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SULPHUR AND PYRITES

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GOVERNMENT OF INDIA
MINISTRY OF MINES
INDIAN BUREAU OF MINES

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In India, there are no mineable elemental sulphur reserves. Pyrites was used as a substitute for sulphur in the manufacture of sulphuric acid by M/s Pyrites Phosphates and Chemicals Ltd (PPCL). There was no production of pyrites since 2003.

The domestic production of elemental sulphur is limited to by-product recoveries from petroleum refineries and fuel oil used as feedstock for manufacturing fertilizer. In addition, during the production of non-ferrous metals from sulphide ores, sulphur is recovered in the form of by-product sulphuric acid. HZL (Vedanta) and HCL together produced about 1.20 million tonnes and 1.31 million tonnes by-product sulphuric acid from indigenous lead-zinc and copper ores in 2010-11 and 2011-12, respectively, equivalent to about 311,000 tonnes and 339,000 tonnes of contained sulphur. In addition, about 2.11 million tonnes and 2.17 million tonnes sulphuric acid equivalent to 549,000 tonnes and 565,000 tonnes of contained sulphur was indigenously produced from imported copper and zinc concentrates as by-product by Sterlite Industries, Binani Zinc Ltd and Hindalco Industries Ltd during 2010-11 and 2011-12, respectively. The total production of sulphuric acid from sulphide ores was thus about 3.31 million tonnes and 3.48 million tonnes, respectively, equivalent to about 861,000 tonnes and 905,000 tonnes of sulphur during 2010-11 and 2011-12, respectively (Table-1).

Sulphur consumption in the manufacture of sulphuric acid has been reported by some of the chemical and fertilizer industries. In fertilizer industry, the sulphuric acid is further used for manufacturing phosphoric acid and single superphosphate (SSP) from rock phosphate which is imported from Jordan, Egypt, Morocco, Togo, Israel, etc.

RESOURCES

Resources of sulphur (native) were estimated in the inferred (STD333) category. The resources are located in Jammu & Kashmir and are placed at 0.21 million tonnes as on 1.4.2010 as per UNFC System.

Total resources of pyrites in the country as per UNFC system as on 1.4.2010 are placed at 1,674 million tonnes. There are no reserves and all resources are grouped under 'remaining resources' category. Of these, about 27 million tonnes are under feasibility (STD211) category. Out of the total resources, beneficiable grade resources are 62 million tonnes, low grade 1,555 million tonnes and soil reclamation grade resources are about 6 million tonnes. Balance of about 51 million tonnes resources fall under unclassified/not-known grades. Major resources are located in Bihar and Rajasthan (Table - 2).

Table – 1 : Production of By-product Sulphuric Acid, 2010-11 and 2011-12 (By Principal Producers)

(In tonnes)

Name of Producer	Production	
	2010-11	2011-12
Hindustan Copper Ltd	7,031	3,539
Hindustan Zinc Ltd	1192,700	1310,000
A. Total : From Indigenous Ores	**1199,731**	**1313,539**
Sterlite Industries (India) Ltd	968,760	1026,471
Binani Zinc Ltd	46,856	43,260
Hindalco Industries Ltd	1097,158	1097,158[e]
B. Total : From Imported Ores	**2112,774**	**2166,889**
Grand Total : (A + B)	**3312,505**	**3480,428**

Source : Annual Reports 2011-12 of Respective Producers except Hindalco Industries Ltd.

Table – 2 : Reserves/Resources of Pyrites as on 1-4-2010 (P)
(By Grades and States)

(In '000 tonnes)

Grade/State	Reserves Total (A)	Remaining resources						Total (A+B)
		Feasibility STD211	Pre-feasibility STD222	Measured STD331	Indicated STD332	Inferred STD333	Total (B)	
All India : Total	**–**	**27129**	**32597**	**9590**	**77729**	**1527356**	**1674401**	**1674401**
By Grades								
Soil Reclamation	–	–	3000	–	–	3024	6024	6024
Beneficiable	–	27129	29597	–	–	4902	61628	61628
Low	–	–	–	9590	26310	1519430	1555330	1555330
Unclassified	–	–	–	–	51419	–	51419	51419
By States								
Andhra Pradesh	–	–	–	–	–	880	880	880
Bihar	–	13462	9680	–	51419	1500000	1574561	1574561
Himachal Pradesh	–	–	–	–	–	2560	2560	2560
Karnataka	–	–	–	–	–	3000	3000	3000
Rajasthan	–	13667	22917	9590	26310	18392	90876	90876
Tamil Nadu	–	–	–	–	–	24	24	24
West Bengal	–	–	–	–	–	2500	2500	2500

Figures rounded off.

