Fall 2014

Dear No-Rosion Customer,

Hopefully you were able to get out and enjoy your cars this summer… overall, it was a great year for it!

In our last few newsletters, we've gone into detail regarding fuel and fuel additives. In this newsletter, we'll switch gears a bit, and provide insight into coolant and coolant additives.

The most frequently asked question about our No-Rosion Cooling System Corrosion Inhibitor product is: "How do I know this stuff really works?" That's a very good question. How DO you know this stuff really works?

The anecdotal answer that a salesman would give is: "We've been selling it for 19 years, and have a successful track record of helping many thousands of car collectors and museums in properly maintaining the cooling systems of their vehicles."

Certainly that is true. But we'd much rather base our answer on science than sales.

So here's a better answer: We know that this product works because a leading independent third-party, OEM-approved engine coolant laboratory has validated this fact. What exactly does this mean?

Every few years, we hire an outside lab to test our additives using ASTM standardized procedures. This acts as an excellent check-and-balance against our internal quality control. Periodic testing is also part of the contractual agreements we have with some of our corporate private label customers that buy our additives in bulk for resell.

This year we ran a full battery of tests, which means we have some new data to share with you. In addition to testing our No-Rosion Cooling System Corrosion Inhibitor, we also tested the "leading" coolant additive as a means of comparing performance. You may have noticed that I put the word *leading* in quotes. That's because, even though sales data indicates that it's the top seller, laboratory data indicates that it's NOT the top performer.

How do we know it's the top seller? A company called The NPD Group collects and tracks retail purchase scanner data, and makes it available to companies like ours for market analysis. NPD data shows that 161,541 bottles of the leading product were sold by US automotive retailers during 2012. This compares to 139,242 bottles during 2013. As you will note, this represents a year-to-year decrease of 13.8% in sales of this product. Are you wondering why their sales have been decreasing? We were too…

We hired the laboratory to test No-Rosion and the leading product in three ASTM standardized tests:

1) ASTM D1384, Corrosion Test for Engine Coolants in Glassware
2) ASTM D4340, Corrosion of Cast Aluminum Alloys in Engine Coolants Under Heat-Rejecting Conditions
3) ASTM D1881, Foaming Tendencies of Engine Coolants in Glassware

What does "ASTM" mean? ASTM is the "American Society for Testing and Materials." It is composed of 141 technical committees that act as global leaders in the development and delivery of international test standards. Over 12,000 ASTM standards are used around the world to facilitate performance evaluations of products and materials ranging from metals, to construction products, to petroleum, to consumer products, and many more.

One of the ASTM's 141 technical committees is the D15 Committee for Engine Coolant and Related Fluids. The D15 Committee plays a major role in the engine coolants industry. It addresses issues relating to test methods for reserve alkalinity of engine coolants and inhibitors, cavitation corrosion and erosion-corrosion characteristics of aluminum pumps and engine coolants, testing engine coolants in car, light truck service and heavy duty engines and specifications for various formulations of engine coolants for light and heavy duty service.

Applied Chemical Specialties is an active member of the D15 Committee, and contributes to coolant technology development through our various research efforts.

So now that you have a basic understanding of ASTM and how it serves our industry, let's have a look at the specific ASTM tests that we use as a means of evaluating the performance characteristics of engine coolants and coolant additives.

1) ASTM D1384, Standard Corrosion Test Method for Engine Coolants in Glassware. This test method covers a simple beaker-type procedure for evaluating the effects of engine coolants on metal specimens under controlled laboratory conditions. In this test, specimens of metals typical of those present in engine cooling systems are totally immersed in aerated engine coolant solutions prepared with corrosive salts for 336 hours at 88°C (190°F). The corrosion inhibition properties of the test solution are evaluated on the basis of the weight changes incurred by the specimens. Each test is run in triplicate, and the average weight change is determined for each metal. This test method will generally distinguish between coolants that are capable of providing full corrosion protection, and those that are not.

OEM automobile manufacturers have accepted the specimens prescribed in this test method, but their composition may not be exactly the same as metals used in all engine cooling system components. Therefore, specimens other than those designated in this test method may be used by mutual agreement of the parties involved. Metal test specimens, 1 by 2 inches in size, representative of cooling system metals, having the following exact specifications, are used:

1. Copper, conforming to UNS C11000 (SAE CA110) or UNS C11300 (SAE CA113). Cold-rolled.
2. Solder, specimen as described in 6.1.3, coated with solder conforming to Alloy Grade 30A (SAE 3A).
3. Brass, conforming to Alloy UNS C26000 (SAE CA 260).
4. Steel, UNS G10200 (SAE 1020), Chemical composition of the carbon steel is as follows: carbon, 0.17 to 0.23 %; manganese, 0.30 to 0.60 %; phosphorus, 0.040 % maximum; sulfur, 0.050 % maximum.
5. Cast Iron, conforming to Alloy UNS F10007 (SAE G3500).
6. Cast Aluminum, conforming to Alloy UNS A23190 (SAE 329).

Here are the corrosion weight losses, in milligrams, for each metal, for each product:

Metal	No-Rosion Corrosion Inhibitor	Leading Product	**ASTM Limit***
Copper	1	2	10
Solder	1	1	30
Brass	1	1	10
Steel	0	0	10
Iron	1	2	10
Aluminum	5	138	30

*Maximum acceptable corrosion weight loss in order to pass test, as specified by ASTM D3306.

No-Rosion passed ASTM D1384 by a wide margin. The leading product failed, due to its inability to provide adequate corrosion protection for aluminum. Why is this important? Many cars, old and new, have aluminum cooling system components – cylinder heads, intake manifolds, water pumps, radiators, etc. Without proper protection, aluminum oxidation and erosion results in accelerated rates of wear, and premature failures.

