Fall 2024

Dear No-Rosion Customer,

Hot summer driving is the ultimate "test" of how well you've maintained your car's cooling system. Hope you "passed the test" with a great summer of reliable, problem-free driving!

We often provide technical support to users of our various products when questions arise. In this newsletter, we'll share several unique scenarios that popped up this summer, along with our responses. It's our thought that you'll benefit from the info obtained as a result of these "*teachable moments*."

User Scenario 1:
"I purchased HyperKuhl last year and converted my cooling system to it with straight water. I drained the regular coolant at the radiator and engine block and flushed the system with water. Then I refilled it with additive and Reverse Osmosis water. For the remainder of the year everything was great. The car ran cooler than it ever did before! At the end of the year, I drained it and stored it in one gallon containers for the winter. In the spring, I poured it back in the cooling system. During my first drive of the season, I noticed the coolant gauge going up and down, as if the coolant was low. The next morning I checked the coolant level and it was the same, but it had turned brown and muddy like Dexcool would do when another type of coolant was mixed with it. I have not mixed any other coolant with it, so I'm trying figure out why the coolant has done this and what the fix is."

Response 1:
Unfortunately, this user unwittingly did the absolute worst thing possible. His reason for draining the straight water coolant for winter was understandable – to prevent the risk of freezing. <u>But draining the system and leaving it empty is the wrong approach</u>.

<u>Metals in a cooling need a constant source of corrosion inhibitors to prevent oxidation (corrosion) and rust.</u> **HyperKuhl** has a robust supply of corrosion inhibitors that provide 100% corrosion/oxidation/rust prevention – sufficient to pass ASTM D3306 specification. By draining the system, he removed all the corrosion inhibitors. <u>The result was predictable</u>: a significant quantity of rust (the brown material he described) was formed.

But it gets worse. <u>Oxygen</u> from air is the key driver in the oxidation/corrosion/rust formation process. When a cooling system is filled with fluid, very little (if any!) air is in the system. So there is insufficient oxygen to drive the corrosion process. BUT, if/when you drain a cooling system, you introduce copious quantities of air (oxygen) into the system. <u>This puts the corrosion process into hyperdrive</u>!

The <u>preventative action</u> is, of course, NOT to store the car with an empty cooling system. If there is freeze risk, fill it with antifreeze. Regarding <u>corrective action</u>, the problem is that he formed a large amount of rust in the system. He was advised to flush the system thoroughly and repeatedly – preferably with hot water – and use a double-dose of **HyperKuhl Super Flush**. Even after this, there remains the possibility that he'll not have gotten all the rust out. But that's how he needs to begin.

User Scenario 2:
"We run your HyperKuhl in our NASCAR racing engines with straight (purified) water. The product works great as we have never suffered any heat-related or mechanical cooling system issues. However, during a recent rebuild, we noticed a lot of black staining inside various aluminum alloy cooling system components. Is this normal? Or is it indicative of a problem? Please refer to the attached photo. Thank you."

Response 2:
This all appears to be normal and actually desirable/beneficial. We see this in lightweight aluminum alloy racing components quite often.

To understand how/why this is normal, and actually beneficial, it's first necessary to know how the OAT (Organic Acid Technology) corrosion inhibitors in **HyperKuhl Super Coolant** function. The mechanism involves stimulating the surface of aluminum alloys to form ENDOGENOUS surface films. They are called "*endogenous*" because the source of the protective film comes from the metal itself. The inhibitor chemically stimulates the aluminum surface to convert to aluminum oxide - which, in high-heat racing applications, appears as BLACK OXIDE - a highly protective, corrosion-resistant, and passive (non-reactive) material. This is how, and why, the black oxide surface film is desirable/beneficial. Research and many years of racing experience indicate this to be the most bulletproof means of protecting aluminum alloys from corrosion and electrolysis.

Comparatively, IAT (Inorganic Acid Technology) corrosion inhibitors, as found in conventional antifreeze coolants, function differently. They form EXOGENOUS surface films. Meaning, the source of the surface film comes from the coolant, not from the metal. Exogenous films constantly slough off and re-form, using inhibitors that are derived from the coolant. So over time, they deplete themselves. Additionally, they are more dose-sensitive than are endogenous films from OAT inhibitors. Meaning, if you have too much, they may drop out of solution and form insoluble coolant gels that bake onto surfaces, causing scales/deposits that are insulative and therefore reduce heat transfer. Or, if under-dosed, there is insufficient corrosion inhibition, which could result in corrosion, and pinhole leaks in radiators, for example.

As an aside, it's noteworthy that although **No-Rosion** contains IAT inhibitors, it is formulated to compensate for dosing excursions. Therefore it is not as dose-sensitive as IAT inhibitors found in conventional antifreeze blends.

Being composed of the oxide form of the metal itself, endogenous surface films are thinner than exogenous surface films, which enhances heat transfer. This is a desirable performance characteristic of **HyperKuhl Super Coolant**. And when combined with wetting agents/surfactants that are also in **HyperKuhl**, thinner oxide surface films are a key to maximum heat transfer.

We don't often see black endogenous surface films in street/automotive applications, where they typically are not visible. Or, if they are, appear grey or pale/light white. There are two main reasons:

1) Alloy components in racing applications tend to have higher aluminum content (less silicon), to be lighter and more efficient in transferring heat. Whereas alloys used in OE automotive applications tend to have lower aluminum content (higher silicon), to be stronger, more durable, less expensive, and longer-lasting. Higher aluminum content (racing application) yields surface films with higher aluminum oxide content, which is what turns black. Whereas lower aluminum content (automotive application) yields less oxide to turn black.

2) Higher heat conditions of racing are what drive the whitish/grey surface films to fully convert to black. And again, this is actually beneficial, as the black oxide form is even more passive, non-reactive, and durable than the whitish/grey form of the aluminum oxide in lower-heat automotive applications.