PRODUCTION & STOCKS

Sulphur

The production of sulphur recovered as by-product from fertilizer plants and oil refineries was at 381 thousand tonnes in 2011-12 as against 237 thousand tonnes in the preceding year.

Two fertilizer plants and eight oil refineries, all in the public sector, reported production of sulphur during the year. Of the total quantity produced in 2011-12, Indian Oil Corp. Ltd contributed about 82.4% of the total production during the year under review. Haryana accounted for 45.9%, Gujarat 17.3%, Maharashtra (14.4%), Uttar Pradesh 9.5%, West Bengal 8.3%, Bihar 2.4%, Assam 1.3% and Punjab (0.9%) (Tables - 3 to 5).

In addition, oil refineries of M/s Bharat Petroleum Corporation Ltd have reported production of 70,000 & 87,000 tonnes of by-product sulphur in 2010-11 and 2011-12, respectively. Data on recovery by Hindustan Petroleum Corpn. Ltd is not available. Refineries of RIL also recover by-product sulphur which is in turn used as feedstock in manufacturing fertilizers and pharmaceuticals. The Vadinar refinery of Essar Oil Ltd is also reported to produce by-product sulphur.

Table - 3 : Principal Producers of By-product Sulphur, 2011-12

Name & address of producer	Location of plant/refinery	
	State	District
Indian Oil Corporation Ltd, (Refineries Division), Scope Complex, Core-II, 7, Institutional Area, Lodhi Road, New Delhi -110 003.	Assam	Guwahati
		Digboi
	Bihar	Begusarai
	Gujarat	Vadodara
	Haryana	Panipat
	Uttar Pradesh	Mathura
	West Bengal	Midnapur
Numaligarh Refinery Limited, Golaghat, Assam - 785 699.	Assam	Golaghat
National Fertilizers Ltd, Scope Complex, Core-III, 7, Institutional Area, Lodhi Road, New Delhi -110 003.	Haryana	Panipat
	Punjab	Roopnagar
Bharat Petroleum Corporation Ltd., Bharat Bhavan, 4 & 6, Currimbhoy Road, Ballard Estate, Mumbai-440 001, Maharashtra.	Maharashtra	Mumbai

Pyrites

Pyrites Phosphates and Chemicals Ltd (PPCL) had two pyrites production units located at Amjhore (Bihar) and Saladipura (Rajasthan) besides phosphorite division in Dehradun. The Government approved closure and hiving off of these two units in July 2002 and Amjhore unit in June 2003. Hence, there was no production of pyrites since 2003.

Table – 4 : Production of By-product Sulphur 2009-10 to 2011-12 (By States)

(In tonnes)

State	2009-10	2010-11	2011-12 (p)
India	**263124**	**236998**	**381146**
Assam	665	3328	4968
Bihar	8681	8353	9329
Gujarat	12045	22436	65923
Haryana	146278	136622	174915
Maharashtra	-	-	54850
Punjab	2468	2111	3407
Tamil Nadu	41346	-	-
Uttar Pradesh	36130	38856	36005
West Bengal	15511	25292	31749

Table – 5 : Production of By-product Sulphur 2010-11 and 2011-12 (By Sectors/States/Districts)

(In tonnes)

State/District	2010-11		2011-12 (P)	
	No. of units	Quantity	No. of units	Quantity
India/Public sector	**10**	**236998**	**11**	**381146**
Assam	**3**	**3328**	**3**	**4968**
Guwahati	1	605	1	777
Digboi	1	141	1	105
Golaghat	1	2582	1	4086
Bihar/Begusarai	1	8353	1	9329
Gujarat/Vadodara	1	22436	1	65923
Haryana/Panipat	2	136622	2	174915
Maharashtra/Mumbai	-	-	1	54850
Punjab/Roopnagar	1	2111	1	3407
Uttar Pradesh/Mathura	1	38856	1	36005
West Bengal/Midnapur	1	25292	1	31749

APPLICATIONS & USES

One of the direct uses of sulphur is in vulcanisation of rubber. Sulphur is a component of gunpowder. It reacts directly with methane to give carbon disulphide, which is used to manufacture cellophane and rayon.

