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(Part- III : MINERAL REVIEWS)

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SULPHUR AND PYRITES

(ADVANCE RELEASE)

GOVERNMENT OF INDIA
MINISTRY OF MINES
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46 Sulphur and Pyrites

Sulphur is an essential raw material for many chemical industries and is essentially used for the production of sulphuric acid which in turn is used for the production of chemical fertilizers, textiles, dyestuffs, pickling and galvanising of steel, storage batteries, refining of petroleum, explosives and other acids.

In India, presently there are no mineable elemental sulphur reserves. Sulphur combines directly with almost all the elements with the exception of gold, platinum and the noble gases. In its native form, sulphur is a yellow crystalline solid. It can be found as a pure element or as sulphate or sulphide minerals. The crystallography of sulphur is complex. Depending on the specific conditions, the sulphur allotropes form several distinct crystal structures, with rhombic and monoclinic S_8 best known.

Pyrites is naturally occurring mineral comprised of the elements iron and sulphur (FeS_2). It is used for manufacture of sulphuric acid, and as direct feed for soil conditioning. Pyrite is a fairly ubiquitous mineral and it occurs most commonly in sedimentary rocks. Pyrite has a brass yellow colour, brownish black streak, metallic lusture and occurs as cubic crystals. Pyrites includes a range of sulphide materials, such as, marcasite, pyrite and pyrrhotite. Marcasite usually occurs in low temperature metasediments and sedimentary rocks. Pyrrhotite occurs usually in magmatic or contact metasomatic deposits associated with basic igneous rocks and high temperature sulphide veins and is often nickeliferous. Pyrites was used as a substitute for sulphur in the manufacture of sulphuric acid. However, there was no production of pyrites since 2003.

Native sulphur deposit has been reported in Puga Valley of Leh district in the Union Territory of Jammu & Kashmir. The grade of the deposit ranges from 9% to 24% of sulphur. Small occurrences of native sulphur are also reported from Barren Island of Bay of Bengal. Sulphur along with hot springs were reported from various parts of Chamoli, Rudraprayag, Uttarkashi, etc. districts in Garhwal & Kumaun divisions of Uttarakhand. In Andhra Pradesh, native sulphur occurs in granular form with clay and silt in coastal areas of Krishna and East Godavari districts. Occurrences are also reported from Alappuzha district of Kerala and Kangra district of Himachal Pradesh.

Sulphide occurs naturally in mineral ores, oil and coal deposits. Natural waters containing elevated concentrations of hydrogen sulphide are used for therapeutic baths and have been consumed for medical purposes. Hydrogen sulphide (H_2S), which exists as a colourless gas under normal conditions, has a characteristic odour of rotten eggs and occurs naturally in coal, natural gas, oil, volcanic gases and sulphur springs and lakes; H_2S is a central participant in the sulphur cycle, the biogeochemical cycle of sulphur on earth. Sulphides form an indispensable link in the sulphur cycle (the reversible interconversion of sulphide and sulphate) in nature.

Petroleum refineries and gas processing plants extract H_2S when making “clean fuels” and use it as a feed stock to produce sulphur and water. The domestic production of elemental sulphur is limited to by-product recoveries from petroleum refineries and fuel oil used as feedstock for manufacturing fertilizer. Tar sands-natural sand (Oil sands) formations contain about 10% bitumen and with high hydrogen sulphide content.

The sulphide ores contain sulphur and during the production of metal from sulphide ores, sulphur is released as SO_2 which is used to produce sulphuric acid. The sulphuric acid thus produced contains about 32.7% of sulphur and contributes in the industries which otherwise would have used elemental sulphur.

RESERVES/ RESOURCES

The total reserves/ resources of pyrites in the country as per NMI data, based on UNFC

system as on 1.4.2015 has been placed at 1,674 million tonnes. There are no reserves and all resources are grouped under 'Remaining Resources' category. Out 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. The balance of about 51 million tonnes resources fall under Unclassified/Not-known grades. Major reserves/resources are located in Bihar (94%) and Rajasthan (5%) (Table - 1).

