

ALUMINIUM

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Depending on one's perspective, last year was either better than feared or a disappointing recovery from the terrible recession of 2001. Early in the year, many worried that massive exports from China would lead to a primary surplus of over a million tonnes. Production did increase by over a million tonnes in China last year, an amount unprecedented in any country. And China did shift away from its usual position as a net importer. But its net unwrought exports only reached 206,000 t. In terms of the primary metal balance, reported stocks were up only about 400,000 t — less than in 2001. Many analysts countered by suggesting that unreported stocks had increased by over 500,000 t. Of course it's intrinsically very difficult to measure something that is 'unreported'. Granted, the price contangos for most of the first three quarters of 2002 were sufficient to finance off-warrant stocks through cash-and-carry deals. Yes, there were anecdotal reports of unwarranted metal building up in places like Rotterdam. But there are a couple of problems with this story.

First, if there was indeed such a large build-up in unreported stocks, then the seasonally adjusted annual rate of aluminium shipments in the Established Market Economy Countries (EMECs) would have been only about 18.5 Mt/y during the first half of 2002. This would imply a huge jump to the shipment rate of 20 Mt/y in the second half, even though industrial production in the G7 industrialised nations was up only about 1% between the two halves.

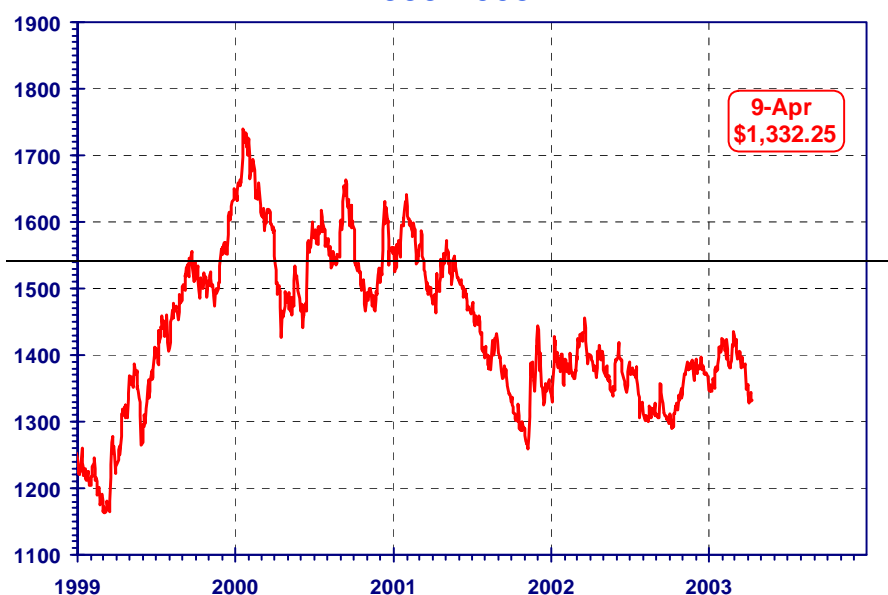
Second, for seven weeks in early 2003 there was a backwardation between cash and three-months prices that reached as much as US\$40/t. If there had been a huge build-up in cash-and-carry stocks early last year, why didn't a large part of this metal come back onto the LME during the backwardation? One explanation is that even if unreported stocks did increase at non-LME warehouses last year, it is quite likely that they declined by a similar amount at independent extruders and fabricators who slashed their inventories as the economies stumbled.

So 2002 was not the disaster some feared — but it was also not a good year when compared with recoveries from previous recessions. The last time both total and primary EMEC shipments declined substantially was 1980-1982 (following the second oil-price shock). But then, in 1983, total and primary shipments each shot up by over 11%. Similarly, shipments were little changed in the slowdown of 1996 but bounced back by about 7% in the following year. For 2001, it was estimated that total EMEC shipments plummeted by 5.3% and primary shipments by 6.3%. Yet, last year, shipments only bounced back by about half of that. The reason is quite clear — it has been a very mediocre recovery. Industrial production actually declined in 2002 in all of the G7 industrial nations except Canada. Even the higher shipments in last year's second half were probably due more to an easing off of 2001's heavy

destocking than to underlying demand growth. Table 1 is the calculation of the EMEC primary balance.

As expected in a weak economy, producers cut their inventories to a minimum, so the surplus in 2002 was entirely reflected in exchange stocks. LME inventories rose by 420,000 t and Nymex/Comex warranted stocks by 67,000 t. But total International Aluminium Institute (IAI) producer stocks declined by 92,000 t and unwrought IAI stocks dipped by 80,000 t. Comex unwarranted stocks (which include secondary and other non-P1020 aluminium) were up 3,000 t, Japanese port stocks fell by an estimated 56,000 t and Shanghai exchange stocks dropped by 22,000 t.

LME 3-MONTHS DAILY PRICE 1999-2003



The lacklustre performance of aluminium markets, coupled with the continuing economic malaise, had its effect on aluminium prices in 2002. For the LME three-months contract, the range between highest and lowest prices was the narrowest in 17 years. Starting the year at US\$1,347/t, the price rose to a high of US\$1,460/t on March 20, but then drifted lower through the spring and summer to reach a low of US\$1,287/t on October 10. In the fourth quarter, the LME three-months price recovered to near US\$1,400/t but ended at US\$1,349/t, almost exactly where it began the year. The annual average was US\$1,364/t, down from the US\$1,453/t in 2001 and US\$1,567/t in 2000.

Consumption by region and end use

In last year's report, we forecast modest consumption growth of between 1% and 4% in the major EMEC consuming regions. In reality, consumption of total aluminium (semi-fabricated from both primary and secondary/recycled metal) in the EMECs is now estimated to have risen about 2.5% in 2002. This was after having fallen 5.3% in 2001 (the largest percentage decline in a quarter-century). By region, growth in 2002 was somewhat the reverse of 2001.

Consumption (Table 2) was up in all geographical regions except Latin America, one of only two regions that had seen positive growth the previous year. The largest increase was in North America, which had seen by far the largest drop in 2001. As a consequence, consumption in 2002 was still below that of 2000 in every region except Africa and Oceania. For the year 2003, with fears over Iraq and SARS, we expect only slightly higher growth than last year. It appears that we will have to wait until at least 2004 for a strong recovery accompanied by heavy restocking.

There was positive growth last year in all of the end-use markets except beverage cans. Transportation returned to its usual position as the fastest-growing market as well as the largest for aluminium. Global light-vehicle production growth of around 4%, and increased automotive penetration, more than made up for the very weak aerospace sector. In the important building and construction market there were large geographical differences. Strong housing markets in North America produced robust growth (+7%), but building and construction was stagnant in Western Europe (+0.6%) and down in Asia (-2.1%) and Latin America (-8.5%). The growth in other end-use markets was quite unremarkable (Table 3).

Aluminium capacity and technology

In terms of technology, 2002 was a very quiet year with no further news on such promising developments as inert anodes or wettable cathodes. In a break from recent history, a significant amount of capacity was permanently closed, even while the number of new smelter projects continued unabated. Except perhaps in China, the cost and availability of power has been the key determinant of where expansions occur and where capacity is idled or closed.

The one important new technology near implementation is Pechiney's AP50. With a fixed 460,000 t/y size for a greenfield smelter, it promises lower per-tonne capital and operating costs, shorter construction time and fewer emissions than previous technologies. For its first implementation of the technology, Pechiney considered a few different locations and, perhaps surprisingly, sought out partners to take a majority 55-65% stake in the €1.8-2 billion project. The Coega industrial area of South Africa, near Port Elisabeth, was chosen after Pechiney had negotiated a multi-year power supply contract with the Eskom utility.

BHP Billiton continued to have success as it expands its recently-built smelters in Mozambique and South Africa. At Mozal, the 250,000 t/y capacity brownfield expansion moved ahead of schedule, with initial production in April 2003 and full production by year-end. BHP Billiton also began construction on a US\$450 million, 132,000 t/y expansion at Hillside. Work is to be completed by the end of 2004 when it will become, at least briefly, the largest smelter outside Russia (with a capacity of about 650,000 t/y). A low-cost, 25-year, Rand-based power contract was negotiated with South Africa's Eskom.

There are always projects in the energy-rich Middle East. Aluminium Bahrain (owned 77% by the Bahraini Government, 20% by Saudi Arabia's Public Investment fund and 3% by Breton of Germany) began construction on a

US\$1.7 billion, 307,000 t/y fifth potline in early 2003, with completion targeted for 2005. A co-operation agreement was also signed with Alcoa for a sixth potline. In nearby Dubai, US\$925 million in financing was arranged for the 175,000 t/y Kestrel expansion. Each of the four existing potlines will be overhauled and extended. Egyptian Aluminium's Nag Hammadi smelter also continues to increase capacity as prebaked anode pots replace the old Soderberg lines. The smelter is expected to produce 244,000 t in the current fiscal year.

