

16 Barytes

Barytes or barite, the mineral form of barium sulphate, is named after the Greek word 'baros' meaning heavy or dense. Approximately, 90% barytes produced worldwide is used for oil and gas drilling as weighing agent in drilling mud because of its unique physical and chemical properties and magnetic neutrality. It is also used as a feedstock for barium chemicals production, and as a filler, extender and aggregate. Another application after its conversion to barium carbonate is in the manufacture of ceramic and glass. The Mangampet deposit in Cuddapah district of Andhra Pradesh is the single largest deposit in the world. India is one of the leading producers and exporters of barytes in the world.

RESOURCES

The total resources of barytes in India as on 1.4.2000 as per UNFC system are placed at 74 million tonnes constituting 46% reserves and 54% remaining resources. By grades, 40% resources are of oil-well drilling grade, 4% chemical grade and 34% low grade. About 21% resources are of other, unclassified and not-known categories. Andhra Pradesh alone accounted for more than 94% of country's resources of barytes (Table - 1).

EXPLORATION AND DEVELOPMENT

In 2006-07, GSI conducted exploration for barytes in Mangampet area of Cuddapah district, Andhra Pradesh by way of test drilling. All the four test boreholes intersected carbonaceous tuff, the host rock for barytes. The first borehole intersected thin bands of barytes. However, the drilling has not indicated any promising results.

PRODUCTION, STOCKS AND PRICES

The production of barytes at 1,072 thousand tonnes in 2007-08 registered a decrease of 36 % as compared to that in the previous year due to lack of demand and labour shortage. There were 8 reporting mines during the year under review as against 10 in the preceding year. Andhra Pradesh continued to account for almost the entire production of barytes. Very nominal production was reported from Rajasthan and Himachal Pradesh.

The Andhra Pradesh Mineral Dev. Corp. (APMDC) Ltd is the sole producer in public sector, which accounted for 97% of the total production during 2007-08. One mine of K. Sivananda Reddy, a private sector producer, contributed above 1% of the production. The remaining 2% was the contribution of 6 mines each producing below 20 thousand tonnes annually.

The entire production of barytes was of off colour variety during the year (Tables - 2 to 6).

The mine-head stocks of barytes at the end of year 2007-08 were 2,619 thousand tonnes as against 2,197 thousand tonnes at the beginning of the year.

The average daily employment of labour in 2007-08 was 185 as against 499 in the previous year. Domestic prices of barytes are furnished in Table-7.

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**Table - 1 : Reserves/Resources of Barytes as on 1.4.2005
(By Grades/States)**

