAT). That's fine for modern-day cars but in most cases the antifreeze is totally unsuitable to our types of cars and their ages. Unless the antifreeze is specifically stated as IAT, you need to check with the manufacturer's technical department.* ***Whilst manufacturers say that the new technology is suitable for old cars, their definition of old means ten years.***

There was also the story from Phantom III expert Stephe Boddice. Wanting to replace his two-year-old fluid Stephe bought new antifreeze for his PHI. His usual brand was out of stock so he bought the new "advanced" formula. It came with no warning of danger, saying it was compliant with BS6580 and suitable for old cars. Four weeks later he found pools of antifreeze under his car. Five months later he had a meeting with the National Technical Manager of the "advanced" coolant manufacturer. He was categoric in his statement that this "technology" is inappropriate for use in any Rolls-Royce or Bentley engine other than the latest Bentley GT and Goodwood Phantoms; no "ifs" and/or "buts"!

It turns out that "advanced" coolant is manufactured using an Organic Acid Technology (OAT) corrosion-inhibitor pack. The previous antifreeze used an Inorganic Additive Technology (IAT). Evidence supplied to the retailer by the manufacturer admits that the OAT-inhibited coolant is known to cause leak problems even in engines that do not use wet liners. The major fault with the inhibitor is that it attacks, amongst other things, silicone compounds. The most commonly used base compound for gasket sealants is silicone. It also attacks lead-based products, e.g., lead bushings in a 20/25 water pump or solder in a Rolls-Royce radiator header tanks.

In the USA, 14 years after General Motors began using Dex-Cool as an antifreeze in most of its cars and light trucks, GM car and truck owners continue to complain that the coolant corrodes and clogs radiators and radiator caps, erodes water pumps, rots radiator hoses and causes chronic overheating and engine damage while leading to leaky engine gaskets.

The conclusion: do not use OAT-inhibited coolant in your 20th century engine! And as we will learn below, do not rely on color to identify the coolant type.

Inorganic Additive Technology (IAT) is the chemical composition for the traditional antifreezes that are blue in color in the UK and green in the US. An IAT can be used with either ethylene glycol (EG) or propylene glycol (PG). The normal IAT service life is two years or 30,000 miles (50,000 km). In the USA antifreeze with IAT is often called ''conventionally-inhibited".

Organic Acid Technology (OAT) was the first long-life/extended-life antifreeze. OAT can be either EG or PG but is mostly EG-based. It was introduced in an effort to reduce maintenance costs, downtime and environmental disposal costs and issues. With the introduction of this totally new concept,

antifreeze manufacturers wanted to differentiate this new product from existing antifreezes. To accomplish this, they introduced different colored dyes for their long-life/extended-life products. Orange and red dyes were used first. These dye colors are still used by GM and Caterpillar. Now it appears there may be virtually no limit to the different dye colors: green, pink and blue have been added to the list of available OAT antifreezes. It is recommended that OAT not be mixed with any other antifreeze technology. The normal OAT antifreeze service life is five years or 150,000 miles (250,000 km).

Hybrid Organic Acid Technology (HOAT) is a combination of IAT and OAT with nitrates added. This makes HOAT suitable for use in both light-duty and heavy-duty systems. Currently, two manufacturers are using HOAT for their vehicles. The Daimler-Benz version is dyed orange and contains 10% recycled antifreeze. Ford Motor Company's version is dyed yellow and does not contain any recycled antifreeze. Both of these HOAT antifreezes use the marketing designator GO-5. They are compatible with each other but mixing them with IAT or OAT is not recommended. The normal HOAT antifreeze service life is five years or 150,000 miles (250,000 km).

Nitrated Organic Acid Technology (NOAT) is an OAT with nitrates added. This makes NOAT suitable for use in both light- and heavy-duty systems. NOAT and HOAT are very similar in performance characteristics. The normal NOAT service life is five years or 150,000 miles (250,000 km).

The color of antifreeze is no longer an accurate indicator as to whether it is an IAT, OAT, HOAT or NOAT formulation. There are currently at least two oranges, two reds, green, dark green, yellow, blue, blue-green, clear and pink dye colors available. Further, some antifreeze manufacturers market "universal" antifreeze they say is compatible with all OAT, HOAT and NOAT formulations. These "universal" formulas are not for use with IAT and they will not convert an IAT to a long-life or extended-life antifreeze.

• • •

As you may know, ethylene glycol is very toxic. As little as 30 ml can be fatal for adults and 4 ml will kill a cat. I will not have it on my property, in case children or animals drink it. In addition, ethylene glycol damages paint, and 0.5-1.0% concentration in the oil will cause rapid main-bearing failure resulting in engine seizure. Propylene glycol is much more environmentally friendly. It is nontoxic and will not damage paint. It is biodegradable and can be mixed with drinking water. It also has an intrinsic bitter taste that makes it less attractive to curious animals. Propylene glycol does not break down into corrosive elements and can be used for many years, retaining excellent aluminum protection and preventing lime scaling around the copper tubes in the blocks. Tests have shown that aluminum corrosion was lower for PG-based antifreeze than for an EG version.

In laboratory and engine dynamometer studies, PG antifreeze has performed better than similar products containing EG with regard to cast-iron cavitation corrosion. Fuel economy, heat transfer and other key performance characteristics were the same for both PG and EG coolants. Public pressure in France has forced the introduction of PG. Since 1998, propylene-glycol-based alternatives have been available highlighting the "green" aspect. California has done a lot of testing on propylene glycol. Sta-Clean Antifreeze™ is one recommended product and is used extensively by transport fleets and also RROC members. It is conventionally inhibited and with correct maintenance their test fleet has run 800,000 miles without changing antifreeze. Sta-Clean tested an engine running with 8% antifreeze added to the oil and is the only manufacturer to claim it will not harm bearings.

• • •