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## ***Dispelling Common Misconceptions Associated With Bio-Lubricants***

### ***Abstract***

While you or your organization may have interest in learning more about environmental strategies related to biobased lubricant usage, or specific technology solutions offered by BioBlend or its global distributor base, it's safe to assume you'd like to make an informed decision and understand the facts. To successfully accomplish this, you'll need foundational knowledge to base your lubricant selection decisions on... which requires that you contrast the bio-lubricant technologies and solutions offered by BioBlend to known elements; namely conventional petroleum and/or synthetic lubricants.

The information and insights offered in this white paper will uniquely position your organization to have a significantly enhanced understanding of bio-lubricants in your market space and are worthy of your consideration. After your review on these insights please recognize that BioBlend is willing and able to answer/address any additional questions you may have, via email or via a face-to-face meeting with you and/or any associated teams or team members within your organization.

BioBlend is interested in you having the facts associated with your lubricant decision-making process, because when the day is done ... your lubricant decisions directly impact your organizations operating profitability picture ... and you do have performance-driven, bio-lubricant solutions and options to consider.

The information in this white paper can be categorized as follows:

- ✓ ***BioBlend ... Overcoming Market Misconceptions Relating to Bio-Lubricants***
- ✓ ***Core Environmental Strategies & OEM's***
- ✓ ***Relational Experience***
- ✓ ***A Case For BioBlend Bio-Lubricant Technologies in your Organization***

### ***BioBlend ... Overcoming Market Misconceptions Relating to Bio-Lubricants***

People and businesses generally 'use and/or make decisions' based upon what those people and businesses 'know and/or have experience with'. In the lubricants world the vast majority of experience is related to conventional petroleum and/or synthetic lubricants. First, we must dispel some common misconceptions:

#### ***Q. Will the bio-lubricant technologies from BioBlend biodegrade in my equipment?***

A. No. The technologies from BioBlend will NOT biodegrade in your equipment ... it takes microorganisms, air, water, heat, etc. for a lubricant to biodegrade - and the biodegradation process does not start until AFTER the product enters the environment.

- ✓ Conventional petroleum technologies are '***Inherently Biodegradable***' (15-35% in 28 days per recognized EPA test protocols). Have you ever had an incident where a petroleum product biodegraded in your equipment? No. They biodegrade just like BioBlend technologies if they enter the environment ... but at a much slower rate. And, the BioBlend technologies are 'minimally toxic while they biodegrade.
- ✓ BioBlend bio-based technologies are '***Readily / Ultimately Biodegradable***' (>60% biodegraded in 28 days per recognized EPA test protocols). Like conventional petroleum products they don't biodegrade unless introduced into the environment. AFTER entering the environment, they start the biodegradation process ... just like conventional petroleum or synthetic technologies would ...but they biodegrade under these conditions at a significantly faster rate. And, it is important to point out, that the bio-lubricant technologies are

**'Minimally Toxic'** (OECD 210, 202, 203) while they biodegrade ... and are **'Not Bioaccumulative'** in soil and/or water micro-organisms, nor do they bioaccumulate up the food chain to include magnification in humans.

- ✓ In short, the bio-lube BioBlend technologies are significantly safer to use and more environmentally acceptable than conventional petroleum or synthetic lubricants ... hence the decisive **environmental advantage**.

**Q. Do I have to do anything special to convert to BioBlend technologies?**

A. No. BioBlend technologies are compatible with conventional petroleum fluids and most synthetic lubricants (except PAG's which are also incompatible with conventional petroleum and synthetic lubes – including other PAG synthetics).

- ✓ BioBlend technologies can be used as top-off ... but the biodegradability and minimal toxicity benefits are diminished. Complete draining is preferred, and flushing is optional ... but not necessary.

**Q. Will BioBlend attack the seals, seal materials and/or hoses used in my systems?**

A. No. The bio-lube BioBlend technologies are compatible with common seals, seal materials and hoses. No special equipment modifications are required.

**Q. What are the limitations of BioBlend technologies?**

A. The bio-lube BioBlend technologies have the same limitations impacting every lube, including conventional petroleum and/or synthetic lube technologies:

**Poorly Maintained Equipment:**

- ✓ Lubricants are NOT 'fix a leak in a can'.
- ✓ Routine/standard equipment maintenance must still be performed regardless of the lube used.

**Too Much Water**

- ✓ Water is the natural enemy of lubes negatively impacting viscometrics and catalyzing the oil oxidation process.
- ✓ Every effort should be made to keep oils water-free ... which include the lubricants you're currently using, as well as bio-lubricant products.

