Fall 2025

Dear No-Rosion Customer,

As our 30th year of operation draws to a close, we're as excited as ever about what the NEXT 30 years bring!

This summer kept us very busy helping customers and OEM's solve various fuel-related problems. As the percent of ethanol continues to climb at fuel pumps across the world, so too do the numbers of incidents related to fuel system **corrosion damage**. These problems can be challenging to address, with the damage they cause being expensive to repair. But fortunately, as you're about to learn, they are all preventable and solvable.

In this newsletter, we'll share details of three recent examples of gasoline corrosivity. The third one may actually surprise you, because it involves gasoline containing 0.0% ethanol!

Because the context of some of this discussion involves fuel tank corrosion, a brief overview of protective coatings is in order. Automakers began using rust-preventive coatings and materials for fuel tanks in the early to mid-20th century, following military aviation developments during the World Wars. However, the use of internal tank coatings in mass-produced passenger vehicles did not come until later, as materials advanced.

The earliest fuel tank coatings were military innovations designed to prevent leaks from bullet punctures. During WWI, self-sealing fuel tank technology was developed, though early versions were not fully effective. Then during WWII, the technology was perfected and widely used in military aircraft. These tanks had multiple layers of rubber and fabric that would swell and seal a puncture when in contact with fuel.

For decades, most civilian vehicle fuel tanks were made from stamped steel, which was prone to corrosion. The push for more durable materials led to innovations in both steel and plastic tanks. In the 1970's, automakers began introducing coatings for steel tanks, and high-density polyethylene (HDPE) as a lighter, corrosion-proof alternative.

During the early 1990's, metal tank coatings continued to improve in quality. And multilayer plastic fuel tanks with special barrier coatings, such as ethylene-vinyl alcohol (EVOH), were introduced to reduce fuel vapor emissions and tank wall permeation. For example, commercial multilayer tanks began being used in 1995.

During the late 1990's and early 2000's, as fuel blends began using ethanol, most existing metal tank coatings proved incompatible and could degrade. Over time, through repeat temperature fluctuations, and vibrations from the vehicle when in use, cracks would form in their surfaces. This allowed corrosive ethanol degradation byproducts to get underneath the coating, resulting in corrosion of the metal tank surface, and accelerated rates of damage to the coating itself from both the top and bottom.

This led to the development of more advanced and impervious coatings by automakers, which then trickled down to the automotive aftermarket. Specifically, epoxy-based sealers solved the ethanol problem, as they are far more durable and, by and large, impervious. They bond to metal, resist corrosive degradation byproducts of ethanol fuels, and provide a durable, flexible, impermeable seal.

Having said this, let's now consider the first of our three examples, involving a 1995 Lamborghini Diablo. Our customer had recently purchased the low-mile vehicle, which had been parked in storage, dormant for at least six years. It came out of a large collection that was sold off, due to the recent passing of the owner. He wrote:

"After taking delivery, I tried to drive it but it would not run. After some sleuthing, we determined it wasn't an ignition issue. It was a fuel delivery issue, as the injectors and filters kept plugging.

We drained the fuel into a pan, and it came out silty. There was a weird dust that filled the bottom of the pan. After the tank was drained, we took off the lower filters that are just outside the bottom of the tank and a huge amount of the same dust came out. It looked like sand. But once dried, if you touch it, immediately turns to dust, like a fine powder. This compelled us to go ahead and remove the tank to identify whether more remained inside. Sure enough, there was still quite a lot of it in the tank. There are 3 ports at the bottom of the tank and they are all now open. We are letting the remaining gas dry out and then will use compressed air to blow it all out.

Please see the attached photo of the debris. Do you have any idea what it could be? The color ranges from yellowish/orange, to brown. The tank has no bladder. It is aluminum tank, holds 26.4 gallons, so it is not rust as there is no iron. Some of the pieces are larger, looking like flakes of something. They too turn to a fine dust when touched.

Our immediate plan is to vacuum out as much as possible and then use compressed air to blow out the remainder of the dust. May we send you a sample for analysis?"

