

## USE OF BIOLUBRICANTS IN MACHINES FOR SUSTAINABLE DEVELOPMENT

M. Murali dhar<sup>1</sup>, P. Vijayakanth<sup>2</sup>, K.Jeevan Kumar<sup>3</sup>,  
K.Girish Pavan Kumar<sup>4</sup>, O.Naveen Sai<sup>5</sup>

<sup>1,2,3,4</sup>B. Tech Mechanical Engineering, GIET(A), Rajamahendravaram

<sup>5</sup>Diploma in Mechanical Engineering, Aditya Polytechnic College, Surampalem

### ABSTRACT

Today the focus of all nations is on environmental protection, on this juncture, the authors made an attempt on the part of lubrication process. There is need for the present day society to adopt measures to reduce the use of equipment, supplies, and other products that contain persistent, toxic chemicals in lubrication. It requires sustainable practices by which includes practices that do not sacrifice the needs of future generations and reduce threats to resources such as clean environment. In this abstract, the authors reviewed the usage of Bio lubricants to achieve the clean and green environment. Bio lubricants, also known as bio-based lubricants or bio-lubes, are made from a variety of vegetable oils, such as rapeseed, canola, sunflower, soybean, palm and coconut oils. The best application for bio lubricants is in machinery that loses oil directly into the environment during use, total loss lubricants (TLLs), and in machinery used in any sensitive areas, such as in or near water. Compared to petroleum-based lubricants, use of bio lubricants. Produces a cleaner, less toxic work environment and fewer skin problems for those working with engines and hydraulic systems. They offer better safety due to higher flashpoints, constant viscosity, and less oil mist and vapor emissions. They produce fewer emissions due to higher boiling temperature ranges of esters. They are highly biodegradable and cost less over the product's life-cycle due to less maintenance, storage and disposal requirements. Numerous bio lubricants are available on the market that meet or exceed the American Society for Testing and Materials International (ASTM) standards for comparable mineral lubricants made from petroleum.

**Keywords:** *Bio chemicals, Bio Lubricants, Mechanical devices, Safe chemicals, Sustainable Environment.*

### I. INTRODUCTION

Bio-lubricants<sup>[1&2]</sup> are generally used in environmentally sensitive applications where low toxicity and high biodegradability are imperative. Increasing awareness about renewable products, legislation encouraging the usage of bio-lubricants, and growth in the end-use industries are driving this niche industry.

The term bio lubricant applies to all lubricants that biodegrade rapidly and which are non-toxic for human beings and aquatic habitats.

They may be based on:

- Plant oils (such as rapeseed oil)
- Synthetic esters manufactured from modified renewal oils.

The key advantages of bio lubricants

- Rapid biodegradability
- Low toxicity
- Environmental friendliness
- Good lubricating properties
- High viscosity index
- Longer equipment life

Synthetic bio lubricant based on renewable resources is important in developing environmentally acceptable lubricating oils<sup>[3]</sup>. Currently, lubricant-based petroleum worldwide ends up in the environment via total loss applications, spills, or major accidents. A fact remains that about 3 million tones are lost in the European environment every year originating from loss and high-risk lubricants mostly based on mineral oil. Emissions of mineral oil may appear to be negligible importance compared to an accident involving an oil tanker spill<sup>[4]</sup>. And also, the emissions of mineral oil arising from lubricant applications in water make lubricants contribution to the pollution of water much more significant<sup>[5]</sup>. In the last decade, a lot of interest was developed to use environmental friendly bio lubricant fluids<sup>[6]</sup>. The use of environmentally acceptable vegetable-oil-based product as bio lubricants has many advantages. They are nontoxic, biodegradable, derived from renewable resource and have a reasonable cost when compared to other synthetic fluids<sup>[7]</sup>. Recently, modern approaches have been adopted to solve the problems associated with application of vegetable oils in bio lubricants, and some of them used for chemical modification and additive treatment<sup>[8]</sup>.

LM systems mainly use grease or sliding surface oil for their lubricants.

The requirements that lubricants need to satisfy generally consist of the following.

- (1) High oil film strength
- (2) Low friction
- (3) High wear resistance
- (4) High thermal stability
- (5) Non-corrosive
- (6) Highly anti-corrosive
- (7) Minimal dust/water content
- (8) Consistency of grease must not be altered to a significant extent even after it is repeatedly stirred.

### **Scope**

Opportunities in Bio-lubricants: Global Market Analysis provides a detailed appraisal of the global bio-based lubricants market and analyses opportunities existing in the key end-use segments. Bio-based lubricants include lubricants derived from vegetable oils, poly glycols, and esters. All consumer, commercial, and industrial lubricants product categories are included in this study. The study is global in scale with focus regions being the Americas, Europe, and Asia-Pacific. The base year for the study is 2013, and the study will include forecasts to

the year 2018.

### Types of Bio Lubricants

#### 1. Chain and Cutter Bar Lubricants

Bar & Chain Oils are premium quality, rapeseed oil based lubricants offering excellent lubricity and improved anti-corrosion & anti-wear protection.

Bar & Chain Oils are readily biodegradable, non toxic and have naturally superior adhesion to metal. Developed to create safer and healthier work environment and reduce environmental footprint by replacing the usual mineral oil based chain lubricants.