Reserves/resources of sulphur (native) have been estimated in the Inferred (STD333) category only. Entire resources are located in Jammu & Kashmir and are placed at 0.21 million tonnes as on 1.4.2015 as per NMI data, based on UNFC System (Table-2).

Table – 1 : Reserves/Resources of Pyrites as on 1.4.2015 (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

Table – 2 : Reserves/Resources of Sulphur (Native) as on 1.4.2015 (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	**–**	**–**	**–**	**–**	**–**	**210**	**210**	**210**
By Grades								
Sulphur (Native)	–	–	–	–	–	210	210	210
By States								
Jammu & Kashmir	–	–	–	–	–	210	210	210

Figures rounded off

PRODUCTION

Sulphur (By-product)

The production of sulphur recovered as by-product from fertilizer plants and oil refineries were 901 thousand tonnes in 2019-20 as against 890 thousands tonnes in the preceding year.

The oil refineries in Public Sector reported production of sulphur. During the year 2019-20, Indian Oil Corp. Ltd contributed about 68.19% of the total production during the year. Among the States, Odisha accounted for 28% of the total sulphur production and it was followed by Kerala (25%), Haryana (19%), Gujarat (11%), Maharashtra (6%), Uttar Pradesh (5%), West Bengal (4%) and the remaining production was contributed by Assam and Bihar.

In addition, refineries of Hindustan Petroleum Corp. Ltd, RIL and Essar Oil also reported recovering of by-product sulphur which in turn is used as feedstock in manufacturing fertilizers and pharmaceuticals. The Vadinar refinery of Essar Oil Ltd is also reported to produce by-product sulphur. In Fertilizer Industry, the sulphuric acid is further used for manufacturing phosphoric acid and single superphosphate (SSP) from rock phosphate (Tables - 3 to 5).

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 and since then no activity is reported.

Petroleum Refining

In fossil fuels, sulphur is naturally present as an impurity when fuel is burnt, the sulphur is released as sulphur dioxide — an air pollutant. Hydrodesulfurisation (HDS) is a catalytic chemical process widely used to remove sulphur from natural gas and from refined petroleum products, such as, gasoline or petrol, jet, fuel, kerosene, diesel and fuel oils. Sulphur is a by-product produced in various refineries processing high sulphur crude oil. Sulphur is produced from the sulphur-rich fuel gas as a process to reduce the emission level of sulphur in the atmosphere along with flue gases from the furnaces. Mathura refinery started production of sulphur from beginning itself and sulphur recovery units have been provided in Haldia, Koyali, Panipat, Mathura and Guwahati refineries.

Refinery-wise Sulphur (by-product) production capacity of Indian Oil Corporation Ltd is as under:

Unit	Production Capacity ('000 MTPA)
Mathura	48.0
Haldia	24.0
Koyali	18.0
Panipat	144.0
Barauni	12.0
Guwahati	0.6

Specification of sulphur at Mathura, Panipat, Koyali, Haldia, Barauni & Guwahati refineries is as under:

Property	
Purity	99.9
Colour	Yellow
Shape	Lump

Table - 3 : Principal Producers of By-product Sulphur, 2019-20

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	Kamrup Metro, Tinsukia Chirang
	Bihar	Begusarai
	Gujarat	Vadodara
	Haryana	Panipat
	Odisha	Jagatsinghpur
	Uttar Pradesh	Mathura
	West Bengal	Purba Medinipur
Numaligarh Refinery Limited, 122S, G. S. Road, Christanbasti, Distt- Guwahati, Assam - 781 005.	Assam	Golaghat
Bharat Petroleum Corporation Ltd, Bharat Bhavan, 4 & 6, Currimbhoy Road, Ballard Estate, Mumbai-400 001, Maharashtra	Maharashtra	Mumbai
	Kerala	Ernakulam

Note: *Sulphur is recovered as by-product from fertilizer plants and oil refineries (excluding units working under Private Sector)*

Table – 4 : Production of Sulphur (By-product) 2017-18 to 2019-20 (By States)

(In tonnes)

State	2017-18	2018-19	2019-20 (P)
India	**825173**	**890400**	**900942**
Assam	8051	7100	5955
Bihar	7330	7050	6843
Gujarat	95343	91962	97107
Haryana	180431	176755	170907
Kerala	155695	225857	227253
Maharashtra	58904	46967	55659
Odisha	231075	239344	253697
Uttar Pradesh	47691	51738	47955
West Bengal	40653	43627	35566

