

Gasification and Oxy-fuel combustion using Australian Lignites – Research and Development Needs

Sankar Bhattacharya, PhD

Associate Professor

Chemical Engineering, Monash University, Clayton 3800, Victoria, Australia

Sankar.bhattacharya@eng.monash.edu.au

Coal provides nearly 40% of the power generated in the world, and its significant role in power generation is set to continue well into the future. Lignites or low-rank coals containing high levels of moisture or ash represent an estimated 45% of global coal reserves. These coals are a major source of power generation in several countries, such as Greece (~90%), Germany (~75%), Poland (~55%), India (~50%), Australia (~50%), Russia (~45%), and the USA (~10%) to name a few.

Australian lignites are friable, have varying composition and different rheological properties. Higher oxygen content and presence of catalytic elements make some of these lignites reactive and ideal for conversion through either combustion or gasification. However, these elements coupled with high-moisture or high-ash content or rheological properties are known to result in operational problems affecting efficiency, emissions and operating hours in current power generation processes based on pulverized coal combustion. These issues are also likely to affect the long-term utilization of these lignites in advanced power generation processes such as ultra-supercritical pulverized coal combustion, integrated gasification combustion cycle, oxy-fuel system, as well as the future ones such as gasification-fuel cell systems. There are consequent implications also for carbon dioxide capture and storage.

This paper summarizes the results of fluidized bed gasification of Australian lignites under air-blown and oxygen-enriched air-blown conditions from laboratory scale to pilot scale units. It also presents results from oxy-fuel combustion of Australian lignites carried out in laboratory scale drop-tube reactors. These results are analysed and interpreted to identify the areas for further development and targeted research to efficiently utilize Australian lignites in gasification and oxy-fuel process for power generation.

Email:

Sankar.bhattacharya@eng.monash.edu.au