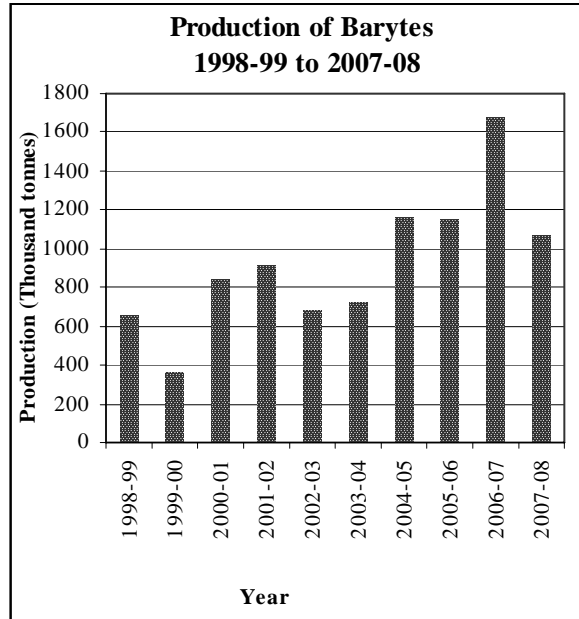
Grade/State	Reserves				Remaining resources					Total resources (A+B)	
	Proved STD111	Probable		Total (A)	Measured STD331	Indicated STD332	Inferred STD333	Total (B)			
		STD121	STD122								
All India : Total	31639934	359813	2313033	34312780	4347714	26482273	244159	708880	8107541	39890567	74203347
By Grades											
Chemical-A	103200	39848	208114	3511162	-	-	-	2858	560285	563143	914305
Chemical-B	152116	29714	201607	383437	23146	24475	16717	474338	842060	1380736	1764173
Oil well drilling	23317906	169400	1475769	24963075	-	3197700	104279	95356	1312626	4709961	29673036
Paint	28513	63801	126625	218939	37700	-	36160	-	159261	233121	452060
Low	5000	55000	13835	73835	310668	21775806	-	26450	3308665	25421589	25495424
Others	7977929	-	250595	8228524	3976200	1484292	-	-	275679	5736171	13964695
Unclassified	37162	2050	29812	69024	-	-	83195	105378	1494283	1682856	1751880
Not-known	18108	-	6676	24784	-	-	3808	4500	154682	162990	187774
By States											
Andhra Pradesh	31438494	347165	2203099	33988758	3980846	25083052	155391	127060	6561343	35907692	69896450
Haryana	-	-	-	-	-	-	-	-	440	440	440
Himachal Pradesh	26699	-	11001	37700	37700	-	36160	12370	15126	101356	139056
Jharkhand	-	-	-	-	-	-	-	-	35900	35900	35900
Karnataka	-	-	-	-	-	-	-	-	15175	15175	15175
Madhya Pradesh	-	-	4472	4472	18500	-	-	35000	233940	287440	291912
Maharashtra	-	-	-	-	-	17000	14800	89450	1610	122860	122860
Rajasthan	174741	12648	94461	281850	310668	1382221	37808	11500	997088	2739285	3021135
Tamil Nadu	-	-	-	-	-	-	-	500	221919	222419	222419
Uttarakhand	-	-	-	-	-	-	-	-	25000	25000	25000
West Bengal	-	-	-	-	-	-	-	433000	-	433000	433000

Figures rounded off.

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**Table - 2 : Principal Producers of Barytes
2007-08**

Name and address of producer	Location of mine	
	State	District
Andhra Pradesh Mineral Development Corpn. Ltd., House No. 8-3-945, Ameerpet, Pancom Business Centre, Hyderabad-500 073, Andhra Pradesh.	Andhra Pradesh	Cuddapah
K. Sivananda Reddy, 1/ 397-1, Court Road, Dist. Cuddapah, Andhra Pradesh.	Andhra Pradesh	Cuddapah



**Table - 3 : Production of Barytes, 2005-06 to 2007-08
(By States)**

(Qty. in tonnes; value in Rs. '000)

State	2005-06		2006-07		2007-08 (p)	
	Quantity	Value	Quantity	Value	Quantity	Value
India	1156227	444147	1680695	947053	1071765	553202
Andhra Pradesh	1149627	438062	1670506	936965	1063437	544943
Himachal Pradesh	549	714	1019	1427	738	1079
Rajasthan	6051	5371	9170	8661	7590	7180

**Table - 4 : Production of Barytes, 2006-07 and 2007-08
(By Sectors/States/Districts/Grades)**

(Qty. in tones; value in Rs.'000)

State/District	2006-07					2007-08 (p)				
	Grades			Total		Grades			Total	
	No. of mines	Snow-White	Off-colour	Quantity	Value	No. of mines	Snow-White	Off-colour	Quantity	Value
India	10	24285	1656410	1680695	947053	8	-	1071765	1071765	553202
Public sector	1	-	1630479	1630479	924482	1	-	1040532	1040532	539067
Private sector	9	24285	25931	50216	22571	7	-	31233	31233	14135
Andhra Pradesh	7	24285	1646221	1670506	936965	6	-	1063437	1063437	544943
Cuddapah	5	24285	1632681	1656966	933165	4	-	1050367	1050367	541889
Khammam	1	-	9930	9930	3078	1	-	8810	8810	2203
Prakasam	1	-	3610	3610	722	1	-	4260	4260	851
Himachal Pradesh	1	-	1019	1019	1427	1	-	738	738	1079
Sirmour	1	-	1019	1019	1427	1	-	738	738	1079
Rajasthan	2	-	9170	9170	8661	2	-	7590	7590	7180
Alwar	1	-	95	95	76	1	-	-	-	-
Udaipur	1	-	9075	9075	8585	1	-	7590	7590	7180