Iran said that it was planning a series of smelter projects to raise annual capacity to 1.0 Mt within a decade. The projects include a series of three 110,000 t/y expansions at the semi-private Al-Mahdi smelter in southern Hormozgan Province; a private 220,000 t/y project possibly near gas fields at Assaluyeh; and a 110,000 t/y smelter near the Jajarm alumina refinery. However, the track record for projects in Iran has not been good.

Two other Middle Eastern projects were discussed last year. Nalco, Japanese investors and the Government of Qatar were in talks to build a US\$2.0 billion, 500,000 t/y smelter by 2006 using alumina from Nalco. And the Saudi Arabian Mining Co. (Maaden) said it was conducting a feasibility study for a US\$3.2 billion project in the Eastern Province, comprising a bauxite mine, refinery and 620,000 t/y smelter.

Scandinavia is another region that has had abundant energy resources, though of late, low precipitation has had an adverse impact on power in Norway and Sweden. The main focus recently has been on Iceland. In the year 2000, Norsk Hydro signed an agreement with the Icelandic Government and, along with local financial institutions, undertook feasibility and environmental studies for a greenfield smelter project at Reydarfjordur. But with the work entailed in integrating its VAW acquisition, Norsk was unable to meet Iceland's deadline for a firm commitment, and the government sought other investors.

Alcoa entered formal talks in May, signed a memorandum of understanding in July, and purchased the Reydaral environmental firm and its previous studies in November. Environmental groups protested that the associated hydroelectric dam would flood part of Europe's second-largest wilderness area, but a 322,000 t/y capacity smelter project was approved by early 2003. Alcoa is to start construction in early 2005 with production beginning in 2007.

Two other Icelandic projects were actively discussed. Plans by Columbia Venture's Nordural to double production at the 90,000 t/y Grundartangi smelter were pushed back a few months to 2006 when the Ministry of the Environment rejected a 70 MW power project by the Landsvirkjun utility that would have flooded the Icelandic highlands near a nature reserve. Finally Atlantsal (owned 20% by an Icelandic engineering firm and 80% by a joint venture of Russian Aluminium and Russia's VAMI National Aluminium-Magnesium Institute) launched a study to build a US\$1.0 billion, 360,000 t/y smelter in northern Iceland and a US\$1.0 billion, 2 Mt/y refinery.

Two expansion projects continued in Norway. Elkem was about five months ahead of schedule on its brownfield expansion at Mosjoen, and expected to finish in March 2003. But soaring spot electricity prices (reaching as high as US\$120/MWh in January this year) led Elkem to postpone start-up of the last phase until June 2003. The power shortage also had an impact on Norsk Hydro's Sunndal expansion. It commissioned the first new pots in October but then decided to close the old 66,000 t/y Soderberg line in December, several weeks ahead of schedule. Sunndal is expected to become the largest smelter in Europe at 330,000 t/y by the end of 2004.

Outside Scandinavia, Western European smelters face the possibility of closure rather than expansion because of high power costs and environmental issues. Pechiney announced plans to close its 47,000 t/y Auzat smelter in the summer of 2003. This is an old smelter in the Pyrenees, far from markets and facing a large hike in power costs next year. A problem with electric shocks led Pechiney to idle the plant prematurely in March. In Germany, the government threatened to close loopholes in 'green' taxes that would threaten aluminium smelters.

There are plans to raise capacity at a few smelters in Eastern Europe, though most require subsidies (such as from the European Bank for Reconstruction and Development) to make them viable. Slovalco plans to increase capacity at Ziar nad Hronom from 110,000 t to 155,000 t/y by 2004, and Romania's Alro hopes to raise capacity at Slatina to 200,000 t/y by year-end and to 340,000 t/y within five years from the current 184,000 t/y.

The picture in North America is similar to that in Europe. Smelters are expanding in energy-rich Québec at the same time as capacity is idled or permanently closed in the US. At Sept Isles, site preparation began in September for Alouette's US\$950 million, 307,000 t/y expansion that should take capacity to 550,000 t/y by 2005. Alcan said it was also considering a 30% expansion at its new 400,000 t/y Alma smelter, but probably only after Alouette is completed.

Alcoa announced two longer-term expansions in Quebec. It plans to expand and modernise Baie-Comeau, replacing the Soderberg line with prebake. Work would begin in December 2003 but only be completed by 2010. Alcoa is also to expand the Deschambault smelter to 570,000 t/y from 250,000 t/y, with construction beginning in 2006 and ending in 2013. Each project would cost about US\$650 million and be assisted by interest-free loans, ten-year tax breaks and preferential hydroelectricity rates from the Québec provincial government. Both announcements came shortly before an election was called.

Elsewhere in Canada, the study for a power and smelter project by Alcoa in the province of Newfoundland and Labrador concluded that it was not feasible without huge subsidies (that the province could not afford). In British Columbia, Alberni Aluminum Corp. still talked about a US\$1.5 billion, 360,000 t/y greenfield project but faced serious obstacles, including the availability of affordable power.

It was a very different situation in the US where much capacity was idle and aluminium companies were pushed into bankruptcy. Alcoa announced in July that it would permanently dismantle its long-closed 121,000 t/y Troutdale smelter in Oregon, as well as the 76,000 t/y idled at its 320,000 t/y capacity Rockdale smelter in Texas. Bankrupt Kaiser Aluminum sold its Tacoma smelter to the Tacoma Port Authority for demolition and redevelopment after concluding that the idled 73,000 t/y smelter was no longer competitive.

The drought and energy rationing of 2001 have reduced the attractiveness of smelter projects in Brazil. Nonetheless, the 100,000 t/y Soderberg expansion at Companhia Brasileira de Alumínio's (CBA) 240,000 t/y Sorocaba smelter began coming on stream in September, with completion expected by October this year. The Albras consortium's Belém smelter is also expanding by 25,000 t to 430,000 t/y.

In Venezuela, government-owned CVG approved plans to expand both of its smelters. At the older 210,000 t/y capacity Alcasa plant, a consortium was chosen for the US\$650 million project to add a 240,000 t/y fifth potline. Glencore will be responsible for the financing, Pechiney for the technology and Fluor Daniel for the construction. At Venalum, a sixth potline of between 135,000 t and 250,000 t/y capacity was discussed. There was also talk of a 55,000 t/y greenfield project in the Guyana region by Aleaciones Ligeras Alisa SA.

In Chile, the environmental regulator Corema sent Noranda a set of follow-up questions and comments on its environmental impact study for the long-discussed Alumysa smelter project at Aisen. Noranda has also been seeking partners. In Argentina, Aluar had plans for a US\$500 million, 45% expansion at Puerto Madryn.

Abundant bauxite reserves and high aluminium tariffs have led to smelter projects at each of India's five producers. Hindalco is expanding its Renukoot smelter by 100,000 t/y (three potlines) and boosting its power plant to 769 MW from 619 MW. The US\$371 million expansion was on schedule with the start of commissioning of the final potline in early 2003 and full capacity by September. Conversely, Nalco has had lengthy delays with the 115,000 t/y expansion at its Angul smelter. Originally scheduled for completion in May 2002, only half was put into operation by March 2003, with the rest now planned for March 2004. Part of the delay was blamed on the failure of an Indian company to supply equipment for the power station.

Indal (owned 94.3% by Hindalco) increased capacity at Hirakud to 57,000 t from 30,000 t/y by transferring pots from its idled Belgaum smelter. Sterlite's Bharat Aluminium subsidiary held talks with major producers including Pechiney and Chalco for an US\$850 million expansion project at Korba. It would take smelter capacity to 350,000 t/y from 100,000 t/y, refinery capacity to 830,000 t from 180,000 t/y and power to 810 MW from 270 MW. Finally, Madras Aluminium Co. (Malco) is looking to increase capacity at its Mettur smelter to 47,000 t/y from 29,500 t/y.

For the past two years there have been numerous reports on a 500,000 t/y smelter project in Malaysia's Perak state, involving Charus Development Corp, Malaysia Aluminium Smelting Co. and Hong Kong investors. But when they failed to reach agreement on an electricity price, the talk shifted to Malaysia's Sarawak region. There, the 2,400 MW Bakun dam project was revived after being shelved during the 1997-98 Asian financial crisis. A group of Middle Eastern investors proposed a US\$2.0 billion, 500,000 t/y capacity smelter using power from the dam. Both Dubal and BHP Billiton were also mentioned in connection with the project.

Another subject of numerous stories over the past few years is the Aldoga project at Gladstone Australia that had started out as the Lithgow project in New South Wales. Russian Aluminium signed a memorandum of intent to participate in some fashion, while Fluor Australia and Leighton Contractors undertook a feasibility study for a US\$2.25 billion, 560,000 t/y smelter. Elsewhere 'down under', Rio Tinto said it was no longer interested in the US\$450 million, 220,000 t/y expansion at Boyne Island because of the "bleak outlook" for aluminium. But Tomago (Pechiney 51.55%, Gove Aluminium Finance 36.05%, Hydro/VAW 12.4%) was proceeding with plans to boost its electric current to 225 kA and increase capacity by 70,000 t to 530,000 t/y.