Table – 5 : Production of Sulphur (By-product) 2018-19 and 2019-20 (By Sectors/States/Districts)

(In tonnes)

State/District	2018-19		2019-20 (P)	
	No. of units	Quantity	No. of units	Quantity
India/ Public sector	**12**	**890400**	**12**	**900942**
Assam	**4**	**7100**	**4**	**5955**
Chirang	1	1680	1	1218
Tinsukia	1	334	1	340
Kamrup Metro	1	376	1	694
Golaghat	1	4710	1	3703
Bihar/ Begusarai	1	7050	1	6843
Gujarat/ Vadodara	1	91962	1	97107
Haryana/ Panipat	1	176755	1	170907
Kerala/ Ernakulam	1	225857	1	227253
Maharashtra/ Mumbai	1	46967	1	55659
Odisha/ Jagatsinghpur	1	239344	1	253697
Uttar Pradesh/ Mathura	1	51738	1	47955
W. Bengal/				
Purba Medinipur	1	43627	1	35566

USES

Flowers of Sulphur (sublimed sulphur)

Powdered form of sulphur produced by sublimation process that which may contain up to 30% of the amorphous allotrope are generally used in rubber vulcanisation, agricultural dusts, pharmaceutical products and stock feeds.

Sulphur dioxide (SO_2)

Sulphur dioxide is a by-product gas generated during processing of sulphide ores as well from other industries. It is used in many industrial processes such as, chemical preparation, refining, pulp-making and solvent extraction and also is the feed stock to manufacture sulphuric acid. Sulphur dioxide is also used in the preparation and preservation of food because it prevents bacterial growth and browning of fruit.

Sulphuric Acid

Sulphuric acid is a strong mineral acid with the formula H_2SO_4. It is soluble in water at all concentrations. Sulphuric acid has many applications and is produced in greater amounts than any other chemical besides water. Principal uses include ore processing, fertilizer manufacturing, oil refining, waste water processing and chemical synthesis.

Miscellaneous

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 in the manufacturing of 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 are an indicator of a nation's industrial development. The principal use of sulphuric acid is in the manufacture of phosphatic fertilizer.

Other applications of sulphuric acid include oil refining, waste water processing and mineral extraction. Sulphur compounds are also used indetergents, fungicides, dyestuffs and agrichemicals. In silver based photography, sodium and ammonium thio-sulphate are used as "fixing agents". Sulphites, 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.

Nitrogen (N), phosphorus (P) and potassium (K) are critical components of a well-fertilized crop. But to achieve yields and more nutritious foods, crops need sulphur (S). It improves protein and oil percentage in seeds, cereal quality for milling and baking, marketability of dry coconut kernel (copra), quality of tobacco, nutritive value of forages, etc. It is associated with special metabolisms in plant and the structural characteristics of protoplasm. Judicious application in sulphur-deficient soils is a cost-effective way to produce more food and feed.

Concrete binder made with sulphur is an eco-efficient alternative to conventional Portland cement for paving stones, sidewalks and building foundations. In road construction, sulphur technology can replace up to 30 per cent of asphalt binder, a high energy-intensive input in blacktop roads. Sulphur-enhanced roads and parking lots offer a longer life cycle.

INDUSTRY

Coromandel International Ltd, formerly Coromandal Fertilizers Limited (CFL), is a leading manufacturer of a wide range of fertilizers & pesticides. Manufacturing units are located at Vizag, Kakinada and Ennore. The plants have the flexibility to produce 13 products from multiple rock and acid combinations.

The present production facility of the Fertilizers and Chemicals Travancore Limited (FACT) includes manufacture of 3,30,000 MTPA of sulphuric acid of Cochin Division. The Company produced 3,07,245 tonnes of sulphuric acid during 2019-20 as compared to 2,93,000 tonnes of sulphuric acid in the previous year at Cochin Division.

