SILVER CLOUD II COOLING SYSTEM

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The cooling system designed for the V8 engine of the Silver Cloud II introduced in 1959 had been a compromise from the start.

The management had imposed strict limitations on the design team. Who would probably have preferred to have done things differently if they had been given a free hand. The costs involved in re-tooling to manufacture the new engine and the associated mechanical upgrades were going to be substantial. Attempting to re-design the body structure around the engine compartment would have been too costly to contemplate, and could have destroyed the beautiful lines of the well liked body.

The Silver Cloud's high sided and narrow engine compartment allowed adequate airflow and access to the in line six cylinder power unit. The same cannot be said when the much wider V8 power unit is installed in the same space. The V8 only just fits between the inner wings. Air flow is therefore drastically impeded. In addition to this situation the design team had been told to design the new engine to use the same size radiator that had been applicable to its six cylinder predecessor. That meant cooling 6.25 litres with the same sized radiator used to cool a 4.9 litre engine.

Engine running temperature is vitally important for several reasons aside from preventing the moving parts from seizing. The carburettors will suffer problems with fuel vaporising in the float chambers and inlet manifolds, if the under bonnet temperature isn't kept within reasonable limits. Modern fuels are vastly more volatile than those around when the cars were new. Therefore even cars with perfect cooling systems can have fuel vaporisation problems in hot weather. Such problems are only made far worse if the engine is allowed to run hotter than it was designed to. Insufficient heat will create problems with the automatic choke system. An excessively cool running engine will suffer accelerated bore wear, and will often suffer with flat spots and not run as sweetly as it should. A cold running engine will also drastically affect the performance of the in car heating system. It is therefore worth an owner's time to ensure his cooling system is in correct order. With the youngest of the Silver Cloud range now in their 41st year it is hardly surprising many cars have problems.

I should say at this point, I in no way suggest the cooling system is effective or badly designed. If everything is working properly, the system works well in normal conditions.

Problems can arise however, if the cars are not treated with a degree of respect. This is especially true of neglected cars that have been fitted with badly designed air-conditioning. Several such cars are required to work hard in very hot environments. During conversations with specialists in Texas and other hot areas of the world, I have heard descriptions of devastating overheating damage sustained by cruelly treated Silver Clouds. If the companies who install air conditioning to Silver Clouds only realised how much damage can be caused by overheating these cars, perhaps they could be persuaded to fit thermal cut-off switches to their equipment. It is an easy matter to introduce a thermal cut out switch to the compressor clutch feed cable. Then if the under bonnet temperature exceeds a safe predetermined limit the air conditioning is switched off until the

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temperature falls back to a safe limit.

Advancing years and ever increasing traffic density bring problems for poorly maintained cars. Many owners are simply unaware anything is wrong. Rather like arterial disease in human beings, chemical reactions slowly and insidiously choke the water jacket in the engine. They eat away the impeller blades of the water pump, and block the capillary tubes in the radiator. After over 40 years without much attention a neglected system may only be performing at 60% of its full capacity.

Many owners have no idea when their antifreeze was last changed or if the ratio of antifreeze to water is correct. The correct antifreeze mixture is absolutely vital in order to maintain the health of the cooling system. Without it severe internal corrosion will destroy the engine from within. Regular flushing and back flushing of the system is also necessary to keep the system clean. When the cars were new the type of antifreeze available only had an effective life of a few months before the corrosion inhibitor degraded and became useless. Rolls-Royce issued the owners of new cars with sachets of inhibitor crystals to enable them to maintain optimum inhibitor levels. This inhibitor was known as NaMBT or sodium mercaptobenzothiazole. Owners were recommended to add the first sachet of inhibitor when the car had covered 1,500 miles. That sort of mileage can easily be covered in a very short time, from this fact alone it may be deduced just how short lived the inhibitor really was. As soon as the inhibitor stopped working damage started. How many owners could be bothered to think about such a thing? Few I would suspect.

Some cars were diligently maintained, others have not been so lucky. Years of neglect will create a sorry mess for anyone looking to bring a car back into top condition.

If there is one thing the Rolls-Royce V8 engine will not tolerate, it is being over heated. Running a Rolls-Royce V8 outside its designed heat range is asking for trouble. It is surprising just how much heat is generated with the engine at idling speed. The amount of heat generated with the engine pulling hard up hill is truly amazing. A large engine such as that fitted to the Silver Cloud can go from normal running temperature to boiling within seconds. If this is born in mind it is easy to appreciate the need to be able to dissipate large surges of heat quickly as engine output rises.

