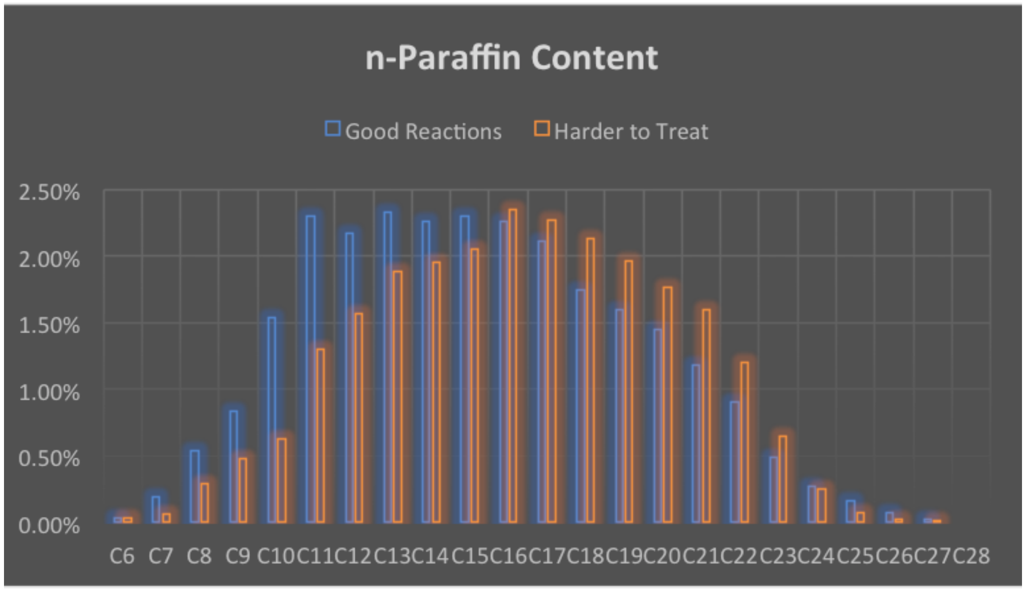
WINTER 2019-2020

WINTERIZING MODERN FUEL

What’s up with “Modern Fuel”?

Fuel Characterization

Fuels are constantly changing, and as a result, effective fuel treatment must change accordingly. The solutions are not so simple. To correctly identify the proper treatment program, more thorough and comprehensive testing methods are needed. For instance, testing for n- paraffin distribution can significantly help to classify different fuel sources.



Some fuels that we encounter today do not react to winterization the same as they did in the past; we classify these fuels as “hard to treat.” To deal with “hard to treat” fuels effectively, a better and more in-depth understanding of the specific fuel properties is needed.

Diesel is composed of about 75% saturated hydrocarbons. Historically, typical refined ultra-low sulfur diesel would have an even distribution of n-paraffin carbon chains gradually increasing and peaking around C-16 to C-20, then gradually decreasing. Gaining a better understanding of refining tendencies is instrumental in creating effective treatment programs.

This example of n-paraffin wax distribution diagrams shows the variability between different sources of fuel.

The “n-Paraffin Content” graphic shows variations that often occur between different fuels. The blue fuel contains higher concentrations of smaller size n-paraffins in comparison to the orange fuel. The n-paraffins mainly contained in the orange fuel are larger in size (to the right), and this higher concentration of longer n-paraffins cause this fuel to be more difficult to effectively treat for cold weather operability.

Summary: Wax content varies significantly from refinery to refinery throughout the USA. Determining the proper fuel treatment protocol varies from region to region and fuel to fuel. These characterization programs allow a much better understanding of fuels in different regions and how they react to treatment.

Winterization Treatment Options	
1. Blend with Kerosene or #1 Diesel	Blending with #1 dilutes the overall wax content in fuel and therefore reduces the cloud point. #1 blending offers a certain amount of protection by thinning out n-paraffin wax content and lowering the cloud point of the base fuel. Blending with #1 is useful but costly. The use of #1 is most effective when combined with proper winter additive chemistry.
2. Blend with Anti-Gel	Anti-gel additive modifies the shapes of wax crystals as they cool to allow them to pass through fuel filters at temperatures below their cloud point. In some fuels, traditional anti-gel is very useful for winterization, however many other modern fuels require additional chemistry.
3. Blend with Anti-Gel and Wax Anti-Settling Agents (WASA)	If fuels sit static for long durations in cold temperatures at or below the cloud point, wax particles start to become denser and fall to the bottom of equipment/storage tanks. The combination of both Anti-Gel and WASA modify the shapes, sizes, and densities of wax crystals to prevent gelling and Wax Fallout.
4. Blend with #1 Diesel, Anti-Gel, and WASA	The use of all three above methods together is most effective because it dilutes the amount of wax with #1 fuel while also using winter additive chemistry to prevent gelling and wax fallout. Keep in mind that blending #1 from the same hard to treat #2 blendstock can produce diminishing returns. Fuel testing is beneficial to observe fuel characteristics and determine the proper treatment method.

Modern fuel refining processes and new crude sources have resulted in harder to treat fuels. Most fuels today contain irregular or unpredicted concentrations of n-paraffin waxes and require additional methods to test and treat for cold weather operability effectively. Higher levels of anti-gel and WASA are commonly needed, and often the use of #1 fuel is also necessary.

Fuel Additive Facts to Know

1) Determining a fuel's cloud point is the most critical first piece of information that we must know to create a proper winter treatment program.

2.) CFPP does not predict the temperature to which a fuel "is good." You may better understand CFPP as an indication of whether additives are effectively attacking the waxes and whether a fuel source is harder to treat than usual. We can use a combination of CFPP and cloud point to help figure out where the exact operability temperature will be, but there are still other factors that come into place (filter size, filter cleanliness, tank exposure, engine, and fuel system design and requirements, etc…)

3.) When we subject treated fuel to prolonged durations of frigid temperatures at or below the cloud point, wax fallout can begin to occur. We then must take proper steps to prevent and avoid issues.