

AUSTRALIAN AMMONIUM PHOSPHATE PRODUCTION – WMC FERTILIZERS

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Abstract

Australia's first, and the world's most technologically advanced ammonium phosphate fertilizer plant has now been producing DAP for over twelve months. This paper gives some background on the project and describes current production performance. It also outlines some of the benefits derived by Australian customers from the manufacture of ammonium phosphates in Australia.

Project History

The Phosphate rock deposits which underpin the current operations were initially discovered by Broken Hill South Pty Ltd in 1966 in North West Queensland. By 1978, after investment of over seventy million dollars in the mine, rail and port infrastructure, export of rock proved unprofitable due to a number of reasons including production difficulties, removal of the Australian superphosphate bounty and the failure to secure long term contracts. This resulted in the closure of mining operations and the collapse of Broken Hill South.

On acquisition of Broken Hill South in 1980, WMC Limited acquired a major interest in Queensland Phosphate Limited and its world class phosphate rock reserves located 130km South of Mount Isa.

The resource is an 11 metre thick deposit of approximately two billion tonnes of sedimentary phosphate rock, which is close to the surface and easily extracted using open cut mining. The defined Phosphate Hill deposit covers an area of 13,400 hectares with a mineral resource of 105 million tonnes, and proven and probable reserves of 50 million tonnes.

This forms only a small part of the total Phosphate Hill lease, and combined with other WMC leases at Ardmoor and Duchess, total reserves are expected to have a lifespan of over 50 years.

The past twenty years have seen a large investment by WMC, simply to bring the operation to start-up. Phosphate rock production was resumed at Phosphate Hill in 1981 at a rate of two hundred thousand tonnes per annum. This activity was ceased in 1983 for reasons of economic viability. It was recognised that, in order to achieve an acceptable return on investment, the phosphate rock would need to be value added in the form of production of either granulated triple super phosphate or ammonium phosphates.

As shown in Figure 1, the fastest growing type of phosphate based fertilizer is ammonium phosphates, that is MAP and DAP. In fact, MAP and DAP account for all of the increase of world phosphate consumption since 1973/4.¹

In the early eighties, the Australian fertilizer market was dominated by single super phosphate (Figure 2), with ammonium phosphates making up only a small percentage of the phosphate fertilizer market. In 1985 WMC acquired fifty percent of HiFert Pty Ltd, a fertilizer importer & retail business that was determined to grow the high analysis share of the market. This holding was increased to one hundred percent in 1988. Subsequent growth of the ammonium phosphate market in Australia, with use of triple super phosphate remaining relatively static, resulted in a decision to pursue assessment of a facility for manufacture of ammonium phosphates.