Gujarat State Fertilizers & Chemicals Limited (GSFC) has two sulphuric acid plants with a rated capacity of 1,350 tonnes per day & 400 tonnes per day. GSFC is contemplating to install 3,000 tonnes per day sulphuric acid plant on EPC basis at its Sikka Unit. This will reduce the import dependency for sustaining the plant operation on continuous basis for production of Phosphatic Fertilizers at Sikka Unit.

The Hindustan Zinc Ltd, has eight sulphuric acid producing plants in the State of Rajasthan. The total sulphuric acid production of HZL was 12,40,468 tonnes during 2019-20 as compared to 12,83,239 tonnes in the previous year.

Khaitan Chemicals & Fertilizers Group has sulphuric acid production capacity of 2,70,600 tonnes. The sulphuric acid plants are located at Nimrani, Distt Khargone, M.P.; Goramachia, Distt Jhansi, U.P.; Malwan, Distt Fatehpur, U.P. and Somni, Distt Rajnandgaon, Chhattisgarh. Sulphuric acid is also a raw material for production of SSP. Khaitan Chemicals & Fertilizers Group produced 2,09,787 tonnes of sulphuric acid during 2019-20 as compared to 1,80,443 tonnes in the previous year.

Hindalco is one of the leading sulphuric acid manufacturers in India. As per available information, the Company has three sulphuric acid plants with a total capacity of 14,70,000 tonnes per annum. About half of the sulphuric acid, a by-product from the copper plant, is used for the generation of sulphuric acid which is used to make phosphoric acid.

TRADE POLICY

Imports of sulphur of all kinds other than sublimed sulphur, precipitated sulphur and colloidal sulphur under Heading No. 2503 are

allowed free under the Foreign Trade Policy (FTP), 2015-20. Similarly, the imports of unroasted iron pyrites under Heading No. 2502 are allowed free.

WORLD REVIEW

Reserves of sulphur in crude oil, natural gas and sulphide ore are large. As sulphur is produced as a result of the processing of fossil fuels, its supplies should be adequate for the near future. Besides, the reality is that petroleum and sulphide ore mostly get processed at long distances from where they are produced, sulphur production reported, therefore, may not be in the country to which the reserves were attributed. For instance, sulphur from Saudi Arabian oil may be recovered at refineries in the United States or elsewhere in the world.

In 2019, the world production of sulphur ore was estimated at 79.90 million tonnes and that of pyrites at 6.20 million tonnes in terms of sulphur content as compared to 78.60 million tonnes & 6.30 million tonnes respectively in the preceding year (Table-6).

Elemental sulphur is obtained from ores by conventional mining or by the Frasch method of mining 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% of 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.

To provide a generalised view of the development in various countries, the country wise description sourced from latest available publication of Minerals Yearbook 'USGS' 2017 is furnished as below:

Canada

In 2017, sulphur production, in all forms, in Canada was slightly higher than it was in 2016. About three-fourths of Canada's sulphur was recovered at natural gas and oil sands operations in Alberta. Minor quantities of sulphur were also recovered from oil sands in Saskatchewan and from oil refineries in other parts of the country, these besides by-product sulphuric acid is produced from metallurgy. Canada's sulphur production is expected to remain stable over the medium term and is likely increase during the long term as a result of expanded oil sands production. Sulphur production from natural gas is expected to decrease with declining as natural gas production.

China

China was the leading global producer of sulphur in all forms and the leading producer of pyrites, with about 25% of its sulphur in all forms coming from that source. The country was the leading sulphur importer with a total of 11.2 tonnes, which was about one-third of global imports. Imports represented about 55% to 60% of elemental sulphur, the bulk of which was used in manufacturing sulphuric acid. The Government of China removed the export tariffs from phosphate fertilizers in 2017. No tariff was imposed on diammonium phosphate and monoammonium phosphate through 2017 and into 2018.

Oman

Duqm Refinery and Petrochemical Industries LLC contracted with Técnicas Ruenidas to build a new refinery in Oman. The contract included the engineering, supply, construction and commissioning of the refinery. In addition, to the 2,30,000-bbl/d crude distillation unit, the refinery would have three 355tonne per day sulphur recovery units.

