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# Copper Strip Corrossion Test in Various Aviation Fuels

Dr. A. Rajesh Kanna[1,*], Rauf Rahim[2], Sanu Salam[2], A Favas[2], L M Vishnu[2]
[1] *Professor & Head, Department of Petroleum Engineering, LORDS Institute of Engineering and Technology, Hyderabad, India.*
[2] *Undergraduate students, LORDS Institute of Engineering and Technology, Hyderabad, India.*
** Corresponding author email: rajeshkanna@lords.ac.in*

***Abstract:*** *This research work takes in to account of corrosiveness test on various aviation fuels in the state of Telengana (India). The purpose of this experiment is to determine the corrosiveness test of fuels. This determination will be accomplished by using copper strip corrosion test by using the copper strip experiment we can determine the corrosive property of the fuel and hence the efficiency of fuel. The research covers the importance of knowing the corrosive property of different petroleum fuels including aviation turbine fuel.*
***Keywords:*** *Aviation Turbine Fuel, Superior Kerosene Oil, Petroleum*

## I. Introduction

Corrosion of metal in the presence of water is a common problem across many industries. The fact that most oil and gas production includes co-produced water makes corrosion a pervasive issue across the industry. Age and presence of corrosive materials such as carbon dioxide ($CO_2$) and hydrogen sulfide ($H_2S$) exacerbate the problem. Corrosion control in oil and gas production is reviewed in depth in Treseder and Tuttle, [2] Brondel, et al., [3] and NACE, [4] from which some of the following material is abstracted. Actually Copper Strip Corrosion is a qualitative method that is used to determine the level of corrosion of petroleum products. In this test, a polished copper strip is suspended in the product and its effect observed.

The method is well suited for specification settings, internal quality control tools and development and research on aromatic industrial hydrocarbons. It also detects the presence of harmful corrosive substances, like acidic or sulfur compounds, which may corrode the equipment. The value of this test is reported in SI units. Copper strip corrosion is also known as the copper strip test. This test can be used for testing gasoline, solvents, natural gasoline, kerosene, diesel fuel, distilled fuel oil and lubricating oil, among other products, using test baths. At elevated temperatures, a copper strip that has been polished is immersed in a sample, usually 30 ml.

The strip is then removed and tested for corrosion and a classification number is given. The number ranges from 1 to 4 after a comparison with the ASTM copper strip corrosion standard is done. There are several methods and tests available. One is the test bomb bath, 7151K59. In this test a thermostatically controlled water bath is used to immerse copper strip corrosion test bombs. This must be done at the right depth as per the ASTM requirements. This test has several specifications that are identified with it:

· Testing up to four copper strips at a time
· Maximum temperature of 221°F (±1°F)/105°C (±0.5°C)
· Using a five-gallon bath
· Conforming to the ASTM D 130; IP 154; FSPT DT-28-65; ISO 2160; FTM 791-5325 and the DIN 51759

Alternative method is using test tube baths, 7151K89 and K92. The features of this test are:

· Testing up to 16 samples at a time
· Microprocessor control
· Maximum temperature of 374°F (±2°F)/190°C (±1°C)
· Using a five-gallon bath and the use of water or heater transfer fluid

This can be used to test samples which do not require a test bomb. These include diesel fuel, automotive gasoline, fuel oil, Stoddard solvent, kerosene, and lubricating oil. [1]

## II. Equipment Description

**Fig.1** Copper strip corrosion apparatus

The apparatus we used is copper strip corrosion test apparatus. It is actually an Owen where we can change the temperature as we like for the experiment. The apparatus consists of a bath either dual purpose (50° C & 100° C) or a boiling bath (100° C only) without stainless steel bomb and copper strips of definite size 6 bombs or 18 test tubes can be accommodate in each type of bath with different temperature regulation system to operate on 220 volts AC. mains.

### 2.1 Samples Used


**Fig.2** Aviation Turbine Fuel and Superior Kerosene Oil samples

The sample used for this experiment is;

- AVIATION TURBINE FUEL (ATF)

Is a type of aviation fuel designed for the use in aircraft.the most commonly used for commercial aviations are JET A & JET A-1

- SUPERIOR KEROSENE OIL (SKO)

Kerosenes are distillate fractions of crude oil in the boiling range of 150- 250°C. They are treated mainly for reducing aromatic content to increase their smoke point.

## III. Experimental Procedure

Take the oil samples to be tested without filtering. Place the copper strip in a clean 250 ml bottle in which 250 ml of oil to be added. Place the copper strip standing on its long edge. Lubricate the ground glass stopper with a small amount of sample. Bubble nitrogen through the oil by a glass tube connected to the needle valve of the cylinder. Place the stoppered bottle in the oven at 140° C. Remove the bottle after heating for 19hrs at 140° C. Carefully take the copper strip from flask and wash with acetone. Hold the test stripe in such a manner that the light reflected it an angle of approximately 45° C.

## IV. Results

**Tab.1** Corrosiveness value of Aviation Turbine Fuel and Superior Kerosene Oil samples

| S.NO | Sample | Initial Wt of the copper strip W1, gm | Initial Wt of the copper strip W1, gm | Difference between initial and final (W2-W1) gm | Percentage (W2-W1)/W1*100 |
|---|---|---|---|---|---|
| 1 | ATF | 1.4 | 1.9 | 0.5 | 35.7 |
| 2 | SKO | 0.9 | 1.25 | 0.35 | 38.8 |

## V. Calculations

- For Superior kerosene oil (SKO)
- Weight of copper strips used =0.9gm
- For Aviation Turbine Fuel (ATF)

- Weight of copper strips used =1.4gm
- Calculation of efficiency for ATF
- After 19hrs of experiment the weight of the copper strip = 1.9 gm
- Efficiency of ATF = (1.9-1.4)/1.4*100 =35.7%
- Calculation of efficiency for SKO
- After 19hrs of experiment the weight of the copper strip = 1.25 gm
- Efficiency of SKO = (1.25-0.9)/0.9*100 =38%

## VI. Conclusion

The corrosiveness determined for samples are as follows:
Aviation Turbine fuel is 35.7% & Superior Kerosene Oil is 38.8%.

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