Aluminium production

Low levels of precipitation and poor electricity planning have caused problems for smelters in disparate parts of the globe. Worst hit has been the US Pacific Northwest. The energy crisis led to blackouts in California and caused spot electricity prices in the region to soar into the hundreds of dollars per megawatt-hour in 2000 and early 2001. The Bonneville Power Administration (BPA) contracted to pay aluminium producers not to use its power. Starting in the summer of 2001, all of the 1.6 Mt/y of capacity in the region (except about 12,000 t/y at Goldendale) was idled. But by early 2002, spot electricity prices had fallen back to around US\$20/MWh and some of the capacity was restarted. Glencore's 168,000 t/y Columbia Falls (believed to be the second-lowest cost producer in the region) was first off the mark. It restarted one of its five potlines in March and two more later in the spring, using non-BPA power. In April, Alcoa announced that two of the three potlines at Intalco's 285,000 t/y Ferndale smelter would be restarted but that the restart of the final potline at Warrick would be deferred. Intalco, owned 61% by Alcoa and 39% by a Japanese consortium, operates the lowest-cost smelter in the region. The final restart was by Golden Northwest. Starting May 1, it came under take-or-pay provisions in its contract with the BPA. In September, after reaching a labour agreement and settling lawsuits, the company announced plans to increase production at Goldendale to 50,000 t from 12,000 t/y.

So by the end of the year, production in the US Pacific Northwest was approaching 340,000 t/y. But electricity prices were rising again, driven by high natural-gas prices, low water flows and, of course, higher consumption by the smelters. Spot rates went from under US\$10/MWh in July and August to around US\$70/MWh by late-February 2003. Equally important, forward prices had all moved above US\$50/MWh. As a rule-of-thumb, smelters have

difficulty operating profitably unless electricity prices are under US\$30/MWh. So Alcoa halted work to prepare the third potline at Ferndale for restart. Within weeks, Columbia Falls idled two of its three operating potlines and Goldendale shut down completely. The rate of production fell to only 223,000 t/y. Kaiser also stopped maintaining the 200,000 t/y Mead smelter in restart readiness.

Besides the closures at Troutdale and Rockdale, Alcoa idled its Badin, North Carolina smelter. Badin had been operating at 75% of its 120,000 t/y capacity following concessions made by workers in 1999. Late last year, Alcoa said it was keeping the (former Reynolds) Massena East smelter operating after eliminating 110 jobs and receiving US\$7 million in economic incentives from the New York Power Authority. But in April 2003, Alcoa said it was idling a combined 60,000 t/y of capacity at its two Massena smelters (and that it would close the two operating potlines at Ferndale if the BPA hiked rates from September 30). In British Columbia, Canada, higher-than-normal snow accumulations and improved water levels allowed Alcan to begin to restart 60,000 t/y of capacity at Kitimat in August. This will still leave almost 40,000 t/y idled at the 277,000 t/y capacity smelter.

Brazil's production was up 16% last year to 1,316,000 t. Most of the increase was from the >300,000 t/y of capacity that had been idled in the summer of 2001 but was restarted early last year as power rationing was phased out. To avoid similar problems in future, most of the primary producers took part in government auctions for the right to build their own power plants and become self-sufficient in electricity.

Western Africa is another region frequently subject to production cuts resulting from drought-related power shortages. This has been especially true at Volta Aluminium Co.'s Tema smelter in Ghana. Owned 90% by Kaiser and 10% by Alcoa, it has not operated at its full 200,000 t/y capacity for many years but was running four of five potlines early in 2002. After a fault at the 912 MW Akosombo hydroelectric power station (60% of whose power goes to Tema), Valco was told by the government in February to idle two more potlines. After negotiations, it was allowed to cut by only one potline, leaving three running. Then in December, Valco was told to idle two more potlines. The government complained that Valco's long-term contract rate is only 1.1¢/kWh compared with an average cost of 6.5¢/kWh and a public rate in Ghana of 7.8¢/kWh (due to increasing reliance on light crude oil in addition to hydro). As usual, Valco will seek to recover damages. By March this year (six months before the rainy season), water levels were already below the minimum so it is quite likely that Valco will have to close the final potline.

An even more troubled smelter is Ikot Abasi in Nigeria. After having started up and operated at only a fraction of its 180,000 t/y capacity in 1998, the smelter closed down and has not operated since, despite frequent reports and attempts by the government to sell it off.

PT Inalum's Asahan smelter on the Indonesian island of Sumatra also suffers from chronic power problems due both to droughts and to excessive logging

near Lake Toba. There was some talk of building a new 90 MW hydroelectric plant nearby. The 225,000 t/y smelter only produced about 160,000 t last year but, with higher rainfall, hopes to increase that to 190,000 t this year. In New Zealand, soaring spot electricity rates led Comalco to cut Tiwai Point's output by 10% in March 2003.

India's smelters continued to lose output for a variety of reasons. For the first few months of 2002, Balco was still recovering from the illegal walkout in protest over its privatisation in March 2001. A cyclone closed Indal's Hirakud smelter in late May while heavy rains affected Hindalco's Renukoot smelter in September. Indal threatened to close its tiny Alupurum smelter after the state of Kerala hiked power prices. A breakdown of production by region is shown in table 4.

Labour, legal, environment and government

The poor economic situation in most of the world was probably responsible for the relative quiet on the labour front. Conditions were the most tumultuous in Venezuela although primary aluminium output was virtually unaffected. Workers at CVG's Bauxilum, Carbonorca and Venalum plants staged brief work stoppages, starting in March, over higher wages and bonuses.

In October, workers at aluminium processor Suralum occupied CVG headquarters when Venalum cut off metal deliveries over unpaid debts. Then in early December, opposition to President Chavez led to a national strike that lasted several weeks. Oil and gas production were the hardest hit and the shortage of natural gas reduced output at the Bauxilum refinery for several weeks.

In April and May last year, Germany also saw large-scale strikes as workers in the IG Metall union sought wage increases of 6.5%. Aluminium industry plants of Alcan, Lechner GmbH, Aluminium-Werke Wutoeschingen and Tscheulin-Rothal GmbH were hit by rotating strikes, as were large aluminium consumers including the automakers before a settlement was reached.

Quite a number of layoffs were announced. Early in 2002, Norsk Hydro said it would cut about 1,000 jobs in its Light Metals division in connection with the take-over of VAW. Pechiney cut 202 jobs (17% of the workforce) at its Ravenswood, West Virginia rolling mill due to the weak aluminium markets, especially aerospace. (In December, it reached a two-year labour agreement extending to May 2005 and promising no further layoffs.) However, these pale in comparison with Alcoa's January 2003 announcement that it would eliminate 8,000 jobs, mostly in aerospace, industrial gas turbines and automotive, as part of its restructuring.

A judge of the US Labor Relations Board ordered Kaiser to pay 3,000 workers for all the wages lost during a 20-month lockout in 1999 and 2000. The cost has been estimated at over US\$100 million, but will depend on the Chapter 11 bankruptcy court. On a happier note, multi-year contract agreements were reached without strikes at Century's Ravenswood smelter, Alcan's Kitimat

smelter and Noranda's New Madrid smelter and Newport Arkansas rolling mill.

There were many labour and legal issues in connection with Michigan Avenue Partners (MAP) and their Longview, Washington smelter. In April, Michael Lynch of MAP threatened to dismantle Longview and reassemble it in Iceland unless workers agreed to a five-year labour pact. The United Steel Workers (USW) claimed in July that Longview Aluminum had locked out employees and cut off health benefits. A mediator was brought in but failed to bring the two sides closer together so the USW filed a lawsuit. They were not alone. Both a former partner and the McCook bankruptcy trustee also sued Longview's chairman last year, alleging that company funds had been improperly transferred or used for personal gain.

In February 2003, Longview sued Alcoa, seeking to terminate a clause in the smelter's purchase contract. The clause required operation of at least one potline for four continuous months out of 22 or the ground lease would terminate and the land would revert back to Alcoa. (An extension had already been granted by Alcoa.) On February 28, Longview got a temporary restraining order preventing the BPA from terminating its power contract over unpaid bills, and the next day filed for Chapter 11 bankruptcy protection. It blamed inconsistent and uneven enforcement by the BPA, which in turn pointed out that Longview had received US\$226 million for not taking BPA power and only used US\$155 million to purchase the smelter from Alcoa. The outcome now rests with the bankruptcy court.

There was plenty of other legal action in the US Pacific Northwest. Four aluminium producers came under take-or-pay provisions last year in their five-year contracts with the BPA. If the producers do not take their electricity allotment and the BPA has to sell the power at a spot rate lower than the contract rate, then the producers must pay the difference at the end of each year. The producers tried various means to escape their take-or-pay commitments. The bankruptcy court did allow Kaiser to annul its contract for 291 MW of power through 2006. In December, the BPA claimed damages of US\$70-80 million from Kaiser, US\$16 million from Longview, US\$13 million from Golden Northwest, and US\$1.0 million from Columbia Falls and Vanalco.