Table – 6 : World Production of Sulphur & Pyrites (By Principal Countries)

In tonnes (sulphur content)

Country	2017	2018	2019
World: Total (Pyrites)	**6300000**	**6300000**	**6200000**
World: Total (Frash)	**700000**	**600000**	**600000**
World: Total (Recovered)	**79000000**	**78600000**	**79900000**
World: Total (Sulphur ore)	**200000**	**100000**	**100000**
China			
*(Recovered)	11590000	11600000	11600000
*(Pyrites)	5850000	5900000	5900000
USA			
(Recovered)[a]	9070000	9010000	8200000*
(Recovered)[b]	575000	670000	620000*
Russia			
*(Recovered)[a]	6600000	6700000	6700000
*(Recovered)[c]	954000	954000	954000
(Sulphur Ore)	96316	83707	57427
*(Pyrites)	71000	71000	71000
Canada			
(Recovered)[a]	4802900	4828000	6418000
(Recovered)[b]	524000	505000	520000
Saudi Arabia			
*(Recovered)[a]	3700000	3900000	3700000
Kazakhstan			
(Recovered)[a]	2947300	2620000*	2625000*
*(Recovered)[b]	604000	604000	604000
UAE			
*(Recovered)[a]	2467000	2474000	2523000
Iran			
(Recovered)[d]	2200000	2200000	2200000*
Korea, Rep. of			
(Recovered)[a]	2000000	2000000	2000000
*(Recovered)[b]	1078000	1078000	1078000
Japan			
(Recovered)[b]	1583867	1710961	1629656
(Recovered)[a]	1788620	1697355	1629365
Qatar			
*(Recovered)[a]	1661100	1669500	1648500
Chile			
(Recovered)[b]	1524437	1476456	1263119
India**			
*(Recovered)[b, f]	1200000	1200000	1200000
(Recovered)[a]	825173	890400*	892894*
Kuwait			
*(Recovered)[a]	850000	850000	850000
Australia			
*(Recovered)[b]	810000	810000	810000
*(Recovered)[a]	90000	90000	90000
Zambia			
(Recovered)[b]	679500	754000*	800000*

(contd)

Table-6 (concld)

Country	2017	2018	2019
Poland			
(Frash)	663000	617370	568240
*(Recovered)[b]	280000	280000	280000
(Recovered)[a]	23000	23770	25200
Mexico			
*(Recovered)[b]	556000	556000	556000
(Recovered)[a]	551218	442657	729934
Peru			
*(Recovered)[d]	556000	556000	556000
Spain			
*(Recovered)[b]	539000	539000	539000
*(Recovered)[a]	515000	515000	515000
Netherlands			
*(Recovered)[a]	520000	520000	520000
*(Recovered)[b]	86000	96000	86000
Italy			
(Recovered)[d]	511000	550000*	550000*
Jordan			
*(Recovered)[a]	490000	490000	490000
Germany			
(Recovered)[a]	537882	419597	460000
(Recovered)[c]	328247	254400	280660
Turkmenistan			
*(Recovered)[a]	380000	365000	363000
Belgium			
*(Recovered)[a, b]	400000	400000	400000
Bulgaria			
(Recovered)[b]	490272	463393	414503
*(Recovered)[a]	60000	60000	60000
Uzbekistan			
*(Recovered)[a]	81000	84000	81000
*(Recovered)[b]	131000	131000	131000
France			
(Recovered)[a]	370000	370000	370000
(Recovered)[c]	78000*	54592	55000*
Finland			
(Pyrites)	291000	271000	233000
(Recovered)[b]	345762	343377	327300
*(Recovered)[a]	130000	130000	120000

Source: *BGS, World Mineral Production, 2015-2019*

a: From petroleum refining and/or natural gas

b: From metal sulphide processing

c: Other; d: Sulphur, all forms

e: Including Frasch

f: Years ended 31st March following that stated.