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Table - 5 : Production of Barytes, 2006-07 and 2007-08 (p)
(By Frequency Groups)

(Qty. in tonnes)

Production Group	No. of mines		Production for the group		Percentage in total production		Cumulative percentage	
	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08
All Groups	10	8	1680695	1071765	100.00	100.00	-	-
Up to 200	1	-	95	-	0.01	0.00	0.01	0.00
201-500	-	2	-	535	0.00	0.05	0.01	0.05
501-1000	2	1	1543	738	0.09	0.07	0.10	0.12
1001-2000	1	-	1019	-	0.06	0.00	0.16	0.12
2001-5000	2	1	5864	4260	0.35	0.40	0.51	0.52
5001-20000	2	3	19005	25700	1.13	2.40	1.64	2.92
Above 20000	2	1	1653169	1040532	98.36	97.08	100.00	100.00

Table - 6 : Mine-head Stocks of Barytes, 2007-08 (p)
(By States/Grades)

(In tonnes)

State	At the beginning of the year			At the end of the year		
	Grades		Total	Grades		Total
	Snow white	Off-colour		Snow white	Off-colour	
India	17896	2178706	2196602	201589	2417766	2619355
Andhra Pradesh	17896	2177766	2195662	201589	2417298	2618887
Himachal Pradesh	-	87	87	-	87	87
Rajasthan	-	853	853	-	381	381

Table - 7 : Prices of Barytes, 2005-06 to 2007-08
(Domestic Markets)

(In Rs. per tonne)

Grade	Market	2005-06	2006-07	2007-08(p)
`A' grade lump	Ex-stock Yard Mangampet (Andhra Pradesh)	1055	1108	1108
`B' grade lump	Ex-stock Yard Mangampet (Andhra Pradesh)	789	829	829
`A' grade, S.G. 4.25	Ex-mine Mangampet (Andhra Pradesh)	1055	1055	1055
`B' grade, S.G. 4.15	Ex-mine Mangampet (Andhra Pradesh)	789	789	789
White Barytes Powder (300 mesh)	Ex-mine Cuddapah (Andhra Pradesh)	3500	3500	3500
Off- colour barytes powder (300 mesh)	Ex-mine Cuddapah (Andhra Pradesh)	1200	1200	1200
Ore Grade	Ex-mine Cuddapah (Andhra Pradesh)	350	350	350
White Barytes, A - grade	Ex-mine Garla (Andhra Pradesh)	1000	NQ	NQ
Buff Barytes, B - grade	Ex-mine Garla (Andhra Pradesh)	400	400	400
Loose	Ex-mine Mudhkotri (Rajasthan)	250	250	250
White Barytes, A - grade lumps	ex-mine cuddapah (Andhra Pradesh)	850	850	1000
Buff Barytes, B - grade Lump	ex-mine cuddapah (Andhra Pradesh)	150	150	250

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MINING, MARKETING AND TRANSPORT

Barytes mines in India are worked by opencast method, except one in Himachal Pradesh and three in Andhra Pradesh. Andhra Pradesh Mineral Development Corp. Ltd, the largest producer, obtains barytes from the mechanised opencast mine in Mangampet area in Cuddapah district, Andhra Pradesh. Drills, loaders, dozers and dumper trucks are used for removing overburden. Barytes won from benches using jackhammers is loaded mainly on to the trucks. Barytes is milled in crushing/grinding plants before marketing. Barytes is exported from Chennai Port, 100 km from the mine.

While marketing, barytes is graded into two varieties: off-colour and snow-white. The white and snow-white varieties are used generally as fillers in the manufacture of rubber goods and as

an opacifying material in the manufacture of paints and paper. The off-colour barytes is used for manufacturing chemicals or as drilling muds. Both the well-known grades; namely, Oil Companies Material Association (OCMA) and American Petroleum Institute (API) were produced and marketed by the country. The country supplies drilling grade barytes to Middle East and South America.