Elemental sulphur is mainly used as a precursor to other chemicals. Most of the sulphur is converted to sulphuric acid (H_2SO_4), which is of prime importance to the world economy. The production and consumption of sulphuric acid is an indicator of a nation's industrial development. The principal use of the sulphuric acid is in the manufacture of phosphatic fertilizer. Almost all trials responded to sulphur fertilizer with increase in crop yield from 14% to 60%.

Other applications of sulphuric acid include oil refining, wastewater processing and mineral extraction. Sulphur compounds are also used in detergents, fungicides, dyestuffs and agrichemicals. In silver based photography, sodium and ammonium thiosulphate are used as "fixing agents". Sulfites, derived from burning sulphur, are used to bleach paper. They are also used as preservatives in dried fruit and processed fruit products.

Sulphur is used as a light-generating medium in the rare lighting fixtures known as "sulphur lamps". The sulphur lamp is a highly efficient full-spectrum electrodeless lighting system whose light is generated by sulphur plasma that has been excited by microwave radiation.

CONSUMPTION

The total reported consumption of elemental sulphur in 2011-12 was about 1.69 million tonnes. The main consumer of sulphur was fertilizer industry which accounted for about 72.5%. Chemical industry, the next important consuming industry, accounted for about 15.9% consumption for manufacturing carbon disulphide & dye-stuffs. Other industries like explosives, iron & steel, paint, paper, pesticides, pharmaceuticals and sugar consumed about 11.6% (Table - 6).

TRADE POLICY

Imports of sulphur of all kinds other than colloidal sulphur, precipitated sulphur and sublimed (flowers) sulphur under heading No. 2503 are allowed freely under the Foreign Trade Policy, 2009-14. Similarly, the imports of unroasted pyrites under heading No. 2502 are allowed freely.

Table – 6 : Reported Consumption of Sulphur* 2009-10 to 2011-12 (By Industries)

(In tonnes)

Industry	2009-10	2010-11(R)	2011-12(P)
All Industries	**1641900**	**1726000**	**1689400**
Alloy steel	3600(3)	3600(3)	3600(3)
Chemical	270000(31)	282700(34)	268700(33)
Explosive	1200(2)	1200(2)	1200(2)
Fertilizer	1206700(34)	1261800(34)	1224600(34)
Iron & steel**	28900(3)	24400(3)	24400(3)
Paint	2200(2)	2200(2)	2200(2)
Paper	3800(5)	3800(5)	3800(5)
Pesticide	24400(6)	24600(6)	24600(6)
Pharmaceutical	4100(5)	4100(5)	4100(5)
Rubber	1700(11)	2000(12)	1900(12)
Sugar	95000(e)	115300(e)	130000(e)
Others (Abrasive, asbestos products, dry cells battery, electrical & glass)	300(10)	300(10)	300(10)

Figures rounded off.
Figures in parentheses denote the number of units in organised sector reporting consumption.*
*(*Includes actual reported consumption and/or estimates made wherever required).*
*** The consumption relates to manufacturing sulphuric acid in the steel plants.*
(e) estimate based on sugar production.

WORLD REVIEW

Reserves of sulphur in crude oil, natural gas and sulphide ores are large. Because most sulphur production is a result of the processing of fossil fuels, supplies should be adequate for the foreseeable future. Because petroleum and sulphide ores can be processed at long distances from where they are produced, sulphur production may not be in the country to which the reserves were attributed. For instance, sulphur reserves from Saudi Arabia may be recovered at oil refineries in the United States.

In 2011, the world production of sulphur was estimated at 71.50 million tonnes and that of pyrites at 7.5 million tonnes in terms of sulphur content. China (15%), USA (12%), Russia (11%) and Canada (9%) were the major producers of sulphur. China (93%) and Finland (5%) were the major producers of pyrites (Table - 7).