**Too Much Heat**

- ✓ Oils age through the oxidation process, which is brought about by a combination of heat + moisture + contaminants.
- ✓ Routine preventative maintenance, proper oil fill levels, oil filtration and use of the proper lube for each application helps enhance the management of oil oxidation.

**Q. In the event my organization has an inadvertent lubricant spill (on soil and/or in water) is there any risk-mitigation advantage to be using BioBlend bio-lubricant technologies versus conventional petroleum and/or synthetic products?**

A. Absolutely there is. Every lubricant application, whether indoors or outdoors, occurs within a specified watershed district. Even spills on soil, concrete or asphalt end up impacting the water-shed district. The use of lubricants that are proven by EPA definitions to offer significantly reduced environmental impacts simply makes good business sense, and offers your organization maximum risk mitigation:

- ✓ While reporting of all oil/lubricant spills is recommended by BioBlend in all cases, being able to report to the governing regulatory agency that your organization is utilizing BioBlend bio-lubricant technologies, with their high degree of environmental sensitivity, suggests to the governing agency that your organization has taken definitive steps to minimize the environmental impacts of its actions. PERIOD.
  - You cannot make this claim if you are using conventional petroleum and/or synthetic lubricants.
- ✓ If fines are levied for the oil/lubricant spill... those fines are typically reduced or eliminated if BioBlend bio-lubricant technologies are in service.
- ✓ Costs associated with oil spill clean-ups are often less intrusive to your bottom-line, if they're even mandated or required at all, when the inadvertent oil spill is a bio-lubricant technology from BioBlend.

- ✓ Potential damage to your organizations brand and/or reputation is significantly reduced if BioBlend bio-lubricant technologies have been deployed and were in service.

**Q. Can BioBlend substantiate the environmental stewardship of BioBlend technologies vs. conventional petroleum and/or synthetic lubricants?**

A. Yes we can- and by using recognized environmental stewardship test protocols recognized by the EPA. In 2013 the EPA issued a mandate to its Vessel General Permit (VGP) making it mandatory that Environmentally Acceptable Lubricants (EAL's) be used in all fresh or salt water environments where the potential for an oil-to-water interface occurs. While this legislation currently applies to all vessels >79' in length operating in US waters, on December 19<sup>th</sup>, 2017 the small Vessel General Permit (sVGP) is scheduled to go into effect and will apply to all vessels <79'.

- ✓ BioBlend offers organizations a comprehensive offering of BioBlend technologies that meet current EPA definitions to be classified as EAL's as per the EPA's 2013 VGP.

<b>TABLE 2: 2013 VGP Criteria for Lubricant Classification as an EAL</b>		
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)		
<b>EAL Criteria</b>	<b>EPA Recognized Testing</b>	<b>Comment</b>
<b>Readily Biodegradable</b>	<ul style="list-style-type: none"> <li>- OECD 301 A-F, 306, and 310</li> <li>- ASTM 5864</li> <li>- ASTM D-7373</li> <li>- OCSPP Harmonized Guideline 835.3110</li> <li>- ISO 14593:1999</li> </ul>	> 60% means 'biodegradable' under this standard (28 day test)
<b>Minimally Toxic</b>	<ul style="list-style-type: none"> <li>- 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)</li> <li>- OECD 210 and 211 for chronic toxicity testing</li> </ul>	Safe for contact with skin, non-carcinogenic
<b>Not Bioaccumulative</b>	<ul style="list-style-type: none"> <li>- The partition coefficient in the marine environment is log KOW &lt;3 or &gt;7 using test methods OECD 117 and 107</li> <li>- Molecular mass &gt; 800 Daltons</li> <li>- Molecular diameter &gt;1.5 nanometer</li> <li>- BCF or BAF is &lt;100 L/kg using OECD 305, OCSPP 850.1710 or OCSPP 850.1730</li> <li>- Field-measured BAF</li> <li>- Polymer with MW fraction below 1,000 g/mol is &lt;1%</li> </ul>	Calculated Value

<b>TABLE 3: 2013 VGP-Compliant BioBlend EAL Technologies</b>		
<b>General Applications</b>	<b>Typical Product</b>	<b>BioBlend EAL Products</b>
Stabilizers	<b>Hydraulic Fluid</b>	BioFlo AW32/AW46/AW68 BioFlo AWS32/AWS46/AWS68 BioFlo Synthetic32/Synthetic46/Synthetic68
Hydraulic Systems (Systems, Doors, Ramps)	<b>Hydraulic Fluids</b>	BioFlo AW32/AW46/AW68 BioFlo AWS32/AWS46/AWS68 BioFlo Synthetic32/Synthetic46/Synthetic68
Thrusters	<b>Gear Oil</b>	BioGear EP100/EP150/EP220

