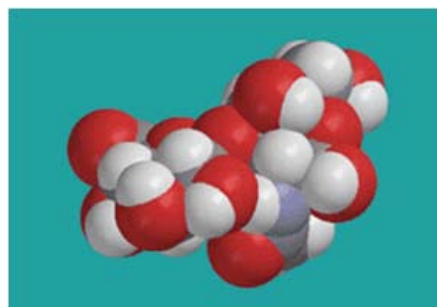


## ANTIFREEZE WITH PHOSPHATE INHIBITORS

In many US and Japanese antifreeze formulas, including those produced by Old World Industries, phosphate is added as a corrosion inhibitor. European vehicle manufacturers, however, recommend against the use of phosphate containing antifreeze. The following will examine the different positions on this issue to help judge the pros and cons on phosphate inhibitors.

In the US market, a phosphate inhibitor is included in many formulas to provide several important functions which help reduce automotive cooling system damage. The benefits provided by the phosphate include:

- Protect aluminium engine components by reducing cavitation corrosion during high speed driving.
- Provide for corrosion protection to ferrous metals.
- Act as a buffer to keep the antifreeze mixture alkaline. This prevents acid build-up that will damage or destroy metal engine parts.



European automobile/ truck producers feel that these benefits are achievable with inhibitors other than phosphate. Their main concern with phosphate containing products are the potential for solids drop-out when mixed with hard water. Solids can collect on cooling system walls forming what is known as scale. This concern comes from the fact that European water is much harder than water in the US. Because phosphate "softens" water by forming solids of calcium or magnesium salts that can drop-out of solution, there is potential for cooling system blockage. The phosphate level in most US and Japanese antifreeze formulas do not generate significant solids. Furthermore modern antifreeze formulations are designed to minimize the formation of scale. The small amount of solids formed present no problem for cooling systems or to water pump seals.

For now, Old World Industries believes that phosphate will remain a primary ingredient for cooling system protection. Still, as a good corporate citizen, we continue research on other inhibitor types that will provide the same benefits without phosphates. To show this commitment, Old World Industries is now marketing a heavy duty antifreeze that incorporates a phosphate free inhibitor package. This new product is called Fleet Charge antifreeze. It is a universal formula that passes both heavy duty and automotive specifications.

In most US and Japanese vehicles, you can use either a phosphate free or phosphate containing antifreeze during the warranty period. However, phosphate containing antifreeze can void European OEM warranties. Old World Industries advises that only recommended antifreeze types be used in these vehicles during the warranty period to ensure complete coverage.

INHIBITOR	PROS	CONS
Phosphate	Iron protection	Hard water scales, depletes with time, Europeans don't use.
Borates	pH buffer, protects iron	Aggressive to aluminium, not used by Japanese
Silicates	Aluminium protection, loved by Europeans	Depletes, linked to gasket leaks, not used by Japanese, short lived / unstable - short shelf life
Nitrites	Cavitation protection, iron protection, loved in US	Depletes, not allowed in Europe
Nitrates	Aluminium pitting protection	None
Molybdates	Protects ferrous metals	Expensive
Organic Acids, Benzoates, 2-EH Sebacic Acid	Long lived, good metal protection, improved heat transfer	Slow film forming, poor compatibility for aliphatic acids with some inorganic additives.
Azoles	Best soft metal protector	Degrades over time
Amines		Banned everywhere