



Final Project 2

PMG 497



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Lubricants Application and Concerns Toward Health and Environment

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3. Chapter 1: Introduction

A chariot was once a machine used by the ancient Egyptians, early chariots were found at the tombs of Yuua and Thuiu back in 1400 B.C. Soon the wooden wheels hubs were becoming charred from frictional heat. That was the spark of many trials and experiments to reduce the cool down the generated heat as a result of friction using water and some olive oil. Eventually, they have noticed that some more viscous liquid didn't only prevent cool down the generated heat but even prevented the heat from being generated. furthermore, the wheels were moving more freely and smoother than before. (The History of Lubrication, [Jim Fitch](#), Noria Corporation)

Since then, lubricants have become very essential, they have developed enormously with time. Many forms like oil, grease, fluids. furthermore, characteristics are wide spreading, there are different viscosity grades, temperature endurance, pressure handling and so on. In addition, lubricants are becoming more critical and crucial with the big evolution of industries and factories, food and beverages machinery, oil & gas, textiles. Almost every machine used even at homes will require some type of lubricant to keep running efficiently without failures.

Petroleum-based lubricants are most popular form known in the modern form. It is derived from crude oil and being processed to be widely used in industries .([Bennett Fitch](#), Noria Corporation) Synthetic lubricants are another modern form is widely used and it is artificially fmade by chemical compounds rather the being derived from refined crude oil. ([Jonathan Trout](#), [Jim Fitch](#), Noria Corporation). Moreover, another form of lubricants is the bio-based lubricants made of renewable energies like vegetable oil and animal fats .([Bennett Fitch](#), Noria Corporation)

2.1 Research Problem

The current research aims to draw your attention to the negative impact of every form of lubricants mentioned, mainly health related issues and environmental pollution. lubricants are being used widely as mentioned in the introduction, and after certain time, those lubricants are being disposed which means there are concerns regarding direct human beings contacts and the affect on both health and environment.

Lubricants might seem to be human friendly and the effect of their vapor inhalation and hand contact might seem mild as they don't cause immediate serious illness ,unlike hydrocarbons such benzene substance that is highly carcinogenic if inhaled or in direct contact through splashes or handling without applicable personal protective equipment .Although , the affect of being exposed to lubricants is not immediate ,long term exposure could cause serious illness due to the nature of lubricants derived from crude oil . In addition, synthetic oil chemical formulation could also lead to serious illness due some chemical additives. Many aspect and characteristics to be taken in considerations like, volatility, temperature, contaminations.

2.1 Research Significance

The significance of this research strengthens the need of balanced, reasonable and strict solutions for saving human lives and raise the

responsibility senses and the awareness level of keeping our environment clean unharmed as well as keeping industries running efficiently without disturbing by figuring out better solutions, better ways of lubricants handling, usage and disposing.

being exposed to lubricants is not immediate, long term exposure could cause serious illness due to the nature of lubricants derived from crude oil. In addition, synthetic oil chemical formulation could also lead to serious illness due some chemical additives. Many aspect and characteristics to be taken in considerations like, volatility, temperature, contaminations.

2.1 Research Questions

This research study will be about offering reasonable solutions or alternatives for lubricants handling, disposing and to study the impact of lubricants toward individual's health and the environment

2.1 Main research question & sub-Questions

- Main Research Question: What possible methods, techniques and procedures can be used to control lubricants environmental pollution and prevent health problems?
 - **Sub-Question 1:** what are the possible remedies to control lubricants spill and wasted lubricant disposal?
 - **Sub Question 2:** Are there additional safety measures to be taken in consideration while handling lubricants?

- **Sub-Question 3:** Can we count on bio-based lubricants that are highly biodegradable and more environment friendly to replace crude based lubricants?

