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Syngas Production for Ammonia from Coal

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Abstract

This Process Economics Program (PEP) review presents an update on the subject of synthesis gas (syngas) production from coal. The review specifically addresses the manufacture of synthesis gas for ammonia production, based on two reputed gasification technologies—GE Energy quench and Shell Coal Gasification Process (SCGP) technologies. Two types of coal feeds have been considered in analysis for each technology—bituminous (represented by Illinois #6 coal) and subbituminous (represented by Powder River Basin Wyodak coal). PEP recently published two detailed reports—PEP Report 148C, *Synthesis Gas Production from Coal and Petroleum Coke Gasification* (September 2013) and Report 148D, *Synthesis Gas Production from Chinese Gasifiers* (December 2015)—that addressed production of syngas from coal and petcoke, using various gasifier technologies in commercial use worldwide. This review pertains to production of syngas only; technologies for ammonia production from syngas are covered in other PEP reports and reviews.

The designs and process configurations for the abovementioned technologies are conceptual in nature; basic data for process design is derived from the patents, technical articles, and companies' brochures available in the public information domain. PEP internal information sources, which are based on in-house data and discussions with the licensors/producers, have also been used.

Process economics have been worked out to obtain capital costs and production costs of syngas. The requirements for syngas produced for an ammonia plant differ considerably from the requirements for the same for other products like methanol, hydrogen, acetic acid, and Fischer-Tropsch products. The difference is mostly in the ratios of hydrogen to carbon monoxide (or nitrogen), and in the allowable impurities of trace components.

In addition to the description of the technologies' technical aspects, this review provides insight into syngas plant process economics that can be used as a tool for cost estimation for different syngas plant capacities. This review is highly beneficial for those industry planners and producers who are looking at downstream products of the syngas; it also expands the coverage and scope of our in-house PEPSyngas™ costing module, as the said module will now also be available for costing coal-based syngas production processes for ammonia plants.

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