

BARITE

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Barite, a name that was derived from the Greek word “barus” (heavy), is the mineralogical name for barium sulfate. In commerce, the mineral is sometimes referred to as “barytes.” As used in this report, the term “primary barite” refers to the first marketable product, which includes crude barite (run of mine) and the products of simple beneficiation methods, such as washing, jigging, heavy media separation, tabling, flotation, and magnetic separation. Most crude barite requires some upgrading to minimum purity or density. Barite that is used as an aggregate in a “heavy” cement is crushed and screened to a uniform size. Most barite is ground to a small, uniform size before it is used as a filler or extender, an addition to industrial products, or a weighting agent in petroleum well drilling specification mud, whether the specification is that of the American Petroleum Institute (API) or the Oil Companies’ Materials Association (OCMA). Barite used for drilling petroleum wells can be blue, black, brown, or gray depending on the ore body; must be finely ground, such that 90% to 95% of the material must pass through a 325-mesh screen; dense, such that its specific gravity is 4.2 or greater; soft enough to not damage the bearings of a tricone drill bit; and both chemically inert and free of soluble salts. A small percentage of iron oxide is allowable. In offshore drilling the U.S. Environmental Protection Agency limits the content of mercury to 1 milligram per kilogram of barite and that of cadmium to 3 milligrams per kilogram of barite (U.S. Environmental Protection Agency, 1997). This has probably become a de facto specification for the API barite producers because they need to keep their distribution channels simple. Although barite contains a “heavy” metal (barium), it is not a toxic chemical under Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 because it is very insoluble.

Production

Domestic sales data for barite were derived from voluntary responses to a survey of U.S. operations and estimates of one company by the U.S. Geological Survey. Actual mine production data were sometimes not reported because some mines sporadically produce directly to their raw ore stockpile, beneficiate and sell from those stocks for several years, and report these withdrawals from stocks as production; others produce normally and report their annual production. Of the 29 operations to which a survey was sent, 22 responded, representing approximately 75% of the primary barite sold or used by producers. Another seven sites were reported with approximations by telephone conversations with site managers. One surveyed mine and mill site was closed. Two surveyed

mines were idle and one surveyed mill was idle. There were 7 active mines and 19 active mills. One active mine without a mill sold only run-of-mine ore.

The quantity of primary barite sold or used by producers fell by about 30% from that of 1997, but weighted average prices rose about 7%. Approximately 5% of barite sales were for industrial end uses and the remainder were for petroleum well drilling for 1998. Grinding to API specifications was not usually performed at the mine site because railroad tariffs were higher for finished barite than for crude barite. This is particularly true for barite destined for use off the Gulf of Mexico. Some barite was ground at the mine sites in Nevada to supply the western United States, the State of Alaska, and the western Canadian provinces API specification markets.

During the year, Dresser Industries Inc. merged into Halliburton Co., after Halliburton agreed to sell its 36% of M-I L.L.C. to Smith International, Inc. Dresser Industries had sold its 64% of M-I Drilling Fluids Co. to Smith International in 1994 so that it could buy 100% of Baroid Corp. from NL Industries, Inc. In 1998, Halliburton sold the 36% of M-I L.L.C. to Smith International so that it could merge with Dresser, which owned 100% of Baroid. This gave Smith International 100% ownership of M-I L.L.C. The third major U.S. barite company was Baker Hughes Inteq, a division of Baker Hughes, Inc., which completed a merger with Western Atlas Inc., a company that did not own a barite mine.

