PHOSPHATE ROCK

By Michael Mew
Fertecon Research Centre

The fertiliser industry entered a recession late in 1999 that persisted throughout 2000 and into 2001. Prices for the main fertiliser product, di-amonnium phosphate (DAP), dropped by an average of US$28/t in 2000, equivalent to a US$18/t drop in phosphate rock prices. The market in the intermediate product, phosphoric acid, has also seen prices falling sharply in the last two years. Phosphoric acid prices fell by US$53/t P_2O_5 in 2000 and a further US$11/t this year. The total drop is equivalent to a US$19/t fall in phosphate rock prices. In reality the phosphate rock market has shown considerably more strength than these figures imply. In fact, phosphate rock prices fell by only around US$2/t in 2000 and currently look likely to fall by a further US$1-2/t in 2001.

Phosphate rock consumption worldwide fell by 1.4% in 2000 to 143.5 Mt This follows a fall of 0.8% in 1999. Consumption is driven mainly by the fertiliser end-use sector. After a number of years of growth, phosphate fertiliser consumption fell marginally in 1999 and again by 1.1% in 2000. Growth in other phosphate rock demand sectors failed to offset this decline in rock use for fertiliser production.

Growth in fertiliser demand worldwide is expected to average 2.9%/y over the next five years from the 2000 level. Thereafter, phosphate fertiliser demand growth is expected to drop to under 2%/y. This growth will be directly translated into increased demand for phosphate rock, it being essentially the only phosphate raw material for phosphate fertiliser production.

Despite the small drop in demand, phosphate rock production increased marginally in 2000 to reach 145.3 Mt. Despite a fall of 0.8 Mt in 1999, inventories worldwide have risen by a net 7 Mt in the past four years. Production levels will have to be reduced in 2001 and beyond to stop and even reverse this trend towards higher inventories.

Phosphate rock trade is estimated to have fallen by 5.8% in 2000 to 28.6 Mt. Continued pressure to reduce chemical processing in West Europe, coupled with continued financial problems in some Asian countries, were the main causes of the reduced trade level. However, in 2000, there were some positive signs for trade. Oswal Chemicals and Fertilizers began commercial production at its new phosphate complex at Paradeep, India. At capacity this plant will consume up to 3 Mt of imported rock. In 2001, we currently expect trade levels to rise marginally, despite the continued recession in the fertiliser sector.

India is expected to continue to import more rock as the government continues to support local producers with a significant subsidy. Three US P_2O_5 production plants now rely wholly on phosphate rock imported from Morocco. Offsetting these increases in trade will be the general trend towards upgrading of rock at the sites of rock production. New phosphoric acid plants in Australia, Morocco, South Africa and Senegal are all based on local rock supplies. New rock mines built in the last two years in Mexico and Canada also support local phosphoric acid plants and thereby displace rock imports.

The main cause of the long-term reduction in phosphate rock trade has been the cost benefit in shipping more concentrated phosphate fertiliser products rather than the raw material. Almost all phosphate rock exporters (with the exception of Togo and Nauru) now have downstream phosphate chemicals facilities, also aimed at the export market. Comparing the 30-38% nutrient content of phosphate rock with the 64% total nutrient content of DAP fertiliser, it is clear

that the shipment of the higher grade product is more cost efficient.

Environmental sensitivity is another factor tending to reduce the processing of rock in some areas such as West Europe. There was a wholesale closure of phosphoric acid capacity in the region in the early 1990s and, in 2000, the two remaining plants in Holland closed. More stringent legislation restricting the disposal of phosphogypsum (a calcium sulphate by-product of the phosphoric acid process) in the river system resulted in the closure of the last two Dutch plants.

Supply Developments

Phosphate rock production worldwide decreased by an estimated 0.3% in 2000 to 145.3 Mt. This followed a larger 3.7% decline in 1999 from the 1998 peak of over 150 Mt. Production grew faster than demand in the late 1990s, adding around 7 Mt to producer inventories around the world. There has had to be a sharper decline in production levels in the past two years as a result and this is likely to continue to be the case in 2001. Production levels worldwide remain substantially below the 157 Mt. produced in 1988. This is largely due to a significant decline in output to 116 Mt in the four years to 1993. This decline in rock use was largely a result of the wholesale scaling down in fertiliser use in the countries of the former Soviet Union (FSU) which has seen P_2O_5 consumption plummet from over 8 Mt P_2O_5 prior to 1990 to a low of just over 0.5 Mt in 1999.