*** India's production of Sulphur (by-product) during 2017-18, 2018-19 and 2019-20, was 8,25,173 tonnes, 8,90,400 tonnes and 9,00,942 tonnes respectively.*

** Estimated*

FOREIGN TRADE

Exports

Exports of sulphur (excluding sublimed, precipitated and colloidal) increased drastically by 67% to 8,02,175 tonnes in 2019-20 as compared to 4,79,651 tonnes in the preceding year. Exports were mainly to China (89%), Jordan and Papua New Guinea (5% each). On the other hand, exports of sulphur (sublimed, precipitated and colloidal) decreased marginally by 7% to 16,813 tonnes in 2019-20 as compared to 18,080 tonnes in the preceding year. Exports were mainly to Netherlands (20%), USA (17%), Indonesia (8%), Russia, Thailand & Brazil (7% each) and South Africa (6%) (Tables-7 to 11). Exports of sulphur (sublimed) & precipitated were at 16,811 tonnes & 1 tonnes respectively.

Imports

Imports of sulphur (excluding sublimed, precipitated and colloidal) decreased by 8% to 1.24 million tonnes in 2019-20 from 1.35 million tonnes in the previous year. Imports were mainly from UAE (48%), Qatar (29%), Oman (7%), Japan (5%) and Singapore & Baharain (3% each). Imports of sulphur (sublimed, precipitated and colloidal) increased drasticaly by 368% to 753 tonnes in 2019-20 from 161 tonnes in the previous year. Imports were mainly from Saudi Arabia (66%), China (15%), Republic of Korea (10%), USA (3%) and Germany & Malaysia (2% each) (Tables -12 to 16). Imports of sulphur (sublimed) & precipitated were at 171 tonnes & 529 tonnes respectively.

Table – 7 : Exports of Sulphur (Excl. Sublimed, Precipitated & Colloidal) :Total (By Countries)

Country	2018-19 (R)		2019-20 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**479651**	**4332476**	**802175**	**3872833**
China	435881	3800154	718977	3385473
Jordan	1	33	38501	160609
UAE	131	5743	2731	129029
Papua N Guinea	34620	323221	38500	111763
Sri Lanka	1148	23124	1187	20479
Nepal	1119	19309	1090	14117
USA	93	1883	123	11006
Oman	116	3072	350	8843
Turkey	373	27521	120	7667
Brazil	-	-	54	5087
Other countries	6169	128416	541	18761

Figures rounded off

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

Country	2018-19 (R)		2019-20 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**18080**	**2128393**	**16813**	**1917965**
Netherlands	3643	460233	3353	406857
USA	2231	253114	2826	310857
Indonesia	1518	169129	1383	150631
Russia	1551	184656	1242	140581
Brazil	1101	126900	1248	139495
Thailand	1447	161864	1240	138243
South Africa	1050	129133	1007	124705
Italy	774	100411	704	83192
Spain	794	92777	720	77855
Portugal	624	75439	624	72713
Other countries	3347	374738	2466	272836

Figures rounded off

Table – 9: Exports of Sulphur (Colloidal)
(By Countries)

Country	2018-19 (R)		2019-20 (P)	
	Quantity (t)	Value (₹'000)	Quantity (t)	Value (₹'000)
All Countries	**3**	**210**	**++**	**24**
UAE	2	147	++	19
Kenya	-	-	++	3
USA	-	-	++	1
Saudi Arabia	-	-	++	1
Nepal	1	57	-	-
Singapore	++	5	-	-
Malta	++	2	-	-

Figures rounded off

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

Country	2018-19 (R)		2019-20 (P)	
	Quantity (t)	Value (₹'000)	Quantity (t)	Value (₹'000)
All Countries	**18077**	**2128091**	**16811**	**1917786**
Netherlands	3643	460233	3353	406857
USA	2231	253114	2826	310856
Indonesia	1518	169129	1383	150631
Russia	1551	184656	1242	140581
Brazil	1101	126900	1248	139495
Thailand	1447	161864	1240	138243
South Africa	1050	129133	1007	124705
Italy	774	100411	704	83192
Spain	794	92777	720	77855
Portugal	624	75439	624	72713
Other countries	3343	374435	2464	272657

Figures rounded off

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

Country	2018-19 (R)		2019-20 (P)	
	Quantity (t)	Value (₹'000)	Quantity (t)	Value (₹'000)
All Countries	**1**	**92**	**1**	**155**
Sudan	-	-	1	87
Kenya	-	-	++	21
Malaysia	-	-	++	20
Ethiopia	++	12	++	10
UAE	-	-	++	10
Kuwait	-	-	++	3
Zimbabwe	++	2	++	3
Jordan	++	5	++	1
Sri Lanka	++	65	++	++
Nepal	++	1	++	++
Other countries	++	7	++	++