Consumption

Compared with 1997, industrial end-use sales declined by about 24% and well drilling sales declined by about 13%. Well-drilling sales declined because this was a difficult year for the domestic petroleum well-drilling industry. “The lowest inflation adjusted oil prices of the past half-century . . .” (Business Week, 1998, p. 34). The price of consumer oil products dropped dramatically during the year, leading to substantially reduced prices to crude producers. Consequently, the return on a “normal” mix of successful and unsuccessful oil well discoveries was at an unprofitable level for the “normal” explorer-driller. This earnings slump reduced the capital available for new exploration drilling and development drilling, which reduced the demand for API barite. Explanations offered included large, new discoveries in countries that are not members of Organization of Petroleum Exporting Countries (OPEC), slumping world demand owing to financial problems in Southeast Asia, and new technologies that reduce crude oil production costs. Some members of OPEC and some oil-producing countries that are not members of OPEC are intent

upon developing their economies with large investments in technologies, education, and downstream production by borrowing instead of funding solely out of cash-flow from crude oil sales. These loans require at least partial payments on a regular basis, which might require sales at very low profits or losses just to maintain a cash flow.

In the fall, it was reported from a large barite firm through a potential seller of imported crude barite that 6-month's consumption of barite was waiting on the U.S. shore of the Gulf of Mexico to be ground to API specifications. Perhaps this was a slight exaggeration to a potential supplier to force down a price, but it belied the slow market for barite in fall 1998. With rumors of increasing imported barite stockpiles, 130,000 tons was subtracted from the import figure and was not used in apparent consumption calculations in 1998 to prevent overstatement.

Prices

Nominal average weighted sales price for primary barite from mines and their associated beneficiation plant in the United States increased by 7%, to \$23.95 per metric ton, in 1998. It is likely that the increase in price comes from a decline in the sales of the lowest priced (run-of-mine and the simply beneficiated) products by domestic mines. Nominal average prices for the crushed and ground barite declined by less than 3%, to \$77.25 per ton, compared with those of 1997.

According to Industrial Minerals (1998), midyear international prices were as follows:

- API, lump, c.i.f. (cost, insurance, and freight) [U.S.] Gulf Coast, Chinese, \$50 to \$52, Indian, \$52 to \$54, Moroccan, \$52 to \$54
- Underground, OCMA/API, bulk, specific gravity 4.2, f.o.b. (free on board) Morocco, \$42 to \$44 per ton
- Ground, bagged, specific gravity 4.22, f.o.b. Morocco, \$75 to \$85 per ton
- Ground, OCMA/API, big bags (1.5 tons) f.o.b. South Turkey, \$64 to \$68 per ton
- Ground, OCMA, bulk, delivered Aberdeen [United Kingdom], \$84.14 to \$91.45 [£50 to £55], (International Monetary Fund, 1998, Exchange Rates, Currency Units per SDR in June 1998, accessed June 23, 1999, at URL <http://www.imf.org/external/np/tre/sdr/1998/sdr9806.htm>) and delivered Great Yarmouth [United Kingdom], \$96.44 to \$108.08 [£58 to £65] per ton
- Micronised, off white, minimum 99%, less than 20 micrometers, delivered United Kingdom, \$232.78 to \$249.40 [£140 to £150] per ton
- Ground, white, paint-grade, 96% to 98% BaSO₄, 350 mesh, 1 to 5 tons delivered United Kingdom, \$324.23 to \$365.79 [£195 to £220] per ton.

World Review

Barite production declined around the world as the higher cost regions in the oil and gas industry lost profitability and the ability to continue exploratory drilling ventures owing to predicted negative values of cash flows using current prices of

oil products (Feld and MacIntyre, 1998). Part of the problem came from "1) OPEC's Dec. 1, 1997, agreement to raise the group's production quota by 10%; 2) a warmer-than-normal winter (1997-98) in the Northern Hemisphere; 3) increasing Iraqi oil exports; and 4) reduced demand stemming from the severe economic crisis in East Asia" (Feld and MacIntyre, 1998, p. 29). In July, the United Nations permitted the sale of an estimated 1.7 million barrels per day of Iraqi crude oil. Because it was actually a dollar sales target for Iraq, the number of barrels sold per month increased through the year as the crude oil price fell.

