

# ACID VALUE OF VARIOUS LIBRICANTS

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## ABSTRACT

Acid value or neutralization number is stated as number of milligrams of KOH required to neutralization the free acid in 1 gm. of lubricants oil. The acid number is measure of the amount of carboxylic acid group in lubricating oil in a procedure. A known amount of sample dissolved in organic solvent, is titrated with a solution potassium hydroxide with known concentration and with a color indicator.

**KEY WORDS:** Lubricant, Acid group present in lubricant, Fatty acids, Neutralization, Indicator.

## INTRODUCTION

Lubricant is a substance which reduces the friction between two moving or sliding surface.(1) the physical and chemical properties such as viscosity, specific gravity, flash and fire point volatility, acid value, saponification value, iodine value etc. are measured in laboratory.(2) The suitability of a lubricant for a particular use will have to be finally decided on the basis of its actual performance under the working condition of the machine.(3) commonly use lubricating oil are castor oil, palm oil, hazel nut oil, whale oil, olive oil etc.(4) A substance which is capable of reducing the function between to surface which are sliding over each other is called lubricant. In determination of acid value the alcoholic solution of the KOH should be used freshly prepared and standardization just before the test and it is standardized first. While carrying out the test on fatty oils the reaction mixture should not be heated while these test fatty acids are decomposed. In case the pink color fades repeatedly after subsequent addition of KOH, the titration completed rapidly and the first appearance of pink color should be taken as the end point.

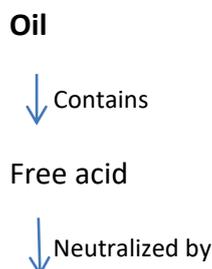
**Acid value:** acid value of lubricating oil is the number of milligrams of KOH required to neutralize the free acid present in 1gm Of oil sample. In good lubricating oil, the acid value should be minimum(less than 0.1) increase in value more than 0.1 indicates the lubricating oil is oxidized. This will consequently lead to corrosion.

**RAW MATERIAL:** Lubricating oil, Alcohol, Water, 0.01N KOH Phenolphthalein indicator

## RESEARCH METHODOLOGY:

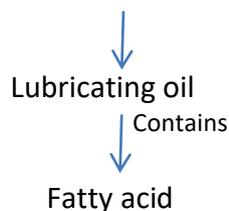
### Experimental and observation method

Flowchart showing concept

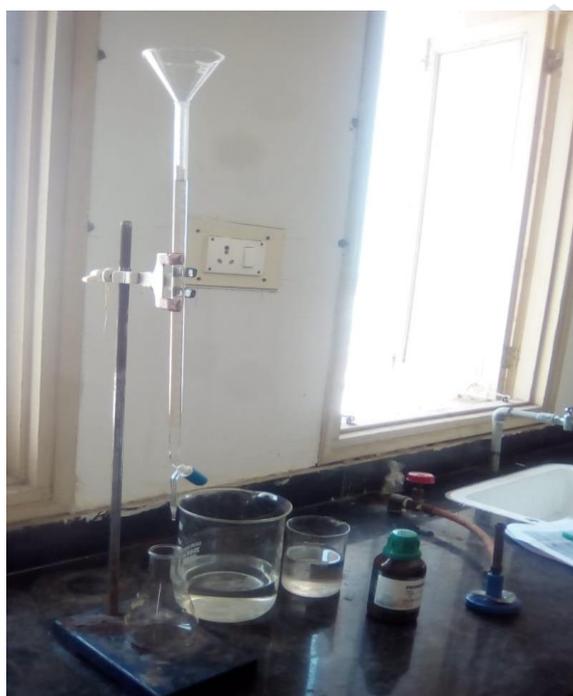


KOH

Lubricant oil contains fatty acid. Lubricating oil is used to avoid the damage of spare smooth functioning of the machineries.

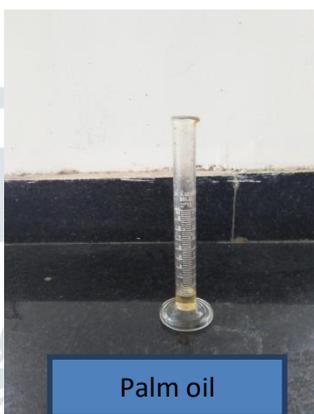
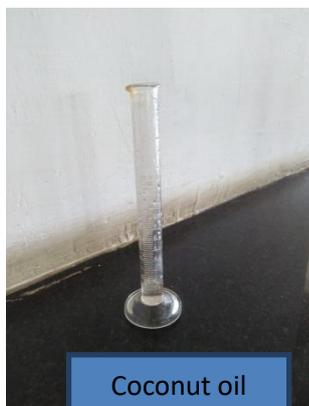


