Flash Point - Explained

The term "flash point" is used to determine the lowest temperature at which a volatile substance can become vapourised into a flammable gas.

Flash point is measured by raising the temperature of a sample material whilst introducing an ignition source to it, the temperature at which vapours above the sample "flash" (ignite) is referred to as it's "flash point".

Why is Flash Point measured?

Classifying the flammability of volatile materials by their flash point value has been an established practice for more than 100 years. Flash point requirements are listed in many regulations and product specifications with mandatory international and national regulations established by UN, IATA, EPA, EU and many other health and safety executives. The fundamental reason for measuring flash point is to assess the safety hazard of a liquid with regard to its flammability and then classify the liquid into a recognised hazard group. This classifiation is used to warn of a risk and to enable the correct precautions to be carried out during manufacture, storage/transportation and disposal. Flash point is also a critical parameter used to formulate safety warnings on household cleaning materials, cosmetics, polishes and many other consumer products.

Changes in flash point are also used to measure the batch consistency of a material and also as an indicator that a material may have been contaminated (for example during storage) or has been subject to deliberate adulteration.

Flammability

Flash point is a convenient and reliable classification of the flammability of many materials which are typically categorised into the following groups:

- Extremely flammable: Flash point below 0°C
- Highly flammable: Flash point below 21°C
- Flammable: Flash point below 55°C

Open and Closed Cup Flash Point Tests

Flash point tests fall into two main categories - "open cup" and "closed cup".

Open Cup Flash Point Tests

Open cup tests simulate the potential ignition of liquid spillage in uncontained conditions.

In open cup tests the sample cup is not enclosed but

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heated openly and an ignition source is introduced over its surface at intervals to check for an ignition flash. The flash point will vary according to the distance between the substance and the ignition source so accurate height dimensions are laid down in test methods.

Cleveland and Small Scale open cup are the most frequently specified "open cup" test methods.

Closed Cup Flash Point Tests

Closed cup test are generally used as industry standards because the test sample is contained and the ignition source is introduced into the test cup itself. This often better simulates real-life conditions such as those found inside a fuel tank or chemical container.

The test results are less affected by laboratory conditions and give a more precise and lower (safer) result which ensures safer practices.

Non-equilibrium and Equilibrium Flash Point Tests

There are two types of closed cup test:

Non-equilibrium Tests - Abel, Pensky-Martens, Tag and Cleveland

The term non-equilibrium means that the vapour is not in equilibrium with the liquid. Non-equilibrium flash point tests are when the liquid is heated at a steady rate of temperature increase while the ignition source is applied at regular intervals.

Advantages: test instrumentation is univerally available and standardised for a wide range of products.

Disadvantages: each time the flame is dipped, some of the volatile components may escape which can give artificially high flash points and poor precision. The temperature of the liquid and vapour can also vary significantly inside the cup.

Non-equilibrium tests also require a large sample size of 50 to 80ml per test.

Equilibrium Tests

Traditional equilibrium flash point tests use a water bath to heat the sample cup to ensure that the liquid and vapour of the sample are in temperature equilibrium, these tests require careful procedure and necessitate a very slow heating rate.

Setaflash Small Scale method overcomes these laborious processes by utilising a 2ml or 4ml sample which achieves 'Rapid Equilibrium' between the vapour and sample in less than two minutes and gives a reliable flash point result.

Advantages: Improved precision compared to non-equilibrium methods.

Low cost and rapid result.

Flash/no flash result is widely adopted in product specifications.

Only 2ml or 4ml of test sample required.

Which Flash Point Test Method To Use?

The appropriate method for a specific material is typically cited in a product specification or regulation. In certain circumstances a referee test method may be stated, this method should be the first choice.

If a number of alternative test methods are specified then the choice will be influenced by other factors such as sample size requirements, speed of testing or precision and availability of test instrumentation.

When testing for contaminants, certain test methods and procedures are more practical than others and commonly an equilibrium test method is recommended for testing samples that may contain traces of volatile contaminants. The Small Scale flash/no flash method is widely adopted because of its simplicity and small sample volume.

To learn more about Flash Point Testing, visit

www.stanhope-seta.co.uk/flashpoint-testing.asp

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