PHOSPHATE ROCK

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The phosphate industry generally is slowly emerging from a period of depression that was triggered in 1999 by the coincidence of falling demand for fertilisers in several major consuming areas and the emergence of additional downstream fertiliser production capacity. The phosphate rock industry has been impacted by the downturn in fertiliser use. Almost 90% of phosphate rock production annually still finds its way into chemical fertiliser products. Phosphate fertiliser demand is therefore by far the most important factor in demand for phosphate rock. Industrial end-use sectors consume around 6% of phosphate rock produced, with animal feed additives making up the remainder. In the industrial sector, the recent slowdown in global economic growth has also continued to impacted negatively on phosphate rock raw material demand.

As usual, phosphate rock production has kept pace more or less with demand levels. Some inventory build-up was evident in 2002, particularly in the US. Production is likely to be pulled down in 2003 to reduce the level of inventories once more.

Trade in phosphate rock continues to struggle against basic industry trend towards processing rock at the site of production. Trade shrank by almost 4% in 2002 to 28.6 Mt, reversing the gains made in the previous year. The outlook for rock trade should see some increase in shipments once more, but only to the 32 Mt level. Much of that gain will depend on continued imports into India, and resumed imports into Mexico, however.

In 2002, phosphate fertiliser demand worldwide increased by an estimated 3.1% following on from a 1.7% increase in the previous year. These two increases were sufficient to raise phosphate fertiliser use to 33.7 Mt. P_2O_5, higher than at any time in over a decade. For the phosphate rock market, the increase in demand in 2001 was lower, but this led to a higher 4% growth in 2002. Again, the level of 176 Mt produced in 2002 was the highest since 1991.

Phosphate fertiliser demand is expected to continue to grow at around 3% annually in the next few years, with growth rates declining thereafter to a long-term 1.5%/y. There will continue to be a number of major factors governing these forecasts. **Asia** remains the largest phosphate fertiliser consuming region, and China continues to account for more than 50% of Asian consumption. China has been going through a period of reduced demand since 1998 as a result of structural adjustments that were necessary in both the economy and agriculture in order to enter the WTO. Despite this, growth in 2001 and 2002 has taken phosphate fertiliser use back to 1998 levels. Most recently the outbreak of SARS has hindered movement of fertilisers internally and, as a result, 2003 is not expected to show much growth. Domestic

production of phosphate fertiliser and phosphate rock in China continue to erode the level of phosphate fertiliser imports. Although only officially reported at just over 20 Mt, we believe that rock production in China must today be over 31 Mt in total. This is based on a calculation of rock requirements of the downstream products produced. Many of the small mines in China (of which there are a very large number) do not report production levels to the government as they are required to do.

Elsewhere in Asia, India remains a difficult market to forecast. The government has supported, through subsides, the development of a large domestic phosphate production industry based on imported phosphate rock and imported phosphoric acid. The government has stated that it wishes to eliminate subsides as a long-term policy. It is not clear yet whether the intention is to remove subsidies entirely, but if that is the case the domestic industry could be rendered largely uneconomic against imported phosphate fertiliser products. This could hit the import of phosphate rock, particularly for the newest and largest plant, that run by Oswal Chemicals and Fertilisers Ltd (OCFL). This 820,000 t/y P_2O_5 plant came onstream in 2000, but has only operated at around 50% of capacity since. Despite having low cash operating costs, partly generated through its novel use of low-grade Chinese phosphate rock, the plant has struggled to break even owing to its debt burden. Any move by the government to reduce the subsidy support for rock-based plants would have serious consequences for OCFL as well as others in this sector.

The second largest phosphate fertiliser consuming region is **North America**. The United States accounts for around 85% of phosphate fertiliser demand in the region. Over the past decade, phosphate fertiliser use in the US has been relatively flat, despite increasing grain production. This has been possible through increased efficiency of phosphate fertiliser use which in turn has led to less environmental problems with fertiliser products. In Canada, drought in 2002 hit the eastern part of the country. Some increase in fertiliser use is expected in Canada in 2003.

Western Europe and **Latin America** both consume around 3.5-4.0 Mt of P_2O_5 in phosphate fertiliser products annually. However, whereas consumption is slowly declining in Western Europe due to environmental and economic considerations, consumption in Latin America is showing signs of robust growth. At the start of the 1990s, Western Europe consumed over 5 Mt/y of P_2O_5 of phosphate fertiliser products, more than double the consumption of Latin America. In 2001, Latin America consumed more P_2O_5 than West Europe for the first time. In 2002, Latin America consumed more than 4 Mt of P_2O_5 for the first time (with Brazil accounting for more than 50% of that), whereas offtake in Western Europe had shrunk to 3.4 Mt.

