

Experiment No. 14: Flash point by Abel's closed cup apparatus.

I

Practical Significance

Lubricating oil selected for a job should have a flash-point which is reasonably above its working temperature. This ensures safety against fire hazards during the storage, transport and use of the lubricating oil. This test helps in detecting the highly volatile constituents of oil. To ensure safety certain minimum temperature are laid down for fuels and lubricating oils below which they should not give off adequate vapours to make them burn. In addition, the flash point of oil is often used as a means of identification and also for detection of contamination of the lubricating oils. The Abel's closed-cup apparatus is best used for oils having flash point below 49°C .

II

Relevant Program Outcomes (POs).

PO3 Experiments and practice

PO4 Engineering tools

III

Relevant Course Outcomes

f) Use paints, varnishes and relevant engineering materials in industry.

IV

Practical Learning Outcome

Determine the flash point of given lubricating oil using Abel's closed cup apparatus.

V

Practical Skills

Measurement skill

1. Adjustment of the rate of heating per minute
2. Introduction of the test flame over the oil surface

VI

Relevant Affective domain related Outcomes

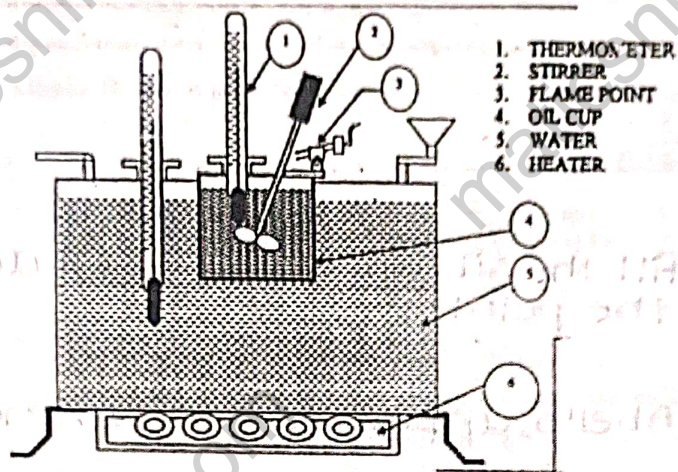
1. Follow safety practices.
2. Maintain tools and equipments.
3. Practice good housekeeping.

VII

Minimum Theoretical Background

1. Good lubricating oil should not volatilize under the working temperature.
 2. Even if some volatilization takes place, the vapours formed should not form inflammable mixture with air under the condition of lubrication. From this point of view, the flash point of lubricating oil is important.
 3. The flash point of an oil is the minimum temperature at which the oil gives off sufficient vapour to ignite momentarily when a flame of standard direction brought near the surface of the oil for a prescribed rate in an apparatus of specified dimensions.
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VIII Experimental set-up



ABEL'S APPARATUS

IX Resources required

Sr. No.	Name of resources	Specification	Quantity	Remark
1	Abel's apparatus		05	
2	Thermometer		05	
3	Oil sample		As per requirement	

X Procedure

1. Fill the oil cup with the oil under test up to the point of the gauge.
2. Replace the cover.
3. Fix the oil cup in to the apparatus and assemble the paddle stirrer and the standard thermometer with its bulb dipping into the oil at their respective places provided for in the apparatus.
4. Fill the water bath with cold water.
5. Close the sliding shutter and light the standard flame.
6. Switch on the heating device and adjust the rate of heating in such a way that the temperature of the oil increases at a rate of 1 to 1.5⁰C per minute
7. Stir the oil continuously by turning the paddle stirrer.
8. Stirring should be discontinued only during the introduction of the test flame over the oil surface.
9. At every degree rise of oil temperature, open the sliding shutter and introduce the test flame over the oil surface through the central opening to see whether the oil gives a flash.
10. Record the minimum temperature at which a distinct flash appears as the flash point of the oil.

XI Precautions

1. While filling oil in the cup, take care that the surface of the oil is free from bubbles and there is no oil above the filling mark.
2. The compartment or room should be as dark as possible so that flash is readily discernible.
3. Use the correct range of thermometer.
4. Temperature of oil should be increases at the rate of 1 to 1.5°C.

XII Actual procedure followed

Fill the oil cup with the oil under test up to the point of gauge.

XIII Resources used (with major specifications)

Abel's apparatus, thermometer, oil, sample

XIV Precautions followed

1. While filling oil in the cup take care that the oil is free from bubbles and there is no oil above the filling mark.

XV Observations

Sr. No.	Increasing temperature	Inference (No flash or flash observed)
1	30	No
2	35	No
3	40	No
4	45	No
5	48	observed

XVI Results

- 1) Given lubricating oil gives no flash up to 47°C.
- 2) Given lubricating oil gives flash up to 48°C.

XVII Interpretation of results

The flash point of given sample determined by Abel's closed cup apparatus is found to be 48°C

XVIII Conclusions and Recommendations (if any)

Given lubricating oil can be use up to below 48°C working temperature

XIX Practical Related Questions

1. Write the precautions while performing the practical.

2. Give the limitations of Able's close cup.
3. Explain the significant of fire & flash point.
4. Name the apparatus used for flash point & fire point determination.

XX References / Suggestions for further Reading

Sr. No.	Title of Book	Author	Publication
1	Engineering Chemistry	Jain and Jain	Dhanpat Rai and sons; New Delhi, 2015, ISBN : 9352160002
2	Engineering Chemistry	Dara, S. S.	S.Chand. Publication, New Delhi, 2013, ISBN: 8121997658
3	Experiments and calculations in engineering chemistry	Dr.S.S.Dara	S.Chand. Publication, New Delhi, 2011, ISBN: 8121908647
4	Applied Chemistry: Theory and Practice	O. P. Vermani, A. K. Narula	New age International. Publication, New Delhi, 2005, ISBN: 8122408141

XXI Assessment Scheme

Process related assessment scheme


Sr. No.	Process related	Weightage(60%)
1	For mounting the thermometer	15%
2	For introduction of test flame	15%
3	For maintaining temperature	15%
4	For temperature reading	15%

Product related assessment scheme

Sr. No.	Product related	Weightage(40%)
1.	Identification of flash point	40%

List of Student Team Members

1.
2.
3.
4.

Marks Obtained			Dated Signature of Teacher
Process Related (15)	Product Related (10)	Total (25)	
14	09	23	

[Space to Write Answers]

Q.1 — ?

- i) While filling oil in the cup take care that the oil is from bubbles of there is no oil above the filling mark.
- ii) The compartment or room should be as dark as possible so that flash is readily discernible
- iii) Use the correct range of the thermometer.
- iv) Temperature of oil should be increase at the rate of 1 to 15° C

Q.2 — ?

We can only use 49° C this is an limitation.

Q.3 — ?

The tests helps in detecting the highly volatile constituents of oil. The Abel's closed-cup, apparatus is best used for oils having flash point below 49° C.

Q.4 — ?

- i) Apparatus used for flash point is Abel's closed cup apparatus.
- ii) Apparatus used for fire point is Cleveland's

open cup apparatus.