The Importance of Recommended AF/C Change Intervals

Modern-day formulations of heavy duty antifreeze/coolant have been specially designed to deliver cutting-edge engine protection – provided they are maintained according to specs

By Colin Dilley, Ph.D,
Prestone Command® Technology Center

Introduction

As a society, we have become programmed to always be on the lookout for "the next big thing." A "new and improved" laundry detergent that promises whiter whites and redder reds. A revised soft-drink recipe that claims to deliver better taste than its predecessor. An over-the-counter medication that is billed as the ultimate preventative or cure for the common cold.

In the world of heavy duty antifreeze/coolant (AF/C), the great white whale has been the number one million, as in: "One million miles of engine operation between coolant changes." This claim is seductive for any number of reasons: one million is an impressive, eye-catching number; it dovetails neatly with the never-ending search to identify the "next big thing"; and, from a more practical point of view, it offers to the heavy duty driver or fleet operator the promise of reduced vehicle maintenance and downtime, which, in turn, could lead to increased operating profits.

However, the allure of this "one million mile" claim might prompt heavy duty vehicle operators to take at face value something that may be nothing more than irrelevant hyperbole, all while putting their vehicles' engines at undo risk of breakdown or failure.

The challenge, then, when confronted with any type of heightened expectations for a product's performance is determining when "new and improved" may be nothing more than a clever marketing slogan. In the world of heavy duty vehicles, this is especially important as the equipment and their components are extremely expensive and exceptionally costly to replace and maintain, in terms of replacement parts, maintenance expenditures and vehicle downtime. In these instances, knowing if the risks associated with what might be a million-mile AF/C change-interval claim outweigh the rewards is paramount to maintaining effective and reliable engine operation.

That being said, this white paper will show how claims of "one million miles between coolant changes" may be impressive on the surface, but, in reality, might actually be more harmful to the performance of a heavy duty engine than beneficial.

The Challenge

There's no doubt that today's modern heavy duty engines are marvels of engineering. Though they power vehicles that have a load factor that is up to three times higher than that of an automobile, and a gross weight that can be eight times as high, they will operate effectively for up to five times as long before needing to be overhauled. In order to reach those lofty operational parameters, these engines – especially those that rely on an Exhaust Gas Recirculation (EGR) system to reduce nitrogen oxide (NOx) emissions – produce extremely high amounts of heat.

Excessively high internal temperatures can be the bane of the heavy duty engine's existence. Among the problems they may cause include increased NOx emissions; possible "hot spots" that can cause pre-ignition; oil degradation; and thermal distortion. All of these conditions can have an adverse effect on engine performance and lead to premature breakdown or failure.

In order to eliminate these potential problems and deliver optimal performance, sophisticated modern-day heavy duty engines need to work hand in hand with a similarly advanced cooling system in the creation of a careful operating balance between the cooling system's various components, all of which affect the operation of the others, and the antifreeze/coolant that is used. In short, these new cooling systems are best served when they use specially formulated antifreeze/coolants that have been designed to meet the demands of the current generation of heavy duty engines.

The era of modern antifreeze/coolant was launched in 1927 when Prestone® created and introduced the first ethylene glycol-based AF/C products to the market. Since then, years and years of research and millions and millions of dollars of investment in development have led to the creation of myriad formulations that are designed for many different types of engines and numerous vehicle operating conditions. However, despite the many significant changes in heavy duty engine design and operation, some AF/C product formulas have remained essentially the same since the days when they were introduced as a 200,000 mile AF/C change interval.

The many decades of industry research, which has led to the discovery of exactly what the specific properties of an effective AF/C are, have created a series of "recommended practices" that govern the operation and maintenance of a heavy duty engine's cooling system. Working with heavy duty engine manufacturers, along with organizations like the American Trucking Associations' Technology & Maintenance Council (TMC), ASTM International and SAE International, who develop recommended standards for safe, efficient and effective engine operation, AF/C producers have taken great pains to refine the "science" behind their formulations, all with the final goal of developing a product that optimizes heavy duty engine performance.

