

Experimental Determination of Flash Point of Lubricating Oil

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ABSTRACT :- In the Pensky-Marten's closed cup flash point test, a brass test cup is filled with a test specimen and fitted with a cover. The sample is heated and stirred at specified rates depending on what it is that's being tested. An ignition source is directed into the cup at regular intervals with simultaneous interruption of stirring until a flash that spreads throughout the inside of the cup is seen. The corresponding temperature is its flash point.

Pensky-Martens closed cup is sealed with a lid through which the ignition source can be introduced periodically. The vapour above the liquid is assumed to be in reasonable equilibrium with the liquid. Closed cup testers give lower values for the flash point (typically 5-10 K) and are a better approximation to the temperature at which the vapour pressure reaches the Lower Flammable Limit (LFL).

KEYWORDS: - Lubricating oil, Flash point, Fire point, Temperature, Vapours

I. INTRODUCTION

The sample is heated in a test cup at a slow and constant rate with continuous stirring. A small test flame is directed into the cup at regular intervals with simultaneous interruption of stirring. The flash point is taken as the lowest temperature at which the application of the test flame causes the vapour above the sample to ignite momentarily. It is used to determine the flash point of the lubricating oils, fuel oils, solvents, solvent containing material and suspension of solids.

Flash point is the lowest temperature at which the lubricating oil gives off enough vapours that ignite for a moment when tiny flame is brought near it.

Fire point is the lowest temperature at which the vapours of the oil burn continuously for at least five seconds when a tiny flame is brought near it.

II. EQUIPMENT DISCRIPTION

This apparatus is used to determine the flash point of fuel oils and lubricating oils. Flashing above 49⁰C. It consists of an oil cup with a circular marking for oil level indication. A lid to cover the oil cup with sliding shutters with ports, oil stirring mechanism and dipping wick holder, cast iron oil cup holder (air bath), electric heater with control

It is used to determine the flash point of the lubricating oils, fuel oil.

It consists of three parts

❖ OIL CUP

1. Material-Brass
2. Height-5.5cm
3. Diameter-5cm

Lid of the cup is provided with four openings of for stirrer, second is for admission of air and third is introduction test flame.

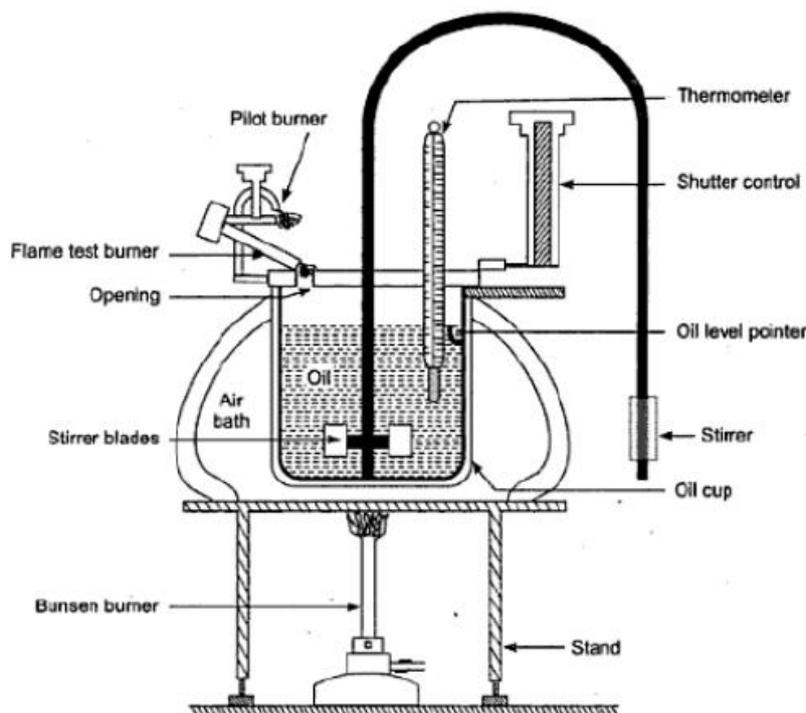


Fig.1:- Pensky Marten's apparatus

❖ **SHUTTER**

At the top of the cup a shutter is provided. By moving the shutter, opening in the lid opens and flame is dipped in to this opening, bringing the flame over the oil surface. As the test flame is introduced in the opening, it get extinguished, but when the test flame is returned to its original position, it is automatically lightened by the pilot burner

❖ **STOVE**

It consists of 1. Air bath, 2. Top plate on which the flange of the cup rest.

III. SAMPLE LUBRICATING OILS

- ❖ **Castrol:** - is a British global brand of industrial and automotive lubricants offering a wide range of oils, greases and similar products for most lubrication applications.
- ❖ **SERVO:** - brand, from Indian Oil, is the brand leader among lubricants and greases in India and has been conferred the "Consumer Super brand" status by the Super brands Council of India.
- ❖ **Red Line:** - Synthetic Oil is a synthetic lubricants manufacturer located in Benicia, California, United States.
- ❖ **Kluber:** - Lubrication India Pvt., Ltd. manufactures and distributes specialty lubricants.
- ❖ **HP:** - HPCL is the market leader in lubricants and associated products. It commands over 30% of market share in this sector. The popular brands of HP lubes are Laal Ghoda, HP Milcy, Thanda Raja, Koolgard, and Racer.

IV. PROCEDURE

1. Clean and dry all parts of the apparatus with the help of suitable solvent e.g. CCl₄, ether, petroleum spirit or benzene and dry it to remove any traces of solvent.
2. Fill the oil cup with the test oil up to the mark.
3. Fix the lids on the top through which are inserted a thermometer and a stirrer. Ensure that the flame exposure device is fixed on the top.
4. Light the test flame and adjust it to about 4 mm in diameter.
5. Heat apparatus as temp. of oil increases by 5 to 60 per min. as stirrer is continuously rotated.
6. At every 10 C rise of temp. Introduce test flame into the oil vapour. This is done by operating the shutter. On moving knob of shutter, test flame is lowered in oil vapors through opening.
7. When test flame causes a distinct flame in interior cup, note temp. which represent the flash point
8. Further heat the oil at the rate of 10C/ min. and continue applying the test flame as before.
9. The temperature at which the vapors of the oil give a clear and distinct blue flash for five seconds is recorded as the fire point of the oil.

V. OBSERVATION

S.NO	LUBRICATING OIL	FLASH POINT(° C)		ACID TREATMENT(° C)
		Fresh oil	Used oil	Used oil
1	CASTROL	204	143	192
2	SERVO	160	98	143
3	RED LINE	224	162	213
4	KLUBER	220	160	209
5	HP	165	100	152

VI. RESULT & CONCLUSION

The results from the tests showed that, fresh lube oil and used lube oil have average flash points of 224⁰C and 162⁰C. The flash point of used lube oil increased from 162⁰C to 213⁰C after the acid treatment. The flash points of different lubricating oils respectively are 192 °C, 143 °C, 213 °C, 209 °C, 152 °C.

From the results presented, flash point of fresh lube oils is more compared to the used lube oils. It is clear that the acid treatment method effectively removed contaminants from different used lubricating base oil and returned the oil to a quality essentially equivalent to oils produced by fresh lube oil stocks. It is envisaged that, it will cost less to procure the used lube oil and has proved to yield about 80% while the yield from crude oil is between 5 to 10%. The recycling of used lubrication oil will reduce environmental concern which it has so far posed. It will also reduce the demand for lubricant rich crude which is a finite resource.

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