

AMMONIA FACTSHEET

January 2004

- **Most concentrated nitrogen fertilizer (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 (NH₃). While it would take close to 50 years for the process to be used on a significant scale for the manufacture of fertilizers, the event can be regarded as the birth of the modern nitrogen fertilizer industry.

Up to the Second World War, the demand for nitrogen fertilizers was largely met from industrial by-product sulfate of ammonia, e.g. from the coking of coal, and naturally occurring Chilean Nitrate of Soda. The demand for nitrogen fertilizers 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 fertilizers. Ammonia is the starting point for most of these fertilizers.

Today, approximately 85% of the world's ammonia production is used as a fertilizer or for fertilizer 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 nitrate (Nitram), ammonium sulfate (Gran-am) or ammonium phosphate (DAP and MAP). These synthetically produced fertilizers account for the greater part of the nitrogen applied in agriculture.

Incitec Pivot Limited operates an ammonia plant in Brisbane, where **granulated urea** and granulated ammonium sulfate or **Gran-am** are made. Our parent company, Orica Limited, operates an ammonia plant at Newcastle where fertilizer grade ammonium nitrate or **Nitram** is produced. 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 fertilizer. 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 fertilizer.

AMMONIA IN THE SOIL

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



Ammonium (NH₄⁺) 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.



Because the land is your life.

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 FERTILIZER

Anhydrous ammonia (NH₃) or Big N is mostly used as a pre-plant fertilizer 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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