The impact of the reduced fertiliser use in the FSU on local rock production has been significant. FSU rock production fell from over 30 Mt in 1990 to under 10 Mt in 1994. In the past four years a recovery in rock exports, together with higher fertiliser exports have taken rock production back to 12.7 Mt in 2000. Outside the FSU, rock production has been much more stable. Production outside the FSU fell by around 10% in the 1990-93 period, from 124 Mt to a low of 105 Mt. Since then it has recovered and reached a peak of 138 Mt in 1998. As we have seen, the need to redress inventories, built up in the 1996-98 period, resulted in a drop in production levels in 1999 and 2000, to under 133 Mt for non-FSU producers.

Phosphate rock production came from around 30 countries in 2000. New mines in Canada and Australia were commissioned in 1999. Canada is the first new country producer for a significant number of years. Australia already had a very small phosphate rock producer prior to the much larger WMC mine being commissioned. The largest four producers, the US, China, Morocco and FSU (as a whole) accounted for an estimated 72% of production in 2000, essentially the same as in 1999.

Production capacity worldwide increased by 3.6 Mt/y (2.1%) in 2000 following a period of stagnation at the 170 Mt/y level.

The oversupply in the phosphate rock market through the late 1980s precluded all but essential new investment and resulted in there being no net addition to phosphate rock mining capacity in the world in the early 1990s. Capacity grew again in the 1995-98 period but then stagnated at 170 Mt/y until 2000. It is now expected to be 2004 before global capacity regains levels seen in 1990. In terms of global capacity use, 1998 was a peak year with capacity use reaching a high 88% worldwide. The need to reduce inventories and the addition of new capacity in Australia and Canada late in the year pulled capacity use down to 85% in 1999 and this was further eroded to 83% in 2000. Capacity use is expected to be eroded further to perhaps 82% in 2001 but to show some recovery thereafter.

The **US** has a huge domestic market for fertilisers and, in addition, exports around 10 Mt of solid phosphate fertiliser products annually. Fertiliser exports have fallen sharply in 2000 from their 1999 peak of over 14 Mt and are expected to fall further in 2001 before recovering slowly thereafter. Exports of rock

dwindled to low levels in the mid-1990s from 10 Mt in the late 1980s. In 2001, rock exports will amount only to under 50,000 t shipped annually into Colombia.

The reduction in solid phosphate fertiliser exports has reduced the requirement for phosphate rock production in the US. The low level of returns from the export markets has also rendered some operators uneconomic and led to industry consolidation in the last few years. One result has been a reduction in the number of phosphate rock mining companies in the southeast US from around 11 in 1990 to just four operating (and two not operating) today.

One of the companies with closed-in facilities is Mulberry Inc. The two plants owned by the group, together with the Wingate Creek phosphate mine, were idled in late 1999 as a result of poor operating economics. The company sought Chapter 11 protection from its creditors in 2000 and the facilities are now thought to be up for sale. Whilst there are likely to be few offers for the idled phosphate complexes in the current market, the Wingate mine could be attractive to existing rock producers, particularly IMC, which faces depletion of some of its own capacity in the next few years.

Wingate is reported to contain reserves of around 40 Mt of finished rock product. However, as much of the reserve area is in a wetlands region, it is environmentally sensitive. Anyone wishing to exploit the reserve would have to obtain permits to mine the rock and the degree to which these permits are likely to restrict the mining area is open to question. IMC was looking at the possibility of purchasing the Wingate reserves and mine in 2000, but pulled away when its own estimates of the size of the reserve came in much lower than those traditionally reported.

The second producer with an idled mine in Florida is Agrifos. Agrifos owns a mine and relatively small reserve at Nichols in Florida and a fertiliser complex at Pasadena in Texas. The relatively high cost of transporting rock from central Florida across the Gulf prompted Agrifos to consider importing rock into Pasadena and it now signed a contract for phosphate rock supply with Morocco and has since switched to Togolese rock. As a result, Agrifos idled its own Nichols mine in August 2000 and is currently considering various options for the future of the mine. Agrifos was forced to seek Chapter 11 protection from its creditors in early 2001, but the Pasadena plant has continued to operate.