The factors driving growth in phosphate fertiliser use in Latin America will continue to be access to increased land area for agriculture and competitive exchange rates that allow good levels of export sales of major crop types.

Agriculture in sub-Saharan **Africa** remains depressed, but some growth has been apparent in the three largest consuming countries, Morocco, Egypt and

South Africa in the past two years. However, for the region as a whole, this growth still leaves total P_2O_5 consumption below levels seen 20 years ago.

In **Australasia**, the drought in Australia in 2002 depressed overall P_2O_5 usage. However, growth in cropland at the expense of traditional pasture is resulting in a growth in high analysis fertiliser consumption. The region saw significant growth through the early 1990s but, overall, there has been little progress since. Some growth can be expected in the next few years as the impact of the Australian drought moves through the system.

Supply Developments

Phosphate rock production worldwide increased by an estimated 5.7% in 2002 to 148.1 Mt. Long term, there has been a significant decline in output from the peak of 159 Mt in 1988 through a low of 120 Mt in 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 of P_2O_5 prior to 1990, to a low of just over 500,000 t in 1999. Since 1999, fertiliser applications in the FSU have grown slowly as measures have been put in place to try and revive the local farming sector.

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 (mainly for export), has taken rock production back to around 11.5 Mt/y. Three main sources of rock exist in Russia. Phosagro now controls the Apatit mines on the Kola Peninsula, where production reached around 9 Mt in 2002. The Kovdor and Kingisepp mines are both controlled by the MDM Group through EuroChem. The Kovdor mine recovers apatite from iron ore tailings. The Kingisepp mine works a more conventional sedimentary deposit. Together these two mines produce around 1.8 Mt/y of rock.

Also in the FSU, there is rock production in Kazakhstan (1.2 Mt in 2002) and Uzbekistan (430,000 t).

Worldwide, phosphate rock production came from around 30 countries in 2002. There have been no new producers in the last year. The last new producers to emerge were in Canada and Australia where mines were commissioned in 1999. Output in the Kapuskasing mine in Canada (another igneous deposit) was problematic at first, but the operator, Agrium, has now stabilised production at around the 1.0 Mt/y level which matches the requirements of its downstream plant at Redwater, Alberta. In Australia, WMC Resources, newly split off from the aluminium sector of WMC, continues to produce 2.0 Mt/y of phosphate rock from its new mine in northern Queensland. This rock is used in the nearby fertiliser complex which also uses sulphuric acid recovered from the nearby MIM smelter at Mount Isa.

The largest four phosphate rock producers, the US, China, Morocco and FSU (as a whole) continued to account for over 70% of global phosphate rock production in 2002.

Although it remains difficult to define in many cases, phosphate rock production capacity worldwide is thought to have increased by just over 1.0 Mt (0.6%) in 2002 following a larger 4.0 Mt increase in the previous year. World capacity for phosphate rock production is thought now to stand at 176 Mt/y, giving an average capacity use of 83% in 2002.

The **US** produces phosphate rock and downstream products to feed a large domestic fertiliser market (amounting annually to around 15 Mt of rock equivalent). In addition, US exporters of phosphate fertiliser products accounted for a further 16 Mt of rock equivalent in 2002. Fertiliser exports fell by 24% in the three years to 2002 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 2002, rock exports amounted just 1,000 t.

The reduction in solid phosphate fertiliser exports by the US in the last three years has reduced the requirement for phosphate rock production in the United States. The low level of returns from the export markets has also rendered some operators uneconomic and led to industry consolidation. In the past year, Cargill has taken over fertiliser plants owned by Mulberry and Farmland, both of which entered bankruptcy proceedings. Cargill also took over the phosphate rock reserve owned by Farmland. Agrifos sold its Nichols mine to IMC and continued in Chapter 11 in 2002. Early in 2003 Mississippi Chemical Corp. (MCC) also filed for Chapter 11 protection from its creditors. There were just four rock operating companies in the southeast US in 2002, down from more than ten a decade ago.

IMC continues to juggle its production systems in order to keep inventories in check and also to plan for future production. Following a run-up in inventories in 2002 and January 2003, it has decided to close its Fort Green mine, leaving just three mines operating with a combined capacity of around 11.1 Mt/y. Fort Green is expected to be down for five months, potentially reducing output by around 2.0 Mt. IMC's requirements for phosphate rock in 2003 are expected to be around 16 Mt, including just over 4.0 Mt in sales to US Chem and Cargill (previously Farmland).

