Assessment and verification of environmental acceptable hydraulic fluids (EAHF) according to the European Ecolabel's revision *Part 2*

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This paper is intended to provide information on the new EEL especially on hydraulic fluids. It is based on the third technical report (TR) 3.0 and Lubricants Act Final highlithed-after EUEB.

Biodegradability & Bioaccumulation data

The biodegradability has to be carried out on each substances at or above 0,10% (w/w).
The cumulative mass (in % w/w) of substances present in the hydraulic fluid must be :

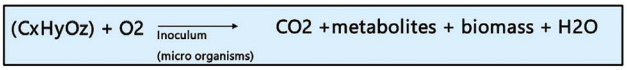
- > 90 % for readily aerobically biodegradable
- ≤ 10 % for inherently aerobically biodegradable
- ≤ 5 % for non-biodegradable and non-bioaccumulative
- ≤ 0,1 % for non-biodegradable and bioaccumulative

Test method

The test methods used to evaluate the biodegradability are both readily biodegradable according to OECD 301, OECD 310, Regulation (EC) No 440/2008 part C.4, C.5, C.42 or equivalent methods and Inherently biodegradable according to OECD 302, OECD 306, OECD 310 Regulation (EC) No 440/2008 part C.9, C.4 or equivalent methods.
A previous article published in Lubes magazine N° 126 "How to choose the most appropriate ultimate biodegradability test method" refers to method OECD 301B.

If applicable, read-across data (difference by only one positive effect functional group or fragment) to estimate the biodegradability may be used.

Biodegradability Evaluation OECD 301B



Degradation is followed by CO2 production

Air (30-100 ml/min) must be CO2-free
CO2 trapped in a $Ba(OH)_{2\ excess}$ solution and is measured by the residual Ba(OH)2
$Ba(OH)_{2\ excess}$ + CO2 → BaCO3 + Ba(OH)2
$Ba(OH)_2$ + 2HCl → BaCl2 + 2H2O
Colorimetric acid-base titration using phenolphtalein as indicator
Titrations evrey 2-3 days at the beginning then 5 days

Biodegradation = % of CO2 produced (corrected by the blank) compared to the ThCO2 (based on the test substance concentration and TOC)

As a inherently biodegradable substance is defined as a substance which achieve a degradation of > 20% but < 60% after 28 days in tests based on oxygen depletion or carbon dioxide generation (OECD 301B), it is recommended to evaluate this property according a readily biodegradable test method.

The 10-days window of readily biodegradability definition was maintained; however exemption is applied for substances identified as UVCB (Unknown, Variable composition, Complex reaction products or Biological materials or complex, multi-constituent substance with structurally similar constituents).

The (potential) Bioaccumulation or bioconcentration factor (BCF) are evaluated by the following test methods:

- BCF according to Regulation (EC) No 440/2008 part C.13 or equivalent test methods
- Log Kow according to OECD 123 or Regulation (EC) No 440/2008 part A.8
- Via calculation CLOGP, LOGKOW and SPARC

Exemption of some substances

- With MM > 800 g/mol or a molecular diameter > 1,5 nm
- With octanol-water partition coefficient log Kow <3 or >7
- BCF ≤ 100L/kg
- Polymer with and its molecular weight fraction below 1000 g/mol < 1 %,

For each applicable substance, the applicant shall provide the test reports or literature data including the references demonstrating the compliance with this requirements.

No documents need to be submitted for substances or main components already registered in LuSC-list.

Renewable ingredients requirements

The EU ecolabel open the scope to those lubricants that are not issued from renewable sources but are able to comply with the requirements of biodegradability and toxicity.

This approach takes into consideration that other ecolabels such as the Blue Angel, US-VGP and Swedish Standard do not require a minimum of renewable raw materials. Therefore, a hydraulic fluid with less than 25% of renewable carbon that fulfill the EU Ecolabel requirements may not be considered as a "biolubricant" according to EN 16807 definition and the term bio-based must not be used.

If renewable ingredients are used in the formulation, these may be preferentially certified according to third party sustainability schemes and information on the original shall be provided.

If this renewable ingredients comes from palm oil, palm kernel oil or derived, a minimum of 25% of this renewable ingredients used shall meet the requirements for sustainable production (RED, ISCC, RSPO, RSB, ...)

In this case, the applicant shall provide the final product test report in accordance with EN 16807, ASTM D 6866, DIN CEN/TS 16137, EN 16640 or EN 16785-1 to demonstrate the % of renewable carbon content.

Minimum technical performance data

To demonstrate the minimum technical performance, the hydraulic fluid shall comply with ISO 15380 specifications.
For a fire resistant hydraulic fluid, additional requirements are necessary:

- A Factory Mutual Approval Standard 6930, or
- Criteria ISO 12922 specification.