For the "relatively low-cost producers" (Saudi Arabia, Kuwait, the United Arab Emirates, and Iraq), the marginal cost of the next barrel of oil is low; therefore, oil production will continue during periods of relatively low price. Because the oil fields are large, drilling is not important to maintain production; therefore, the low number of drill rigs is consistent with the large amount of production. For the "relatively high-cost oil producers" (the United States, Norway, the United Kingdom, and Canada) "low oil prices can turn many oilfields from economical to uneconomical in a short period of time (Feld and MacIntyre, 1998, p. 31)."

In 1998, the total drill rig count for the world dropped from 2,293 in January to 1,576 in December, or a 31% drop (Oil & Gas Journal, 1998-99). The United States drill rig count declined from 993 in January 1998, to 653 in December 1998, or 34%. Canadian drill rig count fell from 507 in February 1998, to 128 in April 1998, or 75%, and spent much of the year below its December 1998, level of 252 rigs. European rig count declined from 109 in January 1998, to 85 in December 1998, or a decline of 22% for the year. Perhaps the relatively large capital cost of those ocean rigs included in the European rig count means that they are not deactivated as quickly as land rigs, since the amortization costs are relatively large and closer to the out-of-pocket costs.

Outlook

Petroleum well drilling, and the ensuing barite consumption, will languish as long as the prices for oil are in the US\$11 per barrel range. The problem is oversupply from the reappearance of Iraq on the supply side of the world oil market and the recession in many countries in the southeast Asian area on the demand side. The supply of crude and finished oil products to the petroleum market, other than the natural gas market, will simply have to be reduced.

In fact, the OPEC countries, and a few non-OPEC countries, did agree on production cutbacks on March 23, 1999, to start on April 1, 1999. Oil prices did rise over 3 months following March 31, 1999. The Oil & Gas Journal "Futures Price" for Light sweet crude for the week of June 14 was \$17.96 per barrel (Oil & Gas Journal, 1999). Barite consumption may take one-half to a full year longer to recover.

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TABLE 1
SALIENT BARITE AND BARIUM CHEMICAL STATISTICS 1/ 2/

(Thousand metric tons and thousand dollars)

	1994	1995	1996	1997	1998
United States:					
Barite, primary:					
Sold or used by producers	583	543	662	692	476
Value	\$19,100	\$10,400	\$14,700	\$15,500	\$11,400
Exports	14	16	31	22	15
Value	\$1,850	\$2,020	\$3,190	\$2,430 r/	\$2,310
Imports for consumption 3/	1,070	1,040	1,540	2,240	1,870
Value	\$47,200	\$52,500	\$81,900	\$122,000	\$108,000
Consumption apparent 4/	1,640	1,570	2,170	2,920	2,340
Crushed and ground sold or used by processors 5/	1,250	1,370	1,870	2,180	1,890
Value	\$81,100	\$99,800	\$141,000	\$173,000	\$146,000
World: Production	4,470 r/	4,870 r/	6,060 r/	6,660 r/	5,890 e/

e/ Estimated. r/ Revised.

1/ Data are rounded to three significant digits.

2/ Barium chemicals data withheld to avoid disclosing company proprietary data.

3/ Includes crude and ground.

4/ Sold or used plus imports minus exports.

5/ Includes imports.

TABLE 2
CRUSHED AND GROUND BARITE SOLD OR USED BY PROCESSORS IN THE UNITED STATES,
BY STATE 1/ 2/

State	1997			1998		
	Number of plants	Quantity (thousand metric tons)	Value (thousands)	Number of plants	Quantity (thousand metric tons)	Value (thousands)
Louisiana	6	1,320	\$105,000	7	1,160	\$89,600
Nevada	3	267	12,300	3	264	11,700
Texas	4	524	40,300	4	409	32,400
Other 3/	6	78	16,000	5	57	12,500
Total	19	2,180	173,000	19	1,890	146,000

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes imports.