Figures rounded off

Table – 12-: Imports of Sulphur (Excl. Sublimed, Precipitated & Colloidal): Total
(By Countries)

Country	2018-19 (R)		2019-20 (P)	
	Quantity (t)	Value (₹'000)	Quantity (t)	Value (₹'000)
All Countries	**1346777**	**15219696**	**1235103**	**8239655**
UAE	491783	5476609	595442	4074208
Qatar	457628	5083600	354407	2236044
Oman	4681	58781	90240	507493
Japan	64948	775092	63939	466787
Singapore	42938	461250	37729	217065
Bahrain	10919	125507	36798	201149
Cyprus	-	-	19700	183653
Korea, Rep. of	14468	200894	19081	156622
Saudi Arabia	151659	1853264	17132	154203
Taiwan	16596	253548	203	24189
Other countries	91158	931151	432	18245

Figures rounded off

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

Country	2018-19 (R)		2019-20 (P)	
	Quantity (t)	Value (₹'000)	Quantity (t)	Value (₹'000)
All Countries	**161**	**25154**	**753**	**42667**
China	27	2890	115	15442
Korea, Rep. of	49	3899	73	7353
Germany	44	11522	16	6361
Saudi Arabia	-	-	500	4091
USA	13	2476	19	3208
Taiwan	-	-	8	2711
Malaysia	-	-	17	2105
Japan	16	2750	4	957
UK	++	38	++	168
Vietnam	-	-	++	160
Other countries	11	1580	++	110

Figures rounded off

Table – 14: Imports of Sulphur (Precipitated) (By Countries)

Country	2018-19 (R)		2019-20 (P)	
	Quantity (t)	Value (₹'000)	Quantity (t)	Value (₹'000)
All Countries	**27**	**3908**	**529**	**9532**
Saudi Arabia	-	-	500	4091
Malaysia	-	-	16	2064
China	-	-	5	1400
Taiwan	-	-	4	1121
Japan	5	1193	3	804
Germany	22	2565	++	35
USA	++	147	++	18
UK	++	3	-	-

Figures rounded off

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

Country	2018-19 (R)		2019-20 (P)	
	Quantity (t)	Value (₹'000)	Quantity (t)	Value (₹'000)
All Countries	**61**	**10959**	**53**	**8730**
Germany	21	8018	16	6063
Korea, Rep. of	28	1162	37	2210
UK	++	28	++	166
Japan	11	1558	1	154
USA	++	188	++	126
Netherlands	-	-	++	5
France	++	6	++	2
Belgium	-	-	++	2
Thailand	-	-	++	1

Figures rounded off

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

Country	2018-19 (R)		2019-20 (P)	
	Quantity (t)	Value (₹'000)	Quantity (t)	Value (₹'000)
All Countries	**73**	**10287**	**171**	**24405**
China	27	2890	110	14043
Korea, Rep. of	21	2737	36	5143
USA	13	2140	19	3063
Taiwan	-	-	4	1590
Germany	1	939	++	263
Vietnam	-	-	++	160
Netherlands	11	1574	++	100
Malaysia	-	-	1	41
UK	++	7	++	2

Figures rounded off

FUTURE OUTLOOK

Country is deficient in sulphur and pyrites which are essential for Fertilizer Industry. Recovered sulphur output was expected to increase significantly worldwide. Refineries in developing countries are 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.

World consumption of natural gas is expected to maintain strong growth, and sulphur recovery from that sector is likely to maintain an increasing trend. Some of the future gas production is expected to come from unconventional natural gas resources, such as, shale gas and coal-bed methane.

In the near term, increased global production and continued demand will keep the sulphur market balanced, which is expected to be followed in the long term by a surplus worldwide. International sulphur trade is expected to increase significantly, driven by demand for sulphuric acid in industrial sectors (particularly new ore-leaching operations) and a modest increase in demand for fertilizers.