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Syngas Production for Ammonia from Natural Gas

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Abstract

This Process Economics Program (PEP) review presents an update on the subject of synthesis gas production from natural gas, specifically addressing the manufacture of synthesis gas for ammonia production based on the Haldor Topsøe technology for syngas/ammonia production. Previous PEP reports—namely, PEP Report 148A, *Synthesis Gas* (November 1995) [1], and PEP Report 148B, *Synthesis Gas Production from Natural Gas Reforming* (August 2013) [2]—addressed the manufacture of synthesis gas for various products like hydrogen, methanol, and Fischer-Tropsch products (naphtha and diesel). This review expands the portfolio of PEP syngas reports on syngas manufacture for use in ammonia production. Just for note here, the requirement of synthesis gas for ammonia differs considerably from the requirement for other products (methanol, hydrogen, acetic acid, Fischer-Tropsch products, etc.). The difference is mostly in the ratios of hydrogen to carbon monoxide (or nitrogen), and the allowable impurities of trace components.

Besides presenting design and cost economics of a manufacturing process, modeled with a similar configuration as of the Haldor Topsøe process, this review also provides a description of the salient features of natural gas reforming technology. Process design and economics are given for syngas production only. Synthesis of ammonia using Haldor Topsøe technology is covered in PEP Review 2016-14, *Ammonia Production by Haldor Topsøe Conventional Technology* (December 2016).

The design and process configuration presented in this review for the above technology are of a conceptual nature, the basic data for which is extracted from patents, technical articles, and the company's brochures, all available within the domain of public information. PEP internal information sources, which are also based on talks with the licensors and producers, have also been used.

This review provides insight into syngas plant process economics, and can be used as a tool for cost estimation for different syngas plant capacities. It will be highly beneficial for planners and producers looking at downstream products from the syngas, especially now when the focus on chemicals manufacturing is shifting to the United States with the development of relatively cheaper shale gas.

This review also expands the application area of the iPEP Syngas module, which will now cover synthesis gas production economics for ammonia production.

Contents

1	Introduction	6
2	Summary	8
3	Technology and chemistry overview	10
4	Technical review	13
5	Process description	15
	Basis of design	15
	Section 100—Inlet gas cleanup	16
	Section 200—Prereforming and reforming section	16
	Prereformer	16
	Primary reformer	16
	Section 300—Secondary reforming	17
	Section 400—Water-gas shift conversion	17
	High-temperature water-gas shift	17
	Low-temperature water-gas shift	17
	Section 500—Carbon dioxide removal section	18
	Section 600—Methanation	18
	Materials of construction	18
	Process waste effluents	18
	Utilities	19
6	Cost estimates	23
	Fixed capital costs	23
	Production costs	23
	Appendix A—Cited references	28
	Appendix B—Process flow diagrams	31

Tables

Table 1	Summary of synthesis gas manufacturing process from natural gas for ammonia	9
Table 2	Design basis for synthesis gas production from natural gas	15
Table 3	Synthesis gas from natural gas for ammonia—Stream flows	19
Table 4	Production of synthesis gas from natural gas for ammonia—Major equipment	21
Table 5	Production of synthesis gas from natural gas for ammonia	22
Table 6	Synthesis gas production from natural gas for ammonia—Total capital investment	24
Table 7	Synthesis gas production from natural gas for ammonia—Production costs	25
Table 8	Synthesis gas from natural gas for ammonia—Production costs	26

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Figures

Figure 1 Derivatives of synthesis gas	7
Figure 2 Block flow diagram for synthesis gas manufacture from natural gas for ammonia	10
Figure 3 Synthesis gas from natural gas for ammonia—Net production cost of synthesis gas as a function of operating level and plant capacity	27
Figure 4 Synthesis gas from natural gas	32
Figure 5 Synthesis gas from natural gas	33

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