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March 2015

Volume 6, Number 3

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Bio-based Lubricants: An Environmental Solution for Refuse Hauling

Waste industry professionals can ensure that they have a positive impact on the environments in which their clientele live and work on a daily basis when they select bio-based hydraulic fluids, greases and other lubricants.

■ By Peter Haines

The waste industry continues to be a pacesetter in regards to environmental stewardship, with many organizations having converted some or all of their fleets to clean burning natural gas engine technologies. The net result is a significantly reduced environmental impact from these power units due to a capital equipment investment proven to lower carbon and NO_x emissions. With refuse fleets operating in both urban and rural settings, the health and well-being benefits to citizens in the operating areas of these progressive fleets are notable indeed.

Refuse fleets are known for operating in a number of different areas and terrains, including near waterways and certainly over soil. The potential damage to the environment as a result of an inadvertent lubricant leak, which could potentially impact both water and soil quality, suggests that refuse equipment owners/operators consider additional pro-environmental steps in regard to their overall maintenance program.

A lubrication strategy to minimize the risks associated with potential environmental exposure is to integrate the use of readily biodegradable, minimally toxic, non bio-accumulative lubricants into fleet operations. This is particularly important when considering hydraulic fluid and grease options, as these lubricants have the greatest potential for accidental release into our environment because of the grueling stop and go driving, intermittent highway driving, and even some off-road driving at the physical dump site that a refuse fleet encounters. This daily occurrence is tough on equipment and componentry and the potential for lubricant leaks is high, which makes

the advantages of integrating the use of high performing bio-based lubricants quite compelling.

Potential Damage

Hydraulic systems have a particularly high risk of potential physical damage due to the exposed hoses of the system, and the likelihood of a busted hose resulting in a hydraulic oil spill is extremely high. Bearings, U-joints and other grease-lubricated applications also have the potential of releasing lubricant into the environment.

The monetary ramifications of an unintentional lubricant spill could be costly fines or expensive cleanup costs due to environmental damage, not to mention the negative impact a spill could have on an organization's brand and reputation. A conversion to readily biodegradable, minimally toxic and non-bioaccumulative lubricants is easily done, with no changes to established PM programs, and absolutely no decrease in lubricant performance when used in accordance with manufacturer recommendations. A conversion to bio-based lubricants is a viable alternative available to refuse haulers to help mitigate the negative impacts resulting from an inadvertent release of conventional petroleum and synthetic lubricants to the environment.

Once the value of converting to a hydraulic oil, grease or other lubricant that performs in service and also eliminates or minimizes the negative monetary and environmental effects of an unintended release is realized, the process of choosing a viable option can be intimidating due to a lack of insight into the

Table 1: Bio-based hydraulic fluid selection criteria.

Physical Performance Properties for Readily Biodegradable Hydraulic Fluid Lubricants	ASTM Test	Readily Biodegradable Hydraulic Fluid Criteria (Numbers compiled are averages from samples of bio-based ISO 32, 46, and 68 grades of fluids)		
		Vegetable Based	Semi Synthetic	Full Synthetic
Viscosity Index (VI)	D2270	>190	>210	>180
Flash Point, °F	D92	>440	>420	>550
Pour Point, °F	D97	<-20	<-25	<-50
Dielectric Breakdown Voltage, kV	D877	>55	>55	>55
Rust Test, A&B	D665	Pass	Pass	Pass
Copper Corrosion	D4048	1A	1A	1A
4-ball Wear, scar, mm	D4172	<0.50	<0.50	<0.50
Demulsibility, 15 min	D1401	40-40-0	40-40-0	40-40-0
FZG Damage Load Stage	D5182	>12	>12	>12
Bio-based Content, % *	D6866	>90	>80	.>80

*>44% qualifies the product as Bio-preferred

Tables courtesy of BioBlend Renewable Resources, LLC.

Table 2: Bio-based grease selection criteria.