In fact, for 30 years, the TMC has produced its *Recommended Practices Manual*, which contains more than 250 Recommended Practices (RP), including RP 313C, which is dedicated to Cooling System Maintenance. There are three basic things to remember when thinking about cooling-system maintenance in heavy duty vehicles:

- Use an antifreeze/coolant that satisfies industry standards and performance requirements
- Maintain proper additive levels and regularly top off coolants at regular service intervals
- Test the coolant regularly for proper additive levels and freeze protection

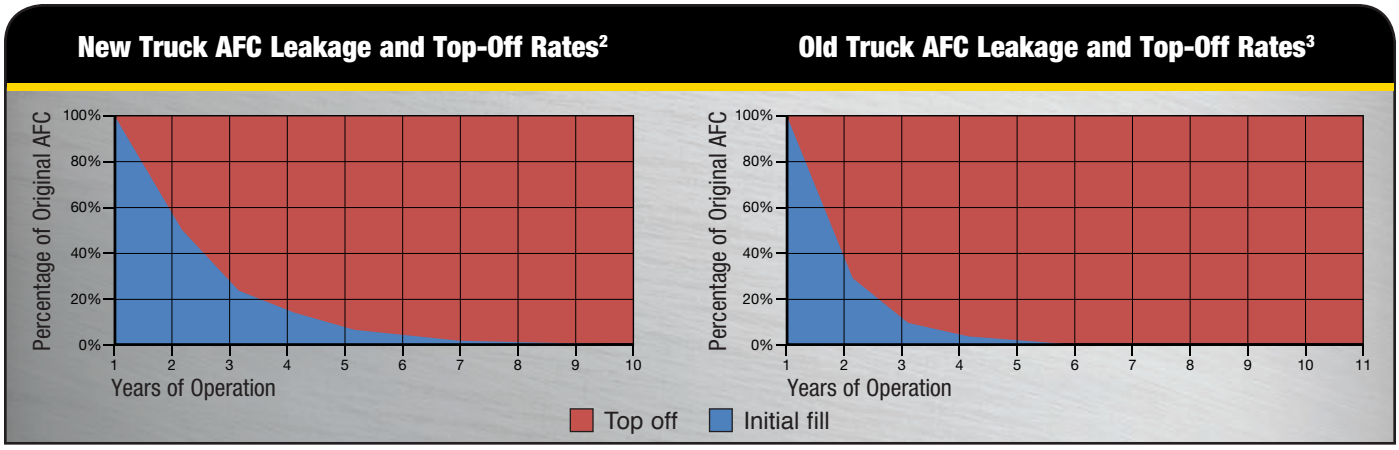
Following these recommendations will help engines achieve their optimum performance levels in real-world on- and off-road applications, but based on historic heavy duty engine design, function and operational levels, i.e. miles traveled and hours of service, million-mile change-interval claims can really just be summed up in one word: irrelevant.

According to the American Trucking Associations (ATA), a long-haul over-the-road truck driver will cover 100,000 to 110,000 miles in his vehicle each year.[1] That means, for example, that it would take between nine and 10 years for the engine to reach one million miles of use. However, the average heavy duty truck engine is in service for only three to five years before it needs an overhaul, which would leave it well short of the in-service time necessary to cover one million miles of operation with its original fluids. Another way to look at it is that a truck operating 20,000 hours a year, at a rate of six hours per day, would need 9.1 years to reach one million miles of operation.

Additionally, in an August 2011 joint report, the U.S. Environmental Protection Agency (EPA) and U.S. Department of Transportation noted that as of 2009, the average age of Class 8 trucks in the U.S. was 7.87 years.[4] Again, this means that these trucks (and their engines), on average, would be put out of service before they reached one million miles of operation.

