



sasol

AMMONIA INFORMATION

INTRODUCTION

Ammonia is one of the most important commodity chemicals produced in the world and as such is manufactured in very large quantities. Most of the world's production is used in the production of nitrogenous fertilizers including urea, ammonium nitrate and ammonium sulphate. Other uses include the production of caprolactum and acrylonitrile, which are used in the production of synthetic fibres, other chemicals and urea melamine resins.

METHOD OF MANUFACTURE

Ammonia, a colourless pungent smelling gas was originally almost entirely produced as a by-product from the destructive distillation of coal in the manufacture of coke and coal-gas. Modern synthetic ammonia manufacturing processes are based essentially on modifications of the so called Haber-Bosch Process. In this process nitrogen and hydrogen are combined directly, under conditions of high temperatures and pressures, in the presence of a catalyst to form ammonia. Sasol's ammonia is formed by applying the Haber-Bosch Process and in the coal gasification stage of the oil from coal process. In the latter process, ammonia stripped from the gas liquor is of very high purity which is used in a variety of industrial applications throughout South Africa.

STORAGE

Ammonia being very soluble in water is sometimes stored as a 10% to 30% solution in water at essentially atmospheric temperature and pressure. However, in view of the large quantities used, only a small portion of production is stored. The type of storage facility being determined by the scale of use. Anhydrous ammonia is normally stored as a liquid in welded ferritic steel vessels. Liquefaction of anhydrous ammonia is achieved either by pressurizing the ammonia at ambient temperatures or by cooling it to -33°C and storing it at atmospheric pressure. Alternatively some other combination of temperature and pressure is adopted. For small scale storage (i.e. less than 100 tonnes) ammonia is liquefied under pressure and stored in cylindrical pressure vessels at ambient temperature. Semi-refrigerated spheres, for the storage of ammonia between 500 and 3000 tonnes, are typically operated at 0°C and 420kPa absolute pressure.

COMMERCIAL USES OF AMMONIA

Fertilizers

- Most of the ammonia produced is used in agriculture as a source of nitrogen which is essential for plant growth. Nitrogen makes up about 16% of plant protein.
- Ammonia containing 82% nitrogen can be applied directly to the soil by injection at a depth several centimeters below the surface of the soil, or dissolving it in irrigation water.
- Ammonia is also used in the production of nitrogen based fertilizer solutions which consist of ammonia, ammonium nitrate, urea and water in various combinations.
- Ammonia is utilised extensively in the fertilizer industry to produce solid materials such as ammonium nitrate, sulphate, phosphate and urea.

Other Uses

- In addition to their use as fertilizers, ammonia and urea are used as a source of protein in ruminant livestock feeds.
- Ammonia is oxidised in the production of nitric acid, the principal ammonia derivative used in making explosives. These include the nitroglycerine, nitrocellulose explosives and the ammonium nitrate slurry explosives.
- The manufacture of ammonium salts and certain alkalies, dyes, pharmaceuticals, synthetic textile fibres and plastics depend upon utilization of ammonia.
- Used in both absorption and compression type systems, ammonia is the oldest refrigerant known.
- Ammonia is used in pH control, in mineral beneficiation, in neutralizing acidic components during petroleum refining and in the treatment of acidic wastes.
- Through the controlled combustion of dissociated ammonia in air, relatively pure nitrogen can be produced.
- Dissociated ammonia provides a convenient source of hydrogen for hydrogenation and other applications.
- Ammonia is used in extracting certain metals such as copper, nickel and molybdenum from their ores.
- Ammonia vapour is utilized as the developing agent in the photomechanical process of whiteprinting and is also employed in the production of diazotype microfilm duplicates.
- Ammonia vapour is utilized in scrubbers to neutralize sulphur oxides in their removal from stack gases in coal based electric power generators and other furnace operations such as in smelting.
- Very dilute solutions (2-5%) are sold as household ammonia.
- Water solutions of ammonia are used to regenerate weak anion exchange resins.