2.1.1 Research Objectives

The main aim of this study is to determine the focus points and to analyze, evaluate and examine the key objectives of this study is based on

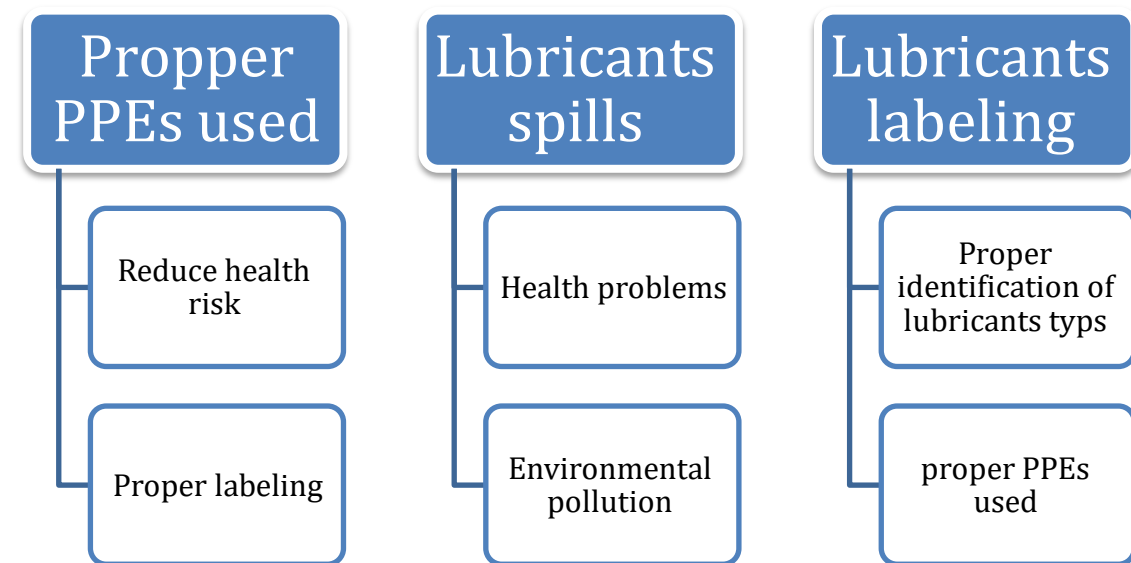
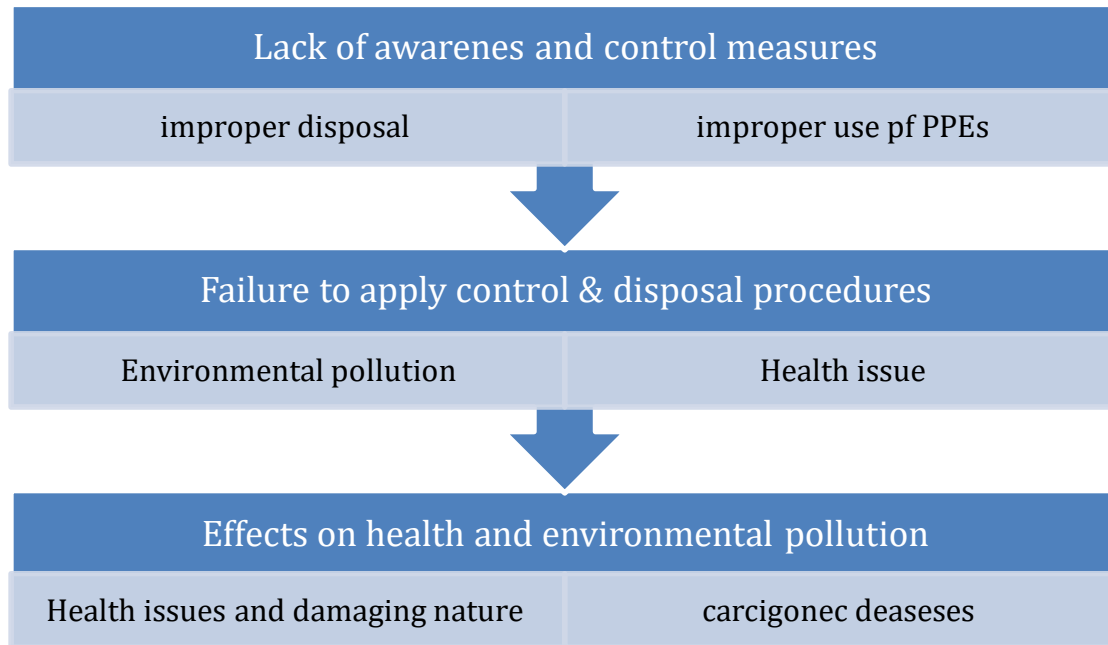
- ✓ To identify all possible lubrication spills and best practices of used lubricants disposal.
- ✓ To evaluate the effectiveness of current safety measures, personal protective equipment and labeling used while handling lubricants.
- ✓ To examine the effectiveness and of replacing crude based lubricants with bio-degradable lubricants and the impact on the environment.