CONSUMPTION

The reported consumption of barytes declined to 125,700 tonnes in 2007-08 from 130,700 tonnes in 2006-07. Oil-well drilling industry, the main consumer of barytes accounted for 68% consumption, followed by chemical industry 26%. Other barytes consuming industries like paint, asbestos products, glass, rubber and paper accounted for the remaining 6% consumption (Table-8).

**Table - 8 : Reported Consumption of Barytes, 2005-06 to 2007-08
(By Industries)**

(In tonnes)

Industry	2005-06 (R)	2006-07	2007-08 (p)
All Industries	131000	130700	125700
Asbestos products	1000 (1)	1000 (1)	1000 (1)
Chemical	33200 (4)	33200 (4)	33200 (4)
Glass	600 (8)	600 (8)	600 (8)
Oil well drilling	90600 (2)	90200 (2)	85200 (2)
Paint	5600 (28)	5600 (28)	5600 (28)
Paper	++ (1)	++ (1)	++ (1)
Rubber	100 (4)	100 (4)	100 (4)

Figures rounded off. Data collected on non-statutory basis.

Figures in parentheses denote the number of units in organised sector reporting consumption.

USES AND SPECIFICATIONS

Oil and Gas Drilling

The properties like insolubility in water, inertness and high specific gravity enable barytes application as a weighing agent in drilling operations to control pressure, prevent blow-out and at the same time to provide lubrication. Barytes powder containing minimum 90% barium sulphate and having 4.15 specific gravity is recommended for drilling. For offshore drilling, the specific gravity should be 4.2. At least 97% ground barytes should pass through 75- micron IS sieve and 95% through 53- micron IS sieve.

Chemical

Major barium chemicals obtained from barytes are carbonate, chloride, oxide, hydroxide, nitrate, peroxide and sulphate. Barium carbonate is used in glass industry, electro-ceramics and for removing inconvenient impurities in phosphoric acid. Barium hydroxide is used in the preparation of barium salts of organic acids which are employed as additives for lubricating oils and as stabilisers for PVC. Barium sulphate is used as pigment, extender and filler in rubber and paper industries.

Lithopone, a mixture of $BaSO_4$ and ZnS , is used in paint and lacquer industries as white pigments, extenders and fillers. Barium nitrate is used in green signal flares, tracer bullets, primers and detonators. Barium oxide is used in electric furnace. Barium titanate finds use in miniature electronic and communication equipment. Barytes is also used for explosive manufacture.

For chemical industry, purity is the prime criterion, with ferric oxide and strontium sulphate limited to a maximum 1% and fluorine as traces. The mesh size is also important in manufacturing chemicals. Barytes used for explosive manufacture may be bleached or unbleached. It should be in dry powder form free from extraneous matter.

Paint

Barytes is used as filler and extender in paint industry. White pigment is manufactured from barytes. Barytes should be free from mud, clay or

siliceous minerals. Presence of iron oxide is undesirable. The material should be in the form of dry powder.

Glass

In glass manufacturing, barytes is added to the glass melt for making the glass more workable and increasing its brilliance. Iron is the most undesirable impurity.

Rubber

Barytes is used as a filler and extender in rubber products. It is added to rubber compounds for reinforcement. Barytes containing minimum 99.5% $BaSO_4$ is usually preferred. Since such purity material is not found in nature, before use, barytes is normally bleached called 'blanc fixe'. The sieve residue through 75-micron and 150-micron sieve should be 4% and 0.01% max, respectively.

Other Uses

Barytes is used in the manufacture of asbestos products required for autobrake lining and other frictional materials. It is used as a filler in paper industry. Finely ground barytes and clay are used as suspension in Barvois system of coal washing. Barytes is also used in concrete aggregate required for reactor shielding.

The specifications of barytes for various industries are given in Table - 9.

