# DIFFERENT APPROACHES TO BIOLUBRICANTS

## Clarification Paper

**DOCUMENT 130**
**October 2018**

Technical Committee of Petroleum Additive Manufacturers in Europe AISBL
Registered in Belgium: 0694709743
Registered Address: Avenue de Tervueren 188A, box 4, B-1150 Brussels, Belgium

# "Biolubricants" and environmental standards associated with the lubricant additive supply chain

ATC, the Technical Committee of Petroleum Additive Manufacturers in Europe, with a current membership of thirteen specialty chemical manufacturers (12 full time and 1 associate member), has developed a consensus position defining the term 'biolubricant' and supporting a common understanding of this term throughout the lubricant additive industry.

There are currently various different approaches used to define a "biolubricant", some of which are presented in the following overview. Until recently this term has been used flexibly to describe any lubricant containing a significant amount of biodegradable components. However, there is now a clear differentiation between the terms 'biodegradable lubricant' and 'bio-lubricant' based on the amount of measurable renewable material that the lubricant contains.

According to EN standard 16807:2017, a product described as a 'bio-lubricant' must contain at least 25% renewable material. In contrast, a lubricant can be described as 'biodegradable' without qualifying as a 'bio-lubricant'. This situation is not entirely satisfactory and could be confusing to consumers and other end users. The purpose of this paper is therefore to standardize the use of the appropriate terminology in the lubricant additive supply chain.

Appendix 1 compares the different requirements of several common environmental standards, labelling schemes and specifications applicable to lubricants that have a favourable environmental profile. It is produced in a way that a quick comparison is possible, although for a detailed comparison the original documents must be studied.

- The requirements to be met by a biolubricant (or bio-based lubricant) can be assessed either on **the finished product** or on the **individual components**. Only the standard EN 16807:2017 fully relies on the finished lubricant in its definition. Other environmental standards usually focus on the environmental profile of individual components, although some offer an alternative approach by measuring certain characteristics of the finished product (e.g. aquatic toxicity).
- There are environmental standards which address **specific end use markets** (e.g. EPA VGP for vessels operating in US waters, OSPAR for offshore use in the North-East Atlantic) and there are others with **a broader scope** (e.g. EU Ecolabel, German "Blue Angel" etc).
- Most of the environmental standards require a formal assessment of supporting data by (or on behalf of) a national government whereas the EPA VGP is a self-assessment scheme containing definitions of "biodegradable", "not bioaccumulative" and "minimally toxic" which are aligned to the EU Ecolabel criteria for lubricants (2014), as well as other European environmental

standards that are commonly applied to lubricants that are “environmentally acceptable”.

- Most of the environmental standards **exclude specific hazardous substances**, e. g. those which are classified as CMR or SVHC, and some have a **positive list** of assessed components or substances (e.g. EU Ecolabel LuSC list, OSPAR PLONOR list).
- Considering the **environmental fate** (**biodegradation/bioaccumulation) and aquatic toxicity requirements**, the environmental standards with a broader scope show different ambition levels depending on the application. Most demanding are those concerning total loss lubricants (e.g. chainsaw oils, concrete release agents etc.) whereas those for accidental loss lubricants (e. g. hydraulic oils or closed gear oils) are less demanding.
- There is no consensus on a **minimum renewable material content** among the various environmental standards. Currently, only the EN 16807:2017 include a criterion with regard to a minimum content. The EU Ecolabel standard in force from 1st January 2019 will contain a renewable content criterion but is voluntary rather than mandatory. However, for an ecolabel fluid to be described as a ‘biolubricant’ it will need to contain a minimum, measured amount of renewable material.

In summary, the ATC consider that the descriptor ‘biolubricant’ should be used only if the lubricant contains at least 25% renewable content as measured by an acceptable method.

Appendix 1: Comparison of criteria for environmental standards relevant for the lubricant additive supply chain

| | European Eco-label Lubricants agreed criteria: 2018 | German Blue Angel RAL-UZ 178: 2014 | Swedish Standard Hydraulics SS 15 54 34: 2015 | OSPAR | US EPA Vessel General Permit (VGP) and small Vessel General Permit (sVGP):2013 | Bio-lubricants EN 16807: 2017 |
|---|---|---|---|---|---|---|
| Area of application | Extensive | Extensive | Hydraulic Fluids | Chemicals used in offshore exploration in the North Sea | Fluids used in/on vessels operating in US inland and coastal water. | Lubricant types described by ISO 6743 |
| Testing of components or final lubricant | Main focus on components, but testing final lubricant permitted for aquatic toxicity | Main focus on components, but testing final lubricant permitted for aquatic toxicity | Focus on components, or final lubricant if one component is present in > 95% concentration | Components | Not specified; testing of components and/or final lubricant permitted (Note 1) | Final lubricant (Note 2) |
| Restrictions due to excluded or limited substances | Yes | Yes | Sensitizing substances only | No | No | No |
| Biodegradability limits | Yes, depending on application > 75-95% of final lubricant should be readily biodegradable | Yes, depending on application > 95% of final lubricant should be readily biodegradable | Yes, > 95% of final lubricant should be biodegradable (Note 3) | Yes, > 60% according to OECD 306 (Note 4) | Yes, ≥ 90% for oil-based final lubricants and ≥ 75% of lubricating grease should be biodegradable | Yes, ≥ 60% for oil-based final lubricants and ≥ 50% for lubricating greases |
| Bioaccumulation limits | Yes, for non-biodegradable components; not acceptable range of log Kow from ≥ 3 and ≤ 7 | Yes, for non-biodegradable components; not acceptable range of log Kow ≥ 3. (Note 5), | No | Yes, not acceptable range of log Kow ≥ 3. | No | No |