He did send us a sample, and we analyzed it in the lab. We found it to consist of a combination of aluminum oxide salts, and degraded epoxy liner. The aluminum oxide results from corrosion of the aluminum tank. Normally it is white to off-white in color. However, in this instance, it had been stained to orange/brown from the decomposition materials associated with the epoxy liner. Specifically, before the development of today's more advanced solvent-free epoxy coatings, solvent-based polyamide epoxies were the standard when this 1995 Lamborghini was manufactured. As evidenced by this problem, these more primitive solvent-based linings often proved inadequate for long-term corrosion protection resulting from ethanol and/or the heavy, corrosive water layer that sinks to the bottom of the tank when phase separation occurs in aged fuel.

Moving forward, the customer will replace the tank with a new one with modern epoxy that is more resilient against ethanol. And as an added layer of protection, he'll use **No-Rosion Fuel System Combustion Optimizer**, as it's formula includes a corrosion inhibitor to protect metals, a dispersant to prevent water absorption by ethanol that can result in phase-separated gasoline, and stabilizer to prevent oxidative breakdown of gasoline.

This segues perfectly to our second example from this summer.

An OE motorcycle manufacturer reached out to us with a problem. Certain bikes being used for off-road racing were experiencing failures of submerged fuel pumps due to corrosion. Peculiar to the type of racing for which this particular bike is used is the humid environment to which they are exposed. In many instances, at least part of the course includes mud bogs. Also peculiar to this type of racing is the fact that regulations require they all run the same exact E6 (6% ethanol) fuel, which is sourced from a branded race fuel provider.

They sent us a sample of a failed fuel pump for analysis. Right away we could see the culprit was certain brass components inside the pump. They displayed corrosion byproducts that accumulated to the point that internal components seized. Brass being an alloy composed of copper and zinc, we know from prior investigations that copper, in particular, is sensitive to corrosive water-laden gasoline emulsions that accumulate in humid environments. For this reason, ASTM has developed the D130 Standard Test Method for Corrosiveness to Copper from Petroleum Products by Copper Strip Test, which is an important spec that most fuels must pass.

But the zinc component of brass can be sensitive to emulsified gasoline as well. In particular, it suffers from a type of intragranular corrosion resulting from increased electrical conductivity of the water in the emulsion. It triggers dissimilar metal electrolysis between the copper and zinc constituents that goes autocatalytic until the entire thickness of the alloy is penetrated.

The solution was easy: Replace the brass components in fuel pumps with non-brass ones that are not susceptible to these problems when (not if) gasoline emulsifies in the high-humidity racing environment.

Their response: Not possible. These fuel pumps must meet certain tolerances and specifications, and are sourced from an overseas supplier who cannot (or will not) swap internals away from brass due to previously identified reliability issues. They must remain brass.

We then turned to Plan B: Have the branded race fuel provider blend **No-Rosion Fuel System Combustion Optimizer** into the gasoline. Testing was conducted in-field to confirm that it solved the problem – which it did. So the solution was implemented. Once again, because No-Rosion contains both a corrosion inhibitor to protect all metals (including brass), and a dispersant to prevent ethanol's water absorption that can result in corrosive emulsions, the issue was solved and eliminated.

Our third and final example is unique in that it does NOT involve ethanol, emulsion, and/or phase separation. But it does involve a different type of fuel corrosivity. The customer's inquiry was as follows:

* Photo courtesy of Mr. Dyke Ridgley

Please see the photo included with this email. It is from the inside of the aluminum fuel tank of our 1957 Ferrari 250 Testa Rossa.

When we acquired the car about 10 years ago, the tank was leaking and also had the old "white" sealer coming loose. We removed the old sealer and applied new "red" sealer to only one lower corner. That is the "red" lines you see in the photo. For the last few years, we have only used leaded racing gas in the car. However, we continue to find "residue" in the carburetors and now it is obvious it is in the tank itself.

Have you seen this situation before? The car and fuel are in Phoenix, AZ, where there is no humidity. And the gas is known to contain zero ethanol.

