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MINING ENGINEERING

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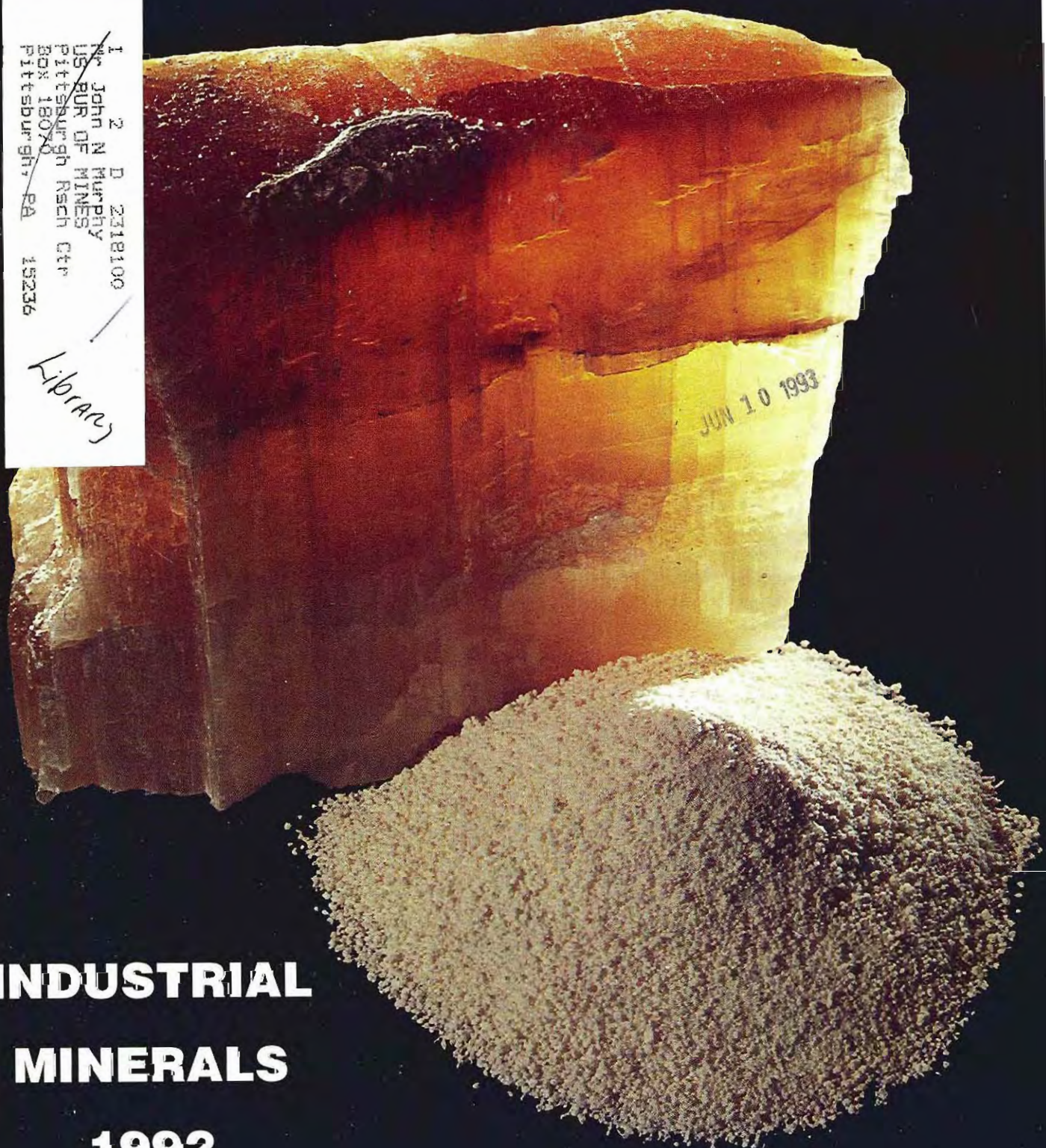

INDUSTRIAL MINERALS 1992

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DEPARTMENTS

ANNUAL REVIEW

Each June, **MINING ENGINEERING** reviews what happened in the industrial minerals industry the previous year. This year, the industrial minerals profiles begin on page 563.

