Spring 2025

Dear No-Rosion Customer,

In this, our 30th year of operation, we pause to reflect on how far we've progressed in our mission of delivering the absolute finest quality engine fluids.

When we began in 1995, our "recipe book" consisted solely of certain tried and true coolant additive and fuel additive chemistries carried over from our founding partner's commercial/industrial chemical business. They included a robust **cooling system corrosion inhibitor** that had been used successfully for decades in large-scale cooling towers, industrial heat exchangers, and boilers. As well, **fuel stabilizers and detergents** used to treat and preserve stationary engine fuels were at the core of our original formularies.

We began selling our **No-Rosion** and **HyperKuhl** products direct to car collectors and museums, both of which had historically been plagued by the corrosive, damaging effects of coolant and fuel degradation – particularly in engines not run during extended dormancy periods. The benefits were tangibly/visibly recognizable by our early customers, many of whom continue to use our products today.

As a result, through no solicitation efforts on our part, certain premium lubricant brands in the automotive aftermarket sought our expertise in formulating additives to fill out their product lines. So in 1998, we began a new division of our business, whereby we research, develop, and manufacture on a turnkey, private label basis.

Shortly thereafter, as a means of further refining our chemistries in such a way that they would quantifiably meet/exceed OEM specifications, we joined and became participating/contributing members of ASTM and SAE.

Today, we formulate and manufacture high-performance additives for premium brands that are sold on shelves of every major automotive retailer in the US, as well as Walmart and Amazon. We also export certain bulk and consumer packaged specialty chemistries to Europe, Asia, and Africa.

What differentiates us from the MAJORS against which we compete? In a word, innovation. As a percent of revenue, we invest roughly 3-4x more on R&D than major refiners or specialty chemical providers. And because of our small size, we are nimble enough to deliver new chemistries to the market roughly 6-7x faster.

We do not, and will not, sell any chemistry until/unless we have fully tested it, both in vitro as well as in fleets and/or the specific vehicle/engine type(s) for which it has been formulated. This means we have full and robust data sets that document all our chemistries' performance under wide-ranging environmental/user scenarios. This guarantees they will deliver results in complete accordance with all claims. Products from manufacturers that do NOT deliver results consistent with claims are the ones that have come (and gone!) during the past 30 years. So, this is yet another key differentiator.

But perhaps most importantly, at least to you, is that we continue selling **No-Rosion** and **HyperKuhl** direct to hard-core car guys, just as we began doing in 1995. Over the years, we have further refined these in-house chemistries, resulting in them being the absolute gold standard in engine fluid technologies today.

For your loyalty and continued trust placed in us to protect the engines, fuel systems, and cooling systems of your cherished vehicles, we are grateful. Were it not for your support, the entire effort would never have gotten off the ground in the first place – THANK YOU!

Speaking of which, as your engines continue to build miles running on today's less stable ethanol-infused fuels, they experience what is referred to as "**Octane Requirement Increase**," or **ORI**.

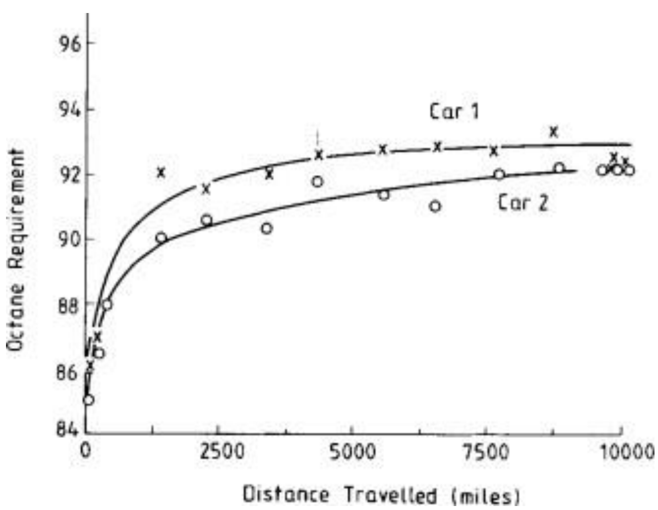
This results from deposits that accumulate in combustion chambers. Over time, and depending on drive habits, environmental conditions, ethanol content, and quality (or lack thereof) of fuel being used, they build-up to cause pre-ignition and detonation. Modern engines of course have knock sensors that dial-back ignition timing to prevent or minimize such. But that comes as the expense of reduced performance and fuel efficiency.