The BPA itself warned of a US\$1.2 billion financial gap between 2002 and 2006 due to the lack of water, increasing demand and higher costs for electricity. For the period beginning in 2006, utilities in the region came up with a plan that completely excluded the smelters from BPA power, while the influential Northwest Power Planning Council recommended that the BPA allocate only 600 MW to the smelters (versus their total needs of about 2,800 MW). The long-term future for smelting in the region does not look bright.

Brett Wilcox, the chief executive of Golden Northwest, obtained required permits and was seeking BPA backing for a plan to build power plants based on both gas turbines and a wind farm. Earlier, workers and bondholders had brought lawsuits claiming proceeds from power contract sales had been diverted to the separate power company. Alcoa also made a proposal to

acquire 700 MW of gas-fired generators, selling the power to the BPA at cost but receiving it back at a price blended with the lower cost BPA hydro power.

There were some successful police investigations linked to the aluminium industry. In the US, Nippon Electro Co. and VAW Carbon GmbH pleaded guilty to price-fixing on carbon cathode blocks and were fined. In the European Union, there were raids on producers of tar pitch over suspected cartel agreements and price-fixing. The Italian police arrested smelter officials as well as customs and tax officers in breaking up a smuggling ring thought to have brought in over 270,000 t of aluminium labelled as scrap to avoid €23 million in taxes between 1997 and 2002.

Venalum had been shipping aluminium to minority shareholders Show Denko KK, Kobe Steel, Sumitomo and Mitsubishi for 20 years. But the Japanese balked when CVG tried to eliminate preferential pricing and change from a fixed 90,000 t/y to 20% of production. Shipments were interrupted between the end of March and December until a new deal was reached.

Many aluminium companies were impacted by the bankruptcies of customers and others. An arbitrator ruled in favour of Powerex, the power marketing subsidiary of British Columbia Hydro, in its US\$100 million claim against Alcan. The latter had provided guarantees to Powerex when it transferred a long-term supply contract to now-defunct Enron several years earlier.

Environmental issues continue to affect aluminium both negatively and positively. Alcoa faced considerable problems over its Rockdale smelter and lignite-fired power plant in Texas, one of the worst polluters in the US. Citizens groups, the Texas Natural Resource Conservation Commission and the EPA all took action. Alcoa has agreed to spend US\$330 million on a new coal-fired power station (unless it closes the plant), US\$2.5 million on conservation easements, US\$750,000 to retrofit buses and a US\$1.5 million civil penalty. The company committed to reducing SO₂ emissions by 95% and NOX emissions by 90%.

To meet more stringent emissions rules in Norway, Hydro will close more than 50,000 t/y of Soderberg capacity at Aardal and 20,000 t/y at Hoeyanger by 2006, and 120,000 t/y at Karmøy by the end of 2009.

Recycling rates for used beverage cans have been moving in different directions around the world. In Brazil, the rate reached 85% in 2002 without any government incentives. This was only slightly higher than the 83% achieved in Japan. But in the US, the rate fell to a disappointing 53.4% in 2002, down from 55.4% in 2001, 52.1% in 2000 and a record 66.5% in 1997. The Danish Government finally bowed to pressure from the European Union and ended its ban on beverage cans. With a DK1.50 deposit, it is estimated Denmark will use 200-300 million aluminium cans per year. At the beginning of 2003, Germany introduced a deposit system on beverage cans (€0.25 on single-serve containers) that required consumers to *keep the receipt and return the empty cans back to the same store for reimbursement*. Many stores responded by halting the sale of beverages in cans and sales plummeted. A

nation-wide refund system is to be in place in October. In the longer-term, aluminium's higher recycling value should see a shift away from steel cans.

Aluminium also played a small role in the conflict with Iraq. The US said that Iraq had acquired specialised, heavy-gauge aluminium tubing for use in a centrifuge to extract weapons-grade uranium. The Iraqis claimed that the tubing was only for missiles.

Mergers, acquisitions, privatisations and restructuring

The size of aluminium mergers generally declined in 2002 while the scale of bankruptcies increased. The largest successful acquisition occurred early in the year when Germany's E.ON (formed in 1999 after the merger of utility conglomerates Veba and Viag) agreed to sell VAW to Norsk Hydro for €3.1 billion. This created the third largest Western aluminium producer and the largest in Europe. Alcan took them to court over pre-emptive rights at the giant 50:50 owned Norf rolling mill but this was resolved in a deal late in the year in which Hydro sold the VAW flexible packaging unit to Alcan for €345 million. Hydro also completed the acquisition of Technal to become a leader in building systems.

Imco Recycling, exercised its rights to acquire VAW's 50% stake in VAW-Imco Guss und Recycling GmbH and bought the 45,000 t/y aluminium recycling plant at Pindamonhangaba in Sao Paulo State, Brazil, along with a long-term tolling agreement with Alcan's rolling mill. Alcan also sold its Italian circles unit at Pieve Emanuele to Spain's Aliberico SA.

One smelter that saw big changes in its ownership was Alouette. Alcan bought two portions of the 243,000 t/y capacity smelter. Early in the year, it bought the 20% held by the Québec Government's Société Générale de Financement (SGF) for US\$165 million. Later, Alcan bought another 20% stake from Corus. In between, SGF re-acquired a 13.33% stake in the smelter from Kobe Steel.

In Scandinavia, Elkem was busy as both a take-over target and an acquirer in 2002. Early in the year, Alcoa was required under Oslo bourse rules to make a buyout bid for the rest of Elkem after boosting its shareholding to more than 40%. However, only 0.1% of the shares were tendered when the Elkem board rejected Alcoa's bid at the minimum price of NK155 per share. Alcoa said it was not seeking to increase its stake further but then made a surprise raid in September, boosting its stake to over 46% and offering to buy a further 7.1% at NK175 per share. Elkem's board again rejected the bid and Norway's Orkla was able to fend off Alcoa. Orkla, however, was forced to sell some shares in February 2003 to get under the 40% threshold after the Oslo bourse determined that it had been acting in concert with a Norwegian investment group.

But Elkem was not only winning the battle to remain independent. The company itself was required to make a compulsory take-over bid for Sapa after raising its stake in the Swedish producer of aluminium profiles and strip to 42%. Elkem ended up with a controlling 71.4% stake. Sapa, in turn,

acquired Pressweld Ltd, a UK designer and manufacturer of extruded aluminium components (mainly for automotive), and was in talks to purchase Remi Claeys Aluminium, a Belgian producer of aluminium profiles and welded tubes. In January 2003, Elkem gained 97.2% of Icelandic Alloys through a take-over bid.

While Alcoa was unsuccessful in its repeated take-over attempts for Elkem, it did make some smaller acquisitions. It completed the purchase of South Korea's Dooray Air Metal Co., a producer of hard alloy extrusions, rod, bar and tubes for industrial, transportation, defence and aerospace markets. Alcoa also bought out its minority partners in Shibasaki Seisakusho, a Japanese maker of plastic and aluminium caps, and purchased the manufacturing equipment from Michigan Avenue Partners' bankrupt Scottsboro Aluminum. Finally, Alcoa bought Fairchild's aluminium aerospace-fastener unit for US\$657 million.

Pechiney's story was similar to Alcoa's: small acquisitions and a large failure. They did acquire the German specialty aluminium group Alufin and the equipment from another bankrupt MAP subsidiary, McCook Metals (which it planned to move to its Ravenswood rolling mill). After having the anti-trust authorities reject the planned mega-merger with Alcan and Alusuisse in 2000, and losing out to Alcan for VAW's packaging unit, Pechiney agreed to buy the former Hoogovens downstream aluminium assets from Corus for €750 million. Included were mills at Koblenz, Bonn, Bitterfeld and Vogt in Germany, at Duffel in Belgium, and its interests in plants at Cap-de-la-Madeleine in Canada and Tianjin in China.

The deal would have made Pechiney the third-largest aluminium rolling company behind Alcan and Alcoa, and of equal size with Alcoa in the aerospace market. Initially, the only real concern was with the EU anti-trust authorities, and there was a contingency plan for Corus to buy back the Koblenz rolling mill. But in the end it was national interests that scuttled the deal. In 1999, British Steel had merged with the Dutch steel and aluminium group Hoogovens to form Corus. But despite restructuring, the UK plants continued to bleed red ink while parts of the Dutch division remained profitable. The Dutch were upset that funds from the sale of the former Hoogovens Aluminium would be used to finance losses in the UK rather than remaining in the Netherlands, so the Dutch Supervisory Board vetoed the sale. Corus remained in a precarious financial condition after an earlier merger with Brazilian steelmaker Companhia Siderurgica Nacional fell through. Early in 2002, Pechiney's ties with the French Government were further loosened as Electricité de France sold its 7.75% stake in Pechiney.

