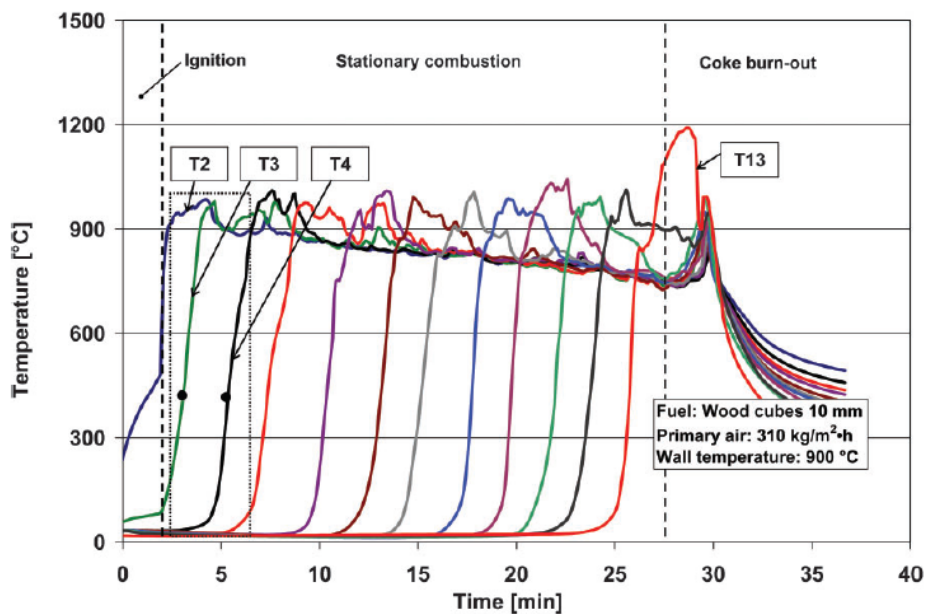


Kolb, T; Bleckwehl, S; Gehrman, HJ; Seifert, H. 2008. Characterisation of combustion behaviour of refuse derived fuel. Journal of the Energy Institute 81: 1-6 DOI: 10.2179/174602208X269526

These researchers set up a bench-top reactor with a 20 cm tall fixed bed of fuel. It had controlled air flow coming in from the bottom and was lit from the top. In other words, it was a TLUD (top-lit updraft gasifier). Their purpose was to characterize the combustion of various fuels to be used in industrial gasification plants.

The change in temperature was measured at various depths in the fuel with thermocouples placed at 2-cm intervals (T2 to T13). The results from one of their runs looked like this:



The temperature of the fuel bed rose from room temperature to about 800-900 °C as the ignition front moved downwards. The charcoal above the ignition front remained at about that temperature. After about 28 minutes, the ignition fire had reached the bottom of the reactor and a charcoal fire remained (as shown by a sharp rise in the temperature of bottom thermocouple, T13).

This pattern has been found by a number of researchers. The ignition front temperature increases with wood vs. paper, and dryness of the fuel. The temperature increases with primary air flow up to a maximum, then declines as excess air starts to impede heating of fuel below the ignition front. Too much air can quench the reaction.

This paper is worth reading, because they also measured CO<sub>2</sub>, CO, H<sub>2</sub>, H<sub>2</sub>O, O<sub>2</sub> and carbon in the effluent gases above the reactor.