Production rates at Four Corners have been secured following a Manatee County decision to approve a new mining permit at the site that will allow mining through to 2005. The overall mining plan for Four Corners envisages the mine to continue through to 2029.

The permitting process for IMC's new Ona mine site continues, but is expected to be complete this year. Initially, the mine will pump matrix to the Fort Green beneficiation plant from the nearest part of the reserve. Even so, pumping distances will be a significant cost factor. Production could even begin by the end of 2003, although the current shutdown at Fort Green will increase IMC's flexibility in this respect. After around seven to eight years of production at Ona, IMC is expected to construct a new beneficiation plant on the Ona site, as pumping distances by then to Fort Green will have increased to over 10 miles.

The future of mining at Fort Green will also be influenced by the outcome of the current dispute over mining permits for the Manson-Jenkins tract which is at the southwest end of the Fort Green reserve and next in line for exploitation. IMC was granted a permit to mine the reserve area by the Florida Department of Environmental Protection (FDEP), but this has been challenged by a coalition of environmental groups and local Charlotte, Sarasota and Lee counties. The appeal could take up to a year to hear and in the meantime, IMC is looking to continue to develop the 2,800 acre reserve which is in Manatee County. The importance of the case is said to go beyond the development of this reserve area as the objections centre on the impact of mining on the Peace River watershed and river system. Manson-Jenkins contains the headwaters of Horse Creek which runs into the Peace River and on into Charlotte Harbour. Decisions made on the Manson-Jenkins tract could therefore set precedents for future larger projects such as the mining of IMC's Ona and Pine Level reserves.

Operations at Kingsford continue to mine largely residual pockets of ore. Acquisition of Agrifos' Nichols reserve will extend the life of this mine and also the life of the Hopewell operation. The acquisition of the Nichols reserve was completed several months ago and IMC has already begun mining the tract. Mining operations at the Nichols site could continue for up to seven years.

Following its take-over of Farmland's Green Bay phosphoric acid complex, Cargill now consumes over 8.0 Mt/y of phosphate rock in Florida. Currently the Green Bay plant is supplied with rock by IMC under a long-term contract that expires in 2005. Thereafter, Cargill will have to find the additional 2.2-2.4 Mt/y of rock for the Green Bay plant. Currently, Cargill has around 1.0 Mt/y of excess capacity, and has been running its Hookers Prairie mine at below its maximum rate to keep inventories down. Its other mine, the 5.0 million short ton/y. South Fort Meade mine has been operating flat out. After the IMC contract runs out, Cargill will ramp-up production at Hookers Prairie to full capacity, but it will still be short of rock. As a result, it has decided to expand its South Fort Meade mine to 7.0 million short ton/y at that time.

With the acquisition of Green Bay, Cargill also bought Farmland's rock reserve near Ona. Farmland had begun the permitting process for its Ona reserve, but there is now no way that it will be completed by 2005. The expansion of South Fort Meade will take the pressure off the development of the Ona reserve. The South Fort Meade reserve will probably be depleted shortly after 2015, at which time the new mine will be needed in order to maintain P_2O_5 production at current levels. CF Industries, one of the other two rock miners in Florida, has sufficient reserves at its Hardee mine to take it beyond 2025.

PCS continued to produce rock at a reduced rate through 2002 in line with the reduced level of di-ammonium phosphate (DAP) production at its White Springs and Aurora plants. Output of rock at Lee Creek/Aurora reached 3.44 Mt, some 4.4% lower than in the previous year. Rock production at White Springs dropped by 7.8% to just 1.55 Mt as a result of the continued closure of the DAP unit there. PCS restarted DAP production in mid-December 2002

at its White Springs complex. Output in 2003 is expected to be at around 90% of the 701,000 t/y capacity. This will require almost an additional 1.0 Mt of rock production at the mine during the year, taking output to 2.5 Mt in 2003. This 2003 output level would be equivalent to almost 70% of capacity use. Production of DAP at Aurora is expected to remain depressed in 2003, although the start-up of an additional 83,000 t P_2O_5 of purified phosphoric acid (PPA) capacity in the first quarter could result in up to an additional 300,000 t of phosphate rock production. Output at Aurora in 2003 is forecast to be around 3.6 Mt.