Azimuth Thrusters	<b>Gear Oils</b> <b>Hydraulic Fluid</b>	BioGear EP100/EP150/EP220 BioFlo AW32/AW46/AW68 BioFlo AWS32/AWS46/AWS68 BioFlo Synthetic32/Synthetic46/Synthetic68
Stern Tubes	<b>Stern Tube Lube</b>	BioFlo STL100/STL150
Multi-Purpose Grease & Wire Rope Lube	<b>Grease</b>	BioGrease HD1/HD2 BioGrease GP00/GP0/GP1 SynGrease XT
Winches & Cranes	<b>Gear Oil</b>	BioGear EP100/EP150/EP220
General Purpose Lube & Penetrating Oil	<b>Multi-Purpose Oil</b>	BioBlend MPO ( <i>aerosol or bulk</i> )

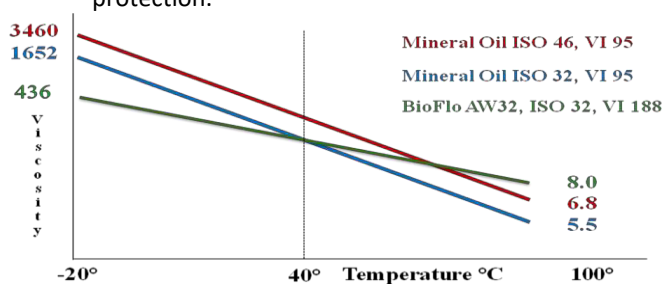
**Q. When converting to, or using, BioBlend technologies should my organization expect an in-service performance deficiency?**

A. No. Without a doubt there are differences between conventional petroleum and synthetic lubricants when contrasted to BioBlend bio-lubricants. For example, were you aware of the following 10 benefits of BioFlo Biodegradable Hydraulic Fluids vs. conventional petroleum and/or synthetic fluids?

- (1) **High VI (Viscosity Index) ...** typically 2x that of conventional petroleum fluids – and most synthetic fluids. VI is the resistance to changes in viscosity with changes in temperature, meaning a high VI is best! Even with typical application shear, the high natural VI of BioBlend products maintains the film strength... viscosity ... of the lubricant better, which in turn provides better friction and wear protection of the metal surfaces of the equipment.

Oil Type	VI (Viscosity Index)
BioBlend (Canola Oil / Natural Ester)	>200
Conventional Petroleum/Mineral Oil	90-100
PAO (polyalphaolefin) Synthetic	120-130
PAG (polyalkyleneglycol) Synthetic	145-155

This naturally high VI also suggests that the BioFlo technologies literally offer multi-viscosity type characteristics. For example you can use BioFlo AW 32 Biodegradable hydraulic Fluid everywhere you use an ISO 32 or ISO 46 conventional petroleum hydraulic fluid ... and not sacrifice viscometric fluid protection.



- (2) **Powerful Metal Polarity ...** canola-based natural ester lube technologies from BioBlend offer significantly higher metal surface 'polarity' than petroleum oils. Polarity benefits include:
- ✓ The oil clings better staying in place to improve lubrication vs. petroleum lubes.
  - ✓ Enhanced 'metal wetting' ... aids in enhanced corrosion resistance and protection vs. petroleum lubricants.

**High Metal Polarity = Enhanced Lubricity ... which means they lubricate better!**

**(3) Superior Lubricity Performance...** biodegradable canola oils offer users excellent lubricity, far superior to that of mineral/petroleum oils:

- ✓ The inherent friction reducing qualities of the vegetable base oil lowers application temperatures, extending equipment life.
- ✓ Conventional petroleum products do not exhibit the same high level of lubricity performance delivered by BioBlend technologies.

*In fact, their lubricity is so potent that in some applications, such as combination gear-hydraulic fluids for tractor transmissions, friction materials must be added to reduce clutch slippage.*

**(4) Very High Flash Points ...** think safety!

- ✓ Flash point - defined as the temp to which a combustible liquid must be heated to give off sufficient vapor to momentarily form a flammable mixture with air when a small flame is applied under specified conditions, according to ASTM D92.
- ✓ An important property of natural ester (*canola*) BioBlend technologies is their high flash points ... typically, 610°F (326°C) for most BioBlend oils compared to 392°F (200°C) for most petroleum oils.
- ✓ In fact, the flash points of natural ester BioBlend technologies typically exceed commonly known conventional synthetic fluid flash points (PAO ~ 221°C / PAG ~ 177°C).
- ✓ Again, think safety.