From a real-world perspective, the ATA's Technology and Maintenance Council created a report titled "Fleet Experiences with EPA 2010 Compliant Diesel Engines" that was presented at its February 2012 S3 Engines Study Group Annual Meeting. In the report, representatives from five major heavy duty fleet operators in the U.S. – FedEx Freight, Schneider National, HEB Grocery, United Parcel Service (UPS) and TransAm Trucking – delivered presentations that included maintenance costs and downtime for their vehicles. The five companies reported a total of 33,481 heavy duty vehicles in service, with only one – UPS – noting that it had a vehicle with more than one million miles of service time.[5]

A second consideration that makes the million-mile change-interval claim irrelevant is that the clamped hoses in a heavy duty vehicle's cooling system will leak. This is not an indictment of the AF/C being used, all of which will leak at the same rate, but is a necessary "cost of doing business" when operating heavy duty vehicles.



In fact, in new heavy duty vehicles, it is not unusual for a 10-gallon cooling system to lose five gallons of AF/C per year.[2] This equates to having to add 50 gallons of "top-off" coolant to the vehicle in the span of 10 years, or one million miles of operation, which is the same volume of coolant that would be required to entirely replace it five times. Additionally, older vehicles can lose as much as 10%, or one gallon, of coolant volume per month, which is a leakage rate of one drop per minute.[3] This means having to add 120 gallons of top-off coolant over 10 years or one million miles, which is equivalent to having to replace the coolant entirely at a rate of once per year.

So, with that much coolant needing to be replenished on an annual basis, which involves not only an upfront cost, but escalating replenishment costs, if the engine were to reach one million miles of in-service time, the original coolant would have leaked out and been replaced long before that threshold is approached.

That's why it is more vital than ever to abide by recommended change intervals, whether from the engine manufacturer or any of the standardization organizations, for AF/C in heavy duty engines. So, when confronted with the claims of a "new and improved" AF/C that may not require a change before one million miles of operation – when the previous, accepted standard has plateaued at 600,000 miles – it makes sense to first step back and assess the risks that may be involved in using a product that veers so far from the established operating norms, in this case, as much as a 67% increase in the AF/C recommended service life. Then there is also the higher cost of some so-called "advanced" formulas, along with the added expense of top-off coolant, which turns "You can pay me now, or pay me later" into "You can pay me a lot now and pay me much more later."

The Solution

As an inventor of modern-day antifreeze/coolant, Prestone has accumulated the knowledge and possesses the commitment to remain dedicated to providing the best cooling-system fluids to the heavy duty engine market. To that end, Prestone is the only national brand that manufactures all of its products in the United States in its own proprietary facilities. The company's U.S.-based state-of-the-art Technology Center works closely with major engine manufacturers and standardization organizations to create heavy duty AF/C formulations that are best-in-class both today and into the future.

Prestone's latest product in the antifreeze/coolant market is its standard-setting line of Prestone Command® antifreeze/coolants for heavy duty on- and off-road vehicles used in construction, mining, oil, gas and agricultural applications, among others. It has been designed to provide reliable engine and cooling-system protection in the most trying of conditions, from the stifling heat of Death Valley to the numbing cold of Alaska's Alcan Highway.

In particular, Prestone Command® is available in a patented extended-life formulation that is based on accepted, responsible science regarding the effective operational life of heavy duty antifreeze/coolants:

- **Heavy Duty Extended Life Coolant (ELC)** — this red-dyed patented AF/C is a blend of ethylene glycol and a specially formulated Organic Acid Technology (OAT) inhibitor package that is silicate-, phosphate- and borate-free and designed for heavy duty cooling systems. It is formulated for a service life of 600,000 miles or 12,000 hours when an extender is added at 300,000 miles or 6,000 hours. It is compatible with other ELC products, as well as conventional AF/Cs, though its extended life benefits will be reduced in those circumstances. It is also available in a 50/50 formulation for convenient top-offs.
- **Heavy Duty Extended Service Interval SCA Pre-Charged (ESI)** — this purple-dyed AF/C is a blend of ethylene glycol and a specially formulated inhibitor package that has been designed for heavy duty cooling-system applications. This ESI AF/C is compatible with any conventional heavy duty AF/C and all filter technologies, and will eliminate the initial pre-charge of SCAs on new vehicles and recharged systems. Also available in a 50/50 formulation for convenient top-offs.
- **Heavy Duty Nitrite Free Extended Life Antifreeze/Coolant (ELC)** – this yellow-dyed AF/C is an Organic Acid Technology (OAT) intended for use and compatibility with any OAT Extended Life heavy duty AF/C in any diesel powered commercial vehicle engine or stationary

