Collecting a Representative Thermal Oil Sample

HEAT SYSTEMS
Carbon Regeneration and Thermal Processing Solutions

Information Sheet

If thermal fluid samples are not collected in a representative method, artificially high flash point values will be returned. This results in the end user perceiving a lower risk from flash points than is actually correct.

This has obvious insurance, health and safety and, with the effect of the new (EUROPE) regulations, important legislative implications.

Representative thermal fluid samples must be:

1. Collected hot at operating temperature

In their document entitled *Monitoring Heat-Transfer Fluids: The Sampling Bomb*, (ref: MP 623 International), dated December 1980, BP Oil states, 'A truly representative sample of the complete charge can be taken only when the fluid is hot and circulating.'

The document then goes on to describe use of 'the bomb' – a closed sampling device designed to capture the volatile light ends that would otherwise be boiled off if the sample was to be taken to atmosphere.

REASONING

Systems design varies widely from site to site: pipe diameter, fluid velocity, pipe layout etc. Also, aged oil can be significantly more viscous. Therefore:

a) If the sample is taken with the system running and at normal working temperature, it is far more likely that turbulent flow is occurring thus ensuring that a homogenous mix of fractions within the bulk fluid is sampled (see example below)

b) Any insoluble contaminants will, for the same reason, be more likely to be suspended within the bulk fluid.

c) Both high and low molecular weight ranges of fractions will be detected.

EXAMPLE

For typical ISO 32 heat transfer mineral oil

At fluid velocity V(m/s) x pipe diameter d (mm) = 10

Reynolds number = 2,000 for fluid @ 100 deg C but Reynolds number = almost 20,000 for fluid @ 325 deg C

At ambient temperatures, turbulent flow cannot be guaranteed.

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- There is a substantial difference in viscosity between a sample at working temperature and an ambient sample. This will also affect the way the fuel-like light fractions mix. It can only be representative when at temperature – if there was an event it would be from a system at temperature.
- If there was an event and a subsequent investigation, it would be vital to know that your flash point values and any corresponding advice given were correct - the only way to ensure this is by having hot, closed and circulating samples.

2. Collected in a Closed manner

A closed sample device such as a 'bomb' must be used to ensure that the fluid does not pass through atmosphere. Light ends or volatiles consist of a homologous mix of hydrocarbons with different boiling/flash points.

Where an 'open' sample is collected, the most volatile (lowest flash point) species will automatically escape and flash off to atmosphere, instead of being allowed to cool and condense back into the sample where it can be decanted under lab conditions.

In this case, as the lowest flash point material has been vented off, incorrect (too high) flash point values will be returned.

3. Collected from a Circulating system

This is again to ensure a homologous mix of hydrocarbons. Light ends will 'pond out' in still fluid.

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