Physical Performance Properties for Readily Biodegradable Greases	ASTM Test	Readily Biodegradable Grease Criteria (Numbers compiled are averages from samples of bio-based NLGI grade 1 and 2 greases)	
		Vegetable Based	Full Synthetic
Flash Point, °F	D92	>510	>510
Fire Point, °F	D92	>540	>550
4-ball EP Weld Load, kg	D2596	>310	>250
4-ball Wear, mm	D2266	<0.61	<0.61
Copper Corrosion	D4048	1A	1A
Dropping Point, °F	D2265	>350	>360
Water Washout, % loss max.	D1264	6	6
Rust test	D1743	Pass	Pass
Timken OK Load, lbs.	D2509	>50	>75
Bio-based Content, %	D6866	>90	>80

proper selection for these types of lubricants. By using the criteria outlined below, you can determine which lubricant will adequately minimize the impact of an accidental release into the environment and, at the same time, perform adequately in service.

Performance Selection Criteria

With the global biodegradable lubricants market projected to reach \$2.1B in 2014 (1)(2)(3) and bio-based lubricant growth outpacing synthetic lubricant growth (1)(2)(3), the use of bio-based lubricants continues to expand. This clearly demonstrates that the in-service performance attributes of modern bio-based lubricant technologies have been established and proven in the field. Bio-

based hydraulic fluid selection criteria or benchmarks might include those indicated in Table 1. On the other hand, grease selection criteria or benchmarks might include those indicated in Table 2.

Environmental Selection Criteria


Lubricants that can serve as operational ‘risk mitigation insurance’ should offer base features that differentiate their environmental attributes, thereby easing the burden of waste hauler lubricant selection for environmental benefits.

It is important to point out that many lubricant marketers claiming their products are ‘environmentally friendly’ actually have very little basis for making this claim. There is no Environmental Protection Agency (EPA)—or other environmental organization—support or regulation regarding the use of the phrase ‘environmentally friendly’. The catch phrase is often just marketing hype based on a single irrelevant product attribute. Consideration should be given to using lubricants that meet the EPA criteria for being readily biodegradable, meaning >60 percent of the lubricant will biodegrade in 28 days or less. They should also be minimally toxic and non-bioaccumulative to soil or water species, which subsequently minimizes toxicological and environmental impacts on higher life forms, including people.

On 12/19/13, the EPA published a revision to its Vessel General Permit (VGP) where it mandated the use of Environmentally Acceptable Lubricants (EALs) in all applications where the potential exists for an oil-to-water interface

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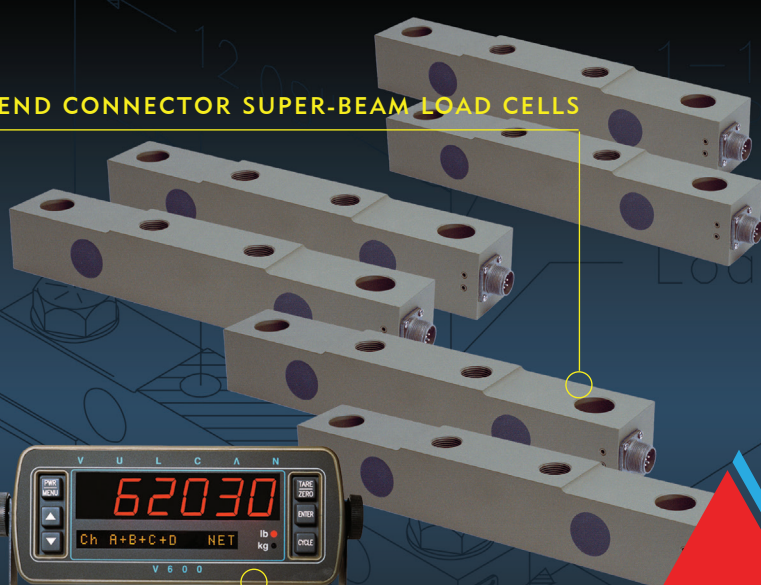
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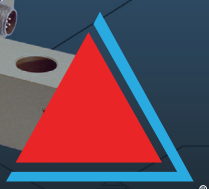
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CASE STUDY:
ENHANCING GREEN AND SUSTAINABILITY
INITIATIVES