*Please give us your thoughts. Would your No-Rosion Combustion Optimizer be a potential solution for this problem? The car does sit for periods of a few to several months at a time between usages. We try to keep very little fuel in the tank during storage, as noted by the fuel level indicated in the photo.**

250 Testa Rossas are legendary, having won 10 World Sports Car Championship races including the 24 Hours of Le Mans in 1958/1960/1961, the 12 Hours of Sebring in 1958/1959/1961, the Targa Florio in 1958, and the 1000 km Buenos Aires in 1958/1960. This resulted in constructor's titles for Ferrari in 1958/1960/1961. One of only 33 built, this particular example was sold new to Piero Drogo, who raced it to 4th at the 1000 km Buenos Aires in 1958. Considering the significance of this car, we took a keen interest in making sure that proper corrective action was implemented. The following additional info was requested by us, and provided by the customer.

1) **What brand of race fuel is used?** XXXXXXXX (name purposefully withheld from this newsletter)
2) **What product?** STANDARD RACING FUEL
3) **What is the spec of their fuel?** 110 LEADED RACING FUEL
4) **Does it contain ethanol, MTBE, other oxygenates?** ONLY TETRAETHYL LEAD LISTED IN LITERATURE
5) **What metallurgy is tank, pickup tubes, etc?** ALUMINUM TANK, STEEL+BRONZE PICKUP TUBES AND LINES
6) **What brands of tank sealers were used (both the "white" and the "red")?** WHITE = VINTAGE AUTOMOTIVE FUEL TANK SEALER. RED = KBS GOLD STANDARD TANK SEALER
7) **Is the "residue" just the older white sealer that is coming off?** DO NOT BELIEVE SO BECAUSE TANK FLUSHED WITH MEK SEVERAL TIMES BEFORE KBS SEALER WAS APPLIED
8) **How long does the fuel reside in the tank?** MINIMAL AMOUNT COULD RESIDE FOR 1+ YEARS BETWEEN USES SEALERS REQUIRED BECAUSE OF ORIGINAL TANK RIVITED ALUMINUM SANDWICH CONSTRUCTION AND TYPICALLY ONLY OTHER OPTION IS TANK REPLACEMENT

With this info, we obtained a copy of the racing fuel blend's SDS (Safety Data Sheet). By law, it must disclose the primary chemical components and percent ranges of each. We found the following:

Naphtha (petroleum), light alkylate, up to 75%
Toluene, up to 25%
Tetraethyl Lead, up to 0.15%
Benzene, up to 0.01%

Toluene is an aromatic octane boost ingredient. Over time, it breaks down to form benzoic acid and formic acid, both of which are corrosive to all metals – particularly brass and aluminum alloys. It is also an aggressive solvent used in paint thinners. Yes, it is a natural component of crude oil, which is the raw material for gasoline, and was historically present in leaded fuels – but at concentrations of only 5-10%. This fuel is using it at a much higher dose as an adjunct octane boost ingredient, because it costs considerably less per unit than tetraethyl lead.

Assuming this fuel does contain 25% toluene, it's corrosive degradation byproducts are corroding the aluminum tank. They also attacked the vintage white tank sealer, which is not an impermeable solvent-free epoxy coating.

We also obtained a fuel sample from the customer, to confirm the composition of the white contaminant. Lab analysis identified it as remnants of the old tank coating, as well as aluminum oxide salts. We then obtained the SDS for the KBS Gold Standard Tank Sealer, and confirmed it is indeed an advanced solvent-free epoxy coating that is capable of remaining chemically impervious to the high concentration of toluene in the race fuel they plan to continue using. And the mystery green deposit was copper corrosion residue from the bronze pickup tube.

There remains the issue of the corrosive 25% toluene fuel. For this reason, the customer will be adding and maintaining at all times the proper dose of **No-Rosion Fuel System Combustion Optimizer**. The corrosion inhibitor in **No-Rosion** will protect the various metals in the tank, engine, and entirety of the fuel system.

Please find the enclosed order form that you can use to place your next order. Or for quicker service, visit our web site and order online at: www.NoRosion.com.

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

Applied Chemical Specialties, Inc.