In a surprising move, Glencore bought the bankrupt Vanalco smelter for US\$24 million. This high-cost 115,000 t/y capacity smelter is the oldest in the US Pacific Northwest, built in 1940. Alcoa closed it in 1986 but it was sold and restarted in the late 1980s before being closed again in 2000.

Kobe Steel of Japan wants to sell many of its minority holdings in aluminium and alumina companies. It sold its 9.5% stake in Australia's Boyne Island

smelter to Rio Tinto for US\$78.5 million, and its 13.33% stake in the Alouette smelter (as mentioned above). But its 4% stake in CVG's Venalum smelter in Venezuela and 1.8% stake in Nippon Amazon Aluminium Co. Ltd in Brazil (which holds 49% of the Albras smelter) proved more difficult to sell.

In 2001, the government of India sold off Bharat Aluminium (Balco) to Sterlite, but not without numerous protests, damaging strikes and political and legal challenges. The privatisation of the larger and more profitable Nalco has not gone much better. Advisors were finally appointed in June 2002 and 15 companies expressed interest before the September deadline. But on September 23, workers at Nalco joined in a 12-hour Orissa state-wide strike over the privatisation. Then, in October, the due diligence stage was suspended after a team from Hindalco was heckled, its vehicles damaged and its inspection of the Angul smelter prevented. Due diligence was to restart in early 2003.

The governments of Eastern Europe continued efforts to divest their aluminium businesses. Romania sold off controlling stakes in both its profitable Slatina smelter and Alprom rolling mill, though not without difficulties and controversy. Prior to the smelter sell-off, US-based Marco International and its affiliate Conef SA bought up almost 42% of Alro on the open market. Then, for each privatisation, there were lengthy delays during which all of the other prospective buyers withdrew, leaving the privatisation agency to negotiate only with Marco. For Alro, Marco bought a 10% stake for US\$11.4 million and then invested a further US\$73 million to take its holding to 78%. The Bank of America cleared the sale after reviewing it for the government. Marco bought the government's 70% holding in Alprom for US\$13.9 million. Hungary's Magyar Aluminium sold aluminium foil producer Kobal Kobanya light metal works to holding company Kobal Invest, which reportedly had links to offshore Russian investors. In 2003, a Magyar subsidiary also bought the remaining 60% of Slovenia's Alusil from Germany's Mineralmuehle.

There was little progress in the countries that used to make up Yugoslavia. In January 2002 (as Glencore's management contract ended), Montenegro's privatisation council said it was preparing for a March sell-off of 65.53% of Kombinat Aluminijuma Podgorica (KAP). Later the government said that US\$30 million of investment would be required in the 280,000 t/y refinery, US\$60 million in the 116,000 t/y smelter and US\$17-27 million for downstream operations over the next five years. Serbia's privatisation agency said two firms were interested in buying Seval, with its 45,000 t/y foundry, 100,000 t/y hot-rolling mill and 30,000 t/y cold-rolling mill. Croatia planned a tender for 78.33% out of the government's 87.75% stake in TLM, which has a long-closed smelter, a rolling mill, an extrusion plant and a foil plant. Slovenia said it had three bidders for its 85.7% stake in the Talum smelter, whose capacity was being raised to 117,000 t/y from 75,000 t/y. There was no word on the successful completion of any of these sell-offs.

In Bosnia there were disputes over both the Mostar smelter in the Muslim-Croat federation (the nearby refinery was destroyed in the civil war) and the Birac refinery (within the Serb region). In the 1990s, 64% of the shares in

Mostar had been given to employees in lieu of unpaid wages and 12% to Croatia's TLM which invested US\$9 million to make repairs and restore production in 1997. The government says those share sales were illegal and is looking for a US\$250 million investment for a second 110,000 t/y potline. A controlling 63.8% stake in the mothballed 900,000 t/y Birac refinery was sold for 10.25 million marka (US\$5 million) in 2001 to Lithuania's Ukio Bank, which also agreed to invest a further 56 million marka. However, Ukio claimed that the unpaid debts and overall financial situation were much worse than stated by the Bosnia Serb Republic's Privatisation Directorate. The situation was apparently resolved in February 2003.

In recent years, there have been numerous bankruptcies amongst secondary producers and a few fabricators. But last year, one of the best known, integrated producers, Kaiser Aluminum, filed for Chapter 11. Henry Kaiser founded the company shortly after the Second World War but it has suffered a litany of woes in recent years. It tried to diversify into chemicals in the late 1970s but got into financial difficulties and was acquired by Maxxam in the late 1980s. With a heavy debt load, Kaiser began selling off assets. A two-year strike and lockout using replacement workers at its US plants began in September 2000 and soured its labour and political relations. Its large Gramercy refinery, in Louisiana, exploded in 1999; and in the year 2000, soaring power costs in the Pacific Northwest led Kaiser to close its Tacoma and Mead smelters. Re-selling its contracted power to third parties got Kaiser into trouble with the BPA but kept the company afloat for a while. Its Tema smelter in Ghana has also suffered from frequent power curtailments. Aerospace was very important for its Trentwood rolling mill in Washington, but that market collapsed after 9-11.

So, after trying unsuccessfully to restructure about US\$800 million of debt, Kaiser filed for bankruptcy in February 2002 with US\$3.3 billion in assets and US\$3.1 billion in liabilities. Excluded from the filing were most of Kaiser's more attractive non-US assets:

- 65% of the Jamaican Alpart refinery;
- 49% of Jamaica Bauxite Co.;
- 90% of the Valco smelter in Ghana;
- 49% of the Anglesey smelter in the UK;
- 20% of Queensland Alumina; and
- Canadian extrusion plant.

With bankruptcy court approval, Kaiser subsequently sold some coating line assets to Alcoa for US\$15.9 million, an office complex in Oakland, California, for US\$65.6 million, and its Oxnard, California, forging plant to Aluminum Precision Products for US\$7.4 million. Nine more subsidiaries were put under Chapter 11 in early 2003 when Kaiser could not meet its pension funding requirements.

Other changes include:

- Furukawa Electric and Sky Aluminium merged in a new joint venture with 30% of Japan's flat-rolled aluminium market;

- Malaysia's Chin Foh group acquired 85% of Alcom Extrusion Sdn Bhd for US\$3.1 million from Alcan Nikkei Asia;
- Vale do Rio Doce Aluminio (Aluvale) paid Mineracao do Rio do Norte US\$41.6 million for 12.6% of the Alumina do Norte do Brasil (Alunorte) refinery, taking its stake to 57%;
- WMC completed the demerger of its alumina/aluminium business as Alumina Limited in response to Alcoa's earlier hostile take-over bid;
- Reliance Steel & Aluminum Co. agreed to purchase the aluminium processing and distribution business in the Pacific Northwest from Metals USA which later emerged from bankruptcy;
- Wabash acquired Culp Aluminum Alloys of Steele Alabama from Leggett & Platt;
- Rexam completed the sale of its beverage can plant in Gelsenkirchen Germany for €65 million; and
- Ball Corp. bought German beverage can-maker Schmalback-Lubeca from Allianz for €900 million.

Secondary, fabricating and downstream investments

There has been a significant shift in the secondary market. After being debated for several years, a 'scrap gap' developed in the EMECs between the demand for scrap and its availability. Part of the explanation is the increasing penetration of aluminium in automobiles. In comparison to the cars of 10-15 years ago now being scrapped and recycled, there are far more cars being produced today and each car has a far higher aluminium content. A second cause is the higher usage of scrap in the production of semis including sheet and extrusions. On the supply side (as noted earlier), the US recycling rate for used beverage cans has tumbled, with the loss of more than 100,000 t in recent years. Also, less mill process scrap was generated due to the economic slowdown. Finally, scrap exports from Russia have been slashed and imports into China have been high. As a result, the price for A380 automotive secondary alloy in the US moved well above that of P1020 (from its usual discount) and the discount for scrap off P1020 slid to its lowest level in years. Western Europe has also experienced problems with the cost and availability of scrap.

With the economic slowdown, there were fewer investments in the secondary and downstream sectors, and more closures. Hydro Aluminium has been active in recent years building plants to produce primary-quality extrusion billet from scrap. Following the 90,000 t/y remelt plant at Henderson, Kentucky in 2001, it completed a twin plant at Commerce, Texas, and a 60,000 t/y plant near Madrid last year. Hydro is also adding a new unit for hardened aluminium strip alloy at Grevenbroich and is investing €76 million in its German auto parts subsidiary Dillingen to produce a new type of aluminium engine block for diesel engines. These two latter plants were acquired with VAW.

Alcan has been active downstream. In Brazil, after acquiring the operations of Alcotex Tecnologia, it converted the plant at Camaracari in Bahia state to produce composite aluminium building panels in a joint venture with the NJK Group. Alcan is also investing US\$20 million to convert some of the capacity

at the Pinda rolling mill to produce cansheet for food cans. At Singen in Germany, Alcan plans at least a doubling of its automotive aluminium components output by building three plants by 2005.