ORI is attributed to two major causes. The first is the influence on ORI of said combustion chamber deposits. These deposits contribute to reduced heat transfer from the combustion chamber, so the chamber remains hotter. The second is the increase in mechanical compression ratio due to the deposits. The former has greater influence than latter, but both result in performance-robbing, potentially damaging, pre-ignition/detonation.

Technically defined, ORI is the highest octane number gasoline that provides repeatable, audible knock when tested by a trained rater using the Coordinating Research Council (CRC) Octane Requirement Test Procedure on an ASTM-spec engine stand.

For example, in a new engine, an ORI of four to six numbers is typical during the first 10,000 miles, after which it tends to level off a bit. Exact factors that exacerbate such include, but are not limited to:

1) Whether or not TOP-TIER gasoline is used in every tank;
2) Whether/how often gasoline with 10% or greater ethanol content is used;
3) Whether/how often the same gasoline resides in the tank for longer than 90 days;
4) Whether/how often fuel additives/stabilizers/detergents are added to the gasoline;
5) Humidity, temperature, range of temperature fluctuations, and other environmental factors.




As miles continue accumulating beyond 10,000, OR (Octane Requirement) plateaus or builds more slowly, as the most drastic ORI occurs during the first 2,500 to 3,000 miles. This is depicted in the graph at left, which was constructed from data accumulated in SAE testing of two pre-1980 vehicles having engines not equipped with onboard knock sensors.

In longer-term studies, SAE data demonstrates that "*legacy deposits*" formed during 50,000 to 100,000+ miles of driving become coked, making them more difficult to remove. This results in engines of older cars having ORI of six to eight or more numbers.

In separate SAE studies, it was observed that beyond 50,000 miles, assuming normal maintenance and oil changes, ORI remains plateaued until the rings and valve guides wear enough to allow oil to get into combustion chambers. Once this occurs, deposit formation begins increasing again, resulting in further ORI. This is especially the case in engines having over 100,000 miles.

ORI results in some pretty undesirable effects, including: increased engine heat (particularly in the cylinder heads), increased wear rates, reduced fuel economy, reduced power and performance, increased risk of catastrophic engine failure, and undue burden placed on the cooling system/radiator.