IMC operated just four mines in 2000, following the closure of its Payne Creek and Noralyn/Clear Springs mines in 1999. IMC has been able to use equipment from the idled mines to increase mining capacity at its remaining mines. IMC is by far the largest producer in the US with a capacity of 16.3 Mt/y This level of capacity is sufficient for its requirements at present due to its reduced operating schedule but would not meet all its needs at full capacity. The next mine to be depleted will probably be at Kingsford in 2005, and IMC is currently active in developing new capacity that will substitute for Kingsford and expand overall availability as required by the market.

PCS produced 2.04 Mt of P_2O_5 chemicals at its north Florida and North Carolina facilities in 2000. This was 4% less than was produced in the previous year. For two years, PCS has been mining a section of its North Carolina reserve with more difficult orebody characteristics. Operations at the Lee Creek mine in North Carolina are now passing out of this more difficult zone and capacity availability should improve at the Aurora plant as a result, if it is required.

PCS closed all its DAP lines at its White Springs complex in north Florida at the start of 2001 and this will lower the production requirement for phosphoric acid there, although much of the acid goes into production of feed additive products. Overall, PCS' P_2O_5 production level in 2000 should

have been equivalent to a rock production of around 7.7 Mt. In 1999, PCS produced 8.0 Mt of phosphate rock, of which 4.45 Mt was produced at Lee Creek, (equivalent to a capacity use of 74%) and 3.6 Mt was produced at White Springs (equivalent to 100% capacity use).

The two other companies mining phosphate rock in the southeast US in 2000 were Cargill and CF Industries.

Three new mines are in the planning stages in Florida. Farmland-Hydro has continued to gather permits to mine a tract of land near Ona. Its supply contract with IMC is due to expire in 2004 and the new mine is designed to replace this contract which IMC has said it does not wish to renew. IMC-Agrico itself has also begun the permitting process to build one or two new mines in Florida. Depletion of reserves at existing mines will require additional capacity also by 2004.

Morocco contains the largest phosphate rock reserve in the world. The state-owned operating company, Office Cherifien des Phosphates (OCP) produced 21.6 Mt of rock in 2000 of which almost all was exported either as rock or as downstream chemicals. Production levels for phosphate rock were almost 1.8% lower than in the previous year, mainly as a result of lower demand from the international phosphoric acid markets.

Phosphate rock revenues amounted to an estimated US$470 million in 2000, putting rock a close second to phosphoric acid as a revenue earning sector. Since phosphate rock prices have fallen much less than other products in the past couple of years, the proportion of OCP's revenue that has come from rock has been growing quite substantially from 26% in 1995 to an estimated 38% in 2000. In 2001, the phosphate rock sector could become the largest revenue earner for OCP as volumes are expected to increase and as rock prices have fallen less than prices for phosphoric acid.

In **Jordan**, production of phosphate rock in JPMC's mines reached 5.53 Mt in 2000, some 8% less than in 1999. JPMC continues to have problems implementing its expansion plan in which Phase II was to take output to higher levels using flotation in the beneficiation stage for the first time. The implementation of Phase II should have increased the proportion of higher grade 73-75% bone phosphate of line (BPL) rock product at the expense of the 70-72% grade. In fact, in the past three years, the reverse has been true and JPMC has produced less high grade rock overall. A higher level of

Phosphate Rock Production ('000t)		
	1999 [r]	**2000 [e]**
Finland	734	740
FSU	11,382	12,670
Algeria	1,093	876
Egypt	1,018	950
Morocco	21,986	21,568
Senegal	1,879	1,805
South Africa	2,941	2,778
Togo	1,715	1,370
Tunisia	8,006	8,304
Other Africa	124	85
Canada	350	800
US	40,700	39,161
Brazil	4,301	5,132
Colombia	4	25
Mexico	955	1,265
Peru	15	40
Venezuela	366	360
Iraq	390	415
Israel	4,128	4,110
Jordan	6,014	5,526
Syria	2,084	2,166
India	1,623	1,650
Christmas Is/Other	683	565
China	30,754	31,000
North Korea	70	65
Vietnam	710	626
Australia	145	750
Nauru	718	504
World	**144,888**	**145,306**

[r] revised
[e] estimated

production of 66-68% BPL product in 2000 was a response to a new contract signed with Oswal in India for 1.5 Mt. However, that contract was terminated after only a couple of months.