As a third generation family business headquartered in Londonderry, MA, the Charles George Companies has seen the trash removal industry evolve as the concerns for the environment have grown. Operating as a full-service waste stream management company for customers throughout New England, they provide an array of solid waste disposal and recycling solutions designed to protect the environment. With their vast experience, effective techniques and deep commitment to the planet, it's not surprising to learn that they not only offer their customers green and sustainable solutions designed to dramatically lessen any adverse impact on the environment, but also practice what they preach.



Charles George Companies' refuse truck.
Image courtesy of Charles George Companies.

As a full-service waste stream management company, Michael Karras, Co-President of Charles George Company Inc., made the decision to offer its customers green and sustainable solutions designed to dramatically lessen any adverse impact on the environment. "We looked for a hydraulic oil that was able to aid us in our social responsibility to protect the environment, as well as meet the high demands of our equipment and fleet. BioBlend has met the challenge and we could not be happier with the results."

The Charles George Companies uses BioBlend BioFlo AW 32 Biodegradable Hydraulic Fluid. They are serviced by BioBlend distributor Dennis K. Burke, Inc., a progressive family-owned business headquartered in Chelsea, MA that has been delivering premium fuel and lubricant products for more than 50 years. Currently running operations in seven New England states, DKB recognizes the importance of bio-lube proliferation in the refuse industry, and other markets, servicing clientele like Harvard University, Fore River Dock & Dredge and other operations interested in enhancing their green and sustainability initiatives.

Bio-based Lubricants: An Environmental Solution for Refuse Hauling

Table 3: Current EPA recognized test criteria to classify a lubricant as an EAL.

TABLE 3: 2013 VGP Criteria for Lubricant Classification as an EAL As defined in Appendix A of the 2013 VGP, there are three criteria for a product to be classified as an Environmentally Acceptable Lubricant (EAL)		
EAL Criteria	Recognized Testing	Comment
Biodegradable	<ul style="list-style-type: none">- OECD 301 A-F, 306, and 310- ASTM 5864- ASTM D-7373- OCSPH Harmonized Guideline 835.3110- ISO 14593:1999	> 60% means 'biodegradable' under this standard (28 day test)
Minimally Toxic	<ul style="list-style-type: none">- OECD 201, 202, and 203 for acute toxicity testing (ISO/DIS 10253 for algae, ISO TC147/SC5/W62 for crustacean, and OSPAR 2005 for fish, may be substituted)- OECD 210 and 211 for chronic toxicity testing	Safe for contact with skin, non-carcinogenic
Not Bioaccumulative	<ul style="list-style-type: none">- The partition coefficient in the marine environment is log KOW <3 or >7 using test methods OECD 117 and 107- Molecular mass > 800 Daltons- Molecular diameter >1.5 nanometer- BCF or BAF is <100 L/kg using OECD 305, OCSPH 850.1710 or OCSPH 850.1730- Field-measured BAF- Polymer with MW fraction below 1,000 g/mol is <1%	Typically a Calculated Value

unless it is deemed technically infeasible to do so. This permitting process is applicable to vessels >79' in length operating in salt and/or freshwater. While adopting this mandate revision, the EPA was careful to define standards that would guide manufacturers and marketers in claiming their products as EALs and to aid end users in selecting approved lubricants suitable for use in these critical marine applications. Since marine vessels have a direct impact on water and soil quality, one can reason that lubricants meeting these defined environmental standards can also serve as a benchmark or selection criteria for choosing lubricants within the waste industry that actually meet EPA definitions for environmental stewardship. To achieve this level of eco-sensitivity, equipment owners and operators should seek lubricants labeled as EALs that meet the following clearly defined EPA test standards for environmental quality (see Table 3).

