

**OBJECTIVE:**

To determine the flash point of given oil by Pensky-Marten's flash point apparatus.

**REQUIREMENTS:**

- *Chemicals:* The supplied oil (Kerosene or Diesel)
- *Apparatus:* Pensky-Marten's apparatus, Thermometer

**DESCRIPTION OF APPARATUS:****1. Oil Cup:**

It is about 5 cm diameter and 5.5 cm deep. The level to which the oil is to be filled is grooved inside the cup. The lid of the cup is provided with four openings of standard sizes to serve the following purposes

- To hold the thermometer
- To introduce the test flame
- To pass the stirrer carrying two brass blades
- To admit air

**2. Shutter:**

It is a lever mechanism provided at the top of the cup. By moving the shutter anticlockwise, the opening in the lid is exposed to flame, carried by the flame exposure device (It is a small flame which is connected with the shutter in such a manner that when the opening in

the lid is exposed by the shutter, the flame of the device is dipped into the opening.)

### **3. Flame exposure device:**

It is a small flame connected to the shutter by a lever mechanism.

### **4. Air bath:**

Its flange supports the oil cup over an air bath, which is heated by a gas burner or by a regulated electrical heater.

### **5. Pilot Burner:**

As the test flame is introduced in the opening, it gets extinguished. But when the test flame is returned to the original position, it is automatically lighted by the pilot burner.

## **PRINCIPLE:**

Through unrelated to the lubricating property of the oils, knowledge of flash point and fire point is highly helpful in providing safeguards against fire hazards during their storage, transportation and use. During use, lubricants are subjected to high temperatures and at such high temperatures they have a tendency to volatilise and cause loss of lubricants and the vapors formed may catch fire. But good lubricants should form inflammable vapours only at the temperatures greater than the working temperatures of the lubricants. Oils having flash point less than  $140^{\circ}\text{F}$  are called flammable liquids and those with flash point above  $140^{\circ}\text{F}$  are called combustible liquids.

Flash point and fire point have also been used to detect solvent contamination and to determine the approximate extent of dilution of the lubricating oil. This test is also useful to refiners in controlling the manufacturing process.

## **DEFINITION:**

### **➤ Flash Point**

Flash point is the minimum temperature at which the lubricating oil gives enough vapours to form an inflammable mixture with air that

ignites for a moment when a small flame is enough to brought in contact with it.

### ➤ **Fire Point**

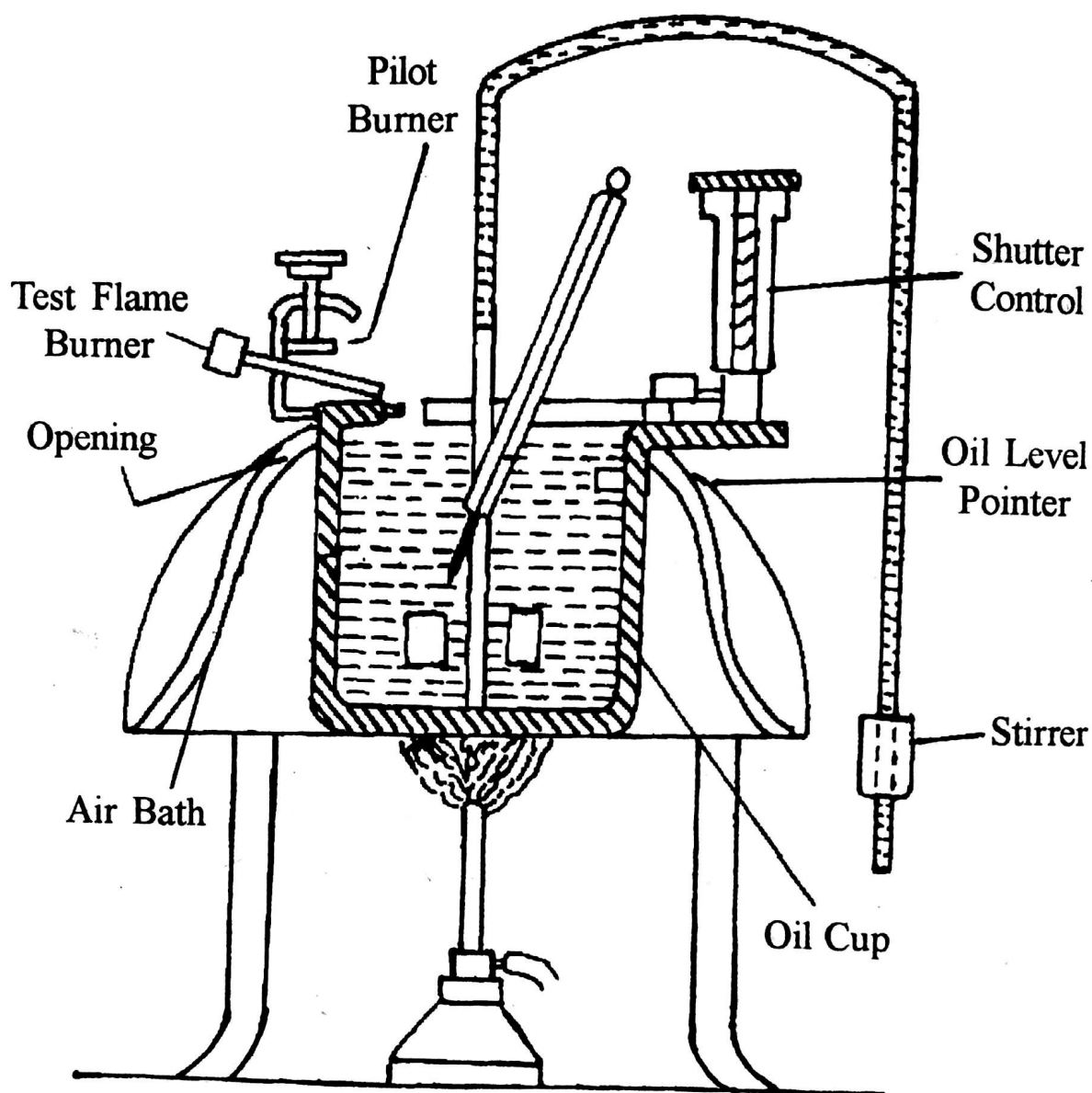
It is the lowest temperature at which the vapors of the lubricating oil burn continuously for at least 5 seconds, when a flame is brought near it.