2.1 Research Hypotheses

- There is a statistical positive relationship between lubricants spill, waste disposal and environmental pollution
- There is a positive relationship between using proper PPEs and reducing health risks
- There is a significant statistical positive relationship between lubricants labeling and proper lubrication identification and proper storage
- There is a significant relationship between replacing crude based lubricants with bio-degradable and the impact on environment

2.1 Research Model

Presents the relation between independent variables and the effect on independent variable



6 Chapter 2: Literature Review

At this section it is important to review the main subject of this research, which is Lubricants importance and concerns toward human lives and environment, lubricant is essential for industries and many machineries. However, safety of people especially those in close contact with lubricant is a major concern. In addition, a safe environment is also a major concern, consuming lubricant never mean to damage environment around which could also lead to human health issues.

6.1

2.1 Lubricants made of base oil (The independent variable#1) & Bio degradable lubricant (The independent variable#2):

As most of us know that lubricant at the old ages were made of animal fat, and through time people become using lubricants made of base oil. waste lubricant made of base oil can only be recycled or used somehow but eventually, where this wasted lubricant will end up a big question mark as they are not degradable it can be used in wide variety of shapes and it is involved in many industries.

It is worth to mention and deeply discuss the possibilities of bio degradable lubricants to replace the base oil lubricant and their importance in industries as well.

2.1 The relationship between the independent and the dependent variables

Oil industries are very essential for our lives almost everything around us is somehow made of oil refining, devices, furniture, plastic bottles clothes, detergents etc. but if there is any possibility to replace oil-based lubricants with a more human and environment friendly lubricants, this might reduce the risk of being exposed to oil products and reduce health risk. Also, it will reduce the risk of polluting environment

Chapter#3

Research Methodology

3.1 Introduction

In this chapter, I will explain the research methodology used in this project which will help answering the research questions clearly. Below topics will identify the operational definitions for the research variables:

3.1.1 Operational definitions for research variables:

In research studies, operational definitions are key in clearly defining the variables being measured. An operational definition describes how a variable will be measured, observed, or manipulated. It helps researchers ensure that their studies are consistent, reliable, and valid

3.1.2 Lubricants made of base oil (The independent variable#1):

Operational Definition: Based oil lubricant is essential for many industries machinery. their impact on health and environment is quite difficult to measure and control and as an independent variable we will figure out if it can be replaced with more environment friendly and less human health impact during long exposure and how to measure the severity and control the risk.

3.1.3 Bio degradable lubricant (The independent variable#2):

Although its market value is around US \$ 1.4 Bn in 2021 and registering Y-o-Y growth of 4.9%. ([Market Study on Bio Lubricants: Rising Demand for Environmentally Friendly Lubricants to Augment Market Expansion \(persistencemarketresearch.com\)](https://www.persistencemarketresearch.com/market-research/bio-lubricants-market-report.asp)) However, it seems it is slowly spreading and not very popular within industries, we will measure how it might change the effect on human and the impact on environment if it can replace the oil fashioned oil-based lubricants.

3.1.4 Effects on health and environment, (The dependent variable#1):

a questionnaire was shared with a refinery employee to effectively measure the actual behavior and how effectively the Procedures & safety measures to control oil-based lubrication handling and exposure. In additions how, it can be enhanced to control, handling and minimize exposure.

3.1.5 Measuring the role of increasing the usage of bio-degradable lubricants (The dependent variable#2):

Possible impacts of widely spreading the awareness of bio-degradable lubricants and investing in manufacturing environment and health friendly lubricants products, a questionnaire was shared to a sample of a refinery employees asking about the future of bio-degradable lubricants.

3.2 Research design (Research Onion)

In this template, we'll present a structure that covers five important methodological matters (as outlined below). This structure is loosely based on "research onion".

1. Research philosophy (Positivist)

This research philosophy will concentrate on discovering the relation between the dependent variables and the independent variables, and understand the effect of each.

2. Research approach (Deductive)

The research approach aims to analyze the data and focus on the relation between each.

