

## FLASHPOINT DETERMINATION FOR THE CEMENT INDUSTRY

### Introduction:

Within the cement industry, flashpoint determination is required for material storage, transportation, disposal and also for product quality specifications. The samples tested show a great variation, ranging from solvents to solids, from burner fuel to waste. Most of the time, the expected flashpoint of these samples is not known.

### Burner Fuel:

Cement manufacturers frequently use a special type of wood grinding mixed with refinery residue to heat their burners. The flashpoint can help to determine the quality of the fuel, if the sample is properly homogenized prior to the test. If differences in flashpoint tests are observed, this is a good indication that the quality of the burner fuel is not homogenous.



*Burner Fuel used by Titan cement, Greece*

### Solids:

In the cement industry, also a number of solid samples have to be tested. The example below shows solid dusty oil foam, tested at BAUMIT cement in Austria.



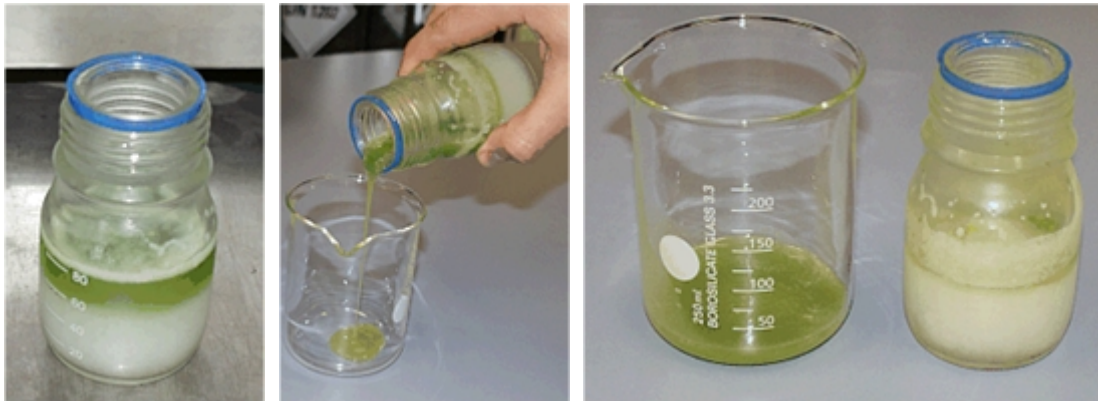
In this example, the expected flashpoint was not known, so a rapid screening procedure was used:

- Sample size: 2 mL
- Heat rate: 12°C/min.
- Air: 0.6 s
- Ignition Step: every 3°C, starting from 120°C
- Expected flashpoint: 189°C

The expected flashpoint of 189°C was used to run a standard D7094 measurement, starting at 170°C, resulting in a flashpoint of 187°C.

### Solvents containing water:

For solvents and oil containing a big amount of water it is highly recommended to separate the water, before a measurement is done. Water boiling during the test can change the flashpoint. Some methods to deal with water are centrifugation, drying, distillation, separation of water with Silica-Gel, adding calcium sulfate or calcium carbonate prior to the test or freezing of the sample.



*Oil separation by sample freezing*

Given the differences in samples to be tested, the “right” method for separation can be different from sample to sample. Distillation for example can evaporate highly volatile substances in addition to water. Water separation with Silica-Gel works only for some oils. And if Summer-Diesel is in the sample, freezing can also turn some Diesel components into waxes.

As an alternative it is possible to measure the flashpoint only up to 100°C to prevent boiling of the sample. ADR limits for class 3 liquids are typically below 100°C. Limits are typically 23°C, 60°C, or above 60°C and below 100°C (e.g. Diesel Fuels).

For samples known to contain water, 2 tests should be performed below 100°C.

#### Step 1: Test from the top:

Samples with a lower density than water will separate to the top of the sample container.

- Let your test substance rest, until e.g. the oil is separated, or freeze it.
- Draw a sample from the top of the sample container.
- Run a flashpoint test. Abort at 100°C.

## Step 2: Test from the mixture:

Samples with a higher density than water will separate to the bottom of the sample container.

- Shake the sample container vigorously, until the sample is homogenized.
- Draw a sample from the middle of the container
- Run a flashpoint test. Abort at 100°C.

From these two tests, the lower flashpoint shall be reported.

If no flashpoint is reached, a flashpoint >100°C can be reported.

## Samples with a very low flashpoint:

Since the flashpoint is not very often known it is the best to put the sample and the cup into a deep-freeze. The “manual” measuring mode allows to cool the oven to the start temperature, before the sample is taken out of the refrigerator and put into the instrument.

## MINIFLASH TOUCH rapid screening procedure for the cement industry:

1. Use 1 mL sample size for solvents and 2 mL sample size for solids and viscous liquids
2. Select the following “custom” settings:
  - Heat rate: 12°C/min. (NOTE: a slower heat rate (5°C/min.) may be required for solid and viscous samples, to allow enough time for sample outgassing).
  - Ignition Step: every 3°C
  - Air: 0.6s
  - Put the stirrer into the cup, as for some kind of samples it might be necessary
3. Select the expected flashpoint. If the expected flashpoint is not known, program a very low start temperature for liquids or a temperature of >100°C for solid samples.
4. Proper homogenisation of the sample is most important: Shake solvents and fuels vigorously EVERY TIME before taking a sample.
5. The drawn sample has to be cooled down at least 18°C below the expected flashpoint.
6. Fill the cooled sample into the MINIFLASH sample cup and start the measurement.
7. Clean the sample cup and the electrodes after the measurement

### NOTE:

Proper cleaning of the sample cup and the electrode is recommended after each test. Sticky residuals can best be removed running an high temperature cleaning program.

## Conclusion:

If you follow the above mentioned procedure you should get a fast and reliable method for measuring the flashpoint of liquids and solids.