**(5) Very High Dielectric Strength ...** typically 55 kV for BioBlend vs. 35 kV for conventional petroleum products.

- ✓ The dielectric strength of an insulating material is the maximum electric field that a pure material can withstand under ideal conditions without breaking down (*i.e., without experiencing failure of its insulating properties*).
- ✓ A higher dielectric strength correlates to a greater margin of safety for equipment/applications near anything using electricity ... power lines, overhead canopies, etc. Considering most organizations have applications where you are operating equipment near and/or around electrical power, this safety feature of BioBlend technologies is an important consideration.
- ✓ Think safety!

**(6) Superior Cleansing Ability ...** an important function of every lubricant.

- ✓ A lubricant's ability to clean is termed '*solvency*'. Bio-based technologies deliver superior solvency vs. petroleum oils with high solvency benefits including:
  - Removes pre-existing varnish and deposits in aged systems.
  - Oil keeps contaminants in suspension for removal by filter.
  - Keeps metal surfaces clean to enhance heat exchange and maintain the lowest system operating temperatures which extends oil and mechanical componentry service life.

**(7) Environmentally Acceptable, ...** minimal adverse effect on the environment compared to petroleum.

- ✓ Beyond basic lubricant performance ... BioBlend lubricants are biodegradable, minimally toxic, and non-bioaccumulative.
- ✓ All biodegradable BioBlend lubricants are readily biodegradable (*>60% biodegradation in 28 days per recognized EPA test protocols*). Considering the fact that when petroleum oil spills occur ... and with oil spills it's a matter of when – not if ... the biodegradability of the technology is important, as is its relative low toxicity to the environment while it biodegrades
- ✓ You won't find a more viable environmental solution than BioBlend technologies.

TYPICAL TEST RESULTS FOR LUBRICANTS	
LUBRICANT TYPE	PRIMARY BIODEGRADED QUANTITY
Vegetable Oils	70 - 100 %
Polyols and Diesters	55 - 100 %
White Oils	25 - 45 %
Mineral	15 - 35 %
PAG	10 - 20 %
PAO	5 - 30 %
Polyether	0 - 25 %

**(8) Technologies Have Minimal Environmental Impact ...** and BioBlend uses recognized EPA test protocols to substantiate its environmental claims!

- ✓ A large number of the BioBlend family of products (*canola-based / semi-synthetic / full synthetic*) are classified as Environmentally Acceptable Lubricants (*EAL's*) as per the EPA's 2011 guidance document Environmentally Acceptable Lubricants EPA 800-R-11-002, making them viable technologies to use in even the most sensitive environments. You can't get any more environmentally responsible than this!
- ✓ Considering that regardless of the application, it is part of a unique watershed district ... the deployment of environmentally sound BioBlend bio-lubricant technology solutions just makes good business sense.

**(9) Renewable & Sustainable ...** reduce dependency on imported petroleum oils.

- ✓ A resource that is replenished by the environment over a relatively short period of time and is capable of maintaining its productivity and usefulness to society indefinitely. Without harm to the environment.
- ✓ Use renewable base oil technologies grown by farmers!
- ✓ Support your or customer's corporate Sustainability initiatives.

**(10) Lowest Total Cost of Ownership ...** BioBlend offers the lowest cost of ownership because BioBlend technologies are superior performers, biodegradable and minimally toxic!

- ✓ Price per gallon/liter is insignificant compared to the total cost to the company in the event of an inadvertent or accidental lubricant release into the environment due to:
  - Clean-up Costs
  - Remediation Costs
  - Public Relations Impact
  - Brand/Image Impact

## ***Core Environmental Strategies & OEM's***

Businesses and organizations operating in today's competitive marketplace have recognized the value in promoting their organizations corporate environmental and sustainability initiatives. While significant time and energy can be spent creating supporting verbiage for your organizations environmental campaign, the use of BioBlend bio-lubricant technologies represents that **ACTION** is being taken by your organization to reduce potential environmental impacts related to inadvertent oils spills in the communities and regions where your business operates ... and people live and work.