Table – 7 : World Production of Sulphur & Pyrites (By Principal Countries)

(In '000 tonnes of sulphur content)

Country	2009	2010	2011
World: Total (Sulphur)	**65822**	**69800**	**71500**
(Pyrites)	**5400**	**6800**	**7500**
Abu Dhabi (Sulphur)	1760	1800	1875
Australia@ (Sulphur)	1024	1026	1026
Brazil (Sulphur)	419	430	470
(Pyrites)	25	25	25e
Canada (Sulphur)	7461	7472	6523
China (Sulphur)	7543	9604	11026
(Pyrites)	4946	6342	6964
Chile (Sulphur)	1601	1601	1650
Finland (Pyrites)	154	250	388
(Sulphur)	401	392	453
Iran (Sulphur)	1429	1500	1575
Germany (Sulphur)	2069	1968	2007
Japan (Sulphur)	3539	3710	3382
Kazakhastan (Sulphur)	2740	2873	2999
Korea, Rep. of (Sulphur)e	1559	1689	1738
Mexico (Sulphur)	1526	1417	1482
Poland (Sulphur)	734	1020	1138
Russia (Sulphur)	6267	7354	7522
(Pyrites)	71	71e	71e
Saudi Arabia (Sulphur)	3214	3200	3250
South Africa (Sulphur)	476	427	430e
(Pyrites)	60	30	-
USA (Sulphur)	8939	9071	8810
Other countries (Sulphur)	13121	13246	14144
(Pyrites)	144	82	52

***Source:** World Mineral Production, 2007-2011.*
@ : Including New Zealand.

Elemental sulphur is obtained from ores by conventional mining or by the Frasch method of mining sulphur (mined sulphur) or as a by-product of sour natural gas processing, sour crude refining, tar sand processing and stack gas clean-up (recovered sulphur). Recovered sulphur production accounted for over 98% world elemental sulphur production.

In Frasch method, three concentric pipes are used. The outermost pipe contains superheated water, which melts the sulphur, and the innermost pipe is filled with hot compressed air, which serves to create foam and pressure. The resulting sulphur foam is then expelled through the middle pipe. The Frasch process produces sulphur with 99.5% purity content, and it needs no further purification. Frasch sulphur production on a commercial scale was operated in Brazil and Mexico. Elemental/native sulphur was mined in China, Poland and Russia.

Canada

Canada ranked fourth in the world in sulphur production. About two-thirds of Canadian Sulphur is recovered at natural gas and oil sands operations in Alberta, with some recovered from natural gas in British Columbia and from oil refineries in other parts of the country.

A report from Alberta's Energy Resources Conservation Board (ERCB) showed that sulphur emissions in 2011 from Alberta's natural gas processing plants declined by 62% from levels in 2000 and 7% from those of 2010 as a result of improved sulphur recovery technology at several plants and closing of one plant in 2011.

China

China was the leading producer of sulphur in all forms. It also was the world's leading producer of pyrites, with about 45% of its sulphur in all forms coming from that source. The country was the leading sulphur importer, with 9.3 million tonnes in 2011. Imports represented 70% of elemental sulphur consumption in China, with the Middle East as the leading source of the imports, followed by Morocco. Fertilizer production consumed about three-quarters of the sulphuric acid produced in China.

In December 2010, the Govt released 2011 tariff rates for many phosphate fertilizers to discourage exports during period of high domestic demand. The surcharge for the phosphate fertilizers would be 110% during Jan to May and Oct to Dec, and 7% during June to September.

Mexico

Petroleos Mexicanos (Pemex) planned to build several new oil refineries in an attempt to reduce the country's imports of gasoline. A 300,000 bbl/d refinery was planned at Tula in Hidalgo State. The refinery was expected to be completed in 2015 at a cost of $ 10 billion. In addition, a 100,000 bbl/d expansion at the Minatitlan refinery, originally planned for 2008, was brought online in July, 2011. This expansion added 200,000 tonnes per year to Mexico's sulphur production.

Morocco

Office Cherifien des Phosphates (OCP) awarded Jacobs Engineering Group Inc. a contract to provide engineering, procurement and construction service for two additional diammonium phosphate/monoammonium phosphate (DAP/MAP) plants to build at Jorf Lasfar. Jacobs Engineering had previously been awarded contracts for two other DAP/MAP plants in December 2010 and March 2011. Each DAP/MAP plant would have the same design with a capacity of nearly 1.0 million tonnes per year and consume 500,000 t/yr sulphur. OCP expects the plants to come online , during six month intervals, beginning July 2013 through July 2015.