Figure 1. World Sources of Phosphate Fertilizer²

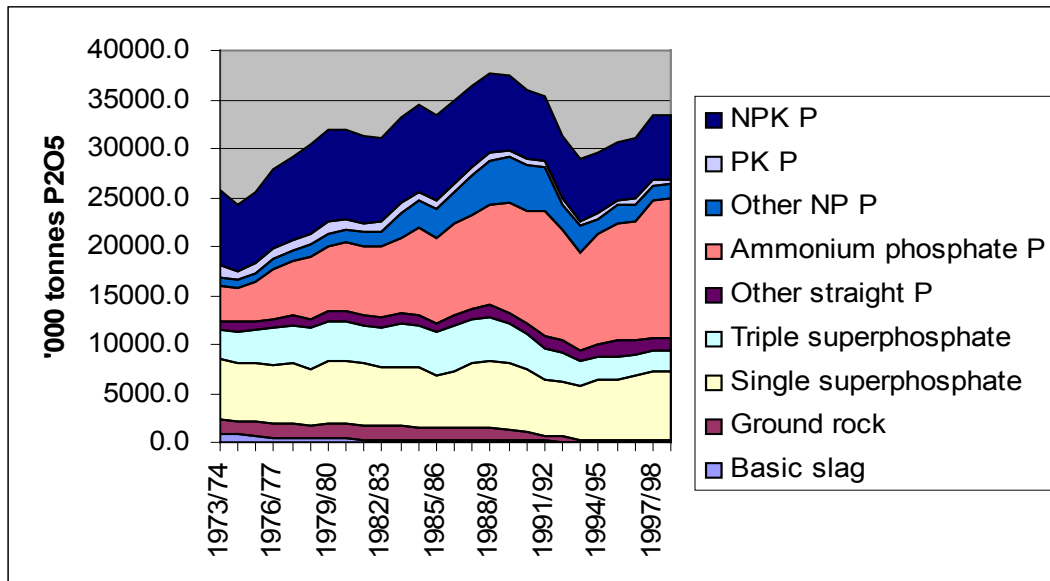
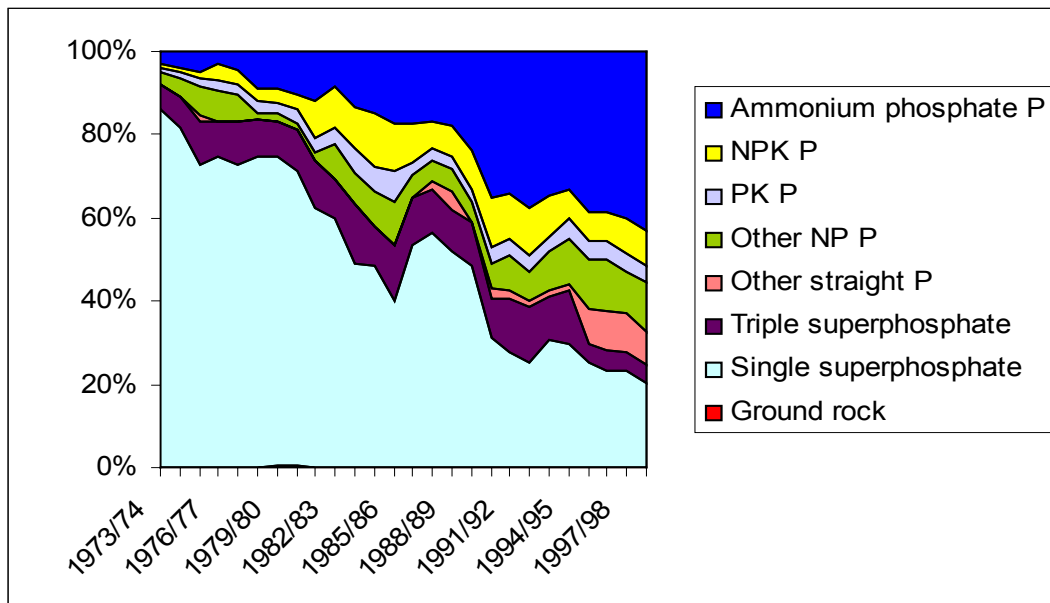


Figure 2. Sources of Phosphate in Australia³



Between 1992 and 1996 a number of key elements came together to make the fertilizer project possible. The natural gas pipeline from Ballera in South West Queensland became viable due to the cooperation and commitment of a number of customers. This enabled cost effective production of ammonia and electricity at Phosphate Hill. Negotiation with Queensland Rail saw the realisation of rail freights which had previously been a major limiting factor in cost effectiveness of the remote deposits. Cooperation with MIM to construct a sulfuric acid plant using sulfur dioxide emissions from the MIM copper smelter resulted in the generation of low cost sulfuric acid for the process.

With these arrangements in place, the WMC Board was able to announce in December 1996 that the Queensland Fertilizer Project would proceed.

Construction was completed in 1999 and consists of a mine, phosphoric acid plant, ammonia plant and granulation plant, all at Phosphate Hill, and a sulfuric acid plant at Mount Isa. Other infrastructure includes rail between Mount Isa and Phosphate Hill and between Phosphate Hill and the Townsville storage and ship loading facility.

