Ministry of Higher Education and Scientific Research
AL Mustaqbal university college
Chemical Engineering Department

Petroleum products Properties Laboratory

3rd. Stage.

Exp. No. 5
Petroleum Products Pour And Cloud Point Test

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Purpose of this test:

1) Know the properties of fuel at low temperatures.
2) Knowing the quantity of waxy compounds present in petroleum products and the ability of these products to flow or pump, and this is of great importance for the transportation of the products and their uses.

Introduction and theory :

As petroleum oils are cooled they tend to become more or less plastic solids. This may be due either to the partial separation and solidification of the wax present or actual congelation of the heavy hydrocarbons composing the oil. When the cooling is carried out under certain prescribed conditions, the temperature at which enough wax has crystallized to give the oil a cloudy appearance is called the cloud point. The chief value of a cloud point determination is as an indication of the completeness of the dew axing process. An oil having a high cloud point has obviously been dew axed less than one having a very low cloud point. It must be admitted, however, that the cloud point is less significant and of more limited application than is the pour point.

The pour point test was designed to indicate the lowest temperature at which an oil, when cooled at a given rate, will remain fluid. ASTM Committee D-2 on Petroleum Products and Lubricants offer this comment on the results of the pour point determination: The pour point gives an indication of the temperature below which it may not be possible to pour or remove an oil from its container, or below which it might be dangerous to use the oil in gravity lubricating systems, where the head tending to produce flow is small. However, it should be borne in mind that the size and shape of the container, the head or force exerted upon the oil, and the nature of its physical structure when solidified, all have an effect upon its tendency to flow.

Under lower rates of cooling than that employed in the ASTM pour point determination, oils have been pumped at temperatures from 10 to 15° F. below the determined pour points. It is indicated that the pump ability of an oil at low temperature is limited more by viscosity than by the pour point.

In the article just referred to, J. L. McCloud, Metallurgical Chemist for the Ford Motor Company, quotes A. E. Becker quite freely. Becker finds that, if oils having a pour point of 0° F. or lower are considered, the time required for a pump to deliver oil to the bearings is proportional to the viscosity of the oil at the pumping temperature. Becker further observed that oils below their pour points require considerably longer to establish circulation than those above their pour points.

Evidence has been submitted to show that the presence of wax in oil, even when the temperature is above the determined pour point, is another important factor in determining the readiness with which an oil may be pumped.

It was first supposed that the pour point of a motor oil was a controlling factor in determining the ease of starting. This supposition was based upon a seemingly natural assumption that less force would be required for movement through a liquid than through a solid, even though the solid was plastic in nature. The fallacy of this idea was demonstrated by the fact that a low-pour-point asphaltic-base oil required greater starting torque than did a medium pour point paraffin base oil. The oils were of the same viscosity at 210° F., but at the temperature of the experiment, the viscosity of the asphaltic-base oil was considerably higher than that of the paraffin-base oil. It is now generally thought that the viscosity of the oil remaining on the cylinder walls is the prime factor in determining the ease with which an engine may be started under conditions of low temperature. In order to facilitate starting in cold weather, it is recommended by some to stop the engine by use of the choke rather than the ignition switch. The viscosity of the oil inside the cylinders is greatly reduced by the raw gasoline without resulting in serious crankcase dilution.

The oil in the bearings exerts only a small influence, if any, on the ease of starting experienced. This is entirely congruous with what would be

expected, since the bearing surface involved is negligible in comparison with the surface of the cylinder walls.