Saudi Arabia

China's National Development and Reform Commission approved the funding for a 400,000 bbl/d refinery joint venture at Yanbu in Saudi Arabia between China Petrochemical Corp. (Sinopec) and Saudi Arabian Oil Co. (Saudi Aramco). Sinopec held a 37.5% interest and the remaining 62.5% was held by Saudi Aramco. The re refinery was expected to begin operations in 2014 and produce 1,200 tonnes per day of sulphur.

Saudi Aramco selected Axen IFP Group Technologies to design its Jazan refinery and terminal project. The refinery would have a throughput capacity of 400,000 bbl/d and a sulphur recovery of 1,260 t/d. The refinery was scheduled to be completed by December 2016.

FOREIGN TRADE

Exports

Exports of sulphur (excluding sublimed, precipitated and colloidal) decreased marginally to 163,372 tonnes in 2011-12 from 167,113 tonnes in the previous year. Exports were mainly to China (63%), Vietnam (34%) and Bangla Desh (1.5%).

Exports of sulphur (sublimed, precipitated and colloidal) sharply increased to 42,673 tonnes in 2011-12 from 22,332 tonnes in the previous year. Sulphur (colloidal) alone accounted for 64.5% whereas the sublimed and precipitated sulphur together shared 35.5% exports in 2011-12. Exports were mainly to Germany, Mozambique, China, South Africa, Turkey, Portugal, etc. (Tables - 8 to 12).

Imports

Imports of sulphur (excluding sublimed, precipitated and colloidal) increased sharply to 20.38 lakh tonnes in 2011-12 from 13.57 lakh tonnes in the previous year. Imports were mainly from UAE (28%), Qatar (24%), Iran (20%) and Saudi Arabia (4%).

Imports of sulphur (sublimed, precipitated and colloidal) decreased sharply to 2,981 tonnes in 2011-12 from 5,468 tonnes in the previous year. Out of the total imports, 2,217 tonnes was precipitated sulphur, 642 tonnes sublimed sulphur and 122 tonnes colloidal sulphur (Tables - 13 to 17).

Table – 8 : Exports of Sulphur (Excl. Sublimed, Precipitated & Colloidal) :Total (By Countries)

Country	2010-11		2011-12	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**167113**	**979567**	**163372**	**1671782**
China	76490	468176	102750	1002991
Vietnam Soc Rep.	-	-	55081	553410
Bangladesh	1205	19456	2524	50471
Ethiopia	-	-	505	17940
Sri Lanka	564	7818	902	16147
Nepal	193	2618	403	7346
Tanzania Rep.	10	216	400	6547
Sudan	-	-	299	6427
Kenya	46	613	166	3052
UAE	53	801	100	2578
Other countries	88552	479869	242	4873

Table – 9 : Exports of Sulphur (Sublimed, Precipitated & Colloidal) : Total (By Countries)

Country	2010-11		2011-12	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**22332**	**902212**	**42673**	**1857142**
Germany	1859	188512	3091	354403
Unspecified	-	-	25512	239307
Mozambique	-	-	2500	218700
South Africa	915	91763	1151	130820
Turkey	392	40057	957	111400
Spain	816	82591	862	101341
Portugal	711	64145	936	96924
Indonesia	760	70143	901	89477
China	60	5523	2375	88603
Iran	539	59660	669	72194
Other countries	16280	299818	3719	353973

Table – 10 : Exports of Sulphur (Colloidal) (By Countries)

Country	2010-11		2011-12	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**13621**	**81076**	**27506**	**281813**
Unspecified	-	-	25432	229434
China	-	-	2000	49618
Lebanon	-	-	28	2005
Nepal	20	277	44	733
Congo, People's Rep. of	1	9	1	13
Canada	-	-	1	10
Other countries	13600	80790	-	-

Table - 11 : Exports of Sulphur (Precipitated) (By Countries)

Country	2010-11		2011-12	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**46**	**631**	**205**	**7002**
Iran	-	-	108	5371
Nepal	25	286	74	1194
Sri Lanka	21	344	22	410
UAE	-	-	1	16
Nigeria	-	-	++	10
Other countries	++	1	++	1

Table – 12 : Exports of Sulphur (Sublimed) (By Countries)