Phosphate rock of an average 23.5% P₂O₅ is mined at a rate of 2.2 million tonnes per year. This material is crushed and formed into a slurry at the beneficiation plant prior to reacting with sulfuric acid.

The sulfuric acid plant at Mount Isa captures ninety seven percent of the sulfur bearing gases emitted by the copper smelter and converts them to four thousand tonnes of sulfuric acid per day. This sulfuric acid is railed to Phosphate Hill (along with an additional two hundred thousand tonnes per annum of acid railed from Sun Metals at Townsville) in specialist GATX wagons and reacted with phosphate rock slurry to produce one thousand, five hundred tonnes per day of phosphoric acid.

Natural gas, transported by pipeline from South West Queensland is used to generate seven megawatts of power and is also converted to ammonia at a rate of six hundred tonnes per day. This ammonia is then combined with the phosphoric acid to produce ammonium phosphate fertilizer at a rate of one hundred and thirty five tonnes per hour, or one million tonnes per year.

Storage at Phosphate Hill allows for a capacity of thirty thousand tonnes of granular ammonium phosphate, or approximately ten days production. Finished product is railed to Townsville in loads of approximately three thousand tonnes per train. The Townsville facility has storage capacity of ninety thousand tonnes for a single product, however storage of a range of products results in a loss of approximately ten thousand tonnes capacity for each additional product stockpiled.

Upon sale of the fertilizer, it is loaded into vessels at the MIM Townsville terminal and shipped either domestically or to export markets. Sales contracts are in place with a number of major domestic customers, while export sales are achieved through a marketing agreement with Cargill Fertilizer Inc.

Commissioning of these facilities took place over a four month period. Beneficiation commenced on the 7th of September 1999 followed by sulfuric acid on September 9th and phosphoric acid on September 26th. Ammonia startup occurred on the 15th of November and granulation on the 11th of December, resulting in the first granular di-ammonium phosphate product being manufactured on the 13th of December 1999. This material was railed to Townsville on December 20th and the first shipment loaded on the 20th of January 2000.

Operation

Since commencement of operation, WMCF has produced over 580,000 tonnes of di-ammonium phosphate. Of this, 326,260 tonnes was produced during calendar year 2000, which included a number of shutdowns related to commissioning of plant.

Production for 2001 to the end of April has seen manufacture of approximately 234,000 tonnes of fertilizer, or eighty three percent of capacity. Achievement of higher production rates has been affected by external issues such as train derailments limiting supply of sulfuric acid in addition to

plant operational issues. Ongoing de-bottlenecking and performance improvements are taking place as the plants are ramped up to full nameplate capacity.

Product quality is among the best in the world and continues to improve. Performance indicators for the month of April 2001 include P₂O₅ (available) at 46.53%, N (total) at 18.14%, an SGN of 286 and uniformity index of 63.

