Abstract

Hydrogen cyanide, HCN, is used as a chemical intermediate, in the concentration of ores, as a pharmaceutical intermediate, as a fumigant, for case hardening of iron and steel, and in electroplating. In particular, HCN is employed to prepare acrylonitrile, used in production of acrylic fibers, synthetic rubber, and plastics. The high toxicity of HCN makes it subject to regulatory restrictions for transport on public roadways. Hydrogen cyanide is therefore usually consumed at its point of production, although a small proportion is consumed via pipeline transfer “over the fence.”

About half of the HCN produced globally is made on-purpose—from ammonia, natural gas, and oxygen—by ammoxidation using the Andrussow process. A substantial quantity of HCN is produced as a coproduct during manufacture of acrylonitrile by ammoxidation of propylene, particularly in the United States. Lesser quantities of HCN are produced on-purpose from ammonia and natural gas via the BMA (Blausäure, Methan, Ammoniak) process, and by pyrolysis of propane or butane with ammonia via the Fluohmic (Shawinigan) process.

This PEP review focuses on the conventional Andrussow process and the newer BMA process, the main difference in approach being that the former uses oxygen (from air) while the latter does not. Both processes use platinum-based catalysis, and both processes coproduce hydrogen. The Andrussow process has advantages inherent to thermodynamic favorability, while the BMA process has the advantages of higher HCN yield and a relatively pure H₂ offgas stream.

The Andrussow and BMA technologies for HCN production are reviewed, the industry status of HCN is updated, and a summary is provided of the modern processes in terms of comparative economics. Lastly an interactive module is attached, the iPEP Navigator HCN tool, that provides a snapshot of economics for each process and allows the user to select the process, units, and region of interest.

While the processes presented herein are PEP’s independent interpretation of the companies’ patent literature and may not reflect in whole or in part the actual plant configuration, we do believe they are sufficiently representative of plant conceptual process designs.
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