In the Western US, phosphate rock production continues at four mines in Idaho and one in Utah. Total production amounts to a total of around 5.5 Mt/y.

Morocco contains the largest phosphate rock reserve in the world. Total resources are now put at 85.5 billion m^3 which roughly is the same number in terms of finished product. In 2002, the state-owned operating company, Office Cherifien des Phosphates (OCP) produced 23 Mt of rock, of which almost all was exported either as rock or as downstream chemicals. Production levels for phosphate rock were 6% higher than in the previous year, driven by higher levels of rock requirements from domestic plants and from overseas markets. Over 90% of phosphate rock production in Morocco is now from open-pit mines. The largest of these are in the Khouribga area, where almost 70% of mined production originates. The rock from Khouribga is used in the Maroc Phosphore III and IV units and the Imacid unit at Jorf Lasfar. The latter unit is a joint venture with India's Zuari/Chambal group. Rock from Khouribga is also exported through Casablanca or Jorf Lasfar ports. Around 2.0 Mt/y of rock is mined in the open-pit Benguerir mines in the Youssoufia district to the south of Khouribga. This low-grade rock is transported to the Maroc Phosphore II plant at Safi for further treatment prior to being used in the phosphoric acid unit there. Youssoufia has the only underground mines in Morocco, producing around 1.2 Mt/y. In the same area, around 1.0 Mt/y of rock is produced in open-pit mines. Most of the Youssoufia rock is used in captive acid units at Safi to the west.

Exports of phosphate rock by OCP increased by almost 280,000 t (2.6%) in 2002 following on from a 3.5% increase in the previous year. This took OCP's share of the global market to almost 39% which was a record high level. Further increases could come in export levels in 2003, although there are also problems in some areas. In the US, now Morocco's largest export destination, MCC entered Chapter 11 in the second quarter of 2003. Although the plant has continued to operate, the economics could prove unfavourable in the short term. The plant uses around 1.0 Mt/y of Moroccan rock. In Mexico, the main rock importer, Fertinal, has remained out of production in the past year following damage caused by a storm in 2001. Any move to resume production there would benefit Morocco in terms of rock shipments. In India, OCP was the first supplier to take a share in downstream plant in 2002. The OCP/Chambal/Zuari joint venture took a 74% stake in the ailing PPL when the government came to sell part of its stake. There should be an opportunity to ship increasing quantities of phosphate rock to the plant in the coming years, providing the government does not substantially alter the subsidy system.

In **Jordan**, preliminary figures released by JPMC show that in 2002 it made a JD7.8 million (US$10.9 million) pre-tax profit on sales of JD198.3 million (US$278 million). This compares to a pre-tax profit of JD6.4 million in 2001 on net sales of JD191.5 million. It is not clear from the information given what is included in the 'sales' total since JPMC sells rock to the Indo-Jordan joint venture as well as to export. It also sells acid to the Nippon-Jordan plant, some of which is usually used to make DAP which JPMC then exports. However, the rise in net sales value does not look great given the fact that output of phosphate rock increased significantly in 2002.

Production of phosphate rock at JPMC's mines increased by 23% in 2002 to reach almost 7.2 Mt. The increase came largely in the output of the lower-grade products. Output of the highest-grade rock declined again, continuing a five year trend that has taken the share of production held by the high grade product from almost 70% to just 30% today. This shift in grade pattern could explain partly why there was not a larger gain in net sales revenue in 2002. Phosphate rock shipments by JPMC also increased, by 17% in 2002, but remained significantly below production levels. Overall, some 880,000 t of rock was added to inventory in 2002.

Exports of phosphate rock by JPMC peaked in the second quarter of 2002 and began to fall back again in the second half of the year. Largely this reflected the situation in India and the contract with OCFL in particular. In the middle part of 2002, OCFL shipped heavily from Jordan following a pull-back from the market by Chinese rock suppliers. In the final quarter of the year, both Togo and Egypt were shipping rock to OCFL also. With both these suppliers active also in the first months of 2003, and with OCFL currently in the middle of a three-month closure, we expect JPMC's rock exports to India to remain at a reduced level this year.

Phosphate rock production levels by Rotem-Amfert-Negev in **Israel** have continued to fluctuate on a quarterly basis, but overall output in the past two years has averaged 850-900,000 t per quarter rather than the average of 1.0 Mt per quarter seen in the previous five years. It is not yet clear whether this represents a change in capacity levels at one or more mines, or just a lower requirement for rock through the recent depressed period in the industry. One clue could come from phosphate rock shipment levels. Shipments of phosphate rock in 2002 were exactly matched by production levels. In 2001, shipments had been lower than production and 160,000 t of rock had been added to stockpiles even at the lower production rate. This would tend to suggest that production levels have been trimmed to meet shipment requirements rather than being dictated by capacity constraints.

