

PHOSPHATE ROCK

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Phosphate rock consumption worldwide fell by just under 1% in 2001 to 138.6 Mt. This is the third successive fall in rock usage following a reduced level of activity in the fertiliser end-use sector in particular. The fertiliser sector consumes around 90% of phosphate rock produced and is therefore by far the most important factor in demand for phosphate rock. Industrial end-use sectors consume around 6% of phosphate rock produced. Here, the recent slowdown in global economic growth has also impacted negatively on raw material demand.

Low cereal prices have been a major factor in the recent recession in the phosphate fertiliser markets. Grain inventories have been high following several bumper harvests and, although inventories are now coming down, grain prices have yet to respond. Another factor in reduced fertiliser demand has been a cutback in support prices for farmers in China. China accounted for 28.5% of world phosphate fertiliser consumption in 1998. World demand in 1998 was 33.3 Mt P_2O_5 . By 2000, global demand had dropped by 1.6 Mt. to 31.8 Mt P_2O_5 . Demand in China accounted for 1.3 Mt. of the overall drop in global consumption.

The importance of events in China to the world's phosphate industry has been underlined in a number of ways in the past year. Fertecon Research Centre (FRC) embarked on a major review of the phosphate industry in China in 2001 which highlighted a number of important trends. Basically, the rock production system in China has allowed cheap exports to reach the export market. This has seriously weakened the price structure in the Asian markets in the past two years against a backdrop of more stable pricing elsewhere. China's succession to the World Trade Organisation (WTO) late in 2001 was also heralded as a major positive factor

for the trade in fertiliser products. However, as the FRC study highlights, China's joining of the WTO is likely to be a double-edged sword, in as much as it opens the Chinese markets to international competition not just in the area of fertilisers, but also in the crop sector. If crop imports prove cheaper than production in China, there could actually be a negative impact on Chinese fertiliser demand in the short to medium term.

However, despite these possible negative influences, most forecasting agencies agree that, overall, the fertiliser industry is about to enter a period of growth, with estimates of annual demand growth of around 3-4% in the short term and 1.5% average in the medium term.

Phosphate rock production fell more sharply than demand in 2001 as producers sought to reverse a significant inventory build-up. Rock production fell by 2.9% to 139.2 Mt, but even this reduction was not sufficient to stop inventories from rising by a small margin globally. Most of the inventory activity has come from the US industry. Data show an inventory build across the US industry of 1.6 Mt in 2000. In 2001, attempts to control this were made by IMC, the largest producer, which included complete shut-downs in two months of the year.

Phosphate rock trade is estimated to have increased by 4.2% in 2001 following a 5.5% drop in the previous year. Trade globally totalled 29.9 Mt in 2001. Continued pressure to reduce chemical processing in Western Europe continued to take rock imports there to lower levels in 2001. In particular, the closure of the two remaining Dutch phosphoric acid units in 2000 reduced import demand for rock there. There was some increase in rock imports into the US as a result of the closure of Agrifos' own rock mine, but it was the Asian

region and India in particular, that boosted the level of rock trade in 2001. Oswal Chemicals and Fertilizers began commercial production at its new phosphate complex at Paradeep, India in 2000 and Indian rock imports increased by almost 30% to 4.3 Mt. At capacity this plant consumes up to 3 Mt/y of imported phosphate rock. In 2001, the plant still only operated at around 60% of full capacity but this and other increases in output led to another 16% jump in Indian rock imports to the 5 Mt level.

Increased imports of phosphate rock into the Philphos plant in the Philippines in 2001 following privatisation also helped boost the Asian import total.

The potential for increased phosphate rock trade is limited by 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 di-ammonium phosphate (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 Western Europe.

Supply Developments

Phosphate rock production worldwide decreased by an estimated 3.5% in 2001 to 138.2 Mt. Output has declined from the 1998 peak of over 147 Mt and, longer term, from the peak in 1988 of 159 Mt. There was a significant decline in output to 120 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). Here P_2O_5 consumption plummeted from over 8 Mt/y P_2O_5 prior to 1990 to a low of just over 0.5/y Mt in 1999. Since 1999, recovery in fertiliser applications in the FSU has been very slow.

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. Since then there has been some recovery in rock exports which, together with higher fertiliser production in the FSU, has taken rock production back to around 11.5 Mt/y.

