



Ammonia is one in a series of reports published as part of Nexant's 2019 Technoeconomics – Energy & Chemicals (TECH) program.

Overview

Commercial synthetic ammonia production started in 1913 with a 30 tons per day plant using the Haber-Bosch process. Today, commercial ammonia plants have typical capacities between 1 000 to 3 300 tons per day, and licensors have proposed plants with capacities as high as 6 000 tons per day, although none have yet been constructed. Most of the world's ammonia output is manufactured by combining hydrogen and nitrogen over a catalyst in an exothermic reaction. Nitrogen is easily sourced from air, whether directly or via air separation where pure nitrogen can be provided. The source of hydrogen, however, is more complex and requires energy intensive processes such as steam reforming or gasification to produce synthesis gas, a combination of hydrogen and carbon monoxide, from which hydrogen is ultimately recovered.

This TECH report provides an overview of the process technologies available for producing ammonia from both natural gas and coal and addresses the questions:

- What are the major technologies for ammonia and how do they differ? Who are the major technology holders and licensors?
- How competitive is coal-based ammonia with gas-based ammonia?
- How do the economics of producing ammonia change across different geographic regions?
- Is an investment in ammonia production attractive today?

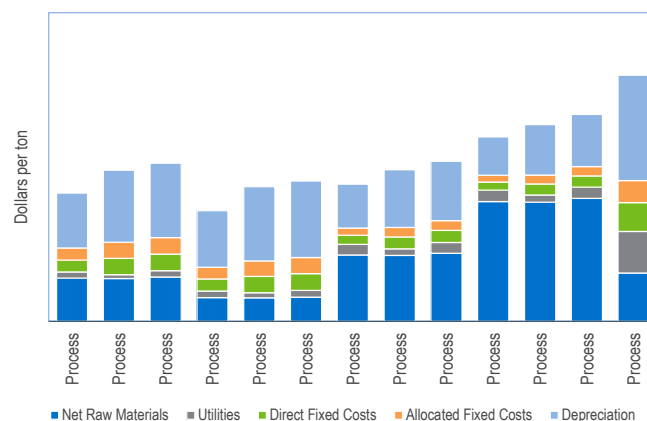
Commercial Technologies

The leading global ammonia technology licensors reviewed in this report are KBR, Haldor Topsøe, and thyssenkrupp. Other key licensors discussed include Casale and Linde. Each provider offers conventional ammonia technology as well as unique unit operations that provide capital, energy or a combination of capital and energy savings. Their offerings range from small-scale to world scale plants, and most offer large scale plants that can reach capacities as high as 6 000 tons per day in a single train.

Process Economics

Detailed cost of production estimates for various technologies are presented for USGC, Middle East, India and China locations. Based on natural gas as feedstock, conventional ammonia production as well as other advantaged routes for producing ammonia are evaluated. In China, both coal-based and gas-based economics are presented. An assessment of investment attractiveness and a historical analysis of margin and return on investment is also included.

Ammonia Production Costs



Commercial Overview

Global consumption of ammonia in 2018 was nearly 180 million tons with the top three consuming regions being Asia Pacific (with China and India accounting for the majority of the demand), North America and Europe. There were over 740 ammonia plants in operation worldwide. The majority of ammonia is consumed in the production of urea and other fertilizer products with a smaller amount going into industrial applications such as synthetic resins, synthetic fibers, polyurethanes, explosives, and refrigeration. This TECH report provides a global and regional overview of the supply, demand, and trade of ammonia.



TECH 2019-6: Ammonia

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The TECH program (formerly known as PERP) is globally recognized as the industry standard source of process evaluations of existing, new and emerging of interest to the energy and chemical industries.

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- Trends in chemical technology
- Strategic/business overviews
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- Chemistry
- Process flow diagrams and descriptions of established/conventional, new and emerging processes
- Process economics – comparative costs of production estimates for different technologies across various geographic regions
- Overview of product applications and markets for new as well as established products
- Regional supply and demand balances for product, including capacity tables of plants in each region
- Regulatory and environmental issues where relevant

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Technology and Costs comprises the Technoeconomics – Energy & Chemicals (TECH) program (formerly known as PERP), the Biorenewable Insights program (BI), the Sector Technology Analysis, and the new Cost Curve Analysis. These programs provide comparative economics of different process routes and technologies in various geographic regions.

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