

BARYTES

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Barytes had a healthy year in 2001. Demand for oil and gas remained strong and the oil price remained high in the early part of the year, encouraging exploration and development wells, which boost barytes consumption. However, the downturn in the US and other economies began to bite in the second half of the year and led to uncertainties in demand for oil and oil prices.

Barytes, or barite, the mineral form of barium sulphate, is named from the Greek 'barys' meaning heavy or dense. Approximately 90% of all barytes produced worldwide is used in oil-well drilling muds, because its high density can withstand the high hydrostatic pressures needed to maintain the formation stability. Barytes is also used as a feedstock for barium chemicals production, and as a filler, extender and aggregate. Another main application is in the manufacture of ceramics and glass, after conversion to barium carbonate.

Today, four countries supply almost 80% of the world's barytes production, with China providing the lion's share accounting for around 57% of supply. Other key producers include India (11%), the US (6%), and Morocco (5%). Total world production in 2001 was an estimated 6.6 Mt, up on the revised figure of 6.2 Mt in 2000, according to the US Geological Survey (USGS).

Environmental concerns and tightening regulations are also becoming more of an issue for barytes producers. There is still some debate and disagreement on the effect of contaminants, such as mercury and cadmium in barytes, which are discharged on to the seabed with drill cuttings. This is particularly so in the US, where the US Environmental Protection Agency has prescribed especially low levels and there is debate as to whether the certification test method used effectively predicts bioaccumulation. However, the

standards are set, and there is unlikely to be any change in the foreseeable future. The knock-on effect that this has had is that today, some Chinese and Peruvian sources of barytes, which are not yet depleted are now considered uneconomic because of the environmental legislation.

Production Asia

Chinese barytes production represents over half the world's supply and China remains the premier producer and exporter of barytes. Government figures are not available for barytes production, probably because it has never been under government administration. The USGS estimates that Chinese production levels in 2001 were 3.8 Mt, up from 3.5 Mt in 2000. The Barytes Association puts Chinese production at 3.5 Mt in 2001. A true figure is probably somewhere between the two. The main producing region in China is Guangxi, which produces just over 50% of the total, with other important producing regions including Hunan, Guizhou, Guangdong and Fujian.

Indian barytes production is largely based on the huge deposit at Mangampet, in the Cuddapah district of Andhra Pradesh, about 280 km from Chennai. Total Indian production fell to 320,000 t in 1999 and only increased slightly to 350,000 t in 2000. However, production levels are estimated to have recovered dramatically in 2001 to 700,000 t. Of this total, some 500,000 t was exported, and the balance of 200,000 t was consumed in the domestic drilling industry. Indian producers are now confident that the problems experienced over the past few years are now behind them. The barytes mines are well developed and exports anticipated to be more reliable in terms of quality and delivery. There were some minor problems with flooding in November and December, but these have now been resolved.

The legal wranglings over mining leases and tender agreements, which had hampered the Indian barytes industry in previous years, have ceased for the moment with the government's decision to postpone the tenders. The government has now formed a committee that will examine aspects to improve the availability of barytes for export and address the issues raised by the leading barytes exporters. There is now speculation that the new contracts will be for both mining and sale of barytes, and will be fixed for a longer term, for example, five years.

The main supplier in India is the government-owned Andhra Pradesh Mining and Development Corp. (APMDC), which also allocates mining leases to other companies, and exploits the Mangampet deposit in the Cuddapah district. Total production from Mangampet is in the order of 500,000 t/y. During 2001, the new mining operation commissioned by Indian Barytes and Chemicals in the Khammam district of Andhra Pradesh suffered some delays. The mine had a production of 80,000 t in 2001, and is predicted to have a production of 100,000 t in 2002, including filler and chemical grades. During 2001, the company was setting up processing facilities, having completed the infrastructure and overburden removal over the previous two years. Additionally, in December, IBCL was given a 20-year mining lease for the Seripum area. Production in Thailand was an estimated 50,000 t in 2001, according to the USGS. The leading producer in the country is Asian Mineral Resources Co. Ltd, which operates a surface mine at Udon and a 60,000 t/y processing plant at Nahpralarn, Saraburi.

In Turkey, the two key producers in the industry are Ado Madencilik AS and Baser Mining Industry AS. Baser has a production capacity of approximately 200,000 t/y, close to Isparta in southern Turkey whilst Ado Mining, a subsidiary of Ado Group, has a capacity of over 100,000 t/y from Konya, where the company has a lease on a government concession. However, total Turkish production

is estimated by the Barytes Association to have been 95,000 t in 2001.

North America

The US is a significant producer of barytes with production estimated at 400,000 t in 2001, up from 392,000 t in 2000 according to the USGS. Most of the production is from Nevada, with small amounts from Georgia and Tennessee. However, the barytes mines in Nevada are nearing the end of their minelife, with depleting reserves, and there has been little discussion of replacement reserves. It is likely in the future that the US reliance on imports, already representing 87% of consumption, will increase further.