3. Research strategy (Survey)

The research strategy will include gathering information in the area of study

4. Research choice (Quantitative):

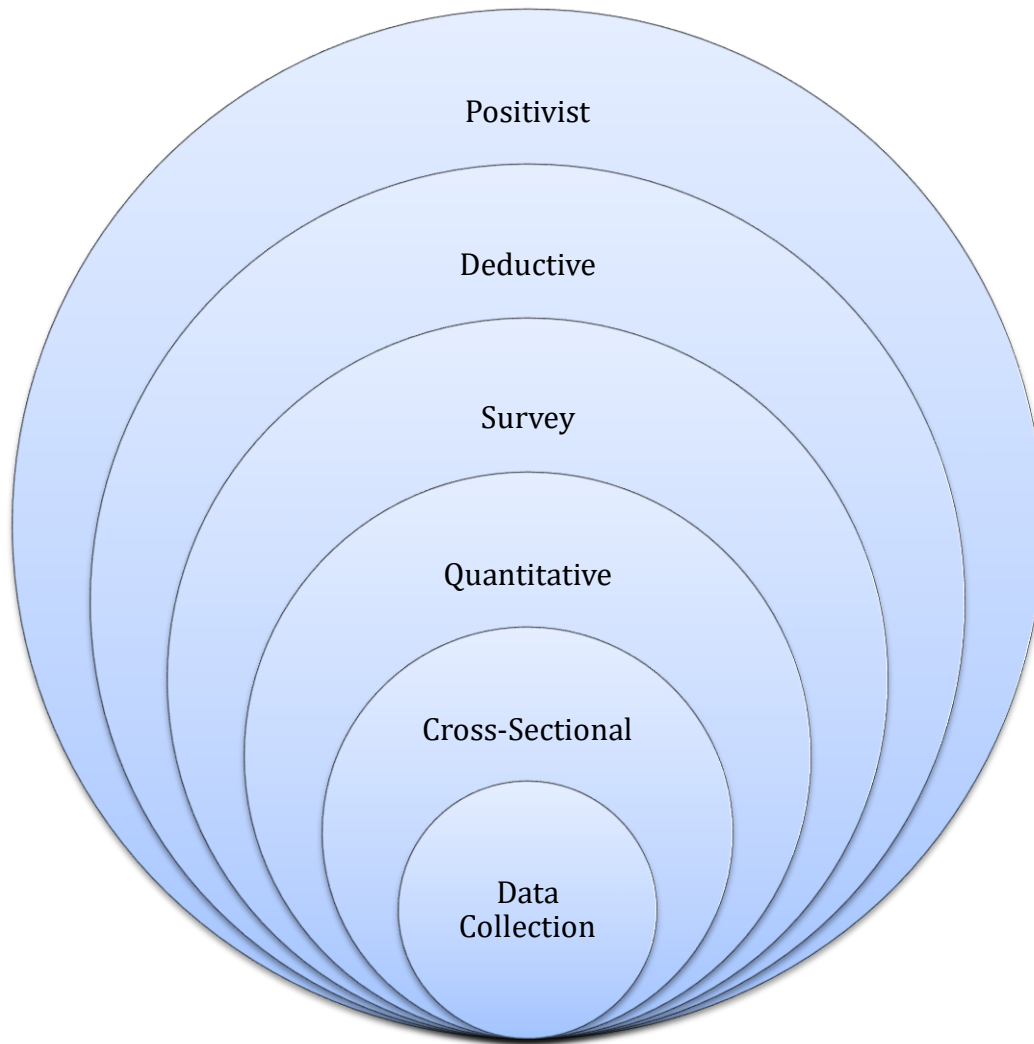
Research choice will be quantitative by collecting data empirically.

5. Time horizon (Cross-Sectional):

Collecting required research data will be within a defined time and limited timing.

6. Data collection and analysis techniques:

Data collection will utilize surveys and questionnaires.



3.3 Research population & Sampling methods and technique

This section provides information about the study population & sample, and this section demonstrates the methods and techniques that were elaborated in order to select the study sample, and determine the sample size.

يقدم هذا الجزء معلومات عن مجتمع الدراسة وعينتها. بالإضافة إلى ذلك، يوضح هذا الجزء الأساليب والتقنيات التي تم وضعها لاختيار عينة الدراسة، وتحديد حجم العينة.

3.3.2 Research Population مجتمع الدراسة

Research population will clarify and share detailed information about the population of the study, an oil refinery employee, their numbers and classifications.

