



An antifreeze is an additive which lowers the freezing point of a water-based liquid. An antifreeze mixture is used to achieve freezing-point depression for cold environments. Common antifreezes also increase the boiling point of the liquid, allowing higher coolant temperature.

Coolant corrosion inhibitors help decrease the corrosion rate of metals within your equipment and help maintain other coolant properties

Modern coolants contain three main ingredients:

1. Water
2. Antifreeze
3. Dye

Modern organic coolants last a long time, but there's a problem. They don't offer the same corrosion protection as inorganic coolant does. That's why coolant manufacturers load their coolants up with additives.

Each additive serves a certain purpose. Some additives may serve the same purpose. But one additive may work with certain materials better than another, and vice versa. Let's talk about the most common additives found in modern coolants, and how each one can damage your engine:

1. Borate

Borate is a pH buffer that:

- ✚ Lowers the freezing point of the coolant
- ✚ Increases the boiling point of the coolant
- ✚ Reduces friction and sludge
- ✚ Prevents corrosion at high temperatures
- ✚ Helps prolong the life of the coolant during storage
- ✚ Gets rid of the sulfur smell

Borate sounds like the ideal coolant additive. But it can damage older engines designed for inorganic coolant. Whenever coolant is changed, there is always some old coolant left behind in the engine. If a new coolant containing borate is installed, the borate will react with the old coolant. The old coolant will lose its cooling capacity. But, worse, it can become corrosive.

2. Nitrite

Nitrite is an acid that helps protect iron from:

- ✚ Corrosion



✚ Cavitation (the forming of tiny bubbles)

It coats the iron and protects it. You'll find nitrite in many coolants made for older engines with iron parts, or for diesel engines. But you won't find it in coolants made for newer engines. It's because nitrite and aluminium don't go well together.

If you put coolant containing nitrites into an engine with an aluminium block or aluminium head(s), the nitrites will cause corrosion. That is, unless the coolant has special additives to protect aluminium parts from corrosion. Otherwise, the nitrite in the coolant can "eat" the aluminium in your engine. Since more modern engines are using aluminium parts, nitrite is becoming obsolete.

3. Phosphate

Phosphate is a fast-acting acid that protects some metals from corrosion. It's found in many IAT coolants. It works with many different kinds of metals, but it's prone to flaking off and forming layers of scale. Scale formation is more likely when phosphate is mixed with hard water. A lot of European automakers avoid coolants that contain phosphates. It's because hard water is commonly mixed with coolant in Europe. Let's say you put coolant containing phosphates into your engine, but you don't replace the coolant often enough. Your cooling system can become clogged with scale. This reduces the efficiency of the cooling system. Removing the scale can also be expensive, as you may have to flush out the coolant system several times. It's because scale slowly flakes off the various cooling system components.

4. Silicate

Silicate is like phosphate. It's a different type of fast-acting acid that provides protection from corrosion. It works with many different metals, especially aluminium. Yet, silicate isn't so friendly to some types of gaskets.

A coolant containing silicates may eat away at the water pump seal/gasket, and/or other gaskets in the cooling system. If you add a coolant containing silicates to the wrong engine, the cooling system may lose some cooling ability. This will be a problem if your vehicle is working especially hard while operating in higher temperatures, such as towing or hauling. Worse, you could see gasket failure.

5. Sodium Benzoate

Sodium benzoate is an odourless crystalline powder that's a combination of benzoic acid and sodium hydroxide.



ANTI-CORROSION AND ANTI-FREEZE ADDITIVES



Sodium benzoate is an important additive in coolant for hybrid engines because it:

- ✚ Helps prolong the life of the coolant in the engine
- ✚ Provides significant protection against corrosion
- ✚ It sounds like an ideal solution, but it's actually detrimental when exposed to:
 - ✚ Aluminum alloys
 - ✚ Hard water

When exposed to these elements, sodium benzoate can increase the risk of corrosion.