

Innovations in High Performance Environmentally Acceptable Lubricants (EALs) - A Real World Perspective

CATEGORY OR KEYWORDS

Lubricants; Novel lubricating fluids and additives

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INTRODUCTION

Green initiatives are everywhere. Bio-fuels, wind energy, renewable fibers are just a few of the environmental initiatives that have recently made headlines. Meanwhile some of the greatest innovations have been in the development and utilization of high performance, environmentally acceptable lubricants (EALs).

This paper focuses on the innovations, features, benefits, strengths and limitation of the different types of EALs. It explores classification of base fluids and additives as well as the requirements of finished lubricants. It compares the performance of conventional petroleum products and biolubricants. The different definitions of environmental acceptability why that is important will be explored. The regulatory driving forces will be identified as well as the requirements for each. The considerations for choosing the type of EAL that is most applicable to specific applications will be studied. Finally, the best maintenance practices to ensure long fluid and equipment life will be discussed.

ABSTRACT

One has only to look around to see green initiatives. Bio-fuels, wind energy, renewable fibers are just a few of the environmental initiatives that have recently made headlines. Meanwhile, for the past several years, industry has been quietly considering and utilizing environmentally safer, readily biodegradable and non-toxic fluids.

The benefits of Environmentally Acceptable Lubricants (EALs) are well known. Their biodegradable properties allow them to break down in the environment reducing the negative impact from leaks and spills. They can be non-toxic, meaning they won't hurt operators, animals or plants that come in contact with the fluid. Furthermore, they are renewable and reduce dependence on petroleum oil.

Conventional knowledge has focused on the limitations of vegetable oils as base stocks for lubricants. The weaknesses of the oxidative stability, the cold temperature performance and incompatibility with elastomers are well documented. Early generation biobased lubricant formulators utilized performance chemistry similar to those used in petroleum-based fluids, creating lubricant products that did not meet industrial performance requirements. Over the past decades, however, improvements in vegetable oils, modified vegetable oils, Estolides, renewable hydrocarbons and other base stocks, improvements in performance chemistry, and improvements in formulation expertise have allowed the development of biodegradable products with performance similar to or better than conventional petroleum fluids.

This paper focuses on the innovation in features, benefits, strengths and limitation of the different types of EALs. We will explore different types and classification of base fluids and additives as well as the requirements of finished lubricants. We will define the different types and measurements of biodegradability, ecotoxicity and bioaccumulation and why that is important. The regulatory driving forces will be explored and identified as well as the requirements for each. The considerations and selection process for choosing the type of EAL that is most applicable to specific applications will be studied. Finally, the best maintenance practices to ensure long fluid and equipment life will be discussed.

At the end of the section, the attendees: (1.) will understand the difference among various classes of EALs, (2.) know how to choose the EAL most suitable for their application, and (3.) know how to maintain the fluid properly.