3/ Includes California, Georgia, Illinois, and Missouri.

TABLE 3
CRUSHED AND GROUND BARITE SOLD OR USED BY PROCESSORS IN THE UNITED STATES,
BY USE 1/ 2/

(Thousand metric tons and thousand dollars)

Use	1997		1998	
	Quantity	Value	Quantity	Value
Barium chemicals, filler and/or extender, glass	106	18,400	81	15,500
Well drilling	2,080	155,000	1,810	131,000
Total	2,180	173,000	1,890	146,000

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes imports.

TABLE 4
U.S. EXPORTS OF NATURAL BARIUM SULFATE (BARITE), BY COUNTRY 1/

Country	1997		1998	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Algeria	7	\$20	--	--
Argentina	110	14	76	\$16
Australia	--	--	20	52
Austria	18	4	--	--
Belgium	--	--	1	3
Brazil	--	--	17	17
Canada	18,900	1,590	11,300	1,250
China	25	25	32	10
Colombia	73	56	413	63
Germany	238	29	5	9
India	1	7	20	9
Ireland	7	8	--	--
Jamaica	2	9	--	--
Japan	3	3	54	87
Mexico	2,010	551	2,330	620
Netherlands	12	8	--	--
Oman	11	17	6	21
Panama	8	7	20	8
Peru	156	26	232	48
Singapore	10	41	72	9
United Kingdom	3	17	--	--
Venezuela	--	--	36	87
Total	21,600	2,430	14,700	2,310

1/ Data are rounded to three significant digits; may not add to totals shown.

Source: Bureau of the Census.

TABLE 5
U.S. IMPORTS FOR CONSUMPTION OF BARITE, BY COUNTRY 1/

Country	1997		1998	
	Quantity (metric tons)	Value 2/ (thousands)	Quantity (metric tons)	Value 2/ (thousands)
Barite, crude:				
Canada	13,800	\$2,560	13,100	\$2,820
China	1,990,000	106,000	1,560,000	86,100
Germany	--	--	748	90
India	154,000	7,460	228,000	12,300
Japan	60	20	--	--
Mexico	8,080	529	2,210	196
Morocco	16,600	809	20,000	1,010
Peru	26,500	909	--	--
Thailand	--	--	25,200	1,120
United Kingdom	22	9	290	9
Total	2,210,000	118,000	1,850,000	104,000
Barite, ground:				
Canada	6,930	1,440	11,900	3,180
China	122	40	200	70
Denmark	--	--	2	8
Germany	167	102	49	52
Mexico	27,000	2,430	9,030	892
Netherlands	93	52	116	57
United Kingdom	29	17	--	--
Total	34,300	4,080	21,300	4,250

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ C.i.f. value.

Source: Bureau of the Census.

TABLE 6
U.S. IMPORTS FOR CONSUMPTION OF BARIUM CHEMICALS 1/

	1997		1998	
	Quantity (metric tons)	Value 2/ (thousands)	Quantity (metric tons)	Value 2/ (thousands)
Barium chloride	1,340	\$863	1,960	\$1,240
Barium oxide, hydroxide, peroxide	4,330	4,690	4,000	4,770
Barium nitrate	3,000	3,150	4,460	6,640
Barium carbonate, precipitated	25,900	15,900	23,500	14,100
Other barium compounds	12,400	13,400	13,300	13,600

1/ Data are rounded to three significant digits.

2/ C.i.f. value.

Source: Bureau of the Census.

