

L.H. COOK PLUMBING & HEATING LTD FACTSHEET LHC-FS018

Premature carboning & problems with vaporising burners

Version 1 February 2018

If you are experiencing shorter service intervals or problems with your AGA type cooker, you aren't alone. There are differing reports; some saying it is a regional problem, others a national one. It has been on the radio, in national newspapers and has been a known problem for many years and was jokingly called *The AGA Saga*. It is a national problem! Also see Factsheet 44 Changes to the properties of standard Kerosene.

When kerosene vaporises from its liquid form into a gaseous state, it "cracks" and the by-product is carbon. This is completely normal and this process starts from the minute the burner is ignited. Some burner designs have always been more prone to the formation of large amounts of carbon and therefore due to modern fuel/conditions, will be even more prone to carbon formation than others. Excessive carbon forming on wicks is now also causing problems.

Despite the many reports and claims about what is causing the problems, in my experience there are only a couple factors that actually affect the combustion process which will then lead to premature carboning:

The first is flue conditions. If you have lost your flue cowl or had it replaced with another of a different design, if your chimney is blocked or restricted, or conditions in your area have changed; such as large trees being removed or smaller trees growing taller, buildings being erected or demolished. These all affect the pressure and wind conditions of your chimney and in turn can affect combustion and the temperature around the burner and carbon leg. If the fuel vaporises in the carbon leg, carbon will form here instead of in the vaporising chamber of the burner; it only takes a piece of carbon the size of a coffee granule to block this pipe, whereas a teaspoon full of carbon forming in the correct place could have no effect.

We find vaporising appliances with shorter chimneys have more problems than those with taller chimneys; this is because the taller the chimney the higher the flue pull, the higher the flue pull the cooler the carbon leg is kept and the less likely for carbon to form in the wrong place. Different cowls can have the same effect as lowering or heightening a chimney. The downside of a High flue pull is that you use more fuel to maintain the oven temperatures.

The second is the most commonly blamed problem; fuel quality. There has been a problem with premature carboning of vaporising burners since the 1980's. Originally the Oil suppliers were blamed for supplying dirty oil, but it occurred when the spec for kerosene was widened, and therefore the quality was not always what we had been used to; it was never dirty oil. The allowable Specific Gravity of Kerosene was widened in 2010 allowing it to overlap with Gas Oil, see Factsheet 44 Changes to the properties of Standard Kerosene.

Every year or so EU directives change and further sulphur reduction from the fuel is needed to help prevent pollution etc. Low sulphur oil is not the problem with vaporising burners. When the original Don burner was designed in 1932 the kerosene we used was the equivalent of premium paraffin; which would have contained little or no sulphur at all. It is not the lack of sulphur but apparently the modern process used to remove the sulphur (which can be very severe), that is apparently changing the chemical structure of kerosene. Whether this process also affects the char value (amount of carbon produced when burning) of kerosene, we are unsure, but it is now much higher than it used to be. The maximum permissible char value for kerosene is 20mg/kg. According to an article titled "The AGA Saga" in a magazine for the fuel suppliers from 20 or so years ago; *"the average UK char value is between 4 and 6 mg/kg. An AGA will have difficulty burning anything above 10 and 12mg/kg. The char value test is also so inaccurate, that if the same sample of oil was sent to 2 different refineries, one could say the char value was 5mg/kg and the other could say it was 15mg/kg"*!

The known average char value of kerosene today is 16mg/kg.

Some additives claim to reduce the char value of fuel, presently we are unsure if they work or not.

What you have to remember is that AGA's are hand built; they all perform differently depending on insulation levels, flue conditions and cooking times and running temperatures. That's why some AGA's cope better than others with the same delivery of fuel; which leads to confusion about what is causing the problems. Vaporising cookers are usually designed to be at cooking temperature 24 hours a day, 7 days a week are not designed to be turned on and off or up and down; this in itself can lead to problems with increased amounts of carbon or carbon forming quicker and therefore may cause premature carboning problems without problematic fuel or chimney problems.