| | European Eco-label lubricants agreed criteria: 2018 | German Blue Angel RAL-UZ 178: 2014 | Swedish Standard Hydraulics SS 15 54 34: 2015 | OSPAR | US EPA Vessel General Permit (VGP) and small Vessel General Permit (sVGP): 2013 | Bio-lubricants EN 16807: 20172017 |
|---|---|---|---|---|---|---|
| Aquatic toxicity limits | Yes, limits vary depending on application and whether components tested or final lubricant | Yes, limits vary depending on application and whether components tested or final lubricant | Yes, LC/EC/$IC_{50}$ > 100 mg/L for components present at ≥ 5%. | Yes, $LC_{50}$ limits | Yes, limits vary depending on whether components tested or final lubricant | Yes, $LC/EC_{50}$ > 100 mg/L, or final lubricant not classified as dangerous to the environment if relying on component data |
| Minimum renewability content | No (Note 6) | No (Note 6) | No | No | No | Yes, ≥ 25% measured by an acceptable method |
| Technical requirements specified | Yes, for some applications (e.g. KWF, ISO, DIN, or NMMA); fit for purpose for other applications | Yes, for some applications (e.g. KWF, ISO, DIN); fit for purpose for other lubricants | Yes | No | No | Yes, for some applications (e.g. ISO, DIN); technical performance to be confirmed between formulator and end user for other uses |
| Positive List | Yes, LuSC list | No | No | Yes, PLONOR list and “Offshore Chemical Notification Scheme List of Notified and Ranked Products” | No | Not applicable |

Note 1 – Lubricants that qualify for EU Ecolabel, Blue Angel, Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR), Nordic Swan, Swedish Standards (SS 155434 (Hydraulic) and 155470 (Grease, not considered here) or EPA Design for Environment automatically satisfy VGP criteria for an Environmentally Acceptable Lubricant (note that Nordic Swan for Lubricants no longer exists)

Note 2 – Testing final lubricant for aquatic toxicity is not required where adequate data at 3 trophic levels is available for all intentionally-added components present ≥ 0.1%

Note 3 – Test method and criterion (i.e. > 60% or > 70%) depends on water solubility (≤ 100 mg/L or > 100 mg/L) of component or final lubricant at 20°C

Note 4 – Components that biodegrade < 60% are permitted for use offshore depending on outcome of risk assessment by operator. Products containing components that biodegrade < 20% have a substitution warning assigned. Other biodegradation methods are accepted but a correction factor is usually applied

Note 5 - Derogation for components with log Kow > 6 if no alternative is possible, and can be justified

Note 6 – The use of the term 'bio' (e.g. bio-based lubricant or bio-lubricant) is only permitted where the final lubricant contains at least 25% measured renewable content

**Abbreviations used in this document**

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| CMR | Carcinogenic, Mutagenic and Toxic for Reproduction |
| DIN | Deutches Industrienorm |
| $EC_{(50)}$ | (Half Maximal) Effective Concentration |
| EN | European Norm |
| EPA | Environmental Protection Agency (US) |
| EU | European Union |
| $IC_{(50)}$ | (Half Maximal) Inhibitory Concentration |
| ISO | International Organisation for Standardisation |
| Kow | Octanol - Water Partition Coefficient |
| KWF | Kuratorium für Waldarbeit und Forsttechnik (Committee for Forest Labour and Forest Engineering) |
| $LC_{(50)}$ | (Half Maximal) Lethal Concentration |
| LuSC | Lubricant Substance Classification (list) |
| NMMA | National Marine Manufacturers Association |
| OECD | Organisation for Economic Cooperation and Development |
| OSPAR | Mechanism by which 15 Governments & the EU cooperate to protect the marine environment of the North-East Atlantic |
| PLONOR | Pose Little or No Risk to the Environment |
| RAL-UZ | Basic Criteria for Award of the Environmental Label (from RAL, the Environmental Label Jury) |
| SS | Swedish Standard |
| sVGP | Small Vessel General Permit |
| SVHC | Substance of Very High Concern |
| VGP | Vessel General Permit |