BioBlend works with interested organizations to create unique campaigns that support their organizations specific corporate environmental and sustainability initiatives. At BioBlend, we believe organizations have a responsibility to incorporate environmental solutions that meet today's expectations for sound environmental stewardship. BioBlend offers viable, performance-driven bio-lubricant solutions with distinctive and quantifiable environmental advantages and recognizes that:

1. Organizations do receive periodic requests from their customers for more environmentally sound lubricant solutions ... BioBlend can help.
2. Organizations often seek discriminating performance and environmental solutions that may involve the deployment of bio-lubricant solutions ... BioBlend can help.

3. Organizations are often interested in differentiating themselves within the market by offering their customers performance-driven, petroleum-free environmental lubricant solutions for maximum risk mitigation as a normal or standard lubricant recommendation ... BioBlend can help.
4. In today's litigious society – your organization does NOT have to needlessly expose itself to potential fines and/or litigation related to oil spills, even inadvertent oil spills ... BioBlend can help.

BioBlend offers a variety of bio-lube choices and solutions. If the OEM of the equipment you operate does not currently offer you bio-lubricant solutions ... let them know you want them to visit with BioBlend and/or share the connection with BioBlend so we can follow up with the OEM on your behalf. In broad scope consideration, there is merit for all OEM's to consider environmental strategies related to the equipment and services they offer.

**(1) Recommend BioBlend in all cases where the OEM's customers are seeking an environmental solution to their lubricant needs.**

- ✓ Again, if your OEM supplier does NOT offer environmental bio-lubricant solutions/alternatives, BioBlend can work with their engineering department to develop the proper lubricant recommendations so that OEM's customers have clear environmental lubricant recommendations for their equipment.

## ***Relational Experiences***

The name of the game with the global success of bio-lubricants and the technologies offered by BioBlend are multi-faceted:

- ✓ BioBlend technologies have proven to perform in service in conventional and unique market sectors.
- ✓ BioBlend technologies offer significant environmental advantages and maximum risk mitigation ... in fact it's like purchasing risk mitigation insurance.
- ✓ BioBlend technologies can replace conventional petroleum and synthetic lubricants with minimal effort or controversy.
  - They are compatible with most commonly used petroleum and synthetic fluids, as well as with commonly used seals, seal materials and hoses.
- ✓ BioBlend technologies are competitively priced and not subject to the same market impacts as conventional petroleum or synthetic lubricants.
  - Which in fact is ALWAYS just one step removed from rapid price volatility based on the next world oil & gas crisis.

Certainly, bio-lubricant technology use has taken off and garnered market-share in business sectors with noted environmental motivation that often sees a high level of environmental scrutiny:

- |   |                              |
|---|------------------------------|
| ✓ Construction Sector                             | ✓ Municipal Operations       |
| ✓ Marine Environments ( <i>fresh &amp; salt</i> ) | ✓ Energy Sector              |
| ✓ Refuse Hauling & Management                     | ✓ Sand & Gravel Operations   |
| ✓ Logging & Forestry                              | ✓ Oil & Gas Field Operations |
| ✓ Mining  | ✓ Etc.                       |

That said, the bottom-line is every market that uses lubricants needs performance-driven lubricant solutions. BioBlend bio-lubricant technology solutions fit any market, anywhere; with canola-based to semi-synthetic to full synthetic bio-lubricant options that meet your specific application and environmental challenges. BioBlend offers its technologies through a global distributor network and thus is often limited by direct feedback on where they're using BioBlend technologies and what kinds of successes they're having. If you have a question pertaining to a specific application(s) within your organization, please do not hesitate to connect directly with BioBlend to make sure you receive the best recommendation for your equipment needs and your specific operating environment.

### ***A Case for BioBlend Bio-Lube Technologies in your Organization***

Although the use of bio-lubes pre-dates the use of conventional petroleum and synthetic lubricants, the proliferation of these common technologies pushed bio-lubricants to the backburner for some time. Today, however, businesses and people everywhere are waking up and realizing there are consequences for their actions ... or lack thereof ... and that modern bio-lubricant technologies from BioBlend can compete with and provide equipment performance and protection on par with the conventional petroleum and synthetic products you're familiar with and currently using.

Take a look at the BioBlend website [www.bioblend.com](http://www.bioblend.com) for information on our entire offering of biodegradable bio-lubricant technologies, as well as our unique NSF H1 food grade offering (*many of which are not only NSF H1-certified ... but compounded with high-lubricity bio-base oil versus conventional white oils that have inherent lubricity challenges*).

We welcome any additional questions you may have and hope this white paper provides you and your organization sufficient insights into some of the most common questions related to the use of BioBlend bio-lubes.

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