Simulation of a base case for future IGCC concepts with CO2 capture

Abstract:
The simulation of complex IGCC plants is a useful tool for the evaluation of new technologies and the identification of further potential. As part of the HotVeGas project this paper deals with the modelling of an IGCC plant with CO2 capture using technology believed to be available beyond 2020. The concept developed will be the base case for comparison of emerging technologies and improved process integration. As simulation tools Aspen Plus is used for the gasification island and gas processing while Ebsilon Professional is applied for modelling the combined cycle. The base design is a dry feed gasifier with full water quench, air side none integrated ASU, 2-stage CO conversion, acid gas removal and combined cycle. The main processes are simulated in detail considering phenomena such as: heat and pressure losses, electrolytic dissociation, nonequilibrium, pH and gas solubility. The models are all verified by manufacture information. The model developed is found to be capable of simulating complex gasification applications. Furthermore, the optimum quench water temperature should be in the range of 165°C. In case of lignite the WTA condensate as alternative quench water source reduces efficiency by 0.3.

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