THANK YOU

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SPECIAL ISSUE: 1992 ANNUAL REVIEW

TECHNICAL PAPERS (peer reviewed and approved)

Industrial Minerals 1992

Barite

A.V. Castelli, *Consultant*

In 1992, United States mine production of barite decreased 8.5%. Barite consumption, sold or used by grinding plants, decreased by 36.9% and imports decreased by 61.6% vs. 1991. World mine production decreased 1.5%, according to the US Bureau of Mines.

The value of domestically produced barite, f.o.b. mine, decreased 11.9% according to the Bureau. The declared value, c.i.f. United States port, of all imported crude barite during 1992 decreased from $42.35/t ($38.42/st) in 1991 to $40.09/t ($36.37/st).

Nevada continued to be the leading producer of barite with 88% of the total, followed by Georgia and Missouri. It is estimated that 80% of the domestically mined barite was used as a weighting agent in drilling fluids. The remaining 20% was used in barium chemicals, glass or as a filler. Most of the production from Missouri, Georgia and Tennessee was used in the non-oilfield sector.

Of the total barite used by grinding plants and chemical manufacturers, it is estimated that 90% was used in drilling fluids and 10% in the non-oilfield sector. This included barium chemicals and fillers in paper, plastics and glass.

The tonnage consumed in the drilling fluids market decreased due to the lower average rig count during 1992. The average number of rotary rigs operating (717) was 16.6% less than the 1991 average of 860 in the United States.

Crude barite imports were 518 kt (571,000 st), 61.6% less than in 1991. Imports accounted for 44.7% of the barite consumed (apparent) in the United States.

During the year, China continued to be the leading exporter of crude barite ore to the United States with 67.2% of total crude ore imports. India followed with 31%, and others with 1.8%. About 90% of the imported barite ore was used in the oilfield sector.

Ground barite imports decreased from 46.3 kt (51,000 st) to 30.9 kt (34,100 st) in 1992. The major exporters to the United States were Mexico, 63.7%, and Canada, 35.6%. Most of the Canadian imports were for non-oilfield use.

US barite statistics (kt)

	1987	1988	1989	1990	1991	1992 (e)
Production mine	406	404	290	430	448	410
Imports for consumption (crude barite)	748	1232	987	988	841	323
Exports	8	1	10	9	43	10
Consumption (ground and crushed)	1301	1612	1277	1434	1267	800
Value/t f.o.b. mine (avg.)	$38.93	$38.40	$43.53	$37.21	$47.57	$41.90

(e) Estimated.

During 1992, the number of grinding plants supplying the drilling fluids market along the Gulf Coast were reduced from 10 to eight. In midyear, the Environmental Protection Agency (EPA) set maximum limits of 1 ppm of mercury and 3 ppm of cadmium in barite used in the western Gulf of Mexico. This eliminates some barite previously imported from certain foreign deposits.

Baroid Drilling Fluids, Inc. started up its Dunphy, NV grinding plant in July. The company has also begun another mining program at the nearby Rossi Mine. Baroid Drill recently purchased Cyprus Minerals' Cartersville, GA barite operation to increase its non-oilfield market.

M-I Drilling Fluids is in the final stages of applying to the United Kingdom planning commission for permission to start up its Clinimore mining project in Scotland. Domestically, M-I Drilling closed its West Lake Charles and New Orleans, LA grinding plants after purchasing IDF's Amelia, LA plant.

Excalibar Minerals continued to operate its grinding plant in Houston, TX supplying filler grade and API barite. Old Soldier Minerals moved its Pecos, TX grinding plant to Bruni, TX, also producing API grade barite.

Domestic mine production will probably increase in 1993. The price of imported barite ore should stay at 1992 levels. Or it could slightly decrease due to competition.

Baker Hughes estimated that the average number of operating rotary rigs in the United States in 1993 would increase to 780 from 717 in 1992. This is possible due to some relief from revisions in the alternative minimum tax for the independent oil and gas companies.

The 1993 market for barite in drilling fluids will probably increase in proportion to the rig count or about 8%. The nondrilling fluid market will probably increase if the expected upturn in the economy occurs. ♦

Bauxite & alumina

E.D. Sehnke, *US Bureau of Mines*

In 1992, the United States continued to depend on foreign sources of bauxite. Domestic bauxite mine production once again amounted to less than 1% of total world production. All of the nation's mine output was used for nonmetallurgical prducts such as abrasives, chemicals, proppants and refractories. Domestic production of bauxite for the year was projected to have been 9% less than that recorded in 1991. Most of this sluggishness was attributed to the general weakness in the US economy.