Number of Employees	Classification(Job Title)
10	Senior Managers
20	Bachelor graduates (Engineers)
15	Supervisors
200	Technicians

3.3.3 Research Sample

This section will mention the detailed information of the study sample, size and their classifications.

Sample Size	Sample Classification
150-200	Oil Refinery Employees

3.3.4 Sampling Method & Techniques

At this section I have determine to choose technique and simple random sample method.

3.4 Data collection method

At the data collection method section, surveys were used to collect the required data.

The independent variable# 1&2 (Lubricants made of base oil) & (Bio degradable lubricant)

the researcher is relied on the questionnaire of Mark (2022). In order to measure the independent variable (**Lubricants made of base oil & Bio degradable lubricant**), in terms of three dimensions namely: health, environment, exposure

Table (3) for the instrument of the independent variable....

Variable 1 & 2	Dimensions	Number of Items	Sources
(Lubricants made of base oil) & (Bio degradable lubricant)	Health	4	(Mark, 2022)
	Environment	5	
	Exposure	4	
	Over all	13	

3.5 Types of data

In this section, you should differentiate between primary data and secondary data that were used in your project.

في هذا القسم، يجب عليك التمييز بين البيانات الأولية والبيانات الثانوية التي تم استخدامها في مشروعك.

3.5.1 Primary data:

Primary data is the type of data that are essential for the research study and this data is the actual basis for the data collection.

3.5.2 Secondary data:

The secondary data is the type of data that is not mainly about the research study

3.6 Research instruments (Questionnaire):

Different types of lubricants and their effects on health and environment.

Dear Participant,

This Questionnaire is a part of final research project, and it is intended to evaluate the awareness of an oil refinery employees toward lubricants (petroleum based / Bio based) and their possible effect on health and environment.

Thank you for your contribution

* Indicates required question

Age*

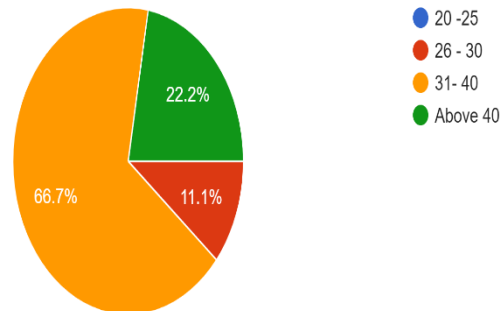
26 - 30

31- 40

Above 40

Age

18 responses



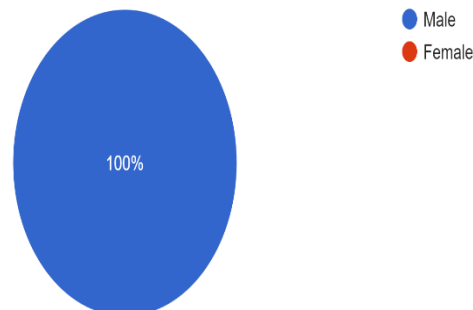
Gender*

Male

Female

Gender

18 responses

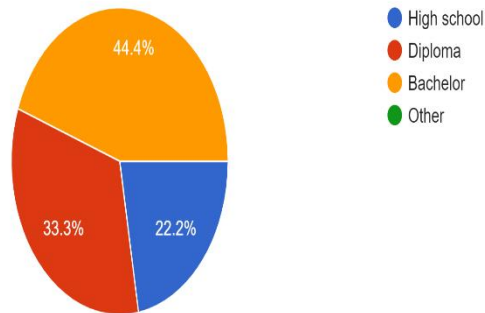


Educational Level*

High school
Diploma
Bachelor
Other

Educational Level

18 responses

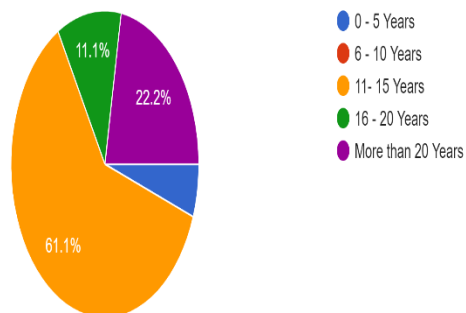


Years of experience*

0 - 5 Years
6 - 10 Years
11- 15 Years
16 - 20 Years
More than 20 Years

Years of experience

18 responses

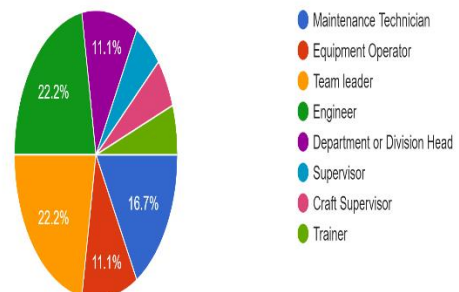


Current Job Title*

Maintenance Technician
Equipment Operator
Team leader
Engineer
Department or Division Head
Other:

Current Job Title

18 responses



How often are you exposed to lubricants?*

Daily

Once a Week

Once a Month

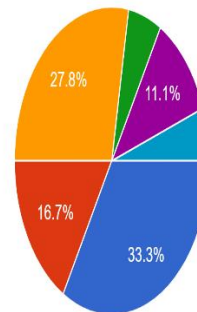
Every 3 Months

Never

Other:

How often are you exposed to lubricants?

18 responses



- Daily
- Once a Week
- Once a Month
- Every 3 Months
- Never
- Rarely based on job requirements

How often do you use lubricant handling PPEs?*

Always

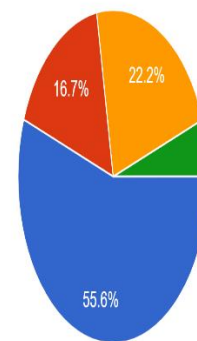
Sometimes

Rarely

Never

How often do you use lubricant handling PPEs

18 responses



- Always
- Sometimes
- Rarely
- Never

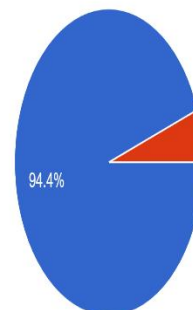
Are you aware of Safety Data Sheet (SDS)?*

Yes

No

Are you aware of Safety Data Sheet (SDS)?

18 responses



- Yes
- No

Are you familiar with lubrication PPEs

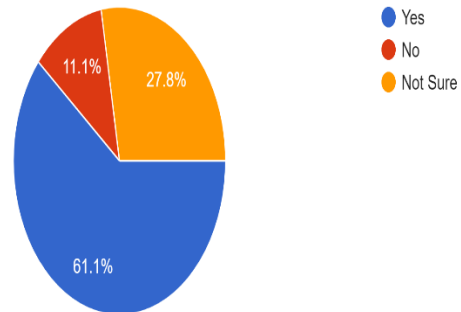
Yes

No

Not Sure

Are you familiar with lubrication PPEs

18 responses



Current health & environment safety measures are effective.*

Strongly Agree

Agree

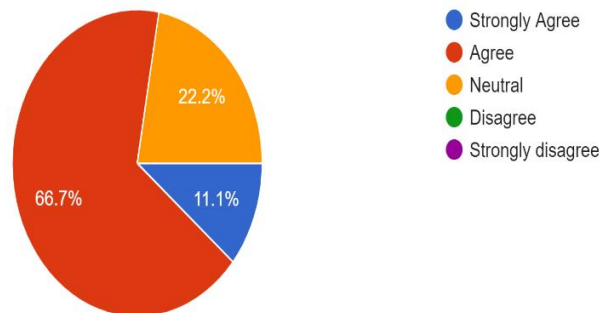
Neutral

Disagree

Strongly disagree

Current health & environment safety measures are effective.

18 responses



Have you ever heard about bio-degradable lubricants?*

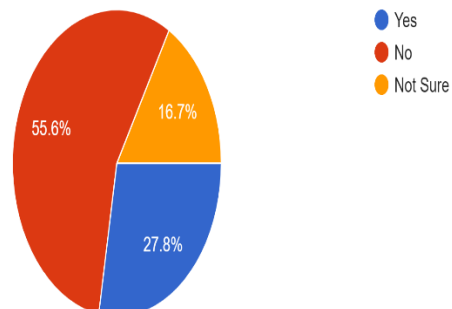
Yes

No

Not Sure

Have you ever heard about bio-degradable lubricants?

