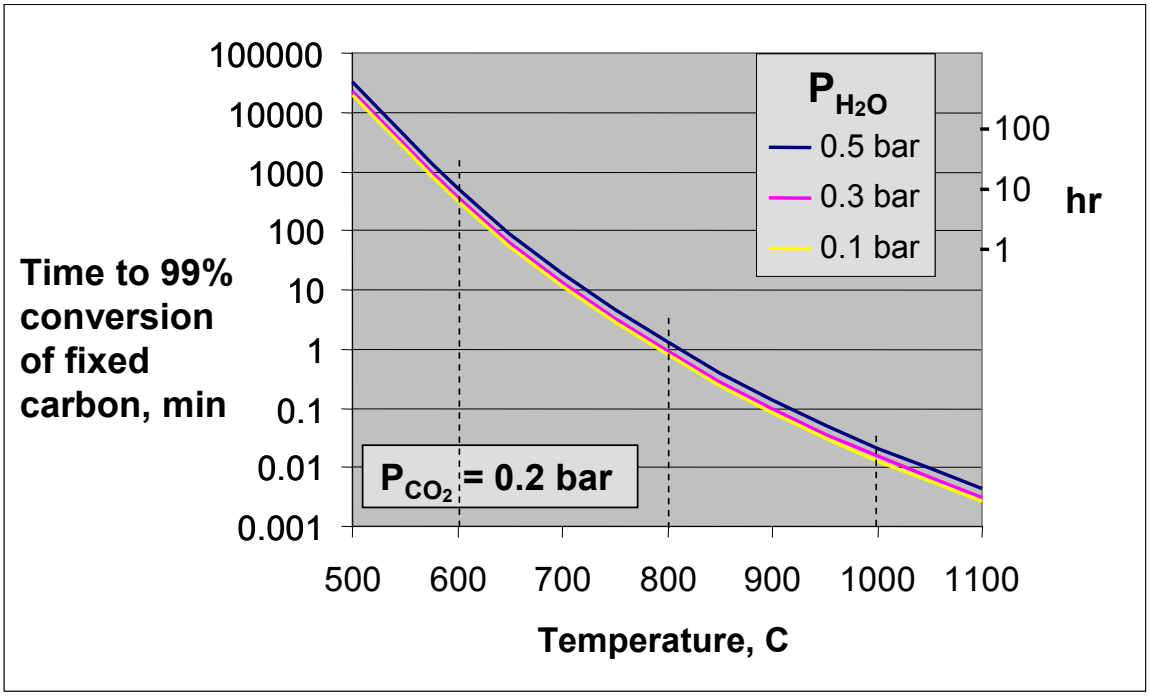
Gasification of black liquor is an attractive alternative to combustion. Synthesis gas produced by gasification can be converted to a wide range of fuels and chemicals, or fired in integrated gasification-combined cycle power plants to increase electric power generation. The split of sulfur between the gas and condensed phases that occurs when black liquor is gasified opens the possibility for alternative pulping processes with higher pulp yields.

The size and cost of a black liquor gasifier, gas clean-up and conditioning, and sulfur gas recovery units, the exportable power generated, and the yield of higher value products from syngas, and process operability depend largely on the conditions at which black liquor is gasified. For example, the residence time for near-complete conversion of char carbon to gases decreases rapidly with increasing temperature, so that a 100°C increase in gasification temperature decreases the residence time requirement by a factor of 10 (Figure 1).



In this paper, we examine the impact of process conditions – temperature, pressure, and gasifying agent on carbon gasification kinetics and conversion, tar production, and sulfur speciation. The results presented are discussed in terms of gasifier design, gas clean-up and conditioning requirements, and energy recovery as products.