Interestingly enough, the EPA is also poised to introduce the Small Vessel General Permit (sVGP), effective 12/19/17, making the same general permitting process mandate applicable to vessels <79' in length, and thereby applying to dredges, tugboats, commercial fishing vessels, diving operations, etc. Both permitting mandates are being put into place to provide lubricant users operating in marine environments guidance and direction on using lubricants that are proven to minimize the environmental impact to both water and soil microbial life, as well as and higher life forms up the food chain.

A Positive Impact

Waste industry professionals can ensure that they have a positive impact on the environments in which their clientele live and work on a daily basis when they use the above basic performance and environmental criteria as benchmarks in selecting hydraulic fluids, greases and other lubricants with the potential for release into the environment. By partnering with a reputable bio-based lubricants supplier that has a proven track record of supplying high performing products, refuse fleet owners/operators can also be sure that they are choosing lubricants that protect their costly capital equipment investments, while at the same time expanding their already significant environmental accomplishments. | **WA**

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Labor and fuel are the two greatest expenses associated with off-highway operations. When less time is spent on post-refuse processing operations, operators can be used for other revenue generating tasks. The monetary benefits of going custom are plain to see, but operator safety is a key factor to consider when making any equipment purchasing decision.

Keep Employees Safe

Even seasoned off-highway truck operators trained to drive on piles, can't anticipate when soft, uneven refuse mounds will sink or give away. Often it's necessary to drive the truck forward a few feet to ensure that all the refuse gets dumped. This uneven footing created by the irregular density of the refuse material can cause a truck to tip or roll, resulting in equipment damage and potentially, personal injury.

On top of the potential injuries and workers' compensation claims, there's damage to the truck and cost of repairs when rollovers occur. These can cost more than \$250,000 and be a major loss for companies, especially if it's an old truck with a depreciated insurance value.

Custom refuse bodies assist in putting managers' minds at ease. The expanded width and low center of gravity of custom bodies increase stability when lifting to dump or driving up steep grades. With rear eject refuse bodies, operators are safer because the truck doesn't lift, providing a consistently low center of gravity regardless of the amount of tons in the truck body.

Less Maintenance, Less Downtime

Equipment unavailability is detrimental to landfill managers. Staying up-to-date on routine maintenance is an essential piece of operations, and equipment that requires little maintenance goes a long way to minimize costly downtime.

High-performance custom body manufacturers know that fewer moving

parts mean minimal breakdowns and maximum uptime. So they've engineered rear-eject bodies with low-maintenance hydraulic controls, no grease points and tailgates that rise and fall mechanically, not hydraulically, in conjunction with the rate of the ejector blade.

When a body is custom designed for refuse hauling, there's no guessing game on how long it will last. Properly designed refuse bodies should last more than 20 years, which is impressive when thinking about all the different materials they come in contact with.

Most custom refuse bodies and ejectors can be outfitted on off-highway trucks the landfill already owns to maximize savings, or they can be designed for a new truck chassis (without OEM body) that are ordered through their OEM off-highway truck dealer. Though the initial investment is higher than the OEM alternative, the return is seen after just a few months of use—and the bodies continue to make money for the landfill every day thereafter, for it's entire service life. It really is easy to see the benefits of going custom.

Maybe one day humans will stop producing waste and landfills will only cross people's minds when thinking, "remember when." But until then, the quest for improved efficiency remains. After all, 680 million tons of refuse a day is nothing to take lightly. | **WA**

Josh Swank is Vice President of Sales and Marketing for Philippi-Hagenbuch Inc. (Peoria, IL). He has been with the company for 12 years and oversees the mining industry sales group. Philippi-Hagenbuch has been building equipment for off-highway haul trucks since 1969, and become a global leader in off-highway truck customization. In addition to custom truck bodies, lowboy trailers, VRTs, rear eject bodies and trailers, Philippi-Hagenbuch designs and builds tailgates and water tanks for nearly every make and model of articulated and rigid frame off-highway truck available. For more information, call (309) 697-9200, toll-free at (800) 447-6464 or e-mail sales@philsystems.com.

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