In general, the fire points have been found to be  $5^{\circ}\text{C}$  to  $40^{\circ}\text{C}$  higher than the flash points.

### **PROCEDURE:**

1. Fill the oil cup up to the mark with supplied oil.
2. Heat the air bath.
3. Insert the thermometer at the opening of the oil cup so that its bulb is dipped in the oil. Stire and heat the oil so as to raise the temperature about  $5^{\circ}\text{C}$  per minute.
4. When the temperature of the oil reaches within  $15^{\circ}\text{F}$  of the probable flash point, apply the test flame. For kerosene or diesel oil when the temperature rises to  $40^{\circ}\text{C}$ , stop heating.
5. At every  $1^{\circ}\text{C}$  rise of temperature, introduce the flame for a moment by working the shutter.
6. The temperature at which a distinct flash (combination of a weak sound and light) appears inside the cup was recorded as the flash point.
7. If the temperature is recorded in degree C, convert it to F.





**Fig. 15.1**  
(Pensky-Marten's Flash Point Apparatus)

### OBSERVATION TABLE

Name of the Oil	No. of Obs.	Temperature in $^{\circ}\text{C}$	Flash point Observed or not
	1.		
	2.		
	3.		
	4.		
	5.		
	6.		

**CONCLUSION:**

The flash point of the lubricating oil was found to be.....°F

**PRECAUTIONS**

- As moisture affects the flash point, all parts of the cup and accessories should be dried before placing the oil in the cup.
- Always fresh oil sample should be taken.
- The bulb of the thermometer should dip into the oil.
- For applying the test flame, the sliding lid should be opened slowly and closed quickly.
- Stirring should be discontinued during the application of the test flame.

**VIVA QUESTIONS**

**Q.1. Define flash point of lubricating oil.**

**Ans.** Flash point is the minimum temperature at which the lubricating oil gives enough vapour to burn temporarily for a moment when a small flame is brought near it.

**Q.2. What is fire point ?**

**Ans.** Fire point is the minimum temperature at which the liquid gives enough vapour to burn clearly at least for 5 seconds when a flame is brought near it.

**Q.3. What is the significance in determining the flash point and fire point of a lubricating oil ?**

**Ans.** Flash point and fire point tell us the maximum temperature up to which a lubricating oil can be used in an engine. This ensures safety against fire hazard during its use.

**Q.4. An oil with higher flash point is more suitable in larger machines - justify ?**

**Ans.** Since large machines have higher working temperature, oil with higher flash point will be more suitable.