There have been reports that the Jordanian Government would like to sell its shares in JPMC to the private sector. Apparently JPMC is not currently making a profit on its operations, but this is partly due to the relatively large number of employees it carries and also the relatively high level of government taxes on JPMC's operations. It seems unlikely that a private operator will be willing to buy into the company without some sort of assurance from the government that it would be able to cut the number of workers and also without fixing a reasonable tax level.

Production of phosphate rock by the **Israeli** industry was flat overall in 2000 at 4.1 Mt. However, less low grade rock was produced for the domestic industry, and production of the 70-72% BPL rock increased by 18% to 2.2 Mt. Production of the Rotem-Amfert-Negev 74-75% BPL product was also down by 20% at just over 1 Mt. Lower production of the semi-calcined 74-75% product was a result of a cut-back in demand by a domestic customer, Haifa Chemicals, which began importing rock in 2000.

In west Africa, **Togo** has continued to experience production constraints as a result of deteriorating reserve characteristics. In 2000, the state-owned operating company, Office Togolaise des Phosphates (OTP), shipped 25% less rock into the export market following on from an even larger fall in 1999. Most of this reduction has been due to the loss of a 1 Mt/y contract with Agrium in Canada in mid-1999. New plans for privatisation of around 40% of OTP have progressed little in the last year.

In **Senegal**, export levels remain restricted as a result of increased domestic conversion of rock into phosphoric acid for export. A new phosphoric acid plant is being built that will substantially increase local rock requirements. This will be complete in late-2001. By 2003, mining will have to move to a new area of the deposit called Tobene. The new capacity will probably be made large enough to allow some rock exports to continue.

Exports of phosphate rock from **Chinese** ports ended 2000 at 3.45 Mt, some just over 1 Mt (42%) higher than in 1999. This increase has come about mainly through higher sales to India, and to Oswal Chemical in particular. India increased its use of Chinese rock by over 900,000 t. in 2000. Also there has been a continued increase in offtake of Chinese rock by importers in Australia and New Zealand. There has continued to be much speculation as to the sustainability of phosphate rock exports from China, given that most of the mines are in the interior and were originally designed to feed into the local industry.

New Projects

A new tender document has been issued relating to the sale of the mining concession on 74,059 ha of a phosphate deposit in the Sechura region of **Peru**. The document outlines the bidding process in which the successful applicant will be the one offering the highest percentage royalty payment on phosphate rock mined.

Empresa Minera Regional Grau Bayóvar (EMRGB) is the holder of the non-metallic mining concessions where the Bayóvar phosphate deposits are located in the District and Province of Sechura, in the Piura Department of Peru. The Bayovar phosphate deposits consist of 816 Mt including 262 Mt grading 30% P_2O_5. Potential reserves are estimated to be around 10,000 Mt.

The successful bidder will be obliged to have set up a 3 Mt/y mine and beneficiation plant by year four along with infrastructure and port equipment for rock export. At the end of year seven, the successful bidder will be obliged to have set up a DAP production unit of capacity

not less than 1 Mt/y and ancillary capacity for phosphoric acid production and rock supply.

EMRGB estimates that an investment of the order of US$500 million will be required to meet the obligations of the contract. Bids were to be pre-qualified on May 30, and a final award was expected on June 5 but Peru's Presidental elections at the end of May have deferred the bidding process.

There has been a significant advance in the **Saudi Arabian** project to mine phosphate rock at Al Jalamid in the north of the country and to convert this into DAP for export. Ma'aden, the organisation charged with developing the project, is negotiating a joint venture agreement with Saudi Oger, a local construction company, which should lead to an agreement being signed early in the June quarter this year. The project will include the development of a north-south rail link that will connect the mines in the north with Al Jubail on the east coast where the phosphoric acid and DAP units will be situated. The rail line will also be used for a bauxite project being developed in the northern area. DAP exports from the new development will probably be phased into the market over a period of time, but could eventually reach 3 Mt.