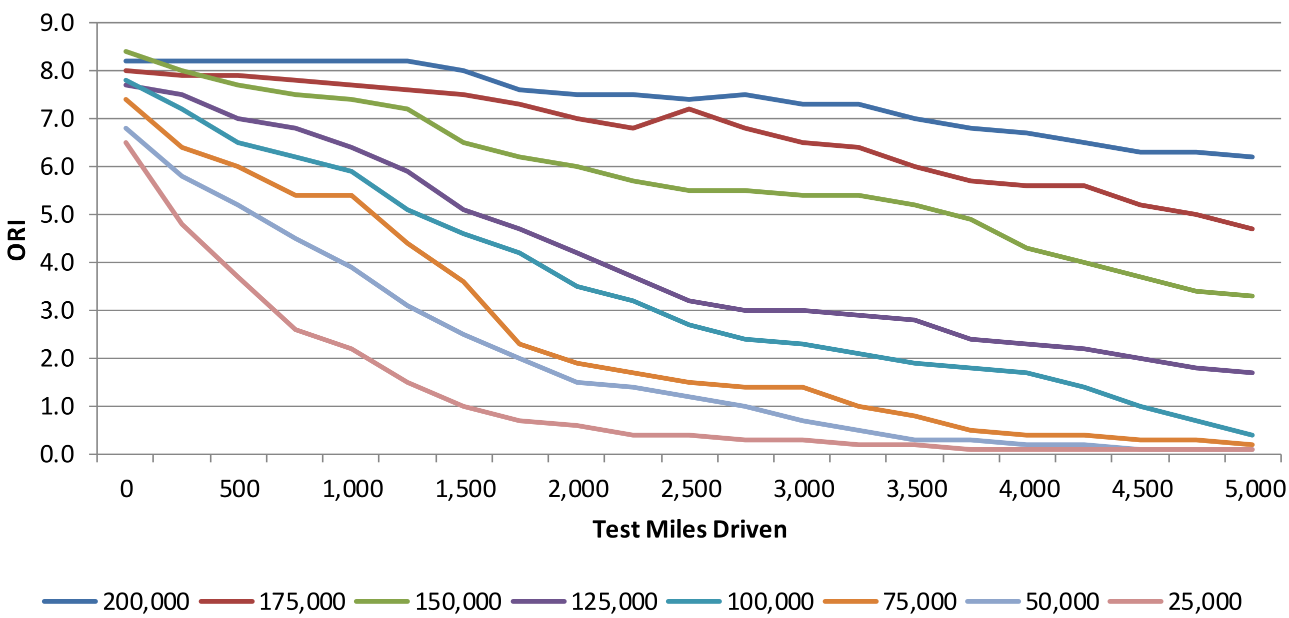
There are two primary ways of managing ORI: (1) preventing, reducing, or eliminating combustion chamber deposits, and (2) increasing or boosting the octane of gasoline being used to overcome it.

The latter can be expensive. At today's fuel prices, regular 87 octane gasoline costs around $3.00/gallon, whereas premium 92-93 octane gasoline costs over $3.60/gallon. So filling an 18 gallon tank with premium, in order to overcome ORI, adds over $10 cost per tank versus filling with regular.

The easiest way to address this, of course, is to simply buy higher octane (more expensive) gasoline when you fill up. But this comes with a hidden threat. That being: Ethanol. The majority of higher octane gasoline today contains a higher percent of ethanol, as it is the cheapest way for refiners to boost octane. And as we already know, ethanol is the enemy of further deposit build-up in combustion chambers. In essence, it's a dual-edged sword trying to chase ORI with ethanol-laden higher-octane pump fuels.

There are other options. Race fuel manufacturers offer 100-103 octane leaded blends for engines in older vehicles that require lead for octane boost and protection of non-hardened valve seats. They contain no ethanol, and have long shelf lives of 2 years. The downside, however, is that they are delivered in unwieldy 5 gallon pails and 54 gallon drums, and cost over $20/gallon. Thus, filling a typical 18 gallon fuel tank costs over $360!

Fortunately we can offer an easier, more cost-effective approach. We've conducted extensive research of ORI reduction via engine deposit removal, with the following results:




In this graph, each of the colored lines represents a different test vehicle, with mileage of each vehicle ranging from 200,000 miles, down to 25,000 miles. As you can see, they all began the test having ORI in the range of 6.5 to 8.2. They were driven using 90 octane E10 gasoline sourced from the pump, treated with the recommended dose of **No-Rosion Fuel System Combustion Optimizer**. As they accumulated miles, you can see the rate of ORI reduction in each, up to the 5,000 mile termination of the tests.