18 responses



What do you think about replacing petroleum-based lubricants with bio-lubricants in machinery?*

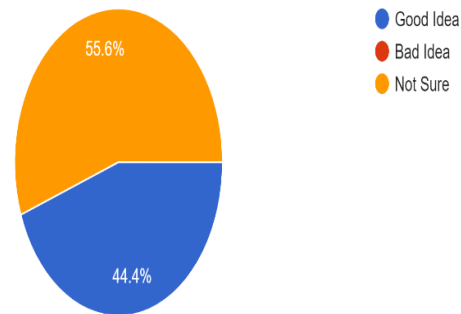
Good Idea

Bad Idea

Not Sure

What do you think about replacing petroleum-based lubricants with bio-lubricants in machinery?

18 responses



Do you think that bio-Lubricants will replace petroleum-based lubricants some day?*

Yes

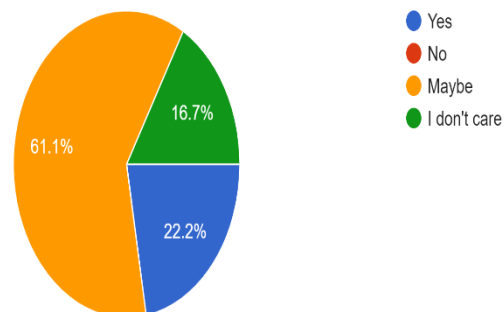
No

Maybe

I don't care

Do you think that bio-Lubricants will replace petroleum-based lubricants some day?

18 responses



Waste oil is being disposed safely to prevent environmental pollution. *

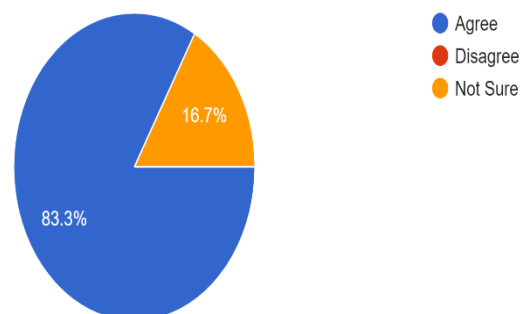
Agree

Disagree

Not Sure

Waste oil is being disposed safely to prevent environmental pollution.

18 responses



Concerned individuals can get required lubricants handling tools.*

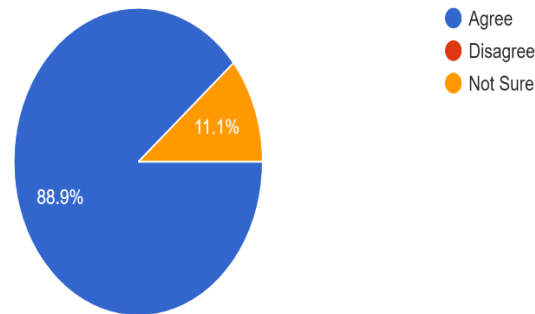
Agree

Disagree

Not Sure

Concerned individuals can get required lubricants handling tools.

18 responses



What do you think we can do to enhance lubricants handling and limit exposure risk?18 responses

Ensure 100% ppes compliance and sds available at storage

Building a clear system to handle all the requirement of lubrication starting from proper selection including storage and handling

We most train the ppl to learn the risk

Special tanks

Safety is value

Enhance now oil specifications and time life high

Using the required Resources PPE

More awareness

yes, we do.

Questionnaire link

<https://forms.gle/Ho6iUiAj5APb2cLx8>

3.7 Conclusion

In conclusion, oil-based products and lubricant have contributed to change the world we know. However, I believe it is the time to try to develop and consider human health and environment as a priority, large

companies and manufacturers of lubricants have a huge responsibility in this matter to keep factories running and in the same time to invest more in researches regrading more efficient and safe lubricants products on humans and environment.

3.8 Reference list

1. (The History of Lubrication, [Jim Fitch](#), Noria Corporation)
2. .([Bennett Fitch](#), Noria Corporation)
3. ([Jonathan Trout](#), [Jim Fitch](#), Noria Corporation)
4. .([Bennett Fitch](#), Noria Corporation)
5. (Ramesh Chand & Binay Kumar, IJSET - International Journal of Innovative Science, Engineering & Technology, Vol. 4 Issue 4, April 2017)
6. ([Market Study on Bio Lubricants: Rising Demand for Environmentally Friendly Lubricants to Augment Market Expansion \(persistencemarketresearch.com\)](#))