

Issue	Cause	Effect	Cure
Rust	Oxidation within the cooling system	Clogs the system. Causes accelerated wear.	The inhibitors in a quality Supplemental Coolant Additive (SCA) prevent the oxidation process
Scale	Salt minerals, especially calcium and magnesium, are present in all tap water. These minerals can solidify and plate onto hot metal surfaces.	Clogs the passages of the system. Deposits on the high temperature areas act as an insulator reducing heat transfer, causing hot spots. This results in uneven metal expansion, resulting in scuffing, scoring, accelerated ring wear and eventually can lead to cracked heads and/or cracked blocks.	SCA keep salt minerals in suspension so that they can not deposit on the engine metal surfaces. Maintaining the level of SCA with regular monitoring ensures that deposits do not occur.
Acidity	Glycol based antifreeze reacts with oxygen in the air and forms acids. A loose head gasket or engine exhaust (blow by gases) can allow sulfuric acid to be formed. The acid can leak into the cooling system.	Sulfuric acid corrodes iron, steel, and aluminum, putting corrosive particles into solution.	A quality SCA neutralizes acids to prevent corrosion. Measurement of the level of SCA is important to ensure that this protection is available.
Pitted Cylinder Liner	Constant vibration of the cylinder liner causes a momentary vacuum to form on the surface of the liner. Coolant boils into the vacuum and the vapor bubbles implode on the surfaces of the liner. The literal cauldron of chemistry wears and eventually penetrates the unprotected liners.	The pits, which can extend over time, through the thickeners of the liner, can allow coolant to enter the combustion chamber or crankcase.	SCA coats the liner with a thin oxide film protecting it from erosion without impeding the heat transfer capability. Maintaining the correct level of nitrites ensures that the liners are protected against pitting. The SCA should be tested at each wet PM.
Foam	The leakage of air into the cooling system can cause bubbling of the antifreeze coolant.	This adds to the cavitation erosion problem. Overheating, due to less efficient heat transfer, can occur. This contributes significantly to the corrosion of the water pump impellers	SCA has an anti-foam agent to prevent the formation of the air bubbles. This foam prevention is effective at all temperatures, including start up.
Pitted Water Pump Impeller	Flow rates and turbulence are high at the impeller blade. This causes cavitation	Loss of pump efficiency, overheating, inefficient fuel usage, and total pump failure.	SCA protects the impeller from cavitation erosion and the filter holds the particulate matter to reduce wear on the cooling system parts.