2) ASTM D4340, Standard Test Method for Corrosion of Cast Aluminum Alloys in Engine Coolants Under Heat-Rejecting Conditions. This test method covers a laboratory screening procedure for evaluating the effectiveness of engine coolants in combating corrosion of aluminum casting alloys under heat-transfer conditions that may be present in engines with aluminum cylinder heads.

In this test method, a heat flux is established through a cast aluminum alloy typical of that used for engine cylinder heads, while exposed to an engine coolant under a pressure of 193 kPa (28 psi). The temperature of the aluminum specimen is maintained at 135°C (275°F) and the test is continued for 1 week (168 h). The coolant's effectiveness in preventing corrosion of the aluminum under heat-transfer conditions (referred to as "heat-transfer corrosion") is evaluated on the basis of the weight change of the test specimen.

Here are the corrosion weight losses, in milligrams, for each product:

	No-Rosion Corrosion Inhibitor	Leading Product	**ASTM Limit* (mg/cm2/wk)**
Weight Loss (milligrams)	0.14	0.45	1.00
pH After Test	9.01	7.66	30

*Maximum acceptable corrosion weight loss in order to pass test, as specified by ASTM D3306.

No-Rosion passed ASTM D4340 by a wide margin. The leading product passed this test as well. But No-Rosion outperformed it by over 300%. As you will also note from the results, No-Rosion also maintained a higher, more stable pH level throughout the test. Why is this important? If your engine has aluminum cylinder heads, coolant without proper corrosion protection causes accelerated rates of corrosion and erosion.

If your car has an aluminum radiator and/or aluminum cylinder heads and engine block, the fact that No-Rosion provides superior heat-transfer corrosion protection of aluminum is very important for your application.

And the fact that No-Rosion better stabilizes pH in the ASTM D4340 test is indicative of the reserve alkalinity that it provides to engine coolant. This allows it to neutralize combustion byproducts that contaminate engine coolant, for example. There are many types of corrosion damage that occur to cooling system metals when pH degradation takes place, due to a poor-performing coolant's inability to provide proper pH stabilization.

3) ASTM D1881, Standard Test Method for Foaming Tendencies of Engine Coolants in Glassware. This test method covers a simple glassware test for evaluating the tendency of engine coolants to foam under laboratory-controlled conditions of aeration and temperature. A solution of coolant and ASTM Type II water is blown with air at a constant rate for 5 minutes, while maintained at a constant temperature of 88°C (190°F) by means of a suitable temperature bath. The volume of foam, and the time for such foam to break, is measured. The test method distinguishes coolants that have a tendency to foam excessively from those that do not.

Here are the foam results for each product:

	No-Rosion Corrosion Inhibitor	Leading Product	**ASTM Limit***
Foam Volume (milliliters)	53	245	150
Break Time (seconds)	4.5	9.6	5.0

*Maximum acceptable foam rates in order to pass test, as specified by ASTM D3306.

No-Rosion passed the ASTM D1881 foam test, whereas the leading product failed. Why is this important? When engine coolant produces foam, it drastically accelerates the rate of impellor erosion in water pumps. Over time, this leads to premature water pump failure. Coolant foam can also cause overheating, as it is more likely to form air pockets that reduce heat transfer. This is especially the case in low-pressure and no-pressure cooling systems found in older cars.

One more word about foam. The leading product contains a **silicone-based** antifoam ingredient called "polysiloxane polymer." Under some conditions, it polymerizes to form a brownish, slime-like coating that adheres to metal surfaces inside a cooling system. Why is this important? Any type of coating in a cooling system will reduce heat transfer, and cause the engine to run hotter. Additionally, some consumers have visually mistaken the brown slime for motor oil, and errantly believed they had a cracked cylinder head. It cost them thousands of dollars in unnecessary repairs. For more info, Google the words "**Brown Slime Coolant Additive**."

No-Rosion contains a **water-based** antifoam ingredient that will not polymerize to form brown slimes.

By way of science, we now know that the leading product doesn't "lead" in performance. (And maybe that's why it's sales are trending down, by the way.) But interestingly, it actually doesn't lead in sales either. It sold 139,242 bottles during 2013. If we add the number of bottles we sold both under our No-Rosion label, as well as under our various private label branded products, we sold well over twice this amount during 2013.

But enough about the scientific data and sales numbers. Here's the bottom line…

When you purchase No-Rosion Cooling System Corrosion Inhibitor, or any product developed and manufactured by Applied Chemical Specialties, you can be confident that you are purchasing quality. We are NOT a sales-driven organization. We are a science-driven organization. This subtle difference has very meaningful implications in terms of the quality of the products we deliver. Rather than spending on sales and advertising, we invest in research, development, and continued refinement of the highest quality automotive additives available.

Test results prove this fact. And so does our nearly 20 year history of successful sales of cooling system and fuel system products. And by the way, this record of accomplishment is due, in no small part, to your continued support as a loyal No-Rosion customer.

Next year we will be celebrating our 20 year anniversary. We have some exciting things planned. So be sure to watch for our Spring 2015 newsletter, which will provide additional details!

Hopefully this information helps you to better understand the importance of selecting the best-performing additive for your vehicles' cooling systems. And don't forget, the protection provided by No-Rosion Cooling System Corrosion Inhibitor is depleted over time. So in order to keep your protection up, you'll need to add a bottle every year…

Thank you for being a customer. We appreciate your support, and look forward to continuing to be of service.

Applied Chemical Specialties, Inc.