Figure 3. Monthly Production 2000 & 2001

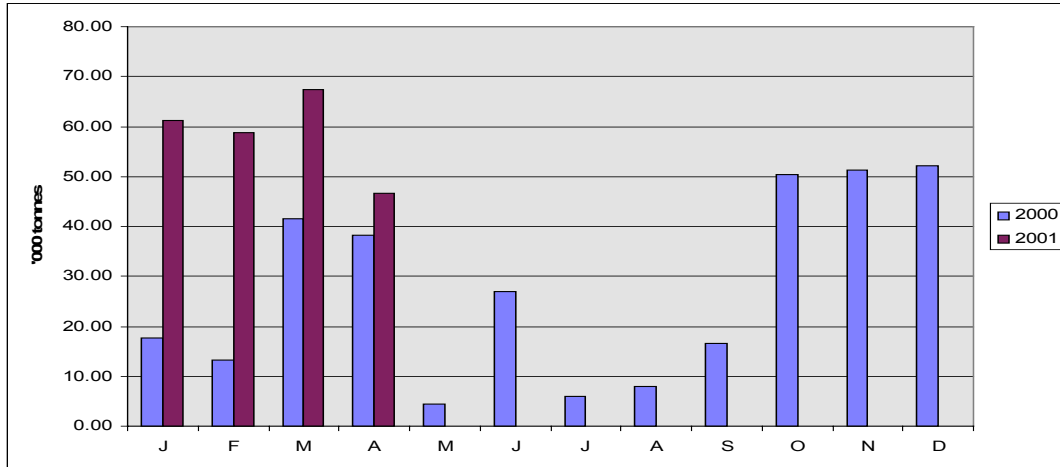
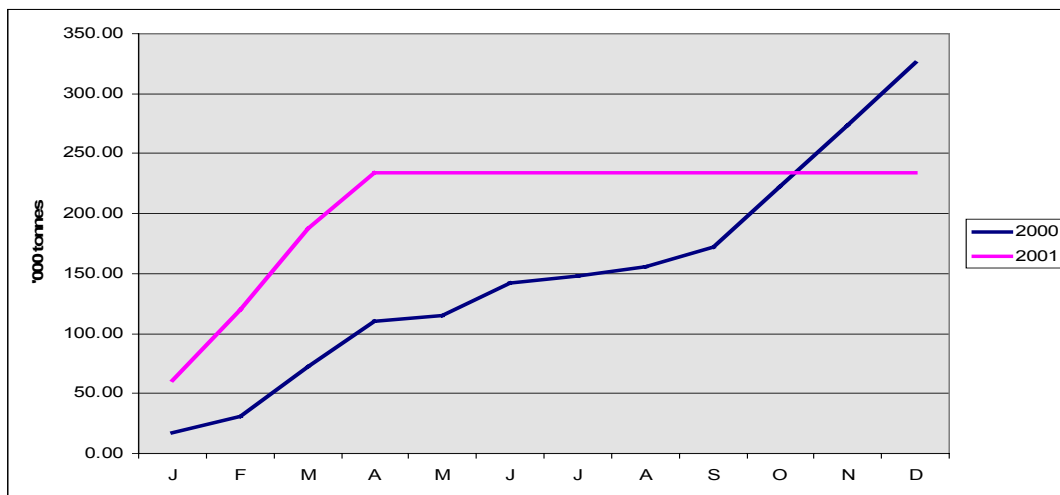


Figure 4. Cumulative Production 2000 & 2001



The operation is working in an ongoing drive to improve quality and throughput and reduce costs. While the cash costs of production are comparatively low on a world scale, the WMC Fertilizers operation has considerably higher capital invested per tonne of capacity than competitors. As a result, the cost structure is very different to that of US Gulf producers with WMCF experiencing a high proportion of fixed cash and depreciation costs in a low cost base. As a result, achieving and then exceeding nameplate capacity is of high importance in driving unit costs down to achieve

profitability. In January 2001 the WMC Fertilizers operation achieved the target of the lowest cash cost producer of DAP in the world, based on exchange rates and input prices at the time.

To date, the WMC Fertilizers project has seen a capital investment of over 800 million dollars. Ongoing benefits to the community are significant with 237 WMC staff currently employed, and external contractors bringing the total full time equivalent number to over 500 people on a fly in – fly out basis. Australian business and industry continue to benefit from ongoing major contracts such as rail freight, natural gas supply, contract mining, aviation, maintenance and shiploading arrangements.

Export sales at 350,000 tonnes are expected to generate revenues of over 100 million dollars per annum. Domestic sales at a production rate of 650,000 tonnes per year would see over 187 million dollars in revenue retained in Australia.

Benefits to Customers

There are a number of benefits arising from the domestic manufacture of ammonium phosphates including several in areas that have been previously identified by FIFA as major issues for the Australian fertilizer industry.

Fertilizer Quality

The DAP produced by WMC Fertilizers has the lowest cadmium and other heavy metals content in the world. This is a significant benefit in an environment where the community is increasingly aware of food chain safety and quality and its impact on human health. As a major input in agricultural food production, the fertilizer industry will be impacted by increasingly strict quality standards for the production and processing of food. Existing statutory regulations on heavy metal application and content in foods may limit application rates of some fertilizers so as not to exceed allowable concentration levels. These limits will remain under pressure to be reduced further, thus increasing the importance of access to WMCF DAP, "the greenest product on earth".

