



Cooling Systems

Your vehicle's engine transforms gasoline into mechanical power to drive the wheels, most of the energy in the gasoline (approx 70%) is converted into heat, and it is the job of the cooling system to take and dissipate that heat. In fact, driving down the highway produces enough energy to heat a three-bedroom home. The main job of the cooling system is to keep the engine from overheating by transferring this heat to the air, but the cooling system also has several other important jobs. The engine in your vehicle runs best at fairly high temperatures. When the engine is cold, components wear out faster, and the engine is less efficient and emits more pollution. So it is important for the cooling system to allow the engine to heat up as quickly as possible, and then to keep the engine at a constant temperature (around 90 deg Celsius) for maximum performance and lowest exhaust emissions. The cooling system circulates coolant through passages in the engine block and cylinder heads absorbing heat, thus cooling the engine; it is then pumped through the radiator, which transfers the heat from the coolant to the passing air. The thermostat in the system regulates the volume of coolant passing through the radiator thereby controlling engine temperature.

The coolant or anti-freeze used in today's modern engines has a very important job; it must conduct heat, prevent corrosion of the various metals, lubricate the water pump seals, prevent gasket deterioration and prevent it from freezing and damaging the engine in cold climate conditions. Vehicles operate in a wide variety of temperatures, from well below freezing to well over 40 degrees C. So the coolant has to have a very low freezing point, a high boiling point and the ability to hold a lot of heat. Anti-freeze is a mixture of water and ethylene glycol, which at a 50/50 mix freezes at 36 deg C and boils at 106 deg C. (note that pure anti-freeze will freeze at -17 deg C, so proper mixture is very important). Since engine temperatures can exceed 106 deg C engineers found by pressurizing the system the boiling point can be raised to as high as 121 deg C. Vehicles equipped with automatic transmissions and air conditioning also add additional load to the cooling system.

The green coolant we are accustomed to seeing has an efficient life expectancy of 2 years, after that its properties dissipate and deteriorate resulting in corrosion of engine materials and gaskets, lime build up may occur, sludge may form and restrict heater core flow (causing low heat output inside your vehicle in cold weather). The coolant becomes acidic (which can damage head gaskets and radiator tubes) and overheating problems can result. So one can see the importance of monitoring coolant condition and regular service intervals of replacing the coolant to reformat the inhibitors and prevent gel formation.

To combat this problem many of today's vehicles have a "long life coolant" installed at the factory (this is usually pink, blue or purple depending on the manufacturer). The advantages of long life coolant are:

- 1: Improved heat transfer (it does not insulate components like regular antifreeze).
- 2: Improved water pump seal life (due to lack of abrasive solids).
- 3: Better protection of all cooling system metals, less pitting, corrosion and erosion (over regular anti-freeze)



4: Being of organic composition they are more environmentally friendly

Proper mix of your coolant is very important. Adding too much antifreeze causes the cooling system to lose its ability to transfer the heat away from the engine. Adding too much water causes the cooling system to lose its ability to fight off corrosion and clogging. A mixture of 50% coolant and 50% water gives you the best efficiency for your vehicle. It is also recommended using distilled water to prevent impurities in the tap water from contaminating the coolant. A pure mixture of ethylene glycol freezes at -17 degrees Celsius, therefore, when topping up your system always use the 50/50 mixture.

Ethylene glycol (green coolant) has a life expectancy of 2 years, after which time it becomes acidic resulting in corrosion of engine materials and gaskets, sludge may form and restrict your heater core and radiator flow. Dex-cool (GM's pink long-life coolant) brags a life expectancy of 5 years. However, here at Buehler Automotive we're finding two to three years is average. You may have heard the GM commercial for Dex-Cool that states "If someone tells you your coolant doesn't have a life expectancy of 5 years, come see us". When you arrive they'll check your PH level and coolant condition, and probably advise you to have a coolant system service.

Dex-Cool's problem is oxidation. One cause is due to poor cooling system designs, where the top of the radiator is lower than the engine. Another cause is improper radiator caps that allow air in the system. When oxidation happens the metal surfaces begin to corrode, which contaminates the coolant. Now a chain reaction occurs and the system degenerates (becomes acidic) and it loses cooling efficiency.

There are a few misconceptions about long life coolant. Some articles state that Dex-Cool is more prone to gasket leaks than green antifreeze. The fact is that regular green antifreeze additives coat the inner surfaces like a "stop leak" however, this will also insulate the system resulting in poor heat conduction. Another statement is that it leaks more readily. Most of these leaks are gasket leaks resulting from the use of inferior gasket materials and are not compatible with the coolant. As manufacturers begin to use better gasket materials, we will see this problem greatly reduced. Another misunderstanding is that if you add regular green antifreeze to Dex-Cool that it will "gel" the coolant. What does happen is that it will revert back to the properties of green antifreeze.

We recommend checking your antifreeze (whether its ethylene glycol or Dex-Cool) every oil change interval, to monitor the acidic or PH level, which is a standard procedure here at Buehler Automotive. Please note that it is quite normal to have to top up in small quantities of coolant on Dex-cool systems due to vaporization. Studies have shown that more than 20% of all automotive failures are cooling system related. This fortifies the need to keep your cooling system in top condition for safe worry free motoring.