Worldwide, phosphate rock production came from around 30 countries in 2001. There have been no new producers in the past year. New mines in Canada and Australia were commissioned in 1999. Canada was 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) account for just over 70% of global phosphate rock production.

Although it remains difficult to define in many cases, phosphate rock production capacity worldwide is thought to have increased by just under 3 Mt (1.6%) in 2001 following a larger 5 Mt increase in the previous year.

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 2005 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 79% in 2001. Capacity use is expected to show some recovery from the low 2001 level as demand for rock begins to improve once more.

The United States has a huge domestic market for fertilisers and, in addition, exports almost

10 Mt of solid phosphate fertiliser products annually. Fertiliser exports fell sharply in 2000 and 2001 from their 1999 peak of over 14 Mt and are expected to recover only slowly. Exports of rock from the US dwindled to low levels in the mid 1990s from 10 Mt/y in the late 1980s. In 2001, rock exports amounted to just 4,000 t shipped to Colombia.

The reduction in solid phosphate fertiliser exports by the US in the past two years 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. There were just four rock operating companies in the southeast US in 2001. In addition, two facilities remained idled. A decade ago there were more than ten mining companies operating in the southeast US fields.

Mulberry Inc. entered Chapter 7 bankruptcy in 2001 having previously been in Chapter 11. 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 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 consumers. Farmland and IMC both face the need to construct new capacity by 2004, and the acquisition of the 1 Mt/y Wingate operation could defer the need to invest.

Wingate is traditionally reported to contain reserves of around 40 Mt of finished rock product. However, much of the reserve area is in a wetlands region, and is environmentally sensitive. IMC's own estimates of the size of the Wingate reserve were 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. After trying Moroccan and Togolese rocks, Agrifos has decided to take a long-term contract for phosphate rock supply with Morocco. As a result, Agrifos idled its own Nichols mine in August 2000 and has since been considering various options for the future of the mine. Agrifos entered Chapter 11 bankruptcy protection in 2001.

IMC, the largest producer of phosphate rock in Florida, has outlined its strategy for maintaining rock supply through the next five to ten years during which several active mines are due to deplete. Current production capacity is around 16.5 Mt/y in total split between four mines, Four Corners (6.9 Mt/y), Fort Green (5.4 Mt/y), Kingsford (3.6 Mt/y) and Hopewell (0.6 Mt/y). These capacities are variable, depending on what mining machinery is dedicated to each site.

The Four Corners mine is operating on an active reserve of 77 Mt (as of end 2000) giving it a life expectancy of 13 years at capacity. The Fort Green mine comprises a reserve of 50 Mt. At capacity, the reserve will last just over nine years, but there are additional reserves nearby which can be mined through the Fort Green beneficiation plant. In particular, to the south of the mine is the Manson-Jenkins tract, containing approximately 20 Mt of reserves. Permits to mine this area were finally awarded to IMC in 2001.

In addition, IMC now intends to pump the initial ore from its new Ona mine area to Fort Green for processing. At the same time a new beneficiation complex will be built on the Ona reserve (97 Mt) with a production capacity of around 5-7 Mt/y, which will be commissioned later in the decade.

The Kingsford mine has only 8 Mt of remaining reserves, sufficient for just over two years at capacity. As it becomes depleted, IMC has decided to switch the Kingsford ore-mining capacity to the Lonesome reserve to the southwest. As with Ona/Fort Green, this is

going to entail a significant increase in pumping distance for the matrix, adding to production costs, but is preferable to having to get new permits to reconstruct a beneficiation complex on the Lonesome site (there was a unit there originally but it was later dismantled). The 44 Mt of Lonesome ore will therefore be processed at the Kingsford site, adding a further 12 years or so to the life of that upgrading plant.

PCS Phosphates remains the second largest phosphate rock producer in the southeast US phosphate fields, with mines at White Springs in north Florida and at Aurora in North Carolina. In 2001, PCS is expected to have produced around 5.6 Mt of rock overall, some 27% less than in 2000 and representing only 58% use of its overall 9.6 Mt/y capacity. The reduction in output will come mainly from the north Florida operations. PCS suspended DAP production at its White Springs complex early in 2001 in response to poor market conditions. Output of phosphoric acid at White Springs is expected to be at least 40% down as a result. Rock production at the Swift Creek mine will therefore be down by a similar amount at around 1.7 Mt. In North Carolina, PCS maintained production at 2000 levels through the early part of 2001, but in the final quarter again decided to drop DAP production levels in response to poor export market conditions.