Physical quality of the product is of an extremely high standard, with recent production regularly exceeding 290 SGN and a uniformity index of around 64. The even, spherical nature of the granule and its hardness have contributed to achieving very low levels of dust and fines in the product. As a result oiling levels have been reduced, thus contributing to continuing improvements in handling.

Continuity of Supply – Quarantine

It is well recognised that Australian agriculture must be protected from importation of exotic diseases or pests. This protection comes at a cost to all importers of fertilizer products and raw materials. These costs include preventative measures and compliance with quarantine regulations, management of contaminated cargoes upon detection and the potential cost of management of a pest or disease once it became established after introduction via imported fertilizer.

A major Australian fertilizer importer has costed the recurring impact on the industry of preventative measures and contaminated cargo management at \$2.81 per tonne.⁴ Given that there is no risk of pest or disease being introduced in wholly Australian produced fertilizer, these costs will not be incurred on WMCF product. Assuming annual production of one million tonnes of ammonium phosphates, of which six hundred and fifty thousand tonnes is sold domestically, this represents a saving to the industry of over \$1.8 million per annum.

Payment Terms

Under current contracts, payment terms for domestic sales of WMCF products is within seven days of completion of out-turn. This compares with import conditions of payment 14 days from Bill of Lading. Assuming that there is generally thirty days steaming from the US Gulf to south-east Australian ports, this means that payment for domestic purchases is required seven days after receipt of product versus sixteen days prior to receipt of imported products. A difference of twenty three days. For an average product cost of US\$150/tonne and cost of capital of 15%, the cost of financing 650,000 tonnes of fertilizer for twenty three days is over US\$920,000. At an exchange rate of 52 cents, this represents a saving of AUD 1.77 million per annum.

A secondary benefit of these terms is that payment is based on reported out-turn tonnes, rather than on draft survey at the load port. Therefore customers pay only for what they have received.

Lead Times & Load Quantities

Due to the considerably shorter lead time for supply of fertilizer from WMCF, Australian customers have greater flexibility in responding to market variation. Domestic contracts specify six weeks notice prior to shipment. This compares to import conditions requiring 45 days notice prior to laycans. Which means that in effect, once an additional four weeks steaming has been taken into account, import shipments require more than an additional five weeks notice. Customers also benefit from the effects of co-shipping. Rather than each bringing in individual vessels with large quantities of product, domestic out-turn is often distributed to up to four customers. As a result deliveries are able to be made more frequently and in smaller quantities without incurring additional costs.

Product Differentiation

The fertilizer produced by WMC in Queensland is a unique, high quality product. It is the only major phosphate fertilizer product produced in Australia wholly from Australian raw materials. As a result customers of WMCF have a very strong point of differentiation in the market against importers.

The natural properties of the phosphate rock from which the DAP currently produced is derived are such that the granule is a readily identifiable gold colour. This has enabled WMCF to develop a strong branding campaign for the domestic market based around the Aussie Gold trademark. No imported fertilizer offers the benefits to customers of such a high quality, unique product supported by a manufacturer driven promotional campaign.



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The Future

The current focus for the manufacturing operation is to consolidate the current plant and ramp up to consistent production at nameplate capacity. While nameplate capacity has been exceeded for periods up to a week, greater consistency and reliability is required. A statutory shutdown in late June will be

utilised to make some modifications that will eliminate some bottlenecks and further improve product quality.

Following the June shutdown, a MAP production trial will take place, with approximately fifteen thousand tonnes to be produced. Addition of MAP to the product range will enable an increase in total throughput due to reduced demand for ammonia and the ability to utilise higher iron content ore.

Further de-bottlenecking and minor capital investment have the potential to enable annual production to reach 1.3 million tonnes. This capacity would then enable investigation of options for further additions to the product range with potential for sulfur fortification of the ammonium phosphates.

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