Country	2010-11		2011-12	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**8665**	**820505**	**14962**	**1568327**
Germany	1859	188512	3091	354403
Mozambique	-	-	2500	218700
South Africa	915	91763	1151	130820
Turkey	392	40057	957	111400
Spain	816	82591	862	101341
Portugal	711	64145	936	96924
Indonesia	760	70143	901	89477
Iran	539	59660	561	66823
Thailand	-	-	590	66723
UK	294	27250	487	51008
Other countries	2379	196384	2926	280708

Table – 13 : Imports of Sulphur (Excl. Sublimed, Precipited & Colloidal) : Total (By Countries)

Country	2010-11		2011-12	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**1356774**	**10977136**	**2037635**	**22832892**
UAE	386976	3099731	580163	6550779
Qatar	258175	2088622	494544	5636339
Iran	280927	2162989	417611	4593722
Kuwait	139795	1124198	213372	2348028
Saudi Arabia	155132	1350562	83554	901715
Jordan	-	-	64038	705613
Bahrain	42693	403805	59158	643539
Iraq	-	-	50917	604271
Oman	500	4112	32498	333065
Russia	5406	42206	15399	169010
Other countries	87170	700911	26381	346811

Table – 14 : Imports of Sulphur (Sublimed, Precipitated & Colloidal) : Total (By Countries)

Country	2010-11		2011-12	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**5468**	**453101**	**2981**	**268017**
Malaysia	1730	166235	1155	125592
China	840	66345	460	39496
France	220	9861	548	26191
Japan	122	11618	240	21955
Germany	63	7571	140	16256
USA	44	2539	147	14115
Korea, Rep. of	29	1443	96	9441
Belgium	17	1045	35	3058
Chinese Taipei/Taiwan	-	-	24	2270
Hong Kong	-	-	16	1848
Other countries	2403	186444	120	7795

Table – 15 : Imports of Sulphur (Colloidal) (By Countries)

Country	2010-11		2011-12	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**32**	**2389**	**122**	**7019**
USA	1	63	34	2489
Korea, Rep. of	26	1149	27	2173
Germany	5	1177	12	2019
Saudi Arabia	-	-	49	338

Table – 16 : Imports of Sulphur (Precipitated) (By Countries)

Country	2010-11		2011-12	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**4327**	**360751**	**2217**	**197091**
Malaysia	1506	145588	915	99843
France	220	9859	533	24642
Japan	90	8334	240	21955
China	63	5425	223	18570
USA	33	2005	95	9580
Korea Rep. of	1	171	68	7174
Germany	39	4447	55	6007
Chinese Taipei/Taiwan	-	-	24	2270
Hong Kong	-	-	16	1848
Italy	-	-	16	1809
Other countries	2375	184922	32	3393

Table – 17 : Imports of Sulphur (Sublimed)
(By Countries)

Country	2010-11		2011-12	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**1109**	**89961**	**642**	**63907**
Malaysia	224	20647	240	25749
China	777	60920	237	20926
Germany	19	1947	73	8230
Belgium	14	840	35	3057
USA	10	470	18	2045
Australia	-	-	17	1802
France	++	2	15	1548
UK	++	10	6	456
Korea, Rep. of	2	124	1	94
Other countries	63	5001	-	-

FUTURE OUTLOOK

Country being deficient in pyrites and sulphur which are essential for fertilizer industry, the Working Group on Mineral Exploration & Development (other than Coal & Lignite) for the 12th Five Year Plan (2012-17) has recommended that taxation policy intervention should be introduced to recover the sulphur going as gaseous emissions in the refinery and petro-chemical industries.

Recovered sulphur output was expected to increase significantly worldwide. Increased production, was expected to come from Russia's increased sulphur recovery from natural gas and Asia's improved sulphur recovery at oil refineries and new development of sour gas deposits. Refineries in developing countries were expected to improve environmental protection measures and eventually compare with the environmental standards of plants in Japan, North America and Western Europe in future. Higher sulphur recovery is likely to result from several factors, viz, higher refining rates, higher sulphur content in crude oil, lower allowable sulphur content in finished fuels, and reduced sulphur emissions mandated by regulations.

Some of the future gas production, however, is expected to come from unconventional natural gas resources such as tight gas, shale gas, and coal bed methane. Use of unconventional gas resources will certainly affect the sulphur supply outlook for the future as these gases have low sulphur content.