Overall, phosphoric acid production in North Carolina is expected to be around 0.9 Mt in 2001, which would equate to a rock production of 3.9 Mt. During 2001, PCS has been opening up production on its NCPC reserve. PCS has promoted the move to the NCPC tract as providing a substantial benefit in the form of lower production costs. Overall, this is true as the ore bed in the NCPC tract is thicker and of higher grade than that of the previous reserve area. In particular, the production economics will look good compared with the more difficult ore zone that has been mined in the past three years by PCS.

The other two companies operating phosphate rock mines in Florida, CF

Industries and Cargill, both continue to mine at rates that match the requirements of their downstream phosphoric acid units.

CF Industries continues to produce around 3.0-3.2 Mt/y from its Hardee mine, sufficient to feed its chemicals plant at Bartow. The CF reserve area still contains around 82 Mt of recoverable phosphate product, sufficient for the foreseeable future.

Cargill has continued to operate its Hookers Prairie mine at below capacity in 2001 in order to control inventory levels. An estimated 1.7 Mt of P_2O_5 of phosphoric acid produced in 2001 would have required around 6.0 Mt of rock feed. Production at the 4.5 Mt/y South Fort Meade mine is usually maximised for cost reasons. This would leave only around 1.5 Mt to be produced at Hookers Prairie from the capacity of 2.7 Mt/y. Reserves at Hookers Prairie are limited to around 25 Mt or less. The slow mining in the past few years will tend to extend the life of this mine and delay the need to invest capital in restarting the currently idle Tencor mine.

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 as described above.

Morocco contains the largest phosphate rock reserve in the world. The state-owned operating company, Office Cherifien des Phosphates (OCP) produced 21.8 Mt of rock in 2001 of which almost all was exported either as rock or as downstream chemicals. Production levels for phosphate rock were 1% higher than in the previous year, despite a continued reduction in demand from the international phosphoric acid markets. OCP produced more solid fertiliser product in 2001 and this offset somewhat the lower export levels for phosphoric acid.

Exports of phosphate rock by OCP increased by almost 400,000 t in 2001, despite increased competition in the Asian market. Despite this increased tonnage, OCP's global market share slipped slightly in 2001 to 36.4%. There were significant increases in shipments to Spain, where a new long-term contract was signed in 2000, to the US, where Agrifos became OCP's third large customer, to Iran and to New Zealand.

In Jordan, production of phosphate rock in JPMC's mines reached 5.8 Mt in 2001, almost 6% higher than in the previous year. JPMC has now changed its development plans for the Eshidiyah area, reducing the dependence on flotation as a means of upgrading the leaner ore levels. Instead, JPMC has discovered two new horizons in the same reserve area that can produce a high-grade rock simply by washing and screening operations.

In 2001, the Jordanian Government announced that it is to privatise JPMC, selling part of its controlling interest which it holds through Jordanian Investment Corp. In 2001, JPMC saw a significant reduction in its workforce and a reduction in its mining fees (levied by the government) from US\$7/t to US\$2/t. These factors were pivotal in turning JPMC's finances around from a JD128 million loss in 2000 to a JD4 million profit in 2001.

Exports of rock by JPMC increased by 15% to 3.6 Mt in 2001. Despite shipping some product to Oswal in India, tonnages overall did not increase in that market. Major increases came in shipments to smaller markets, Germany, Poland, Ukraine, Iran, Pakistan and the Philippines.

Production of phosphate rock by the Israeli industry dropped by 15% in 2001 to 3.5 Mt in response to lower levels of sales, both at home and abroad. Domestic processing of rock fell by 21% as one customer began importing rock from Russia. Exports of phosphate rock fell by just over 10% to around 1 Mt. Deliveries to Spain and Brazil were much lower than in the previous year,

although there was some recovery in shipments of rock to the SSP sector in India.

In west Africa, Togo has continued to experience production constraints as a result of deteriorating reserve characteristics. In 2001, the state-owned operating company, Office Togolaise des Phosphates (OTP), produced 6% less rock, although exports actually increased marginally as shipments to the Philippines, Australia and New Zealand increased significantly and more than offset lost sales to Spain.