**Equipment:** Glassware, conical flask (100ml), burette(25ml), measuring cylinder (25ml), pipette(25ml).



#### PROCEDURE:

- Set up the apparatus as indicated in the diagram.
- Weigh the conical flask accurately on the chemical balance.
- Take about 1ml of lubricating oil in the conical flask.
- Weigh the conical flask with oil accurately to get correct weight of oil.
- Add 50milliliters of alcohol to oil and shake the solution to dissolve in completely.
- Add 2-3 drop of phenolphthalein indicator to conical flask.
- Wash the burette with KOH solution.
- Rinse burette with KOH solution.
- Fill the burette with 0.01N KOH solution.
- Titrate the oil solution in conical flask against 0.01N KOH solution from burette.
- Appearance of faint color indicates completion of reaction which indicates neutralization of acid from oil.
- Note the volume of 0.01N KOH requires for neutralization of oil.
- This procedure is done for various oil and water as water is also lubricant.



**OBSERVATON AND CALCULATION:**

**OBSERVATION:**

- I. weight of empty conical flask= 117 (w1gm)
- II. weight of conical flask with lubricating oil= 118 (w2 gm)
- III. weight of lubricating oil taken (w1-w2)= 1(w gm)
- IV. solution of burette= 0.01N KOH solution
- V. solution in conical flask= dissolved in ethanol
- VI. indicator= phenolphthalein
- VII. end pint= colorless to pink

**OBERVATION TABLE: WATER**

Burette reading	1 (ml)	2(ml)	3(ml)	Constant reading
Initial	0.0	0.0	0.0	2.4(ml)
Final	2.4	2.4	2.4	
Difference	2.4	2.4	2.4	

**CALCULATION:**

1000ml of 1N KOH=56.11gm of KOH

$$X \text{ ml of } 0.01\text{N KOH} = \frac{56.11 \times X \times 0.01}{1000 \times 1} 1000\text{mg KOH}$$

$$X \text{ gm of KOH} = \frac{56.11 \times 2.4 \times 0.01}{1000}$$

$$= 0.00134 \text{ mg of KOH}$$

$$\text{Acid value of oil} = \frac{56.11 \times 0.01 \times x}{\text{Weight of oil}} \text{ mg of KOH}$$

$$\text{Acid value of oil} = \frac{56.11 \times 0.01 \times x}{W} \text{ mg of KOH}$$

$$\text{Acid value of oil} = \frac{56.11 \times 0.01 \times 0.00134}{10} \text{ mg of KOH}$$

Acid value of oil = 0.00007 mg of KOH.

**OBERVATION TABLE: COCONUT OIL**

Burette reading	1 (ml)	2(ml)	3(ml)	Constant reading
Initial	0.0	0.0	0.0	17 (ml)
Final	17	17	17	
Difference	17	17	17	

**CALCULATION:**

1000ml of 1N KOH = 56.11gm of KOH

$$X \text{ ml of } 0.01\text{N KOH} = \frac{56.11 \times X \times 0.01}{1000 \times 1} 1000\text{mg KOH}$$

$$X \text{ gm of KOH} = \frac{56.11 \times 17 \times 0.01}{1000}$$

$$= 0.009 \text{ mg of KOH}$$

$$\text{Acid value of oil} = \frac{56.11 \times 0.01 \times x}{\text{Weight of oil}} \text{ mg of KOH}$$

$$\text{Acid value of oil} = \frac{56.11 \times 0.01 \times x}{W} \text{ mg of KOH}$$

$$\text{Acid value of oil} = \frac{56.11 \times 0.01 \times 0.009}{10} \text{ mg of KOH}$$

Acid value of oil = 0.00050 mg of KOH.

#### OBERVATION TABLE:SUNFLOWER OIL

Burette reading	1 (ml)	2(ml)	3(ml)	Constant reading
Initial	0.0	0.0	0.0	23 (ml)
Final	23	23	23	
Difference	23	23	23	

#### CALCULATION:

1000ml of 1N KOH = 56.11gm of KOH

$$X \text{ ml of } 0.01\text{N KOH} = \frac{56.11 \times X \times 0.01}{1000 \times 1} 1000\text{mg KOH}$$

$$X \text{ gm of KOH} = \frac{56.11 \times 23 \times 0.01}{1000}$$

$$= 0.0129 \text{ mg of KOH}$$

$$\text{Acid value of oil} = \frac{56.11 \times 0.01 \times x}{\text{Weight of oil}} \text{ mg of KOH}$$

$$\text{Acid value of oil} = \frac{56.11 \times 0.01 \times x}{W} \text{ mg of KOH}$$

$$\text{Acid value of oil} = \frac{56.11 \times 0.01 \times 0.0129}{10} \text{ mg of KOH}$$

Acid value of oil = 0.00067 mg of KOH.