The ISO 15380 specification focus on the following property:
Physico-chemical property :

- Appearance
- Color ISO 2049
- Water content ISO 12937 / ISO 6296
- Clealiness ISO 4406
- Specific gravity at 15°C ISO 12185 / ISO 3675
- Ash content ISO 6245
- Flash point ISO 2592
- Pour point ISO 3016
- Acid number ISO 6618 / ISO 6619

Rheology property:

- Kinematic viscosity at -20°C, 0°C, 40°C and 100°C – ISO 3104
- Fluidity at low temperature 7 days – ASTM D 2532

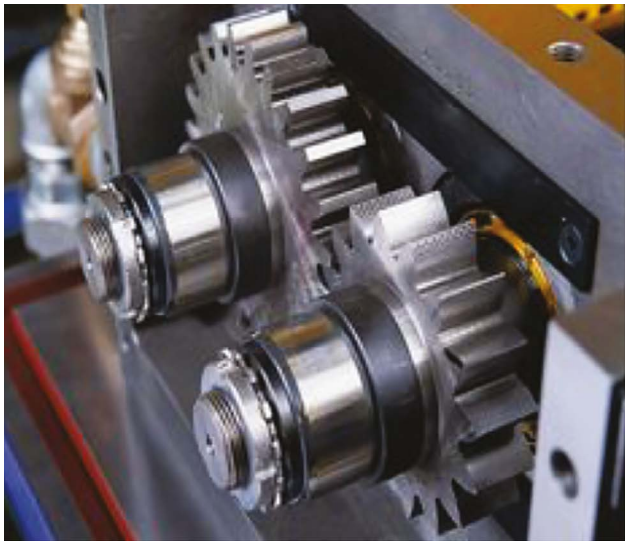
Surface property:

- Foaming characteristics ISO 6247
- Air release value ISO 9120
- Water separability at 54°C ISO 6614

Anti-oxidant property:

- Oxidation stability TOST lifetime ISO 4263-3 and 4263-1 (HEPR)
- Baader ageing test 72 hours at 95°C (HETG) or 110°C (HEES) DIN 51554-3

Anti-corrosion property:
- Copper corrosion test 3 hours at 100°C ISO 2160
- Rust preventing characteristics 24 hours ISO 7120A



Anti-wear property:
- FZG gear test A/8,3/90 ISO 14635-1
- Vickers vane pump test ISO 20763

Compatibility property:
- Seals compatibility test 1000 hours on NBR1, HNBR (tous), FKM-2(HETG, HEPG, HEPR), AU (HETG, HEES), FPM AC6 (HEES) - ISO 6072

The elastomers tested (minimum two seals that pass the specification ISO 15380) shall be indicated on the product information sheet.

The properties, in general, for a fire resistant hydraulic fluid are "similar to a classic hydraulic fluid" but refers to different test methods depending on the type of fluids HFAE, HFAS, HFB, HFC, HFDR and HFDU in specifications ISO 12922.

There are additional tests for the fire resistant properties:
- Wick flame persistence ISO 14935
- Manifold ignition test ISO 20832
- Spray ignition characteristics ISO 15029-1 and 2 are excluded from the minimum technical performance.

The applicant, in order to prove compliance on the specific technical performance, has to give the reports to the competent body. Only reports from a third party independent accredited laboratories should preferentially be accepted as requested in the general assessment and verification conditions.

Summary

The assessment and verification of the environmental acceptable hydraulic fluid according to the EU Ecolabel revision require the following data :

On substance from 0,01% (w/w) :
- Trade name and/or chemical name (IUPAC)
- CAS or EC No
- Fraction present (% w/w)
- Function and form present in the final product
- Hazard-statements (for some H-phrases, the concentration limit is 0,01% (w/w) or must be < 0,5 x or equal to the final product classification limit for the concerned H-phrase)
- The substance is not in the Union List of priority substances ((water policy Annex X to Directive 2000/60/EC amended N° 2455/2001/EC)
- The substance in not in the OSPAR List of Chemicals
- The substance is not in the list for Substances of Very High Concern (SVHCs)
- The substance doesn't contain organic halogen compounds or nitrite compounds
- The substance doesn't contain metal or metallic compounds with the exception of Na, K, Mg and Ca and, in case of thickeners, also Li and/or Al)

On components from 0,10% (w/w):
- Acute toxicity test on daphnia (e.g. OECD 202 – ISO 6341)
- Acute toxicity test on algae (e.g. OECD 201 – ISO 8692)
- readily biodegradable according to OECD 301, OECD 310, Regulation (EC) No 440/2008 part C.4, C.5, C.42 or equivalent methods
- If not biodegradable or inherently biodegradable, BCF according to Regulation (EC) No 440/2008 part C.13 or equivalent test methods or Log Kow according to OECD 123 or Regulation (EC) No 440/2008 part A.8

On formulated hydraulic fluid:

- Acute toxicity test on daphnia (e.g. OECD 202 – ISO 6341)
- Acute toxicity test on algae (e.g. OECD 201 – ISO 8692
- Acute toxicity test on fish embryo (FET e.g. OECD 236)
- If renewable carbon present, a test report in accordance with ASTM D 6866 or DIN CEN/ TS 16137 to demonstrate the % of renewable carbon content
- Tests included in ISO 15380 specifications
- For Fire resistant hydraulic fluid, test included in ISO 12922 specifications.

References

[1] Technical Report 3.0 – Draft criteria proposal for revision of EU Ecolabel criteria – JRC

[2] ISO 15380 - Lubricants, industrial oils and related products (class L) -- Family H (Hydraulic systems) – Specifications for categories HETG, HEPG, HEES and HEPR

[3] Lubes magazine N° 126 "How to choose the most appropriate ultimate biodegradability test method"

[4] ISO 12922 - Lubricants, industrial oils and related products (class L) -- Family H (Hydraulic systems) -- Specifications for hydraulic fluids in categories HFAE, HFAS, HFB, HFC, HFDR and HFDU

[5] ISO, DIN, ASTM, OECD test methods and specifications

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