Without new investment it will be difficult for OTP to improve its production levels. This investment was due to come from the partial privatisation of OTP, but this was eventually abandoned. However, in 2001 a new company, International Fertilizers Group (IFG) took a controlling interest in OTP, signing an agreement in September 2001. As of January 2002, IFG took over the production and commercial functions of OTP. The Togolese Government has a 50% stake in IFG, with the remaining share being split between three foreign individual partners. The agreement covers new investment that should eventually bring production rates at the Togolese mines back closer to the original 3.4 Mt/y capacity.

In Senegal, plans are being put in place to transfer mining from the current reserve area, at Keur-Mor-Fall to a new area at Tobène within the next two years. Current mining capacity is insufficient to support full use of the newly expanded domestic processing capacity without cutting exports to zero. However, sufficient rock has been stockpiled to allow ICS to continue the current low level of exports to India until the new mine commences operations. It is expected that the new mine will have a larger capacity than the old operation and should allow exports to continue at least at the level of recent years.

A recent study published by Fertecon Research Centre ('Phosphates in China') estimates that current annual phosphate rock production levels in China are likely to

be around 31 Mt (2000 figure on a 30% P₂O₅ basis), significantly higher than the officially reported level. We think this partly stems from a lack of reporting from some mines, particularly the small-scale 'commune industry' mines which in many cases are unofficial or even illegal. Despite only producing a few thousand tonnes each year on average, the very large number of these mines results in them contributing to over 20% of the total rock production in China. The government has expressed an interest in reducing the number of these small mines, particularly as they often work the high-grade portion of reserves, leaving the subsequent large-scale exploitation of the main reserve more difficult to achieve. New capacity in future will therefore be needed, not just for overall expansion, but also to offset the closure of some of this small mine capacity.

Exports of phosphate rock from Chinese ports ended 2001 at 4.9 Mt, some 1.5 Mt (42%) higher than in 2000 which itself saw a 42% increase from 1999 levels. These increases have 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 and by a further 800,000 t in 2001. However, there has also been a continued increase in offtake of Chinese rock by other regional importers in Indonesia, South Korea, the Philippines, Australia and New Zealand. The Chinese Government, through the SETC has been considering forming an industry cartel to control the volume and price of Chinese exports. Such a move would clearly have implications for importers, Oswal in particular.

New Projects

With international rock prices slipping by a few dollars in 2001, and with fertiliser markets still in the doldrums, there was a distinct lack of interest in investments in new mining projects. In Peru, the privatisation of Bayovar as a prelude to the development of mining the Sechura reserve was finally abandoned.

Phosphate Rock Production (^{'000 t product})

	2000 ^r	2001 ^e
Finland	751	750
West Europe	751	750
FSU	11,591	11,105
Algeria	876	877
Egypt	1,096	1,200
Morocco	21,568	21,766
Senegal	1,806	1,708
South Africa	2,778	2,550
Togo	1,370	1,062
Tunisia	8,304	8,109
Others	113	105
Africa	37,910	37,377
Canada	330	800
US	39,161	31,600
North America	39,491	32,400
Brazil	4,825	5,000
Colombia	34	30
Mexico	1,053	850
Peru	6	5
Venezuela	389	330
Latin America	6,307	6,215
Iraq	420	455
Israel	4,110	3,511
Jordan	5,526	5,843
Syria	2,166	2,043
Middle East	12,222	11,852
India	1,136	1,250
Christmas Is/Other	634	615
China	30,807	33,970
North Korea	140	115
Vietnam	790	860
Asia	33,507	36,810
Australia	977	1,450
Nauru	504	266
Oceania	1,481	1,716
W O R L D	143,261	138,225

^r revised ^e estimated

Development of the Yichang phosphate project in China continues. Spur Ventures Inc., the Canadian resource company that is leading the development of the project, recently announced the appointment of Triennex (Pty) Ltd of South Africa to develop a capital strategy for the development. Following a feasibility study and follow-up work by Jacobs Engineering, Spur has identified various project options including the production of animal feed additives and NPK fertiliser products as well as the original product, DAP.

In Saudi Arabia, the development of the phosphate resources in the north of the country continues. The Saudi Arabian Mining Co. (Ma'aden) and the local Saudi company, Oger, have both signed a letter of intent with the government to form a joint venture through which the resources will be mined and a new rail link constructed from the north to the processing plants at Al Jubail. The development of the mine and rail link is expected to take at least five years.