FERTFACTS

AMMONIA
FACT SHEET

- **Most concentrated nitrogen fertiliser (82% N);**
- **Economical;**
- **Stored, transported and applied directly into the soil as a liquefied gas.**

MANUFACTURE

In Germany in 1909, Fritz Haber and Carl Bosch developed a large scale economic method for synthesising ammonia (NH_3). While it would take close to 50 years for the process to be used on a significant scale for the manufacture of fertilisers, the event can be regarded as the birth of the modern nitrogen fertiliser industry.

Up to the Second World War, the demand for nitrogen fertilisers was largely met from industrial by-product sulphate of ammonia, e.g. from the coking of coal, and naturally occurring Chilean Nitrate of Soda. The demand for nitrogen fertilisers increased rapidly from this time in line with world population growth, meaning that supply from traditional sources had to be supplemented with synthetically produced nitrogen fertilisers. Ammonia is the starting point for most of these fertilisers.

Today, approximately 85% of the world's ammonia production is used as a fertiliser or for fertiliser production. Whilst it may be applied directly to the soil, most is converted to solids by reacting it either with carbon dioxide to produce urea, or with appropriate acids to produce ammonium sulphate (Gran-am) or ammonium phosphate (DAP and MAP). These synthetically produced fertilisers account for the greater part of the nitrogen applied in agriculture.

Incitec Pivot Fertiliser operates an ammonia plant in Brisbane, where **granulated urea** and granulated ammonium sulphate or **Gran-am** are made. The feedstocks for these two ammonia plants are natural gas, steam and air (from which the nitrogen is derived).

Anhydrous ammonia is sourced from both the Brisbane and Newcastle plants for direct application to the soil as a fertiliser. Ammonia is a gas at normal temperatures and pressure. It is stored, transported and applied as a liquefied gas under pressure, in special pressurised tanks. Anhydrous ammonia is marketed under the brand name of **Big N** and is available in many inland grain and cropping areas in the states of New South Wales and Queensland.

Incitec Pivot Limited is Australia's sole supplier of anhydrous ammonia for use as a fertiliser.

AMMONIA IN THE SOIL

Anhydrous ammonia can be applied directly into the soil as a fertiliser due to its affinity with water. On application, it combines with soil moisture to produce ammonium ions, as depicted in the following equation:

$$NH_3 + H_2O \rightarrow NH_4^+ + OH^-$$

Ammonium (NH_4^+) ions are attracted to and are tightly held on the surface of clay and organic colloids in the soil. As such, ammonium is resistant to loss (to the atmosphere by reversion to ammonia, or by leaching deeper into the soil in the event of heavy rainfall).

The use of **Cold-Flo*** application technology allows Big N to be applied under soil conditions in which it could not be applied using conventional application equipment.

With conventional equipment, Big N, as a pressurised liquid, converts to the gaseous form immediately on application. Unless the soil flows freely around the application tine and adsorbs the gas, ammonia may be lost to the atmosphere. This may preclude its use under reduced or minimum tillage conditions and in poorly prepared cloddy seed-beds.

In Cold-Flo* converters, pressurised ammonia expands from the liquid to the gaseous phase, chilling the gas and converting about 85% of it to a liquid. The liquid and remaining gas is applied at normal atmospheric pressure. This allows greater opportunity for the adsorption of the ammonia by the soil and reduces atmospheric loss.

Cold-Flo is a registered trade mark of USS Agri-Chemicals, a division of U.S. Steel Co.*

USE AS A FERTILISER

Anhydrous ammonia (NH_3) or Big N is mostly used as a pre-plant fertiliser in grain and cotton. Big N is not available in all districts, as considerable capital investment in transport, storage and application equipment is required to service markets to which it is supplied.

If applied at planting or as a side-dressing in row crops, Big N must be placed away from seeds and crop roots, due to its toxicity. Such effects are localised and short-lived, i.e. confined to the soil around the point of application. With time, the ammonium is converted to nitrate by soil microbes, and moves with soil moisture away from the site of application.

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