engine with aluminum or other engine metals. Premium long-lasting inhibitors provide up to 600,000 miles/12,000 hours of protection against temperature extremes, rust, corrosion, scale and premature water pump failure. The phosphate- and borate-free formulation provides long lasting inhibition and corrosion protection, protecting aluminum and all other engine metals. Also available in a 50/50 formulation for convenient top-offs.

The complete Prestone Command® line of AF/C formulations meet or exceed the performance requirements of many industry specifications, including, but not limited to, ASTM D-6210, ASTM D-3306 and TMC RP 329, 302A and 351, the phosphate-free requirements of European OEMs, the silicate-free requirements of Japanese OEMs, and those of numerous OEMs in the U.S., such as Caterpillar, Cummins, Navistar, Detroit Diesel and Mack.

Prestone recognizes that heavy duty fleet managers are under immense pressure to maximize their budgets and dollars spent. Improving the performance and reliability of their rolling stock is one critical way to enhance the bottom line. To some, that may mean undertaking a maintenance program that includes lengthened AF/C change intervals. To do this – and maybe to even reach the nirvana of one million-mile AF/C change intervals – requires much more than blindly trusting new and improved usage claims. Remember, just because a car's speedometer says the vehicle can reach speeds of 120 mph doesn't mean it needs to be driven 120 mph.

The overriding point is that for an AF/C to reach one million miles of service, a thorough maintenance plan needs to be put in place to ensure that all of the vehicle's vital components are operating at their utmost efficiency and effectiveness for many years. Prestone, through its decades of industry experience, research and development, and the creation of its new Prestone Command® Extended Life Coolant formulation, stands ready to work with heavy duty fleet operators to responsibly lengthen their AF/C change intervals, while not jeopardizing the health and performance of the engines in their vehicles.

Conclusion

We are all susceptible to the allure of "new and improved" or "bigger is better." The key consideration when confronting these claims is to determine whether the risk is worth the reward. In the case of heavy duty AF/C, that means weighing the cost of a $12 bottle of AF/C that needs to be purchased after 600,000 miles of engine operation versus the risk of pushing your engine – which is an undeniable asset to your operation that must be handled with extreme care – into that great unknown of one million miles of service life.

For more than 85 years, Prestone has made a steadfast commitment to developing and producing, in the U.S., AF/Cs of the highest quality and performance. In that time, and buttressed by years and years of research and development, Prestone has helped create a recognized baseline for effective AF/C performance life. Eye-catching claims to the contrary, adhering to recommended, tried-and-true AF/C change intervals remains the most effective way to protect heavy duty engines.

Sources:

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About the Author:

Colin Dilley, Ph.D, is the Vice President of Technology for Prestone Products Corporation. Colin can be reached at: Colin.Dilley@Prestone.com. Colin.Dilley@Prestone.com. Headquartered in Lake Forest, IL, Prestone Products Corporation manufactures and markets Prestone®, a leading brand of AF/C and related products. Prestone Command® Heavy Duty products, lead by patented AF/C technologies, deliver value by keeping Heavy Duty truck engines in optimal condition in the most demanding heavy-duty on-road and off-road applications. Anywhere. Anytime. Any Engine™. You can find more at www.prestonecommand.com.

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PRESTONE PRODUCTS CORPORATION,
1900 West Field Court, Lake Forest, IL 60045
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