The speed with which a Rolls-Royce V8 can go from normal running temperature to boiling was graphically demonstrated to me on my own car. I had carried out a cylinder head overhaul. To do this it was of course necessary to drain the cooling system. The job took several weeks to have parts made etc. As the job neared completion I became concerned that the dirt clinging to the internal surfaces of the water spaces within the engine would have dried out. If this sort of dirt does dry out, it loosens. When the engine is re-filled it leaves the walls of the coolant passages as the engine warms up and is carried around the system in the coolant. If these particles of dirt enter the radiator they will effectively bock the capillary tubes rendering the radiator useless. With this in mind I fitted a conical copper mesh filter inside the top hose. My intention was to carefully watch the temperature gauge with the engine running to ensure the engine did not overheat due to the filter becoming choked with dirt. With the engine running I kept my hand on the top hose, waiting for the surge of heat which would tell me the thermostat had opened. After I felt the surge of heat I kept a close eye on the temperature gauge as I carried out some fine tuning. With the engine warm I drained down the cooling system and cleaned the filter that I had fitted to the top hose. I repeated the process over 8 times until I thought I had removed as much dirt as I could. With the engine at normal temperature, I continued my adjustments. I remember stopping work to check the temperature gauge which showed the engine to be maintaining normal temperature. In the time it took me to walk from

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the driver's door around the front of the car to the passenger side, the engine boiled. A jet of steam burst out of the radiator overflow pipe, combined with the gut wrenching rumble of boiling water.

Upon investigation I found the conical filter had become completely choked with dirt, shutting off the flow of coolant to the radiator. I realised immediately the engine would need to be stripped down. Overheating is almost always destroys the cylinder liner seals. (The tell tail for this having happened is leaking oils or water from the drain holes in the flanks of the crankcase.) If an engine overheats when it is under load piston and bore damage often result.

(An account of the engine rebuild I carried out can be read in the engine section of the site)

Whilst I re-built my engine, I sent my original Marston Excelsior radiator to be professionally cleaned and flow and pressure tested. Fortunately it was pronounced fit for further service.

Another cause of ineffective cooling is of course the use of hard water in the system. Many cars have suffered at the hands of uninformed service personnel and owners who used hard tap water in the system over a number of years. Lime scale deposits fur up the capillary tubes in the radiator as well as the engine cooling passages, and heater matrix. It is therefore important that only soft or de-mineralised, or rain water is used in the system.

When the Silver Cloud II was launched, Rolls-Royce recommended their service agents to change thermostats with the seasons. The summer thermostat was calibrated to open between 66 and 70 degrees C. The winter thermostat was calibrated to open between 76 and 80 degrees C. Both thermostats were at their full flow position at 90 degrees C. The type of thermostat used was the Alcohol filled bellows type, made by Smiths Industries. This differed slightly from the run of the mill Alcohol thermostat used on nearly all British cars of the period. Rolls-Royce designed their thermostats to operate two valves. The main valve controlled the water flow through the top hose, the second valve shut off the flow of water flow to the bi-pass circuit when the main valve opened.

In 1961 Rolls-Royce sent out a service bulletin advising their service agents of a new all year round thermostat. It was to be fitted to cars whose owners complained of poor interior heater performance. The part number was RE23713.This thermostat started to open between 70 and 75 degrees C and was at its maximum flow at 90 degrees C.

Personally I think the original alcohol filled bellows type thermostats were a far superior design to the current highly priced, unreliable (at least in my experience) "wax stat" offerings from Crewe.

I like the alcohol thermostat for two reasons. Firstly if they fail they nearly always fail in the open position doing no harm to the engine. Secondly an alcohol thermostat reacts to changes of temperature far faster than a wax stat, resulting in more stable engine temperature.

A "wax stat" by the very nature of its design nearly always fails in the closed position. Bearing in mind a Rolls-Royce V8 can cost well in excess of £17,000 to fully rebuild, I find it amazing no fail safe thermostat is currently available from Crewe. Even the fusible plug fitted to earlier "wax stats" has been deleted from the design of the current part. The fusible plug melted unblocking a hole which reinstated the flow of coolant if the thermostat failed in the closed position.

In my experience the "wax stats" currently supplied by Crewe are unreliable. In four years I have found it necessary to replace three "wax stats".

It has always been my practice to check thermostats are correctly calibrated before fitting them to any engine. The first and third new Crewe supplied "wax stat's" I tested failed to open at all, the second was correctly calibrated at the time I fitted it to the engine. However 2 years later I had occasion to check it again. To my disgust, I found it out of calibration to a serious degree. Instead of opening at a maximum temperature of 80 degrees C it opened at 98 degrees, just short of boiling! This seems to me to be wholly unacceptable, especially when these things cost a whopping £151 plus VAT! As apposed to the £10 charged by nearly every other manufacturer for their thermostats!