SUBSTITUTES AND TECHNICAL POSSIBILITIES

Drilling mud substitutes include celestite, iron ore, synthetic hematite and ilmenite but the low cost and technical advantages of barytes deter substitution. Iron ore fines and ilmenite are substitutes used for deep drilling. Reclamation and recycling of drilling muds would decrease the requirement of new supplies. New oil exploration techniques and drilling methods are reducing the need for new boreholes and wells, and hence, the requirement for drilling muds may decrease. As a filler, barytes can be substituted by diatomite, felspar, kaolin, mica, talc and silica flour.

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Table - 9 : Specifications of Barytes in Different Industries

Industry	IS Specifications/ Specifications of other organisation	Chemical constituent					Physical characteristic					Remarks		
		BaSO ₄	SiO ₂	CaCO ₃	BaCO ₃	Alumi- nium as Al	Iron as Fe	Fineness	Relative density	Colour	Volatile matter		Residue on sieve	Oil absorption
1. Oil-well drilling	IS : 2881-1984, 90% min (Second Revision, Reaffirmed 2003) Grade-2	-	-	-	-	-	-	(a) Passing through at 75-micron 27°C IS sieve : 97% min (b) Passing through 53- micron IS sieve : 95% min	4.15	Off colour	-	-	-	For offshore drilling, relative density shall be 4.20.
2. Chemical	IS : 2881-1984, Quality 'A' (Second Revision, Reaffirmed 2003) Grade-1	2% max	-	0.1%	-	0.1%	0.1%	-	-	-	-	-	-	-
	Quality 'B' (90%)	-	-	-	-	-	1.5%	4.0 min	-	-	-	-	-	Silica and aluminium oxide together shall be 6% max.
3. Paint	IS : 64-1972, 95% min (First Revision, Reaffirmed 2004) Type - I Grade - I	-	-	-	2.24% max	-	-	4.45 at 25°C	Snow- white to white.	0.5%	0.25% on 40-micron IS sieve	6 to 12	6 to 8	Matter soluble in water should not be more than 0.5%.

(Contd.)

Table-9 (Concl'd.)

Industry	IS Specifications/ of other organisation	Chemical constituent				Physical characteristic						Remarks			
		BaSO ₄	SiO ₂	CaCO ₃	BaCO ₃	Alumi- num as Al	Iron as Fe	Fineness	Relative density	Colour	Volatile matter		Residue on sieve	Oil absorption	pH
	Grade-II min	95%	-	-	2.24% max	-	-	-	4.45% at 25°C	-do-	0.5%	0.25% on 63- micron IS sieve	6 to 12	6 to 8	Matter soluble in water should not be more than 0.5%.
	Type-II precipitated	97% min	-	-	0.45% max	-	-	-	3.36	A close match to that of approved sample	0.5%	0.1% on 40-micron IS sieve	15 to 30	6 to 8	Matter soluble in water should not be more than 0.5%.
4. Glass	Based on user's demand	90 to 98% (preferably 96%)	1.5% max	-	-	0.15% max as Al ₂ O ₃	0.3 to 0.5% max (pre- ferably 0.1% Fe ₂ O ₃)	30/80 mesh	-	-	-	-	-	-	Iron is the most undesirable impurity; white colour or light shades are preferred.

Note : BIS has prescribed IS: 1083-1994 for specifications of barytes used in rubber industry and IS:7588-1992 for that used in explosive industry.

TRADE POLICY

As per Foreign Trade Policy (FTP) 2004-09, in force, import and export of barytes (both lumps and powder) as also witherite (natural barium carbonate) are allowed without restrictions under heading No. 2511.

WORLD REVIEW

The world reserve base of barytes was assessed at 880 million tonnes. China, Kazakhstan, India, USA, Algeria, Morocco, Thailand and Turkey accounted for 62% world reserve base (Table-10). The world production of barytes decreased to 8.1 million tonnes in 2007 from 9.1 million tonnes in 2006. The leading producers were China (53%), followed by India (12%), Morocco (8%) and USA (7%). The countrywise production of barytes is given in Table - 11.