PARAMETER	UNIT	TEST METHOD	BAR&CHAIN OIL 100	BAR&CHAIN OIL 150	BAR&CHAIN OIL 220
Density at 15 °C	Kg/m <sup>3</sup>	ISO 12185	935	945	945
Kinematic Viscosity at 40°C	mm <sup>2</sup> /s	ASTM D445	100	150	220
Viscosity index (VI)			>200	>200	>200
Pour Point	°C	ASTM D97	<-20	<-20	<-20
Flash Point, COC	°C	ASTM D92	>250	>250	>250
Steel Corrosion at 100°C/3h			Negative	Negative	Negative
Biodegradability (within 21 days)	%	OECD 301B	>98	>99	>98

#### 2. Wire Rope Biolube

WIRE ROPE BIOLUBE is a premium range of environmentally friendly synthetic lubricants based on special, highly refined vegetable synthetic esters and state-of-the-art additive technology consisting of water displacing adsorption corrosion inhibitors, penetrants, depressants and adhesion agents.

PARAMETER	UNIT	TEST METHOD	ISO VG 150	ISO VG 460
Kinematic Viscosity at 40°C	mm <sup>2</sup> /s	ASTM D445	150	460
Pour Point °C	ASTM	D97	-45	-40
Flash Point, COC	°C	ASTM D92	>230	>230
Steel corrosion at 100°C	1		Negative	Negative
Viscosity Index	1	ASTM D2270	140	150
Biodegradability (within)	%	OECD 301B	>70	>70

21 days)				
Rust test Tap water	1	ASTM D665	Pass	Pass
Salt water	1	ASTN D665	Pass	Pass

## II. ENVIRONMENTALLY ACCEPTABLE HYDRAULIC FLUIDS

### Hydraulic Oil Plus (HEES)

Fully synthetic, environmentally friendly hydraulic fluid based on saturated synthetic esters offering improved lubricity, excellent thermal oxidation stability and cold exposure properties. Hydraulic Oil PLUS provides greater temperature range performance enabling prolonged oil change intervals.

### PREMIUM Hydraulic oil (HEES)

Fully synthetic, premium quality, readily biodegradable hydraulic fluid based on saturated synthetic esters providing excellent high pressure and high temperature properties. It offers a multiple extendibility of change intervals and great cold exposure characteristics.

### BIO Hydraulic Oil (HETG)

Rapeseed oil based readily biodegradable hydraulic lubricants.

## III. UNIVERSAL LUBRICANTS

Readily biodegradable multifunctional lubricants with improved lubricating and protective characteristics. Designed for general lubrication, greasing and protection of all mechanical equipment.

## IV. SECTORS OF APPLICATION FOR BIOLUBRICANTS

Bio lubricants are to be preferred for all applications that may present risks for the environment.

This is the case for:

- Lost oils (chainsaw chain oils, 2-stroke engine oils, formwork release agents and greases)
- Oils that may leak accidentally (hydraulic oils, oils for engines, gearboxes, axles, etc.)

### BIOLUBRICANTS FOR SUSTAINABLE ENVIRONMENT

#### 1. WATER IS THE SECTOR WITH THE MOST NUMEROUS SOURCES OF OIL-RELATED POLLUTION.

This applies, for example, to machinery operating in rivers and canals (dredging, bank development work, etc.) and the vessels themselves, whether the application is professional (push-tugs, trawlers, etc.) or recreational (outboard engines, jet skis, etc.).

All equipment operating on or near water (canal locks, hydroelectric power stations) is also a source of concern in this respect.

TOTAL can offer a complete range of biolubricants suited to all the above activities.

Applications:

- River and coastal fishing
- Coastal and inland marine navigation

- Leisure boating
- Locks and hydroelectric plants

## **V. BIOLUBRICANTS FOR A CLEAN ENVIRONMENT**

Public works machinery often operates in the natural environment on construction sites and in development projects, quarries and urban road works.

Accidental spillage of transmission or hydraulic oil can occur during this type of work, and this can be a cause of environmental pollution.

### **Applications:**

- Extraction machinery
- Construction machinery
- Earth-moving machinery
- Drainage cleaning machinery

## **VI. BIOLUBRICANTS FOR CLEAN SOILS**

Lubricants are used in forestry and agriculture for small items of equipment (chainsaws, brush cutters) and machinery for logging (forwarders, log loaders), soil preparation and harvesting

.Lost oils for chainsaw chains and 2-stroke engines and hydraulic oils can be a source of pollution of the natural forestry or farming environment in the event of accidental leakage. Concerned to protect such natural environments, TOTAL supplies a range of lubricants well suited to these types of equipment and covering the whole range of requirements.

## **VII. APPLICATIONS**

- Forestry work
- Soil preparation
- Agricultural equipment
- Chainsaws, brush cutter

## **VIII. CONCLUSION**

Lubricants are essential in engineering; however more sustainable formulations are needed to avoid adverse effects on the ecosystem. Bio-based lubricant formulations present a promising solution. Total Lubrificants is acutely aware of the need for environmental protection and sustainable development. In response to these challenges, bio lubricants. In addition, flash points greater than 300°C classify plant oils as non-flammable liquids. To improve characteristics such as sensitivity to hydrolysis and oxidative attacks, poor low temperature behavior, and low viscosity index coefficients, plant oils may be chemically modified. Plant oils

may be used in almost all automotive and industrial applications. It will become more difficult to find a balance between the economic possibilities of bio lubricants and their ecological requirements. Products with toxicological and ecological issues must be excluded from further use in lubricants, if they pose a significant health risk. However, it must be taken into account that the technological level of lubricants will decrease if unnecessary restrictions are put into place. In conclusion, plant bio-based oils are an important part of new strategies, policies, and subsidies, which aid in the reduction of the dependence on mineral oil and other nonrenewable sources.

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