Metallurgical-grade bauxite was imported from 11 countries in 1992. Principal suppliers for this 10.8 Mt (12 million st) of ore were Jamaica (38%), Guinea (30%), Brazil (15%), Guyana (13%) and Australia (2%). The average value, delivered to US ports c.i.f. as reported to the US Customs Service, was $36.93/t ($40.70/st).

Calcined refractory-grade bauxite imports totaled 238 kt (262,100 st) with an average value of $96.72/t ($106.61/t) c.i.f. US ports. China supplied 73%, Guyana 23% and Brazil 4%.

Imports of other grades of calcined

bauxite, primarily for the abrasives market, totaled 198 kt (218,140 st). They were supplied by China (44%), Guyana (30%), Malaysia (16%) and India (6%). The average value was $68.50/t ($75.50/st) c.i.f. US ports.

Annual alumina production for the five Bayer process plants operating in the United States last year was estimated at 5.2 Mt (5.8 million st), about the same as in 1991. Year-end 1992 alumina production capacity was about 5.67 Mt (6.25 million st), with a total capacity use rate of93%.

Alumina imports in 1992, including 61 kt (67,780 st) of aluminum trihydrate (as calcined equivalent), totaled 4.7 Mt (5.2 million st), valued at $203/t ($223.76/st) c.i.f., US ports. The total amount imported last year was slightly above that recorded for the previous peak year of1988 and 2% higher than in 1991. Australia supplied 74%, Jamaica 11% and Suriname 5% of this imported product.

Alumina exports during 1992, including 31 kt (34,450 st) of aluminum trihydrate (as calcined equivalent), were 1.1 Mt (1.2 million st). Canada received about 64% of the shipments for the year.

Defense stockpiles

There were no announced additions of bauxite to the National Defense Stockpile (NDS) in 1992. However, 437 kt (482,164 st) of bauxite were reportedly released in compliance with a contract to upgrade NDS metallurgical-grade bauxite to aluminum metal. An additional solicitation to upgrade a further 166 kt (183,427 st) of NDS bauxite to aluminum was cancelled by the Defense Logistics Agency (DLA) in light of revised NDS materials requirements. At year-end, the Stockpile status was:

- Metal grade, Jamaica-type dried — 12.38 Mt (13.7 million st) uncommitted inventory and 12.38 Mt (13.7 million st) authorized for disposal.
- Metal grade, Suriname-type, dried — 4.9 Mt (5.5 million st) uncommitted inventory and 4.9 Mt (5.5 million st) authorized for disposal.
- Refractory grade, calcined — 280 kt (309,195 st) uncommitted inventory and 210 kt (231,915 st) authorized for disposal.

Under a new Department of Defense Annual Materials Plan for fiscal year 1993, DLA intends to offer for sale 762 kt (840,000 st) of metallurgical-grade bauxite; 508 kt (560,00 st) of Jamaica type and 254 kt (280,000 st) of Suriname-type. As a part of this program, DLA also intends to dispose of 51 kt (56,000 st) of refractory-grade bauxite in fiscal year 1993. These are the maximum amounts recommended for disposal during the fiscal year. The actual level of sales will depend on prevailing market conditions.

World production

World bauxite production decreased slightly last year to an estimated 105.4 Mt (116.2 million st) compared with 109.2 Mt (120.3 million st) in 1991. The major producing countries were Australia (38%), Guinea (16%), Jamaica (11%) and Brazil (10%).

Estimated world alumina production was 39 Mt (43 million st), a 2% drop from 1991s 39.8 Mt (43.9 million st). The principal producing countries in the western world, in order of volume, remained Australia, the United States, Jamaica, Brazil and Suriname.

The 1992 price of metallurgical-grade alumina was strongly impacted by very low primary aluminum metal prices. Alumina spot prices ended the year in the $170 to $180/t ($187 to $198/st) range.

Early in 1992, sanctions on US imports of Chinese bauxite and other commodities were avoided when the United States and China reached agreement over the protection of US copyrighted and patented property. China had been identified by the US Trade Representative for its failule to provide adequate and effective protection of US intellectual property. US bauxite traders and consumers lobbied strongly to keep Chinese bauxite off the proposed list of sanctioned items.