The four main US producers are split between those supplying drilling grade material, which accounts for 95% of the barytes sold in the US, and those supplying barytes as a filler. The two main companies supplying the drilling industry are Baroid Drilling Fluids Inc., part of Halliburton Co., and M-I LLC (Formerly M-I Drilling Fluids Inc.), whilst Cimbar Performance Minerals and New Riverside Ochre Co. Ltd concentrate on non-drilling grades. Cimbar is a subsidiary of Baroid Drilling Fluids Inc. and both use the material from Cimbar's mines in Cartersville, Georgia.

Europe

The largest European barytes producer is Sachtleben Bergbau GmbH & Co., in Germany. Sachtleben Bergbau Services produces just under 60,000 t/y, from its operations in Wolfrach. Deutsche Baryt-Industrie Dr Alberti GmbH & KG produces barytes from an underground mine in Bad Lauterberg. All the sales and marketing of Deutsche Baryt are carried out thorough Sachtleben. Total production of barytes in Germany was reported to be 115,000 t in 2001, with all of it consumed in the filler and chemical industries, mostly in the domestic market.

UK production is dominated by M-I Great Britain Ltd, from its Foss mine in Aberfeldy, Scotland. Production in 2001 was 70,000 t, but depleting reserves mean that the mine has

a limited lifespan. Current estimates are that the mine will be in operation for at least three years, if not longer, because in the past reserve estimates have been on the conservative side. The company has also been seeking to develop a mine at Duntanlich since 1995, but the necessary planning permission required has been refused to date. However, the project is still active and under review at the present time. M-I also operates 200,000 t/y of barytes processing capacity in the UK in Aberdeen and Great Yarmouth.

Viaton Industries Ltd, is a leading supplier of filler and extender grades of barytes to the paint, plastics and automotive industries. Sales to these industries are over 35,000 t/y from its processing plant in Brassington, near Wirksworth, Derbyshire. Early in 2001, the company closed its Closehouse mine. Glebe Mines Ltd, (formerly Laporte Minerals) now a wholly owned-subsiary of Land Regeneration Management Ltd (LRM) produces some 15,000 t/y of co-product barytes from its fluorspar operations in Derbyshire.

Spain is one of the main producers of drilling-grade barytes in western Europe, following its re-entry in to the market in the early 1990s. The principal producer is Minerales Y Productos Derivados SA (Minersa) from its 100,000 t/y capacity operation in Vera, Almeria, 10 km from the deep-water port of Garrucha. Spanish production in 2001 was closer to 50,000 t.

The main French barytes producer is Barytine de Chaillac, which operates a mine and plant in Chaillac with a capacity of 80,000 t/y of concentrate. Some 65% of the output is used to produce barium salts, principally barium carbonate for special glass. The balance is sold into the filler industries, mainly the automotive industry, which consumes 95% of the filler material, using it in sound-proofing applications and as a friction material in brakes. Over the next two to three years, Barytine de Chaillac is planning to lift barytes filler sales to over 40,000 t/y, and is targeting environmental applications.

In 2000, Khoilinsky GOK, reportedly Russia's largest barytes miner, produced 53,000 t, and is estimated to have had a similar production in 2001. The other significant Russian barytes producer is Salayirskiy GOK, from its operations in Kemerovo oblast. The company produced 50,600 t of concentrate in 2000, which was mostly supplied to the Russian oil industry. However, in mid 2001 the company had its electricity consumption limited by 50% owing to an outstanding debt with the electricity company, which will have affected production output last year. Additionally in Russia, Tekhnopromex Corp. has commissioned a 20,000 t/y pilot plant and has begun mining at the Medvedevsky barytes deposit, Chelyabinsk oblast. The company plans to raise production to 50,000 t/y in the near future. Investment to date in the project totals US\$0.7 million.

Jt.St.Co. Yuzhpolimetall, based in Shymkent in Yuzhno-Kazakhstan produced around 70,000 t of barytes concentrate in 2001 from its mine in Ansai. The company also reworks the waste dumps of Jt.St.Co. Achpolimetall in Kentau, Yuzhno-Kazakhstan.

Africa

Total Moroccan production in 2001 was 350,000 t, according to the Barytes Association. Compagnie Marocaine des Barytes (Comabar) produces over 100,000 t/y of barytes from its mine at Zelmou in Western Morocco, and the balance of its 170,000 t/y total production comes from various mines supplying its milling plant at Safi.

The other principal producer is Sté Nord Africaine de Recherches et d'Exploitation des Mines d'Argana (Snarema) from its mine in Seksaoua, north east of Agadir. Production is around the 110,000 t/y mark of which some 80,000 t/y is drilling grade and the remainder chemical grade from its beneficiation plant in Argana.