In Asia, Taiwan's China Steel Aluminium Corp. unveiled plans to boost capacity at its Kaohsiung rolling mill from 110,000 t to 170,000 t/y in order to feed a planned foil mill at Ningbo in China. In a US\$110-120 million joint venture called Emiroil, Pechiney, Dubai Investments and Al-Ghurair plan to build a 33,000 t/y capacity thin aluminium-sheet rolling mill in Dubai.

There are a couple of investments in Eastern Europe to supply Japanese carmakers. Mitsubishi announced an aluminium processing plant at Varpalota in Hungary and Sumitomo is to build a plant at Sumikei, near Prague. The latter will produce extruded aluminium tubes for car air-conditioners.

In North America, Superior Industries plans to boost its aluminium wheel capacity at Pittsburg in Kansas and Fayetteville in Arkansas by 25% over two years. UBE Automotive built a US\$120 million high-pressure, die-casting plant to produce 1.28 million aluminium wheels per year. Assured Castings Corp., a member of Leggett & Platt Aluminum Group, planned a 40% expansion at its Rogersville, Tennessee, diecasting operation, and Superior Aluminum Alloys was expanding its New Haven smelter in Indiana by adding a fourth 26,000 t/y furnace, taking capacity to 90,000 t/y.

There were many plant closures either carried out or announced, including:

- Wabash Alloys' Syracuse, New York and Benton, Arkansas secondary plants;
- Hydro's Moultrie Georgia extrusion and anodising plant;
- Alcoa's Kawneer architectural aluminium plant at Jonesboro and its extrusion plant at Swansea in Wales;
- the 81-year-old Cradley Castings in the West Midlands, UK;
- Pechiney's Aubagne extrusion plant near Marseille and Provins packaging plant at Avallon; and
- Alcan's Banbury research centre and one of two cold mills at its Fairmont light-gauge rolling mill.

There were some promising downstream developments, particularly in transportation. Nippon Light Metal and Sumitomo Light Metal Industries jointly developed a new aluminium casting technology for car hoods. To eliminate air bubbles, the mould is first vacuumed and then a small amount of oxygen is injected before the metal. At the Paris Auto Show, Jaguar introduced its new XJ sedan, the first volume production vehicle with an aluminium sheet unibody structure.

The Aluminium Association reported that the average 2002 North American light vehicle contained 124 kg of aluminium, up from 114 kg in 1999. Although the US Congress quashed a proposed large increase in Corporate Average Fuel Economy (CAFE) standards (especially for light trucks including the popular sport utility vehicles), California countered with a bill capping greenhouse gas levels produced by automobiles. Alcoa was active in R&D for

the aerospace market. In the wake of 9-11, with Aviation Equipment Inc., it developed the 'Fortress' cockpit door from Alcoa 2519 ballistic aluminium and composite armour laminates. Alcoa also developed three new advanced alloys for use in Airbus' A380 super-jumbo jetliner.

In packaging, Alcoa introduced Reynolds Wrap Release Non-Stick aluminium foil with a special non-stick surface, 55 years after the invention of aluminium foil. There was also a development in beverage cans. Daiwa's recloseable 'New Bottle Can' proved quite popular in Japan, and Ball Corp. won the right to sell and distribute it in North America.

Alumina, bauxite and other raw materials

The situation for alumina was quite stable through most of 2002 but changed markedly late in the year and into 2003. Metallurgical supply slightly exceeded demand through the first three quarters of the year and spot prices (fob Australia) remained between US\$140 and US\$160/t. However, late in 2002 there were production problems that reduced supply at the huge QAL and Worsley refineries in Australia, at Bauxilum in Venezuela and at Paranam in Suriname. Bauxilum suffered from a shortage of natural gas due to the national strike and the others were hit by power outages.

Meanwhile, soaring Chinese aluminium production (and a reduction in Chinese alumina import tariffs to 10% from 12%) moved the market into deficit and caused prices to double. From around US\$140/t in October 2002, alumina prices rose to US\$170/t by early December, US\$185/t in early January 2003, and as high as US\$280/t in March 2003. As a result, Alcoa World Alumina and Chemicals (AWAC) planned to bring its Point Comfort refinery back to full 2.3 Mt/y capacity by mid-year after operating it at around 1.7 Mt/y. AWAC, owned 60% by Alcoa and 40% by Alumina Ltd (formerly WMC), is by far the largest alumina producer in the world.

For a while last year it looked as though AWAC would have to cut output in Australia. It was ordered to reduce emissions at its 2.35-Mt/y Wagerup refinery or cut production by 150,000 t/y. In the event, it managed to complete the installation of emission equipment at Wagerup, Pinjarra and Kwinana before the June 30 deadline. Almost a third of the world's alumina is produced in Australia and it is the most attractive place for expansions. In January 2002, Comalco began work on its A\$1.4 billion, 1.4 Mt/y greenfield refinery project at Gladstone. Bauxite is to be supplied from the Weipa deposit and first production is targeted for the March quarter of 2005. Much of the output is destined for Comalco's Bell Bay and Tiwai Point smelters. Subsequent project phases could lift output to 4.0 Mt/y. Elsewhere in Australia, BHP Billiton is aiming to boost output at the Worsley refinery by 600,000 t/y to 3.7 Mt/y by 2008, and Alcan is studying a 75% expansion at its Gove refinery.

The world's richest bauxite deposits are found in Guinea but the political and legal situation has deterred investment over the years. Guinea's parliament ratified a deal giving Russian Aluminium (RusAl) the concession to develop the Dian-Dian deposit, even though Compagnie Bauxite de la Guinée (CBG) claimed a right of first refusal. In the first phase, RusAl planned a 6.62 Mt/y

bauxite mine, a 1.2 Mt/y refinery, a power station and a 117 km rail link; a second phase would raise bauxite output to 12.0 Mt/y and alumina to 2.4 Mt/y; and a 240,000 t/y smelter would be considered in a final phase. RusAl was looking to raise US\$2.4 billion for the project. Early in 2003, it purchased most of Guinea Alumina Co. and, in a deal with Alcoa's Reynolds Metals, hoped to raise output at Fria Kimbo to 1.2 Mt/y from 700,000 t/y. Boké Alumina Corp.'s Guinea Aluminium Products Corp. (Gapco), a consortium including Mitsubishi and Marubeni was planning a new US\$2.2 billion, 2.6 Mt/y alumina project using slightly lower-grade bauxite from CBG's Boké operations.

Historically, Jamaica has been an important producer of bauxite and alumina, though the industry has declined in recent decades. But last year, it rebounded to the highest level in 29 years with bauxite production of 13.12 Mt (up 6.1%) and alumina output of 3.63 Mt (up 2.5%). At Jamalco's 1.0 Mt/y Clarendon refinery (AWAC 50%, Jamaican Government 50%), production was restarted in January 2002 after being closed by a wildcat strike the previous October. One sore point with producers has been the 29-year-old bauxite levy, which was set at US\$5/t plus a US\$0.50/t royalty. After negotiations, the government agreed to remove the levy from Jamalco beginning in 2003 in return for an investment of US\$115 million to modernise the refinery and boost output by 25%. At the Alpart refinery (Kaiser 65%, Norsk Hydro 35%), a US\$21 million investment will boost output to 1.65 Mt/y by the end of 2003 from 1.45 Mt/y.

South America is also an important source of bauxite and alumina. After lengthy negotiations, Pechiney agreed to a US\$210-230 million deal in Venezuela with CVG's Bauxilum. Pechiney will increase refinery output and be repaid in alumina. There was also talk that BHP Billiton, Glencore, Pechiney and others were interested in a bauxite-alumina-aluminium and iron ore project in southeastern Venezuela. In nearby Suriname, Alcoa and BHP Billiton decided to work even more closely together. They extended their 55:45 joint venture beyond 2006, planned to boost output at the Paranam refinery by 250,000 t/y, and obtained permission for two years of studies in the western Bakhuis area. BHP Billiton will try to prove bauxite reserves of at least 300 Mt for a refinery, and Alcoa will look into the feasibility of a smelter and hydro dam. In Brazil, Alunorte (CVRD 57%, Norsk Hydro 32%, a Japanese consortium 7%, and Cia Brasileira de Alumínio 4%) completed the US\$300 million expansion of its refinery to 2.4 Mt/y in early 2003 from 1.6 Mt/y. CVRD said that a further expansion of 0.9-1.8 Mt/y could be implemented at a cost of only US\$400/t. Minercao Rio de Norte's (MRN) Trombetas bauxite mine is expected to reach its full 16.3 Mt/y rate in 2005 from 11 Mt/y.

India is also blessed with large bauxite deposits though many projects have faced opposition from local residents, environmentalists and rebel groups. By 2004, Hindalco expects to complete the expansion at its Renukoot refinery to 660,000 t/y from 450,000 t/y. But the company had to suspend work at its Gurdari bauxite mine in Jharkhand and its Samri mine in Chattisgarh after equipment was vandalised. The Maoist People's War Group was suspected. Local opposition has also caused lengthy delays in the planned US\$1.0 billion

Utkal project and led to Norsk Hydro's withdrawal. There was talk of refinery and smelter projects in the Kutch district but high power costs were a deterrent.

