

Re-refining: Reducing Costs and Protecting the Environment

by Rodney Walker

As a rising sun replaces the industrial floodlights that cast shadows across 15 acres of holding tanks, vacuum towers and dehydration units at a re-refinery in East Chicago, Ind., it's unlikely the untrained eye would know it was anywhere other than a traditional oil refinery. The precision hum of activity and the constant motion of inbound used oil deliveries are matched only by the equal motion of tanker trucks leaving the facility with "new" product. But what is held inside those outbound trucks is what makes this plant different — it's a re-refinery, where used oil is processed into base oil and finished lubricants that are equal to or better in quality than oil refined from virgin crude. For oil blenders, high quality re-refined base oil can mean reduced need for Group III and lower formulated cost to meet ILSAC GF-5 specifications.

"Today, used oil feedstock has ever-increasing amounts of Group III oil," said Curt Knapp, chief marketing officer of Safety-Kleen. "So, we collect passenger car engine oil (PCEO) that contains more Group III that improves the quality of

our feedstock and re-refined base oil. Our labs test the used oil we collect to ensure it meets our high standards for feedstock and base oil."

Reduced NOACK, Reduced Formulated Cost

Due to improved feedstock and rigorous production processes, re-refined base oils have low NOACK Volatility Test (otherwise known as ASTM D-5000) values. And that can reduce blended formulated cost, because less Group III is required. "In 2012, NOACK has averaged 13.6 in our re-refined base oil," said Knapp. "That number has continued to improve over the years. And we only expect that trend to continue as refining processes and feedstock continue to improve across the industry."

The Process

The most reputable re-refineries meet API and OEM standards for quality management which means they're extraordinarily consistent in every measure of quality as they produce Group II base oils, along with other lubricants.

Once a shipment of used oil is deemed suitable for re-refining, it is first dehydrated, removing any water present in the oil. This process also removes light fuels and ethylene glycol from the feedstock. The light fuels are used to power the refinery, while

the ethylene glycol is captured to manufacture anti-freeze. Industrial fuel is then separated from feedstock to be used as an alternative energy.

The oil undergoes vacuum distillation to remove the "lube cut" of feedstock, while the remaining additives and by-products are used to create asphalt extender.

The lube cut next undergoes hydro treating or catalytic hydrogenation to remove residual polymers and other chemical compounds. This process also saturates the oil's carbon chains with hydrogen to enhance the re-refined base oil's stability.

Finally, the re-refined base oil is separated into three different oil grades: light viscosity lubricants suitable for general lubricant applications, low viscosity lubricants for automotive and industrial applications and high viscosity lubricants for heavy duty applications.

Tested in Real World Conditions for a Million Miles

To prove the quality of products made from base oil, Safety-Kleen enlisted a third-party to conduct an independent, fully-loaded, long-haul service engine test using two heavy-duty semi-trucks. The trucks, equipped with 2007 Cummins ISX 450hp EGR engines, used only engine oil comprised of about



Tank trucks deliver used oil to a re-refinery.

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Bird's-eye view of a re-refinery.



Re-refinery worker.

85 percent re-refined base oil. The oil was changed at intervals exceeding 40,000 miles. When the trucks reached 1,000,000 miles, their engines were disassembled and inspected; the lack of wear to internal engine parts was clearly visible.

The million mile test was an extension of a half-million mile test that compared the re-refined HD 15W-40 CJ-4/SM to two super-premium heavy-duty engine oils refined from crude. In that test, the re-refined oil provided engine protection and cleanliness that was as good as or better than engine oil made from virgin crude.

Protecting the Environment

When oil is re-refined, it becomes a renewable and sustainable resource.

Since the oil molecules don't break down, the additives can be replaced and reclaimed oil can be re-refined over and over again.

Alternate methods of oil disposal are terribly harmful to the environment. For instance, if the oil Safety-Kleen re-refines was burned for energy, it would produce 300,000 more metric tons of greenhouse gas emissions than it does through re-refining. The savings in greenhouse gas emissions is the equivalent of removing 200,000 cars from America's roads.

Beyond environmental benefits, however, re-refined base oil reduces the United States' dependency on foreign oil. For instance, it takes 42 gallons of crude oil to create one gallon of high-quality motor oil. But using re-refined

base oil to create that same gallon of motor oil requires no virgin crude oil, and 85 percent less energy to produce.

"For companies to choose a re-refined product over a more traditional crude-based product, it's helpful to understand that doing so is a no-lose situation," said Knapp. "Using high quality re-refined base oil can reduce blended formulated cost, due to lower need for adding Group III to meet requirements for many formulas." 💧



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