Current Consumption

Barytes and bentonite are by far the most significant of the dozen or so minerals used in

the production of drilling fluids for oil wells. The state of the energy industry and the oil price are crucial to the demand for barytes. High oil prices encourage oil company exploration and development projects, which boost barytes consumption. Low oil prices prompt oil companies to withdraw from non-essential expenditure and exploration budgets are cut back. As the demand for drilling muds falls, barytes demand drops with it. However, as the oil price recovers, there is a time lag of six months to a year before barytes demand begins to pick up. This is because barytes is usually fixed on six-month contracts, and therefore reacts little to short-term influences.

The Baker-Hughes active rig count is taken as a reasonable indicator of the drilling mud requirements. In 2000, oil prices hit record highs, and the rig counts lifted accordingly, and by the end of 2000 the world rig count reached 2,212. In 2001, high gas prices helped to boost the rig count numbers to their highest levels for 15 years to 2,374 at the start of the year. However, by the end of 2001 gas prices were 50% lower than the first nine months and the world rig count fell back to 1,917 in December 2001. The average world rig count for 2001 was 2,242, up from an average of 1,913 in 2000. Oil demand and prices also fell during the year, due to the slow down in the US economy.

One of the main drivers of the barytes market is the requirement of the North American drilling fluid industry, especially the US Gulf Coast, because the US accounts for some 30% of global barytes consumption. Much of the Gulf Coast market is supplied by Guangxi province in China. In 2001, consumption of crude barytes lifted to an estimated 2.96 Mt, up from 2.46 Mt in 2000, largely on the back of increased consumption in oil-well drilling. Imports of crude barytes climbed to an estimated 2.67 Mt, from a figure of 2.07 Mt in 2000.

The balance of world barytes production is used in glass and ceramics production and filler and chemical markets, each market accounting for approximately 200,000 t/y

worldwide. High purity barytes is used as a feedstock for many chemicals, including barium carbonate, precipitated barium sulphate (blanc fixe), lithopone (co-precipitated barium sulphate and zinc sulphate), barium chloride, barium oxide and hydroxide, barium nitrate and barium titanate.

The ceramic and applications of barytes and barytes chemicals include glazes, frits and enamels, glass tableware and black and white television screens. In brick and tile making, barium carbonate is added to control scum, discolouration and porosity.

Barytes possesses a number of properties, which make it an invaluable workhorse in the fillers and extenders sector. It is relatively inert, light in colour, has high brightness and exhibits low oil absorption. Barytes' natural density is also some 50-90% higher than other mineral fillers and extenders, and is the major reason for its use in a number of applications as a filler in sound and radiation adsorption materials. Broadly speaking, off-colour grades are used in industrial filler applications such as sound insulation and weighting, off-white grades are used in paints and coatings, brake linings and friction products, while the whitest grades are used in paints, plastics, powder coatings and printing inks. One area of growth for barytes is its increased consumption in powder coating paint systems, which are being used more widely as an environmentally friendly alternative to solvent-based paint systems.

Environmental applications for barytes could prove to be a growth area for the mineral. Sound-proofing applications are already an important market for floors, walling, pipes and tubes, and further developments are underway. Barytes is already used in the automotive industry for soundproofing cockpits, where it is compounded with plastics or elastomers such as PVC, EPDM, EVA and PUR to produce high-density sheets. These sheets are used as carpet backing, as a shield between engine compartment and cockpit, or to reduce vibrations in door panels. Further automotive applications could include the

sound-proofing of engine parts such as turbo pipes and acoustic shields.

In the construction industry, barytes is already established for radiation shielding in the walls on X-ray wards. This property could lead to further applications in radiation adsorption and insulation. Barytine de Chaillac is currently investigating the use of high-density sheets as anti-radiation coatings to substitute for lead sheets. The company is also exploring the use of containers and drums made from PVC or PEHD containing barytes for the storage of radio-active waste.

In terms of substitutes, in certain applications, such as an extender in plastics, barytes is facing increasing competition from cheaper calcium carbonate. However, the loading requirement for barytes is much less (about 1:3) for an equivalent performance and, consequently, it is still competitive despite its higher price.

Pricing

Prices vary considerably with factors such as the specifications, the source, the quantity purchased, the application for the mineral and finance and other costs. At the start of 2001,

drilling-grade Chinese barytes was priced at US\$43-46/t, cif US Gulf Coast, whilst Indian was US\$48-51/t same basis. By the end of the year, Chinese drilling-grade barytes had climbed and was priced at US\$45-48/t, whilst Indian material was steady at US\$48-51/t.

Chemical-grade barytes prices are higher than drilling grade, because of the higher BaSO_4 content, typically 96-98%. Chinese chemical-grade barytes was priced at US\$55-60/t at the US Gulf Coast during the year. Prices for fillers and extender grades also vary depending on the end user industry and available substitutes. There is a wide range of grades used in the industrial sector and prices vary from as little as US\$50/t up to US\$1,000/t.

Barytes prices 2001 (US\$/t)

	Jan 2001	June 2001	Dec 2001
API grade, lump CIF Gulf Coast, US			
Chinese	43-46	43-46	45-48
Indian	48-51	48-51	48-51

Source: Mineral PriceWatch

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