User Scenario 3:
"I have been using HyperKuhl Super Coolant in straight water with great results. However, I've noticed that over time, the mixture loses the blue color it has after the first few months of mixing. Does this mean the product has lost any performance? Should I be concerned?"

Response 3:
The blue color in **HyperKuhl** comes from a dye that is blended into the formula when it is produced. It is normal for this blue color to be lost over time. As **HyperKuhl** is a 100% water-based formula, slight amounts of nucleate boiling constantly occur where the water/HyperKuhl blend interfaces with hot cylinder heads. Because of this, a small percent constantly enters gaseous phase, then condenses back to the liquid phase in bulk coolant. The condensed phase loses the dye that creates the blue color. So over time, as a greater and greater percent of coolant has gone through the condensation process, it slowly depletes the dye, and fades the color. This is the nature of the beast with water-based coolant, and can't be changed.

Because of its higher boiling point (compared to water), glycol-based antifreeze coolant does not gasify and condense the same inside the heads. This allows it to maintain its color over time, as the dye is not lost during condensation.

User Scenario 4:
"I have a 1970 Mustang that I've owned for about 10 years. When I first flushed my cooling system 5 years ago, it had a 50/50 mix of Prestone and bottled water as the coolant. I read up on No-Rosion and decided to try it. I thoroughly flushed with hot water from a garage shop sink to completely remove all coolant from the engine. I then flushed with bottled water to remove the garage tap water, and filled with bottled water and 4 bottles of No-Rosion into my 19.3 quart system. Once circulated, I could see a nice clear and slightly pink color, as expected.

Due to age and recommendation from No-Rosion, I recently drained and flushed the coolant, using same procedure as above, and added 4 fresh bottles. After driving it a few times, I removed the radiator cap to see if it needed topping off. I noticed some grey gook inside the radiator. I took a popsicle stick and scraped away part of it, to show you what it looks like.

I now realize that I overdosed No-Rosion, as I actually needed 2 bottles, not 4. Did overdosing cause the No-Rosion chemicals to become unstable and form the grey gook? My worries are about clogging up my coolant system. Please see attached picture for your kind advice."

Response 4:
This cooling system likely contains "*legacy deposits*" that are well-established and have existed for years if not decades. Even though the system has been well-maintained for the last 5 years, deposits likely existed in the system before this user acquired the vehicle 10 years ago. They were formed from silicates in conventional antifreeze, and from hardness (calcium/magnesium) in tap water that was used in prior years/decades. This was confirmed analytically, as the user did follow-up by sending us a sample of the grey material to analyze in our lab.

Polymer dispersants in **No-Rosion** that PREVENT scale/deposit buildup also tend to SOFTEN scales/deposits over time, especially if overdosed. When this happens, the deposits are solubilized, and convert to gels that appear as grey "*mud*," as this user observed.

He has already taken preventative action in the form of now using bottled water and **No-Rosion** instead of antifreeze. As corrective action, he was advised to fill the cooling system with a double-dose of **No-Rosion Industrial Grade Cooling Flush**, run the engine for at least 2 hours, then flush again to remove this material. Moving forward, of course, he was advised to use **No-Rosion** at, *not above*, the recommended dose.

User Scenario 5:
I purchased a bottle of HyperKuhl additive for my Hummer H2. Since adding the product, it runs about 12 degrees hotter than before. Why did it cause my engine to run hotter, instead of cooler?"

Response 5:
The fact that the temperature INCREASED indicates that **HyperKuhl** is actually doing its job of reducing coolant surface tension, thereby allowing it to ABSORB more heat from the engine cylinder heads. But the problem is, it's not properly DRAINING that extra heat to the external environment via the radiator. This is due to an issue with the radiator and/or water pump. Likely culprits include, but may not be limited to: (a) insufficient coolant flow due to clogged, or partially clogged, radiator tubes, and/or (b) scales/deposits inside the radiator from coolant having not been properly maintained, and/or (c) water pump impeller wear that compromises coolant flow rate. Usually heaviest scales and/or clogged radiator tubes occur in the bottom of the radiator, as gravity causes coolant insolubilities to settle to the bottom when the engine is not running. Therefore, removing the radiator cap and looking down into a radiator with a flashlight is not an effective way of attempting to establish visual evidence of whether this is the issue. This user was advised to: (a) confirm whether coolant flow is consistent with OE specifications, (b) flush the system thoroughly, and (c) consider possible replacement of water pump and/or radiator as corrective action. If any/all these issues are present, the problem will only worsen over time, eventually resulting in overheating, roadside breakdown, and/or possible engine damage.

User Scenario 6:
I recently completed Year 5 of the No-Rosion service interval in my 1961 Mercedes 190 SL, having added it annually to RO purified water at proper dose all five years. I drained the system to begin the next five year interval, and captured photos of the used coolant at the beginning, middle, and end of the drain cycle, to identify any sediment or rust that may have been present. As the attached photos show, it came out clean and clear, with proper pink color. Is it necessary for me to use No-Rosion Flush, or will flushing with water-only suffice?"


Beginning


Middle


End

Response 6:
This user has done everything right. Adding **No-Rosion** annually to RO purified water, and draining after five years, visually indicates absolutely zero corrosion or dropout. Additionally, as **No-Rosion** contains a pH indicator that turns pink at or above a pH of 8.5, the visual also indicates that no acidic byproducts of combustion are present. As such, there is no need to use **No-Rosion Industrial Grade Flush**, as flushing with water-only will certainly suffice in a well-maintained cooling system like this one.

We thank you very much for your support, and look forward to continuing to be of service to you and your cars.

Sincerely,

Applied Chemical Specialties, Inc.