**Table - 10 : World Resources of Barytes
(By Principal Countries)**

(In '000 tonnes)

Country	Reserve base
World : Total (rounded)	880000
Algeria	15000
Brazil	5000
China	360000
France	2500
Germany	1500
India*	80000
Iran	NA
Kazakhstan	150000
Korea, North	NA
Mexico	8500
Morocco	11000
Russia	3000
Thailand	15000
Turkey	20000
UK	600
USA	45000
Other countries	160000

Source: Mineral Commodity Summaries, 2008.

* India's resources of barytes as per UNFC system are placed at about 74 million tonnes.

**Table - 11 : World Production of Barytes
(By Principal Countries)**

(In '000 tonnes)

Country	2005	2006	2007
World : Total	8100	9100	8100
Brazil	43	48	37
Bulgaria	77	75	51
China	4100	4600	4300
France	81 ^e	40 ^e	-
Germany	89	86	88
India*	1156	1731	999
Iran	231	226	226 ^e
Kazakhstan	269	261	280
Mexico	269	200	186
Morocco	598	628	665
Russia	63	63	64
Thailand	4	5	9
Turkey	157	160	150
UK ^e	64	48	53
USA	489	598	540
Vietnam	116	90	90
Other countries	294	241	362

Source : World Mineral Production, 2003-2007.

* India's production of barytes in 2005-06, 2006-07 and 2007-08 was 11,56,227 tonnes, 1,680,695 tonnes and 1,071,765 tonnes, respectively.

FOREIGN TRADE

Exports

Exports of barytes decreased to 5.65 lakh tonnes in 2007-08 from 6.30 lakh tonnes in the previous year. Exports were mainly to Saudi Arabia (34%), Mexico (21%), UAE (15%), Venezuela (8%), Egypt (6%) and Oman (5%). In 2007-08, 120 tonnes of witherite was also exported. (Tables - 12 and 13).

Imports

In 2007-08, imports of barytes decreased to 1,369 tonnes from 3,181 tonnes in the previous year. Imports were mainly from China (73%) and UK (8%) (Tables - 14 and 15). There were no imports of witherite.

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**Table - 12 : Exports of Barytes
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs.'000)	Qty (t)	Value (Rs.'000)
All Countries	629518	1475606	564800	1327465
Saudi Arabia	111154	296998	193430	383368
Mexico	-	-	117633	228197
UAE	130536	248098	82305	181885
Egypt	21273	63653	32339	93997
Oman	42909	79316	28400	93671
Venezuela	22000	39471	44111	92961
Sudan	11762	40849	19609	70616
Trinidad	16295	38843	9999	33359
Kuwait	62200	97060	397	1561
USA	192500	501931	-	-
Other Countries	18889	69387	36577	147850

**Table - 13 : Exports of Witherite
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs.'000)	Qty (t)	Value (Rs.'000)
All Countries	-	-	120	1349
USA	-	-	20	821
UAE	-	-	100	522
Germany	-	-	++	3
Kuwait	-	-	++	3

**Table - 15 : Imports of Witherite
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs.'000)	Qty (t)	Value (Rs.'000)
All Countries	180	1695	-	-
China	180	1692	-	-
USA	++	3	-	-

**Table - 14 : Imports of Barytes
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs.'000)	Qty (t)	Value (Rs.'000)
All Countries	3181	16492	1369	12592
China	2996	12903	993	8229
UK	59	1289	114	1668
Germany	16	314	5	1233
Thailand	74	1105	84	982
Vietnam	-	-	162	369
USA	-	-	11	108
Nepal	-	-	++	3
France	3	39	-	-
Italy	++	51	-	-
Japan	33	791	-	-

FUTURE OUTLOOK

India ranks second in the production of barytes in the world after China and is one of the important exporters in the world market. India has surplus resources of barytes and it can meet comfortably not only the needs of the domestic industry but also of the export market. Therefore, concerted efforts are necessary to boost up the export of barytes and its micronised products from the country. The worldwide demand for barytes may probably continue to grow till petroleum products are preferred as chief energy source. Demand for oil and gas remained strong and would further encourage exploration and development of wells which consequently will boost barytes consumption.