#### OBERVATION TABLE: MACHINE OIL

Burette reading	1 (ml)	2(ml)	3(ml)	Constant reading
Initial	0.0	0.0	0.0	65.5(ml)
Final	65.5	65.5	65.5	
Difference	65.5	65.5	65.5	

#### CALCULATION:

1000ml of 1N KOH = 56.11gm of KOH

$$X \text{ ml of } 0.01\text{N KOH} = \frac{56.11 \times X \times 0.01}{1000 \times 1} 1000\text{mg KOH}$$

$$X \text{ gm of KOH} = \frac{56.11 \times 65.5 \times 0.01}{1000}$$

$$=0.0367 \text{ mg of KOH}$$

$$\text{Acid value of oil} = \frac{56.11 \times 0.01 \times x}{\text{Weight of oil}} \text{ mg of KOH}$$

$$\text{Acid value of oil} = \frac{56.11 \times 0.01 \times x}{W} \text{ mg of KOH}$$

$$\text{Acid value of oil} = \frac{56.11 \times 0.01 \times 0.0367}{10} \text{ mg of KOH}$$

$$\text{Acid value of oil} = 0.0201 \text{ mg of KOH.}$$

#### OBERVATION TABLE: PALM OIL

Burette reading	1 (ml)	2(ml)	3(ml)	Constant reading
Initial	0.0	0.0	0.0	52(ml)
Final	52	52	52	
Difference	52	52	52	

#### CALCULATION:

$$1000\text{ml of } 1\text{N KOH} = 56.11\text{gm of KOH}$$

$$X \text{ ml of } 0.01\text{N KOH} = \frac{56.11 \times X \times 0.01}{1000 \times 1} 1000\text{mg KOH}$$

$$X \text{ gm of KOH} = \frac{56.11 \times 52 \times 0.01}{1000}$$

$$=0.0291 \text{ mg of KOH}$$

$$\text{Acid value of oil} = \frac{56.11 \times 0.01 \times x}{\text{Weight of oil}} \text{ mg of KOH}$$

$$\text{Acid value of oil} = \frac{56.11 \times 0.01 \times x}{W} \text{ mg of KOH}$$

$$\text{Acid value of oil} = \frac{56.11 \times 0.01 \times 0.0291}{10} \text{ mg of KOH}$$

$$\text{Acid value of oil} = 0.0016\text{mg of KOH.}$$

#### OBERVATION TABLE: SOYBEAN OIL

Burette reading	1 (ml)	2(ml)	3(ml)	Constant reading
Initial	0.0	0.0	0.0	18 (ml)
Final	18	18	18	
Difference	18	18	18	

**CALCULATION:**

1000ml of 1N KOH = 56.11gm of KOH

$$X \text{ ml of } 0.01\text{N KOH} = \frac{56.11 \times X \times 0.01}{1000 \times 1} 1000\text{mg KOH}$$

$$X \text{ gm of KOH} = \frac{56.11 \times 18 \times 0.01}{1000}$$

$$= 0.010\text{mg of KOH}$$

$$\text{Acid value of oil} = \frac{56.11 \times 0.01 \times x}{\text{Weight of oil}} \text{ mg of KOH}$$

$$\text{Acid value of oil} = \frac{56.11 \times 0.01 \times x}{W} \text{ mg of KOH}$$

$$\text{Acid value of oil} = \frac{56.11 \times 0.01 \times 0.010}{10} \text{ mg of KOH}$$

Acid value of oil = 0.0005mg of KOH.

**RESULT:-**

- Acid value of various lubricants.
- 1. Water acid value is **0.00007** mg of KOH
- 2. Coconut oil acid value is **0.00050** mg of KOH
- 3. Sunflower oil acid value is **0.00067** mg of KOH
- 4. Machine oil acid value is **0.0201** mg of KOH
- 5. Palm oil acid value is **0.0016** mg of KOH
- 6. Soybean oil acid value is **0.0005** mg of KOH

**CONCLUSION:**

The acid value of given lubricating is **0.1** (more than 0.1 so corrosive and less than 0.1 so non corrosive).

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