Alusuisse-Lonza Services reportedly signed an agreement with Virgin Islands Alumina Corp. (VIALCO), a unit of Clarendon Ltd., under which Alusuisse would provide its proprietary alumina precipitation technology to VIALCO's alumina plant located at St. Croix, US Virgin Islands. The technology should assist VIALCO in improving and maintaining the quality of its alumina product, while providing the basis for increasing the plant's production capacity.

Reynolds Metals Co. indicated that its 1.7 Mt/a (1.9 million stpy) capacity Sherwin alumina plant near Corpus Christi, TX operated at a reduced production level in 1992. This was a result of the company's effort to balance its alumina supply system following the temporary closure of its primary aluminum plant at Troutdale, OR. At the close of 1992, the Sherwin plant was reported to be operating at 77% of its annual rated capacity.

The new A.J. Parker Cooperative Research Centre at Curtin University in Perth, Western Australia, established a research program devoted to development of new hydrometallurgical techniques for use in minerals processing. Alumina was specifically identified as a principal focus of this work. The research effort was developed as a cooperative venture funded by federal and state governments in conjunction with private industry.

The joint Comalco-Alcan feasibility study was near completion for a new 1 Mt/a (1.1 million stpy) alumina plant based on undeveloped bauxite deposits in northern Queensland's Weipa area. The viability of various Queensland coastal plant sites was assessed. A decision on the next phase of the evaluation program is expected near the end of 1993.

In 1992, Alcoa of Australia completed the expansion project at its Wagerup alumina plant in Western Australia. The expansion lifted capacity by 630 kt (694,455 st) to an annual 1.5 Mt (1.7 million st).

Industry sources indicated that a formal decision by potential Japanese participants in the long stalled Alunorte alumina plant in northern Brazil continued to be delayed. Any further judgment on the project is not likely to be made until mid-1993.

Greece's Bauxites Parnasse Mining reportedly suspended bauxite production until February 1993 and commenced drawing down inventories. This action was in response to declining sales to the former Soviet Union and Romania.

In addition, the proposed 700 kt/a (770,000 stpy) Greek-Russian alumina project planned for Thisvi, near Athens, remained on hold in 1992. The project's principal controlling interest is state-owned Hellenic Industrial Development Bank. It is looking for third party investors to participate in the $850 million project.

In Guinea, Friguia, the sole alumina producer in Africa, was scheduled to receive about $18.5 million from the European Investment Bank to modernize its alumina plant at Kimbo.

In 1992, Guyana began restructuring the administration of its bauxite industry. This is part of an attempt to cut losses and lift productivity before the intended sale of its bauxite interests within the next two years. To prepare for this privatization, an 18-month contract for the management and reorganization of the bauxite industry was awarded to Minproc Engineering of Australia.

In late 1992, HungAluker, the trading arm of Hungary's aluminum group Hungalu, signed an agreement with the Russian trading organization Raznoimport and the Russian aluminum smelter at Volgograd. The contract involved the export of 150 kt (165,000 st) of alumina from Hungary by rail through Ukraine to Volgograd. Hungary would receive in exchange 27.5 kt (30,300 st) of aluminum ingot that would be used as feed to produce semis at Hungalu's operations in Hungary.

India's National Aluminium Co. reportedly signed an agreement with Norway's Hydro Aluminum AS to work on a detailed feasibility study for setting up a $600-$800 million, 900 kt/a (992,000 stpy) alumina plant in the Koraput district of Orissa state. It has been estimated that Hydro currently needs about 1.3 Mt/a (1.4 million stpy) of alumina for its smelting operations. Of that, only around half is presently supplied from sources in which the company holds an equity position.

The Jamaican government reportedly entered into negotiations with Russia's Raznoimport to recover about $4.5 million in payments for bauxite that Jamaica delivered under an agreement with the former Soviet Union in 1991.

Additionally, the Jamaica Bauxite Institute began a study to assess the feasibility of building a caustic soda plant to serve Jamaica's alumina industry.

At the end of 1992, after a six month's delay, plans to reactivate the Lydford bauxite mine near Ocho Rios, Jamaica, were approved by Ukraine. The formation of a mining joint venture awaited receipt of final financial guarantees. Under the agreements, the Nikolayev Alumina Plant in Ukraine, Jamaica Bauxite Mining Ltd. and American business interests proposed to reopen the mine that Reynolds closed in 1984.