Iran Aluminium Co.'s troubled Jajarm refinery finally started up last year using imported Indian bauxite. Originally scheduled to begin operation in 1998 using nearby bauxite reserves, it reached 150,000 t/y by the end of 2002 with plans for 400,000 t/y by 2005.

The market for specialty chemical-grade alumina has been difficult. After failing to find a buyer, Alcan closed its 100,000 t/y refinery at Burntisland in Scotland. Norsk Hydro announced plans to sell its 50% interest in the 800,000 t/y Stade chemical-grade refinery in Germany.

Carbon, in such forms as petroleum coke and graphite, is a major raw material used in smelter anodes and cathodes. Aluminium Bahrain commissioned a US\$400 million, 450,000 t/y petroleum coke calcining plant last year. At Aardal in Norway, Norsk Hydro is to invest NK560 million to raise output of prebaked carbon anodes to 210,000 t/y by 2004 from 160,000 t/y.

The Commonwealth of Independent States

Consolidation appears to have brought the Russian aluminium industry almost full circle. Until the 1990s, all the aluminium assets were owned by the communist state. When the Soviet Union broke up, aluminium was one of the few industries that was profitable and had hard currency earnings (that could be invested offshore). Groups fought, often violently, for control of each of the plants in what was sarcastically dubbed the 'Great Patriotic Aluminium War'. But through a series of mergers and take-overs, virtually all of the aluminium industry is now in the hands of two integrated producers: Russian Aluminium (RusAl) and SUAL Holdings.

SUAL (owned over 90% by the US-Russian joint venture Renova) was the more acquisitive in 2002. First, it took control of the Nadvoitsky smelter. The deal allowed it to manage the 23% holding of Nadvoitsky chairman Anatolii Bezrukov (and have a right of first refusal for its sale), in addition to its own 37% stake. In a surprise move in October, RusAl snapped up a 32% stake in Nadvoitsky from private shareholders but was bought out by SUAL early in 2003. Meanwhile, the Volgograd and Volkhov smelters and the Pikalyovo refinery in northwestern Russia had been merged with two pulp and paper plants as Sevzapprom. Then, in December, Sevzapprom's aluminium assets were merged with SUAL. Finally, in January 2003, it was announced that Fleming Family and Partners of the UK would be taking a 23% stake in a new entity formed by the merger of SUAL with FF&P's Cuban ferronickel and Mozambiquan tantalum projects, as well as coal mining assets in Kazakhstan. Chris Norval, from BHP Billiton, was nominated to head the new entity. SUAL's other main focus was on a project at the Sredni Timan bauxite deposit in Russia's Komi Republic. It announced plans to close its South Urals bauxite mine, which had been in operation since 1936, as reserves were depleted. To replace this, SUAL plans to increase production at Sredni Timan to 950,000 t this year from 730,000 t in 2002. In September, SUAL opened up a 158-km

rail line connecting Sredni Timan to the national network. It was the first private rail line opened in Russia since the 19th century. Canada's Hatch Associates was engaged to do a prefeasibility study for a US\$1.7-2.0 billion project involving a 1-1.4 Mt/y refinery and a 330,000-500,000 t/y smelter. If the project is viable, Pechiney will take a stake and provide technology. Within the next few years, SUAL also hopes to expand the Irkutsk smelter to 490,000 t/y from 272,000 t/y currently.

RusAl is a large integrated aluminium company with 68,000 employees and a turnover of US\$4 billion. It is trying to transform itself into a more Western-style organisation, though still controlled by two of the most secretive Russian oligarchs: Oleg Deripaska and Roman Abramovich. RusAl has appointed executives from Western aluminium companies to several key posts. Duncan Hedditch from Comalco became director of Krasnoyarsk (KrAZ), Marie-Jose Neulandt became personnel director, Frank Ferago from Alcan is responsible for the proposed Sayansk expansion after being deputy production director at KrAZ, and Steve Hodgson from Comalco was made director of sales and marketing.

In the legal and political realms, RusAl had both gains and losses, many in connection with the 2000 take-over of the bankrupt Novokuznetsk smelter. The former director of Novokuznetsk had filed a US\$360 million damages claim but in early 2003 the Swedish arbitrator ruled in RusAl's favour. Also, a New York judge dismissed the US\$2.7 billion racketeering case brought by Base Metal Trading and others against Rusal, ruling that Russia was the proper legal jurisdiction. As a small consolation, another arbitrator awarded US\$846,000 to Base Metal Trading because RusAl's Bauxal failed to deliver 100,000 t of alumina to Novokuznetsk in early 2000. The former head of the Krasnoyarsk smelter, Anatoly Bykov, was given a six and a half year suspended sentence for ordering the murder of a business competitor and then freed from jail after having served 20 months.

The biggest setback for RusAl may have been political. In the Krasnoyarsk gubernatorial election, the candidate backed by RusAl lost to the one backed by Norilsk, although the results were initially invalidated over irregularities said to include pressuring, bribing and misleading voters. After the election it was reported that the Krasnoyarsk smelter had been paying less than 10% of the state's budget while Norilsk had been paying 60%.

RusAl has talked about either an Initial Public Offering, a US\$200-300 million Eurobond issue or merging with the aluminium assets of a Western company such as Rio Tinto, BHP Billiton, Kaiser or Nalco. Any of these steps would necessitate opening up financial records to public scrutiny. By 2012, RusAl said it wants to be the world's largest aluminium producer. Some of the projects under consideration:

- the expansion of Sayansk to 600,000-660,000 t/y from 400,000 t/y;
- a US\$1.2 billion, 500,000 t/y greenfield smelter in the Irkutsk region;

- a US\$330 million, 250,000 t/y smelter outside Taishet in Irkutsk, in conjunction with Alyukom-Taishet (stalled by a quarrel with Irkutskenergo over power prices); and
- a 300,000 t/y smelter near Murmansk.

It should be noted that, aside from the 11,200 t/y experimental project at Taishet, no greenfield smelter has been built in Russia since Sayansk in the mid-1980s. To further these projects, RusAl made a US\$10 million investment in UES' planned 3,000 MW Boguchanskaya hydroelectric power station, was looking at the Bureskaya project and met with atomic energy producer Rosenenergoatom and the Murmansk authorities. RusAl also wanted to merge the Irkutskenergo utility (in which it has a 30% stake and SUAL 10%) with the Krasnoyarsk hydroelectric station in which it has a controlling stake. The government is unlikely to allow this. RusAl signed a ten-year deal under which Hydro Aluminium will upgrade the casthouse at Sayansk (increasing the billet capacity by 80,000 t/y initially and eventually by 160,000 t/y). In return, Sayansk will supply high-quality billets to Hydro.

Downstream, RusAl was planning a US\$70 million plant at Vsevolozhsk near St Petersburg capable of producing 1.7 billion cans per year; bought Siemens equipment to upgrade its Samara rolling mill; and signed a long-term deal to supply non-stick cookware to IKEA.

In the other CIS nations, production is generally rising (Table 5) but privatisations have stalled. RusAl subsidiary Ukrainian Aluminium, boosted its stake in the Nikolayev alumina refinery to 91% by buying the government's remaining 10% stake for US\$11.4 million. As part of the deal to buy a controlling stake in Nikolayev in 2000, RusAl had committed to building a new smelter in Ukraine. In April 2002, Ukraine said it would not force RusAl to honour its commitment at the time because of falling aluminium prices. But late in the year, RusAl's Ukrainian Aluminium said it would begin construction on a US\$300 million, 122,000 t/y smelter in 2003. Ukraine's leading producer of aluminium alloys, SP Intersplav, suspended output in early 2003 after producing 37,000 t in 2002 and 67,300 t in 2001. It said that the Ukrainian Government had failed to refund US\$4.15 million of VAT on exports.

Kazakhstan's planned sale of a 31.6% stake in Alyumini Kazakhstan and its 1.4 Mt/y refinery was repeatedly announced and then cancelled for lack of bidders. The latest tender would have required the building of a US\$800 million, 240,000 t/y smelter (of which 60,000 t/y would have to be operating by 2007) but was cancelled when only one bid was received. Kazakhstan also expressed an interest in acquiring Tajikistan's Tursunzade smelter. Though it has nameplate capacity of 517,000 t/y, output at the smelter peaked at 416,000 t in 1989 before the break-up of the Soviet Union and civil unrest reduced production to less than 200,000 t/y in the late 1990s. By 2002, output was back to 309,000 t of which 305,000 t was exported. In Azerbaijan, the 120,000 t/y Sumgait smelter had been idled since 1999, but was restarted in January 2003 after repairs by the Dutch company Fondel Metal. It expects to produce 29,000 t in 2003.