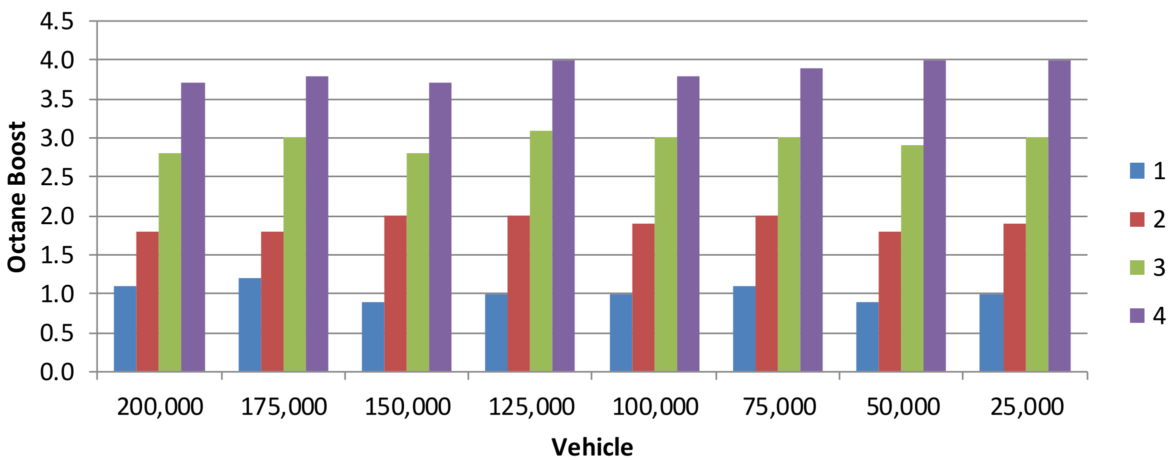
Obviously, and not surprisingly, higher-mile engines with well-established legacy deposits took more miles of drive time to facilitate clean-up, and corresponding ORI reduction. Whereas, lower-mile engines with fewer, less-established deposits, cleaned up quicker, requiring less drive time.

Based on the compression ratio, and piston crown/combustion chamber configuration of the non-ECU controlled test vehicle engines, they had an OR (Octane Requirement) of 87. In the example of the engine with 200,000 miles, at the start of the test, it suffered ORI of 8.2. Meaning, it needed gasoline of 95.2 octane in order to prevent perceptible performance deficits related to pre-ignition/detonation without some degree of ignition retardation. Because the pump gas being used was 90 octane, boost of 5.2 numbers was therefore required.

While it's feasible to boost octane 5.2 numbers in the short term, longer term it's an <u>expensive</u> proposition. That's one of the reasons why reduction of ORI is desirable. As ORI is reduced, you can resume using lower-cost, lower-octane fuel. In the <u>extreme example</u> of the 200,000 mile engine, with difficult to remove legacy deposits, it took 4,500 miles of driving with **No-Rosion Combustion Optimizer** to reduce ORI from 8.2 to 6.2.

Now let's consider the <u>less extreme example</u> of the 75,000 mile engine. At the start of the test, it suffered ORI of 7.4. But because it's deposit were less established, clean-up occurred at a comparatively quicker rate, having achieved almost complete clean-up within a few tanks of driving. Post-cleanup, with ORI almost completely eliminated, 89-90 octane gasoline is once again sufficient to provide 100% performance.

After studying <u>ORI reduction</u>, we turned our attention to studying <u>octane boost</u>, in the same 90 octane E10 gasoline, in the same vehicles, using our **No-Rosion Fuel System Octane Booster**, with the following results:




In this graph, each of the colored bars represents the quantity of bottles of **No-Rosion Octane Booster** added to the 18 gallon tank of each of the same test vehicles. As can be observed, each bottle reliably delivers about 1 number of octane boost, up to the maximum recommended number of bottles per tank, which is <u>four bottles</u>. (Note: Vehicles equipped with catalytic converters/oxygen sensors should not exceed <u>two bottles</u> per tank.)

Which brings things full circle. You may have noticed that user directions for **No-Rosion Combustion Optimizer** state: *"Use in conjunction with **No-Rosion Octane Booster** to achieve synergistic performance enhancements."*

In less abbreviated form, we could instead say: *"Use **No-Rosion Octane Booster** to overcome ORI for the first few thousand miles of cleaning with **Combustion Optimizer**, while it removes deposits to reduce ORI, after which continued use of **Octane Booster** depends on engine's compression ratio/OR. Then, use **Combustion Optimizer** every few tanks, and/or during storage, for fuel stability and keep-clean performance, so ORI does not return."*

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.