In West Africa, **Togo** continued to experience production constraints in 2002 as a result of deteriorating reserve characteristics and equipment failure. However, the second half of 2002 saw the first possible signs of a recovery in production rates at the Togolese mines. The International Fertilizers Group (IFG), which took a controlling interest in OTP in 2002, has made some initial investments mining and transportation equipment that it hopes will allow production levels to increase through 2003. Production levels were matched

by sales in 2002 following a 240,000 stock draw-down in 2001. Part of the remit of the new IFG group is to bring new investment into the industry in order to increase production levels once more. IFG purchased two new rock-washing baskets from Agrifos, of the US. Agrifos had been intending to install the baskets in its own mine at Nichols, Florida prior to its closure. This, together with other equipment purchases is expected to boost production capacity in Togo to 2.0 Mt/y in 2003 and eventually back to the original capacity of 3.5 Mt/y. The IFG group is again looking at the possibility of building downstream phosphoric acid production facilities in Togo. OTP is one of the few phosphate rock producer/exporters worldwide wholly reliant on the phosphate rock export market.

In **Senegal,** exports of phosphate rock by ICS/CSPT remain constrained by available production levels. ICS/CSPT is in the process of moving to a new mine site at Tobene. When the transfer is complete, probably sometime in 2003-04 there is expected to be an increase in available capacity, which will not only cover the increased requirements of the domestic industry, but also allow ICS to continue to export rock to traditional customers in India.

The first two years of the current decade saw a significant level of inventory building in Senegal ahead of the commissioning of the new phosphoric acid plant at Darou. Since the beginning of 2002, shipments have been well ahead of production thanks to increased domestic processing. In all, around 950,000 t of rock was added to inventory in the three years to 2001. In 2002, around 700,000 t of this was removed. In theory, ICS/CSPT will find it difficult to repeat this level of withdrawal in 2003. If phosphoric acid production levels are maintained at the same high rate as in 2002, there could be less rock available for export unless the development of the new mining area is brought to fruition this year.

New projects

According to press reports, the Peruvian state privatisation agency, ProInversion, is looking to put the Bayovar phosphate rock deposit out to auction again shortly. There have been seven auctions in as many years for the 800 Mt reserve which is some 1,050 km north of Lima. Despite interest from IMC Global, WMC Resources, Rio Tinto and others, the deal for the sale of the exploitation of the deposit has never been concluded. Now ProInversion is hoping to have come to an agreement with the 9,000 or so people that live on the reserve as this has formed one of the obstacles to a successful sale in the past. Another factor has been the government's past insistence that the terms of the sale should include the construction of a phosphate fertiliser project in Peru, but this time around the government has said it is willing to be more flexible about the timing of such a project.

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 Oger have been awarded contracts for the mining of phosphate rock resources at Al Jalamid in the north of the country and the development of a new rail link from the north to the processing plants at Al Jubail. The construction of the mine and rail link is expected to take around four years.

Phosphate Rock Production ('000 t)		
	2001 (r)	**2002 (e)**
Finland	767	800
West Europe	**767**	**800**
FSU	**11,685**	**12,386**
Algeria	877	741
Egypt	972	1,550
Morocco	21,766	23,028
Senegal	1,708	1,554
South Africa	2,550	2,913
Togo	1,062	1,281
Tunisia	8,109	7,566
Others	129	86
Africa	**37,173**	**38,719**
Canada	780	1,004
US	31,704	36,200
North America	**32,484**	**37,204**
Brazil	4,805	5,027
Colombia	31	42
Mexico	800	0
Peru	5	43
Venezuela	399	400
Latin America	**6,040**	**5,512**
Iraq	450	450
Israel	3,511	3,476
Jordan	5,843	7,179
Syria	2,043	2,483
Middle East	**11,847**	**13,588**
India	1,253	1,185
Christmas Is/Other	604	586
China	35,258	34,930
North Korea	100	100
Vietnam	683	788
Asia	**37,898**	**37,589**
Australia	1,933	2,075
Nauru	266	147
Oceania	**2,199**	**2,222**
WORLD	**140,093**	**148,020**

(r) revised (e) estimated