371d Deflagration Behavior during Ignition of the Flash Carbonization^{Tm} Process

Samuel R. Wade, Teppei Nunoura, and Michael J. Antal

Flash Carbonization^{TM} is a novel process in which biomass is converted to bio-carbon (i.e. charcoal) quickly and efficiently. To begin this process a canister containing a packed bed of feedstock is placed within a pressure vessel. The system is charged to an initial pressure of approximately 10-20 bar using compressed air. An electric heater is used to ignite a flash fire within the bed. After two minutes additional air delivery is initiated, the flame propagates through the bed, and the biomass is converted to a high-yield bio-carbon.

In lab-scale tests some fuels have been observed to ignite violently within the initial two minutes. The result is a sudden drastic pressure rise ($\Delta P \sim 10$ bar within 1-2 seconds). Because this event could potentially be hazardous, a study of this phenomenon was undertaken in preparation for a scale-up of the Flash Carbonization^{TM} process to a commercial sized demonstration reactor. The influence of initial pressure, feed moisture content, and ignition heater power were examined by following a 2^3 full factorial experimental design approach. The results of this study—which indicate that a safe scale-up of the process is achievable—will be presented.