What a pity alcohol thermostats were discontinued. Their demise was brought about by the advent of pressurised cooling systems. Manufacturers like Rolls-Royce switched to pressurised cooling in order to improve cooling of certain hot spots in their cylinder heads. By applying pressure to the coolant, it is forced to keep in contact with the hottest parts of the cylinder head without turning to steam. Pressurisation also gave more stable cooling at higher altitudes by preventing the coolant boiling at lower temperatures in reduced atmospheric pressure.

The alcohol filled thermostat uses a hermetically sealed bellows. Made of film brass, the bellows were filled with a pre-determined quantity of pure alcohol. As the alcohol became heated in the bellows it evaporates and expands causing the bellows to expand upward at a finite rate against temperature. As temperature falls the alcohol re-condenses and contracts. Soldered to the bellows is a valve which moves with it. The Valve and bellows are contained within a casting which forms the outer body of the unit. The bellows are delicate and are easily punctured or crushed, their correct operation is also drastically affected by the pressure of the surrounding coolant. When cooling systems were designed to be pressurised, this pressure crushed the bellows of the alcohol thermostat preventing it from opening. When used in systems with pressures drastically exceeding 8 PSI the design could not be made to operate effectively. Higher altitudes also affect the calibration of the alcohol thermostats, when used in ambient pressure systems. The lower the atmospheric pressure, the lower the temperature the valve opens, causing engines to run cooler and cooler as the altitude rises. This inability to operate in pressurised or high altitude environments was the downfall of the failsafe alcohol thermostat. Failure is nearly always due to a leak in the brass bellows. Any leak, results in the bellows expanding to their full extent. This of course allows the engine to run cold.

The wax stat unaffected by external pressure soon took the place of the alcohol thermostat. They use a hermetically sealed bulb filled with wax into which bears a conical pin. As the wax is heated it expands forcing the pin out of the bulb. The pin in turn pushes open the valve against the pressure of a return spring. As the temperature drops the wax contracts, the pressure on the pin is reduced, and the return spring forces the assembly toward the closed position. Wax stats have a reputation for reliability in service, but when they do fail, they fail closed. This is usually because the hermetically sealed bulb of wax has started to leak and cannot provide the pressure to open the valve.

As far as I am aware no-one offers a failsafe thermostat for the Silver Cloud II and III. At the time of my last request for information Crewe could not supply me with a thermostat that starts opening under 80 degrees C. If you ask your local dealer for a new thermostat, you will probably be supplied with one calibrated to start opening at 88 degrees C. Some 22 degrees hotter than the opening temperature of the original summer thermostat! Many owners will in all likelihood not experience problems when running their engines fitted with an 88 degree thermostat. However a surprisingly large number of cars do suffer with fuel vaporisation problems especially in the summer months. In my experience, the Silver Cloud III rarely suffers with fuel vaporisation. It was of course designed to run using an 88 degree thermostat and uses different carburettors to those fitted to the Silver Cloud II.

It is an accepted fact that engines burn fuel more efficiently at higher running temperatures. Perhaps this added efficiency together with improved interior heater performance is the reason Crewe decided to produce the current thermostat.

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Whilst I am interested in fuel economy, the long term health of my engine is far more important in my view.

	Silver Cloud I	Silver Cloud II & III	Freezing Point
25%	7 pints	5.3 pints	-12□c
30%	8.4 pints	6.3 pints	-16
35%	9.8 pints	7.4 pints	-19
40%	11.2 pints	8.4 pints	-23
45%	12.6 pints	9.5 pints	-30
50%	14.0 pints	10.5 pints	-37

Having experimented with several different thermostats I noted my own car runs far more sweetly when the engine temperature is maintained below 80 degrees C. After fitting an 88 degree C Crewe thermostat fuel vaporisation became a persistent problem when the engine attained its full operating temperature. It would appear to me that Jack Phillips and his team, (the designers of the Rolls-Royce V8) knew better than anyone which running temperature was right for this engine. Their original specification for a cool thermostat setting, not doubt arrived at after exhaustive testing, seems to me to be ideal.

With no thermostat conforming to the original design still readily available, I embarked on a lengthy search for a new old stock item. Finally after over 6 weeks searching all over the world I was able to acquire a new old stock summer thermostat from the United States.

Having seen the ravages of neglect on these lovely cars too often, I would urge anyone maintaining a Rolls-Royce V8 to make regular checks to ensure the system is regularly flushed, filled with the correct ratio of antifreeze to de-mineralised water, and is fitted with a working, correctly calibrated thermostat.

ANTI-FREEZE RATIOS

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