TABLE 7
BARITE: WORLD PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country 3/	1994	1995	1996	1997	1998 e/
Afghanistan e/ 4/	2,000	2,000	2,000	2,000	2,000
Algeria	20,584	29,838	31,348	32,000 e/	32,000
Argentina	27,828	28,907	14,038	9,532 r/	10,000
Australia e/	11,000	11,729 5/	12,000	15,000	15,000
Belgium e/	30,000	30,000	30,000	30,000	40,000
Bulgaria 6/	120,000	150,000	120,000	120,000 e/	100,000
Bolivia	3,307	10,845	4,745	4,402 r/	4,500
Bosnia and Herzegovina e/ 7/	1,000	1,000	500	2,000	2,000
Brazil (beneficiated)	31,499	30,750	39,662	51,961 r/	52,000
Burma	21,969	34,601	24,679 r/	17,111 r/	17,000
Canada	55,000	61,000	58,000	84,000 r/	80,000 p/
Chile	3,670	3,080	2,559	2,654 r/	1,430 p/
China e/	1,500,000	1,800,000	2,800,000	3,500,000	3,000,000
Colombia	7,000	21,300	6,800 r/	600 r/ e/	600
Egypt	419	500 e/	-- r/	-- r/	--
France	72,100	75,450	75,000 e/	75,000 r/ e/	75,000
Georgia e/	30,000	20,000	20,000	20,000	20,000
Germany (marketable BaSO ₄)	127,383	122,268	121,476	118,698 r/	120,000
Greece (crude ore)	701	668	671	700 e/	700
Guatemala	1,200 r/ e/	1,152 r/	1,090 r/	1,200 r/ e/	1,200
India	497,971	421,867	369,500	400,000 e/	430,000
Iran e/ 4/	139,000	150,000	150,000	181,174 r/ 5/	180,000
Italy	57,856	44,000 e/	80,463	26,300 r/	30,000
Kazakhstan 7/	90,200 r/	83,000 r/	50,000 r/ e/	38,000 r/ e/	9,000 5/
Kenya e/	20 5/	20	20	20	10
Korea, North e/	110,000	120,000	110,000	120,000	100,000
Korea, Republic of	85	90	80	105 r/ e/	100
Malaysia	17,144	16,966	17,458	2,608 r/	2,600
Mexico	86,605	248,367	470,028	236,606 5/	161,555 5/
Morocco	264,526	289,308	288,308	343,314 r/	353,438 5/
Nigeria	--	--	--	4,000 e/	5,000
Pakistan	20,320	15,360	18,582	19,000 e/	20,000
Peru	53,074	37,476 r/	37,103 r/	63,600 r/	63,000
Poland	26,600	25,400 r/	21,700 r/	25,000 e/	25,000
Portugal e/	50	-- r/	--	--	--
Romania	104,700	18,169	12,541	12,000 e/	15,000
Russia e/	70,000	70,000	70,000	60,000 r/	60,000
Saudi Arabia	5,000	6,000	8,000	8,000 e/	8,000
Slovakia e/	25,000	25,000	25,000	25,000	20,000
South Africa	1,945	1,990	7,428	2,071 r/	2,000
Spain	28,037	28,600	28,000 e/	28,000 e/	28,000
Thailand	36,356	35,883	48,074	54,817 r/	110,000
Tunisia	15,732	10,825	15,360	12,841 5/	8,011 5/
Turkey (run-of-mine)	116,220	153,719	104,872 r/	140,872 r/	130,000
United Kingdom	54,000	85,000 e/	102,000	74,000 r/	75,000
United States 8/	583,000	543,000	662,000	692,000	476,000 5/
Total	4,470,000 r/	4,870,000 r/	6,060,000 r/	6,660,000 r/	5,890,000

e/ Estimated. p/ Preliminary. r/ Revised.

1/ World totals, U.S. data, and estimated data are rounded to three significant digits; may not add to totals shown.

2/ Table includes data available through June 10, 1999.

3/ In addition to the countries listed, Bulgaria also produces barite, but available information is inadequate to make reliable estimates of output levels.

4/ Data are for fiscal year beginning March 21 of that stated.

5/ Reported figure.

6/ Based on an estimated 70% recovery factor.

7/ Barite concentrates.

8/ Sold or used by producers.