
Smoke without Fire

Going back a few years, deep fat frying simply meant a saucepan full of fat, typically lard, which was heated on the top of a stove whilst the potatoes were being peeled and chipped. When the oil started to smoke, that's when you knew the oil was hot enough to cook the chips! Little wonder that chip pan fires were an everyday occurrence and almost everyone who had ever fried in this way had scars on their arms from fat burns. Thankfully, things have moved on a long way since then and the introduction of thermostatically controlled fryers has significantly reduced the risks associated with high temperature frying. Unfortunately, fat fires do still occur and the damage this causes runs into tens of thousands of pounds each year.

One area which has been under discussion recently is the subject of smoke point and flash point of frying oils. Most fryers will have no doubt heard these terms used but how many really know what they mean. Text books define the terms as;

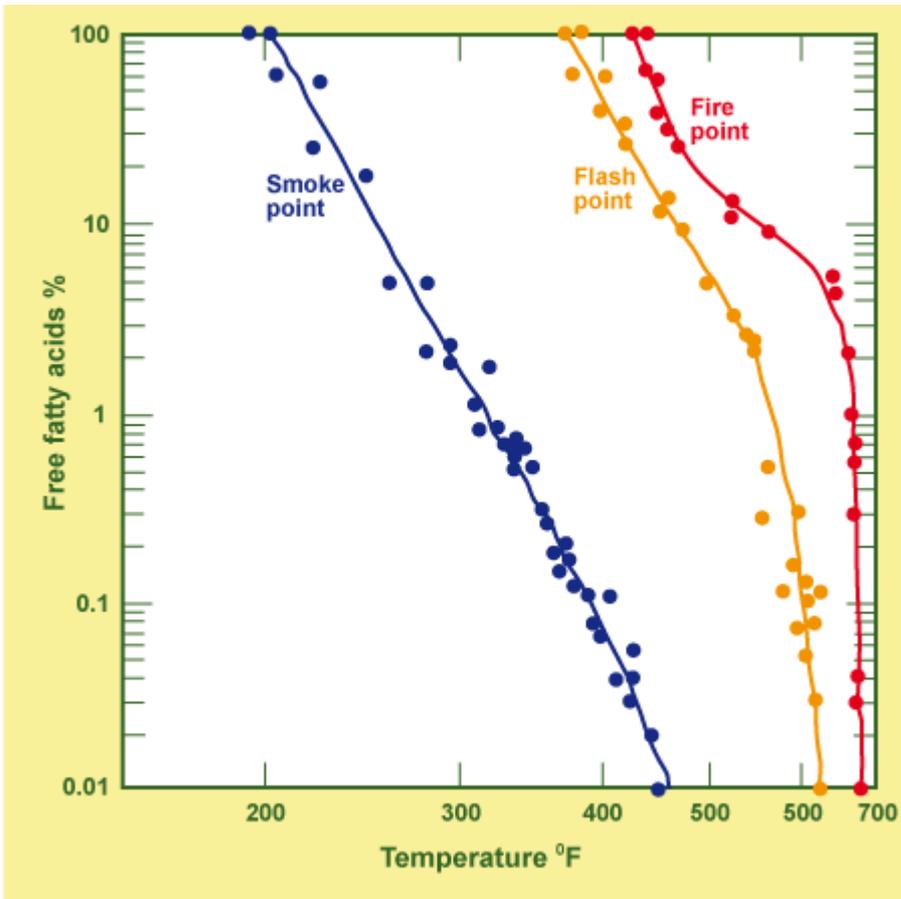
Smoke Point: The temperature at which the oil gives off a visible stream of smoke.

Flash Point: The temperature at which the oil gives off vapours which can be ignited in the presence of a flame.

It is one thing to understand the definition of these terms but another to understand what they mean in a practical context.

For most fully refined vegetable oils the smoke point will be around 230°C (455°F) and the flash point around 325°C (615°F). This is well above the normal frying temperature range of 170 - 190°C (335 - 375°F) and explains why fresh oil does not smoke when heated. However, when the oil is used to cook food, breakdown products are formed (often referred to as Free Fatty Acids) which reduce the smoke and flash point temperatures. After a time, the oil degrades to the point where the smoke point falls inside the frying temperature range. When this occurs a haze of smoke starts to appear over the surface of the oil. As the oil degrades further the amount of smoke produced increases. Whilst not the most accurate way to judge the quality of the oil, it can be used as an indication of when the oil is in need of changing.

The flash point will also be reduced as the oil degrades however, as can be seen from the following graph, showing the effect of oil breakdown on smoke and flash points, if the temperature of the fryer is correctly controlled, the flash point would never be reached. Even in the case where the oil has been totally broken down into Free Fatty Acids (100%) the flash point is still over 200°C (425°F). It is worth noting at this point that, in the majority of frying operations the level of Free Fatty Acids is unlikely to rise above 5%.



We can therefore conclude that, if the temperature of the oil is correctly maintained, the risk of fire resulting from the flash point being reached is negligible.

There have been a number of surveys conducted looking into the causes of fryer fires and the most noted is faulty or badly calibrated thermostats. Other causes include, uncovered heating elements and poor cleaning.