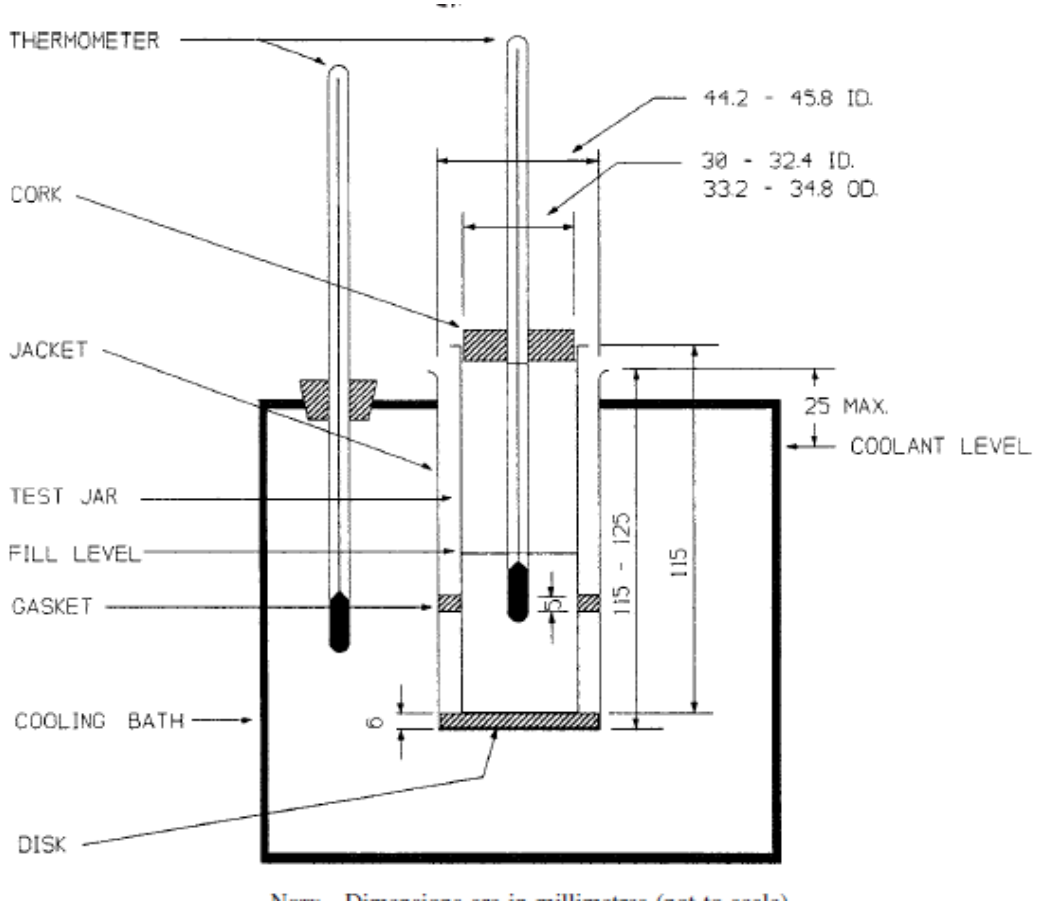
While the ease of starting under conditions of low temperature is highly important, A. E. Becker is of the opinion that the lubrication of the engine during and immediately after starting is of major importance.[21] In regard to lubrication during the initial period of operation when the oil is highly viscous, J. C. Geniesse, Research Engineer of the Atlantic Refining Company, offers this comment:

As a result of the lack of proper lubrication undue wear takes place on the cylinder walls and pistons. Obviously, it is difficult to determine the amount of wear that takes place during the warming up of the motor, but it is reasonable to estimate that from 50 to 75 per cent of the wear takes place during this period.

This consideration serves to emphasize further the importance of selecting an oil that will not only permit easy starting at low temperatures, but will require a minimum time to establish full lubrication of all the moving parts of the engine. Evidence has been submitted to indicate that both a low pour point and a low viscosity are important properties of a lubricant to be employed in low temperature lubrication. Although a low cloud point is desirable, it is of less importance than either a low pour point or low viscosity

Significance and Use

The pour point of a petroleum specimen is an index of the lowest temperature of its utility for certain applications.



