



# INTRODUCTION TO COOLANT TECHNOLOGY



## ABOUT THIS WHITEPAPER

*This whitepaper was developed to guide professionals through the usage and formulation of heavy-duty coolant products. In it, we will examine:*

- ▶ THE DEFINITION OF "COOLANT"
- ▶ THE CHEMICAL MAKEUP OF HD ENGINE COOLANT PRODUCTS
- ▶ DIFFERENCES IN COOLANT FORMULATIONS

HD Expert provides a variety of coolant solutions for heavy-duty engines. Our team of expert engineers has developed an array of proprietary formulas specifically for HD applications. These precise formulas keep your engine cool and clean, so you can get the job done.

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## The Essentials of HD Coolant Chemistry

With so many proprietary technologies available, understanding the fundamentals of coolant formulation can be a challenge for both industry newcomers and veterans alike. Fortunately, the principles that guide your coolant decisions are much less impenetrable than they may first appear. Let's examine some basics of coolant formulation, from what they are to what they do and what they are usually made of. Once you have a solid grasp of these coolant essentials, choosing which you need for your particular vehicle (or fleet) will become much more intuitive.

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### COOLANT DEFINED

Let's start with the most fundamental question of all: What is "coolant?"

Coolant is a specially-formulated fluid designed to protect your HD engine by dissipating excess heat. However, this is just one of the many functions that your coolant carries out, all of which are invaluable to keeping engines healthy and safely operational. In addition to facilitating this heat transfer, coolants also contribute to:

- ▶ FREEZE PROTECTION
- ▶ CORROSION PROTECTION
- ▶ CHEMICAL STABILITY
- ▶ ANTI-BOIL PROTECTION

As we have mentioned, the primary purpose of coolant is to circulate through your engine and absorb excess heat generated during combustion. In HD vehicles, typically only one third of the energy derived from fuel combustion is converted into force – the same force that drives pistons, turbines, etc. While one third pushes your vehicle (or machinery) along, the other two thirds become heat.

The second third of that excess heat dissipates through exhaust, which leaves the final third still trapped inside your engine block. HD coolant absorbs the rest of this leftover heat and transports it to the radiator, where it can safely dissipate into the environment. Through the removal of this heat via coolant fluid, your engine is able to operate in an efficient manner.

Similarly, even when external temperatures rise, coolant is designed to remain a fluid. Though water is one of coolant's major components--something we will explore more later on – coolant resists water's natural tendency to boil/vaporize. If it didn't, turning to steam would reduce the coolant fluid's ability to competently dissipate heat.

But just because this fluid is called "coolant" doesn't mean that its only purpose is to keep your engine from overheating. Coolant may be roughly 50% water, which on its own is incredibly adept at dissipating heat. However, pure water is also prone to freezing in low-temperature conditions. That's why HD coolant contains a balance of both water and glycol, to provide your engine with protection from extreme cold. Many people use the terms "coolant" and "antifreeze" interchangeably because of this function. However, not all coolants provide the same degree of antifreeze protection, so their distinction is important to note.

Additionally, the longer they are in use, the more the elements of your cooling system corrode. To combat this, high-quality HD coolants contain additional defense measures for all the sensitive metal, plastic, elastomers, and rubber components that make up your system. They promote engine longevity by providing anti-foam protection, and cut down on corrosion by inhibiting the formation of acids. Different types of coolant also contain unique proprietary additives that prevent the gradual buildup of scale and gross, harmful gunk.

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## COOLANT COMPOSITIONS

Now that we have a better understanding of what coolant does inside of your HD engine, let's focus on its components. Although the function of coolant can be complex, its composition is relatively simple. In fact, most modern coolants contain only three primary ingredients:

- ▶ **WATER**
- ▶ **GLYCOL**
- ▶ **CORROSION INHIBITORS**

However, this third ingredient is technically a combination of several other substances mixed together.

We've already briefly discussed how water comprises around 50% of most coolant fluids. That's because H<sub>2</sub>O serves as the primary heat transfer medium in coolant – but only after it's been thoroughly deionized. By contrast, "normal" water (like you might get out of your tap) contains harmful mineral salts which can build up over time in an engine. Deionization is an important first step in protecting your engine from gradual wear and tear.

Moving on, ethylene glycol and propylene glycol are the two main materials used as antifreeze in coolant. Both can be used in automotive or HD engine coolants. Either way, it is generally accepted that ethylene glycol-based coolants offer the greatest cost-effective performance advantage when used as directed. However, while ethylene glycol is less expensive than propylene glycol, it is also considered to be more toxic. That's why propylene glycol-based engine coolants tend to be used in locations where a low toxicity product may be required.

Coolants also contain corrosion inhibitor packages, which are a combination of various chemicals/compounds that protect engine components from corrosion, oxidation, and other harmful effects resulting from usage. Each batch is designed for a specific application under specific conditions. If you want your HD engine to last, it's vital to select a coolant with a corrosion inhibitor package that is engineered to meet its unique needs.

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## COOLANT FORMULATIONS

Despite the seemingly simple composition of coolant, there is a wide range of formulations available on the market. The differences between coolants are primarily dictated by the quality of the glycol and water used, as well as the choice of corrosion inhibitor package. When choosing your coolant, make sure you select one with the appropriate package, of which there are three main types:

- ▶ **CONVENTIONAL**
- ▶ **OAT**
- ▶ **HYBRID**

Other differences in formulation also come down to trace elements like dyes and bittering agents. Dyes are used to give each coolant a distinct color – this is useful both for telling them apart at a glance and noticing when there's been a leak of some sort. Bright pink or blue fluid is much easier to spot than clear. Bittering agents counteract the natural sweetness of glycol, to prevent accidental consumption by small children and animals.

The successful pairing of an HD engine with its ideal coolant provides a myriad of benefits: Effective heat transfer, corrosion protection, freeze point depression, boiling point elevation, chemical stability, and safety/ease of use. Conversely, failing to do so can increase your engine's risk of overheating, freezing, and suffering from cavitation or the degradation of vital components. Do your coolant research well in advance and make your selection carefully – or consult an expert to save time and money.

*HD Experts are the heavy-duty coolant professionals for all your most challenging coolant needs. Their sole focus is creating specialized coolant formulations for HD engines, resulting in superior protection, improved temperature control, and an extended service life. Discover what their solutions (including ProShield corrosion defence) can do for you today!*