

Leakage and Combustion Issues

Flash Point – The lowest temperature at which a heated liquid’s vapours when mixed with air can be ignited (“flashed”) by a flame or spark, or other ignition source.

Fire Point – The lowest temperature at which a heated liquid’s vapours burn continuously when combustion is supported by ignition sources such as the above.

Autoignition Temperature – The temperature at which the vapour formed by a heated liquid will flash without a source of ignition.

Flash Point & Fire Point Testing – The liquid to be tested is heated in a cup and the rising liquid temperature is continually measured. A small flame is mechanically passed back and forth just above the surface of the liquid. As the liquid gets hotter, more of it evaporates causing the fuel/air mixture above the liquid to gradually become richer. When the lower flammability limit is reached, the ignition source will ignite the vapour/air mixture, causing a pop. The observed temperature when the flame momentarily ignites the vapour/air mixture is the Flash Point. The ignitions repeat as the liquid temperature continues to rise. The observed temperature when the burning becomes continuous is the Fire Point.

Autoignition Temperature Test – A sample is injected into a flask which is heated to the test temperature. If a “flash” is observed in the container, that temperature is the Auto Ignition Temperature. IF no flash is observed after a period of time, the flask temperature is increased and the test repeated. This method (ASTM E659-78) is valid only for fluids that are completely vaporised at the test temperature since the degradation products formed by any remaining liquid will affect the test result.

So, three conditions to be aware of; For a flash-point-related fire to occur, all three of the following conditions must be met:

1. Vapour concentration – These combustion tests allow vapour to concentrate. In real life, the vapours turn to smoke as they encounter air and dissipate
2. Temperature – Thermal oils cool rapidly when exposed to air
3. Source of ignition – Thermal-fluid leaks are difficult to ignite unless a significant amount of very hot fluid leaks into a closed area where inadequate ventilation allows unreacted vapour to collect and mix with air. An exception occurs when fluid leaks onto an extremely hot surface such as the housing of a pump that is failing, or a rotary union that has seized. Technically, this is not a flash-point-related problem but one of autoignition

Heat Transfer Fluids in closed-loop systems, whether natural or synthetic, are routinely used well in excess of their flash and fire points.