Pour and cloud point Apparatus

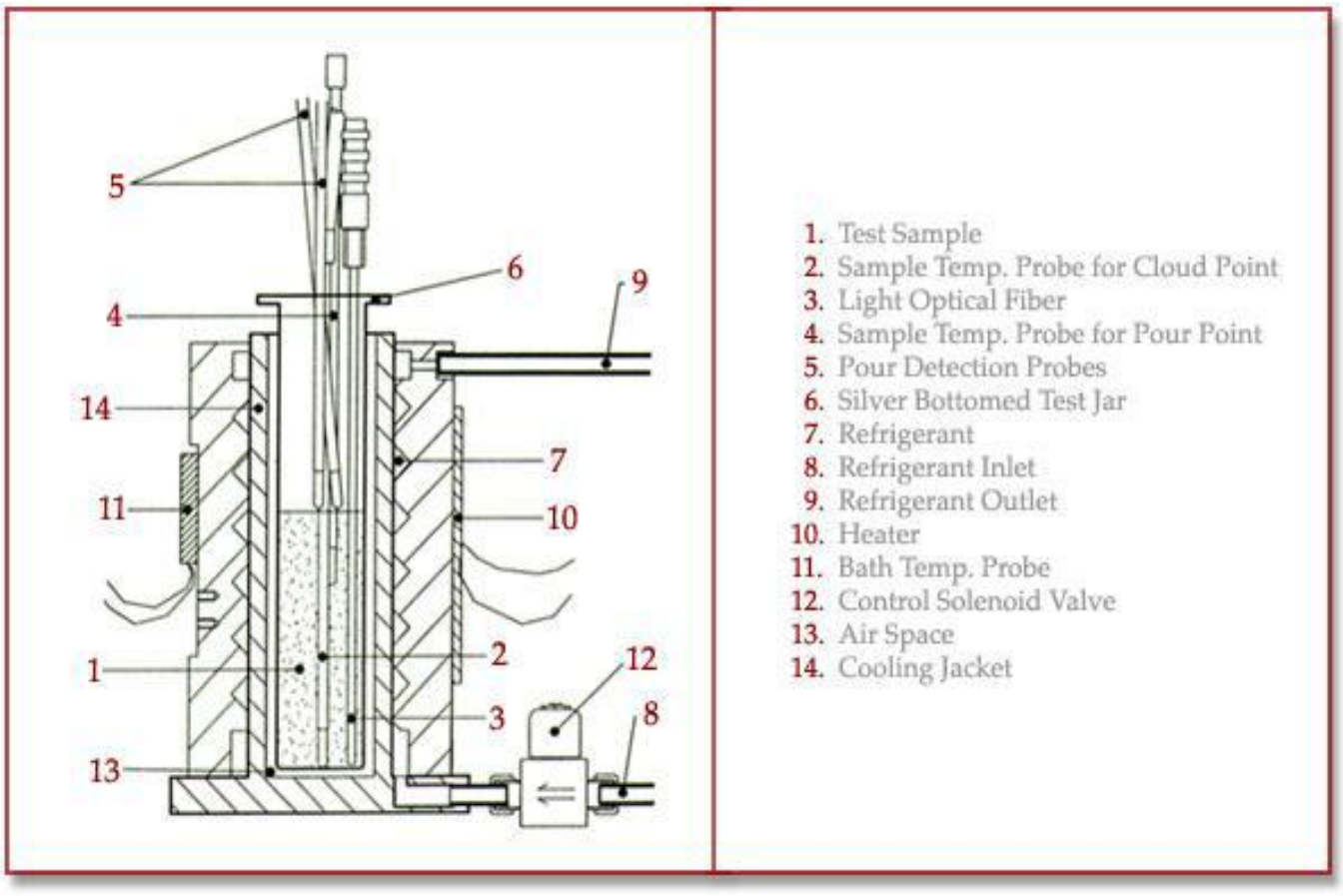
Equipment's Used :

1. seta cloud and pour point bath

- the seta cloud and pour point bath is used to give the required cold bath to liquid to take them to the required stage.
- it utilizes the current and with the help of conditioners and couples present in them they cool the fluids up.
- they hold four test positions.
- they have the ability to supply the temperature range from 9°c to -69°c.
- the equipment identifies the minimum safe operating temperature.
- the bath accommodates four jackets and steel cover and a drain tap.

2. digital thermometer

- since the reading of temperature is seen to be in the lowest stage the normal thermometer won't be able to help us in getting the correct data hence we prefer to use digital thermometer to compare the meter reading on equipment by removing the test jar out.



Procedure :

1. the oil is being kept to a test at temperature of at least 25°c about approximate point.
2. then moisture that is present is being removed by filtration through any lint less filter paper until the oil was perfectly cleared.
3. then the oil is being poured into the test jar until the level marked.
4. adjust the position of cork carrying the test thermometer bulb at the bottom of the jar
5. the ring gasket is being place in such a way that it is one inch away from the bottom.
6. the disk gasket and the inside gasket should be clear and dry
7. then the test jar is being placed in the jacket and the temperature is being maintained.
8. after every 2°c fall in temperature the test jar is taken out of the jacket and the cloud is being checked, without disturbing the solution.
9. the checking shouldn't take, not more than 3 seconds.
10. the process is being further continued until the solution reaches a stage such that the solution loses the ability to flow, which is said to be its pour stage.
11. the procedure is being repeated three times and the values are tabulated and compared then the average is being noted down.

Discussion:

1. What is the pour and cloud point ?
2. What is the importance of the experiment ?
3. What are the parts of the device used in the experiment?
4. Why is the test tube and its contents placed in a cooling bath ?