Korea General Chemical Corp., a state-owned enterprise, reportedly awarded a $215 million contract to Kaiser Engineers Australia to design and build a 215-kt/a (237,000-stpy) alumina plant in the Mokp'o area of southwestern Korea. Korea General officials anticipate that the plant will begin production by mid-1995. Its output of high-purity aluminum hydroxide has been targeted to supply domestic markets for specialty aluminas such as those used in chemical and ceramic applications.

One of the principal issues addressed at the International Aluminum Conference in St. Petersburg, Russia was the supply of raw materials to the aluminum industry of the former Soviet Union.

Preliminary plans were presented in 1992 to develop the Sredniy-Tirnan bauxite deposit in the northern Russian autonomous Komi republic. Government officials proposed that a joint stock company be set up to carry out work on the development project.

Venezuela's CVG-Interalumina reportedly set the first half of 1996 as the start-up date for a third production line at its Puerto Ordaz alumina plant. That would increase the plant's total capacity from 2 Mt/a to 3 Mt/a(2.2 million stpy to 3.3 million stpy). Accordingly, to accommodate this expansion, Bauxiven would need to increase its bauxite production at Los Pijiguaos to 3 Mt/a (3.3 million stpy). ♦

Cement

C.C. Solomon, *US Bureau of Mines*

In 1992, US consumption of portland cement increased 6% to 74.8 Mt (82.5 million st) from 70.5 Mt (7.7 million st) in 1991. This increase changed the downward trend in US cement consumption that had lasted from 1988 to 1991.

Each month saw increases in cement shipments over the comparable month in 1991. The largest increases, 10% to 15%, occurred in the first quarter. Shipments increased about 7% in the second quarter and tapered to a 6% average increase in the second half.

The mountain states had posted an 18.9% gain, the biggest increase over 1991. That was followed by the west north central states at 15.9%. Only the Pacific states recorded a decline over 1991, down 3%.

Imports of cement and clinker declined by 22% from 7.9 Mt (8.7 million st) in 1991 to 6.2 Mt (6.8 million st) last year. Imports had declined 34% in 1991 compared to 1990. The present level of imports is only 40% of the high of 16 Mt (17.7 million st) attained in 1987. In that year, imports accounted for 20% of US cement consumption.

In 1992, the imported share of total consumption was 8%, down from 11% in 1991. In 1991, domestic plants shipped 63.7 Mt (70.2 million st). In 1992, importers shipped 69 Mt (76.3 million st), a 9% increase. That made up for the 5.5% decline in domestic shipments over the period from 1987 to 1991.

A few major cement exporting countries lost their anti-dumping suits, which resulted in a decline in imports. Exports to the United States decreased substantially due to anti-dumping duties that were imposed. Duties were placed on Mexican cement imports in 1990 and on Japanese imports in 1991.

Thereafter, Mexico saw a substantial reduction in its exports from 1988 of 4.5 Mt (5 million st) down to 800 kt (880,000 st) in 1992. There was a better than 85% reduction in exports from Japan from the maximum of 2.2 Mt (2.4 million st) attained in 1989 down to 280 kt (310,000 st) in 1992.

In 1992, Mexico lost an appeal, before the US Court of International Trade, for a reversal of the anti-dumping charges. The General Agreement on Tariffs and Trade (GATT) ruled that the United States improperly applied stiff anti-dumping duties on Mexican cement imported into the United States. However, the recommendation would have to be approved by the full GATT Trade Association. So it was not likely that the duties would be removed.

Venezuela settled an anti-dumping case in February 1992 by agreeing to stop dumping. In 1992, that country's exports to the US reached 55 kt (60,000 st) down from 838 kt (923,000 st) in 1991.

Cement imports from Canada made up some of the difference in the decline of imports from Mexico, Japan and Venezuela. (Imports of cement from Spain and Greece declined as well due to increased use of cement in their own markets.) Canadian cement imports accounted for 3 Mt (3.3 million st), up from 2.8 Mt (3.1 million st) in 1991.

China exported 21 kt (23,100 st) of cement to the United States at the end of 1992, up from 882 t (972 st) in 1991. Australia exported 90 kt (99,000 st) of cement to the United States in 1992, up from 100 t (110 st) in 1991.

Cement exported from the United States in 1992 was 746 kt (823,000 st). This was 18% higher than 1991 and eight times higher than the 92 kt (101,000 st) exported in 1988. In 1992, Canada was the nation's biggest customer, receiving 72% of the exports or 536 kt (591,000 st).