China

Growth in the Chinese aluminium industry has been nothing short of phenomenal. Early in 2002 it had been forecast that China's primary production would rise by between 12% and 18% during the year. In reality, it was up by close to 30% or 1.0 Mt. Fortunately for the global market, Chinese consumption also increased much more than expected, at close to 20%. In fact, starting in August, an aluminium shortage developed in China. Domestic prices rose and a backwardation occurred on the Shanghai exchange. Some smelters reportedly delayed shipments and failed to deliver on their contracts with Western traders. Owing to the shortage (and to avoid alumina import duties through tolling), China re-imported its own metal. For the year 2002, over half of China's primary imports were from...China!

It would take several pages to discuss all the projects planned or under way in China. Indeed, if all planned smelter projects are completed, Chinese capacity will exceed 6 Mt/y by 2005. The State Economic and Trade Commission has warned about overproduction of aluminium and sought to have all aluminium projects strictly scrutinised and only approved by the central government. But although Beijing tried to rein in the uncontrolled growth, the provinces and municipalities were trying to increase employment and tax revenues. So, instead of closing, most of the tiny and highly-polluting Soderberg smelters were launching large prebake expansions.

Why are there so many expansions in China? It is not due to lower operating costs. Though labour is very inexpensive, this is more than offset by higher power and alumina costs. The major incentive is on the capital side. A typical greenfield project in the West costs between US\$3,000/t and US\$4,000/t, but in China the capital costs are typically about US\$1,500/t. Some of this may be due to lower environmental requirements. Much of the financing is provided through interest-free government loans so there is often little thought of making a return on investment. Also, Chinese greenfield projects are implemented more quickly than those in the West.

Most of the major western aluminium companies have looked at opportunities in China and a few have signed memorandums. In late 2001, Alcoa bought an 8% stake in Chalco and agreed to pursue a 50-year joint venture with Pingguo. The details were to have been finalised by the end of 2002, but were postponed until mid-2003. Alcoa was also upgrading the Bohai rolling mill in which it has a 35% stake. In June, Alcan reached an agreement in principle to set up a 50:50 joint venture with Qingtongxia Aluminium (QTX) in the Ningxia Autonomous Region.

The accord would see Alcan invest in QTX's existing 130,000 t/y prebake line and optionally in a 150,000 t/y expansion (but not the older 110,000 t/y Soderberg line). Finally, Pechiney signed a letter of intent with Lanzhou Aluminium in Gansu Province for a 51:49 joint venture. The French company will conduct a prefeasibility study in 2003 to build a 260,000 t/y smelter and a 600 MW power plant.

As China increased its exports, (Table 6) and moved from being a net importer to a net exporter, it was able to make inroads in South Korea and, to a lesser extent, Japan. Metal quality is less of an issue as several Chinese producers are LME-certified, but there were concerns about delivery reliability. In the early part of 2003, escalating alumina prices and some regional power shortages were threatening some Chinese smelters.

Markets, trading and websites

On the LME, aluminium holdings were highly concentrated in 2002. For much of the year, two entities held over half of the warrants between them. Yet it was only late in the year and in early 2003 that a squeeze was engineered and the contango disappeared. To address these concerns, from November 1 2002 the LME lowered the thresholds above which participants must report large positions, from 1,000 lots to 100 lots. Starting in October, LME futures contracts were traded out to 63 months from the 27 months previously. This was an important step in providing price transparency, efficiency and hedging for the longer term. Outside the LME, one of the few remaining online metals trading platforms, EMETRA, closed because of a lack of activity.

Most of the news concerned secondary aluminium. The LME has had its aluminium alloy contract for a decade but the specifications were suited to European requirements. So, in March 2002, the LME launched the new North American aluminium alloy contract (NASAAC). It experienced some early problems with low volumes and large backwardations, and generated some quarrels late in the year. One controversy was over including T-bars and large sows in the specifications. Secondary prices rose strongly in 2002 and the spread vis-à-vis P1020 reached a premium of over US\$0.10/lb (versus the normal US\$0.03-0.05/lb discount). This led Alcoa and Alcan to register brands from their primary smelters and deliver under the contract. Some diecasters were upset because they are unable to use alloy in the large formats, and secondary smelters didn't like the competition. Wabash Alloys threatened to withdraw its support from the contract. Then Ford (and later GM) changed their cost price formulae for A380 alloy material to use the NASAAC contract price. Diecasters said this would lower prices by over US\$0.01/lb and some refused to ship under the new formula.

Outlook

Although the world economic situation deteriorated in early 2003, with consumer and business sentiment adversely affected by the Iraq situation, aluminium demand held up remarkably well. Apparent primary shipments in the first two months of the year were running about 6% above year-earlier levels. Meanwhile, about 275,000 t/y of primary capacity was idled in the first quarter of this year. Power shortages and the sharp escalation in alumina prices could close more capacity or slow expansions in other regions, particularly China.

LME inventories rose during the price backwardation in February and March, but afterwards started falling again as the number of cancelled warrants soared. So the picture appeared bright. However, aluminium demand is closely tied to overall industrial production. With over 1.1 Mt/y of brownfield

expansions coming on stream in the EMECs in 2003 and 2004, and even more in China, it will require a strong economic recovery to avoid more surpluses. The price is not expected to vary much from the US\$1,364/t average in 2002.

Tables next page.

Table 1. EMEC Primary Metal Balance (Mt)

	1999	2000	2001	2002
Primary Capacity	17.94	18.28	18.95	19.36
Operating Rate	94.5%	94.9%	88.0%	89.0%
Primary Production	16.95	17.35	16.67	17.23
Net Former East Bloc Flow	2.65	2.40	2.70	2.75
Primary Supply	19.60	19.75	19.37	19.98
Primary Shipments	19.51	20.18	18.92	19.57
Reported Unwrought Inventory Change	+0.09	-0.44	+0.45	+0.41

Sources: IAI, LME, Nymex/Comex, Alcan estimates.

Table 2. Consumption

	Change 2001/00	2001 Mt	Change 2002/01	2002e Mt	Total Share
North America	-11.3%	9.60	+4.4%	10.02	35.3%
Latin America	+3.2%	1.58	-3.4%	1.52	5.4%
Western Europe	-1.1%	8.61	+0.7%	8.67	30.5%
Asia	-4.6%	7.03	+3.5%	7.27	25.6%
Africa & Oceania	+4.0%	0.92	+0.9%	0.93	3.3%
Total EMECs	-5.3%	27.73	+2.5%	28.42	100.0%

Source: Alcan estimates, may not add due to rounding. e: estimate.

Table 3. EMECs Consumption

	Change 2001/00	2001 Mt	Change 2002/01	2002e Mt
Building and Construction	-5.7%	4.97	+1.4%	5.04
Transportation	-7.8%	8.10	+5.2%	8.53
Consumer Durables	-8.6%	1.66	+0.4%	1.67
Machinery and Equipment	-8.5%	2.38	+0.5%	2.39
Electrical	-7.1%	2.41	+1.1%	2.44
Cans	0.0%	3.49	-0.5%	3.47
Other Packaging	-0.6%	1.46	+2.6%	1.50
Other	-0.1%	3.25	+3.9%	3.38

e: estimate.

Table 4. Production

	2000 Mt	Change 2000/01	2001 Mt	Change 2001/02	2002 Mt
North America	6.04	-13.6%	5.22	+3.7%	5.41
Latin America	2.17	-8.1%	1.99	+12.0%	2.23
Western Europe	3.80	+2.2%	3.89	+1.1%	3.93
Asia	2.07	+0.6%	2.08	+1.7%	2.12
Africa	1.18	+16.2%	1.37	+0.2%	1.37
Oceania	2.09	+1.3%	2.12	+2.3%	2.17
Total EMECs	17.35	+2.3%	16.65	+3.2%	17.23

Source: IAI, Alcan estimates.

Table 5. CIS Smelter Production (t)

	2001	Change 2001/02	2002
RusAl			
Bratsk	914,600	+0.1%	915,900
Krasnoyarsk	855,700	+1.1%	864,900
Sayansk	406,800	+1.7%	413,900
Novokuznetsk	281,700	+2.2%	287,800
SUAL			
Bogoslovsk, Irkutsk, Urals, Kandalaksha	601,800	+3.1%	620,500
Nadvoitsky	72,500	+2.1%	74,000
Volgograd	145,200	+2.1%	148,300
Volkhov	21,600	+2.3%	22,100
TOTAL RUSSIA	3,299,800	+1.4%	3,347,400
Tajikistan	290,000	+6.6%	309,000
Ukraine	106,100	+6.0%	112,500
TOTAL CIS	3,696,000	+2.0%	3,769,000

Table 6. China production, exports/imports ('000 t)

		2000	2001	2002
Primary	Production	2,795	3,428	4,464
Unwrought	Imports	914	529	582
	Exports	209	409	788
	Net Imports	705	121	-206
Semis	Imports	457	404	476
	Exports	130	136	189
	Net Imports	327	268	287
Scrap	Imports	805	369	447
	Exports	8	9	10
	Net Imports	797	360	438
Alumina	Imports	1,776	3,346	4,570