PETRO-CANADA LUBRICANTS
AN HF SINCLAIR BRAND

TECH BULLETIN

LUMINOL™ BIODEGRADABILITY

LUMINOL ELECTRICAL INSULATING FLUIDS

Petro-Canada Lubricants LUMINOL family of electrical insulating oils represents a breakthrough in electrical insulating fluid technology. Unlike conventional naphthenic transformer oils, LUMINOL is manufactured using Petro-Canada Lubricants ultra-pure severely hydrotreated iso-paraffin base fluids. This innovative technology imparts physical and chemical properties to LUMINOL that make it corrosive sulphur free and give it enhanced performance benefits over a conventional mineral oil such as oxidative stability and heat transfer properties. But what about biodegradability? What is the LUMINOL biodegradability classification?

BIODEGRADABILITY DEFINITION

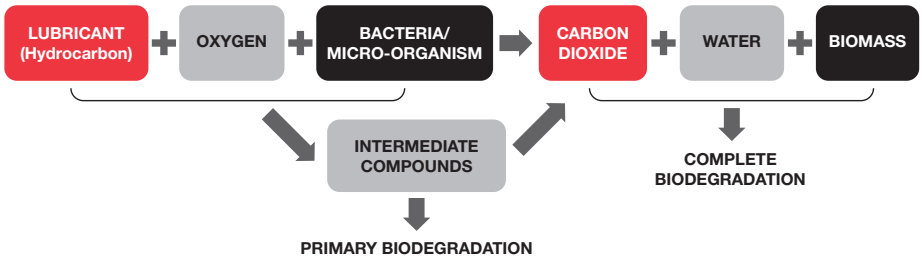
There are two main principles for biodegradation: primary/partial and mineralization/complete. Primary/partial biodegradation is the alteration in the chemical structure of a substance, resulting in the loss of a specific property of the substance. Primary/Partial is defined as the very first step of a degradation process. Mineralization/complete is the last step of degradation process which is the level of degradation achieved when the chemical compound is totally utilized by microorganisms resulting in the production of carbon dioxide, water, mineral salts, and biomass. The term “complete” here is related to degradation steps and not the amount of substance.

MEASURING PRINCIPLES

For testing biodegradability, there are many different test methods. Some of them measure the remaining test substance, while others measure gases (carbon dioxide evolution, oxygen consumption or decrease of dissolved oxygen). The methods which use test substance concentration do not determine if complete biodegradation process/mineralization has been achieved. The biodegradability level of LUMINOL products has been tested using OECD 301B method. This method uses carbon dioxide evolution as measurement which the results are indication of complete biodegradation process.

There are three different biodegradability classification as below:

- **Inherently Biodegradable:** A classification of chemicals for which there is evidence of > 20% but < 60% in 28 days biodegradation in any test of biodegradability (primary or complete).
- **Readily Biodegradable:** This classification is rapid and complete/mineralization. It is a classification of chemicals for which there is evidence of ≥ 60% mineralization in 28 days and the 60% level is reached within 10 days of reaching the 10% mark.
- **Ultimate Biodegradability:** This classification is complete/mineralization. It is a classification of chemicals for which there is evidence of ≥ 60% mineralization. There is no time limit to achieve ≥ 60% for this classification.

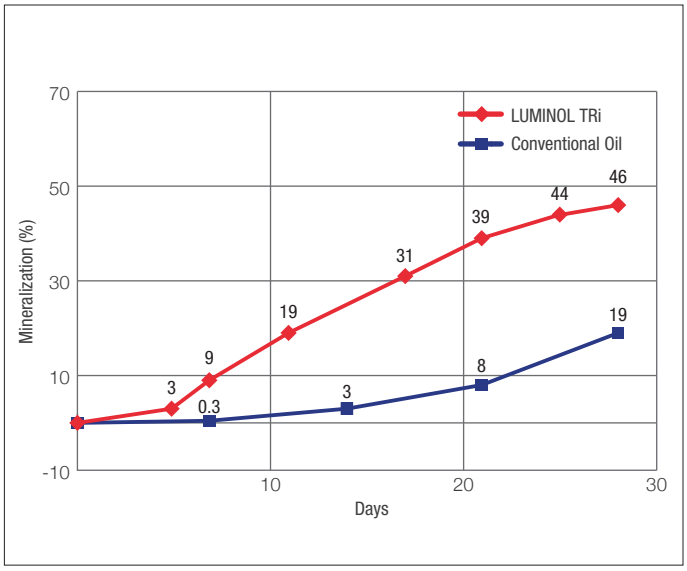


LUMINOL BIODEGRADABILITY CLASSIFICATION

LUMINOL transformer fluids have been tested for biodegradability using OECD 301B method (carbon dioxide evolution). The results show:

- LUMINOL TRi and LUMINOL LV achieving of > 60% mineralization after about 100 days. The biodegradation claim for these two products is ULTIMATE Biodegradable.
- The mineralization percent for LUMINOL LS is about 51%. It passes the Inherently Biodegradable criteria.

The graph below shows the biodegradability of Luminol TRi versus a conventional naphthenic oil (tested in the past) during the first 28 days of the test.



POINTS TO REMEMBER

- LUMINOL is manufactured using Petro-Canada Lubricants ultra-pure severely hydrotreated iso-paraffin base fluids.
- LUMINOL TRi and LUMINOL LV are ultimate biodegradable with >60% mineralization.
- The biodegradation level criteria for Ultimate biodegradability classification is the same as Readily biodegradability (≥ 60%) and for both these classification microorganism should totally utilize substances resulting in the production of carbon dioxide, water, mineral salts, and biomass.
- The only difference between Ultimate and Readily is the speed of degradation which ultimate is not as fast as readily biodegradability classification.

Learn more about us: **lubricants.petro-canada.com**
Contact us: **lubecsr@hfsinclair.com**

Committed to the disciplined operation of our business.

CERTIFIED
ISO 9001: 2015
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Petro-Canada Lubricants Inc.
2310 Lakeshore Road W. Mississauga, Ontario, Canada L5J 1K2
lubricants.petro-canada.com

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