

MINERAL-BASED INDUSTRIES



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(Part- I : General Reviews)

61th Edition

MINERAL-BASED INDUSTRIES

(ADVANCE RELEASE)

**GOVERNMENT OF INDIA
MINISTRY OF MINES
INDIAN BUREAU OF MINES**

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7 Mineral-based Industries

Minerals are vital raw materials for many basic industries and are major components for growth and industrial development. The management of mineral resources, hence, has to be closely integrated with the overall strategy for development and exploitation of minerals, aligning with the long-term national goals. In tune with the Economic Liberalisation Policy adopted in July 1991, the National Mineral Policy announced in March 1993 has opened the Mineral Sector for private entrepreneurs, both domestic and foreign. The changing global scenario necessitated revision in the National Mineral Policy which led to notifying of National Mineral Policy 2019, with an objective to have more effective, meaningful and implementable policy that which ensures transparency, better regulation and enforcement, balanced social and economic growth as well as sustainable mining practices.

The National Mineral Exploration Policy (NMEP) approved by Government of India in June, 2016, aims at accelerating the exploration activity in the country through enhanced participation of the Private Sector and these policy initiatives are expected to bring about a turnaround to the entire Mineral Sector across the country.

Capacity and production of important mineral-based products are detailed in Table-1.

FERROUS METALS

India is poised for brownfield expansion of existing steel plants, backward integration of re-rollers, forward integration of DRI or pig iron producers unfolding of a few greenfield projects.

The National Steel Policy 2017 projected a target of 300 million tonnes of domestic steel production by 2030. The total production of finished steel during 2021-22 stood at 113.597 million tonnes of which the contribution of SAIL, TSL Group, RINL, AM/NS, JSWL & JSPL stood at 57%.

In view of the long-term demand projection for steel, the Government adopted a two-pronged strategy for increasing steel production in the country through modernisation and expansion of existing Public Sector steel plants in the country and encouraging creation of new steel capacities in Private Sector.

Pig Iron

Pig iron is one of the basic raw materials required by the Foundry & Casting Industry for manufacturing various types of castings for the engineering section. The domestic production of pig iron was at 6.262 million tonnes in 2021-22, a growth of 28.4 % as compared to the production of 4.877 million tonnes in the last year. Plant-wise capacity details as available in respect of major pig iron units are furnished in Table-2

Sponge Iron

Commercial production of sponge iron in India commenced in 1980. Sponge Iron India Ltd was first to set-up a plant in 1980 at Palwancha, district Khammam in Telangana.

The production of sponge iron was 39.2 million tonnes in the year 2021-22 as compared to 34.376 million tonnes in the previous year. State-wise no of units, capacity & production details as available in respect of sponge iron units are furnished in Table-3.

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Table – 1 : Capacity and Production of Important Mineral-based Products, 2020-21 to 2021-22

Mineral-based product	Unit of quantity	Annual Installed capacity	Production	
			2020-21	2021-22 (P)
Ferrous Metals				
Sponge iron	million tonnes	49.273	34.376	39.20
Crude/liquid steel	"	154.062	103.545	120.293
Ferroalloys				
Ferrochrome/Chargechrome	'000 tonnes	1690*	868	1113
Ferromanganese	"	3160 ^s	NA	NA
Silicomanganese	"	-	329	349
Ferrosilicon	"	250	NA	NA
Magnesium Ferro-Silicon	"	-	10	15
Ferromolybdenum	tonnes	-	428	436
Ferrotitanium	"	-	249	416
Ferrovandium	"	-	634	850
Ferroaluminium	"	-	1119	1139
Non-ferrous Metals				
Aluminium	million tonnes	4.126	3.62	4.02
Copper (Cathode)	'000 tonnes	785	364	359
Lead (primary)	"	210	214	191
Zinc Ingots	"	951 [^]	715	776
Silver [@]	tonnes	966	706	647
Cement	million tonnes	590	300	360
Fertilizers				
Complex Fertilizer	lakh tonnes	85.97 [#]	93.21	83.27
SSP	"	123.15 [#]	49.35	53.34
DAP	"	74.52 [#]	37.74	42.22

Sources: 1. Annual Statistics 2021-22, JPC ; Annual Report 2022-23 Vedanta Ltd. Figures rounded off.

2. MSMP - March, 2022; IMYB 2022 Data supplied by MMS Division, IBM ; Annual Report 2022-23, DPIIT

3. Monthly Summary on Minerals & Non Ferrous Metals , Ministry of Mines.

4. Fertilizer statistics 2022-23, Fertilizer Association of India. #: Capacity as on 1.11.2023

5. Annual Report, 2021-22 & 2022-23, Department of Fertilizers, Govt. of India.

* The Installed capacity of Chromium Alloys as per source available in ferro alloys IMYB Review- 2022.

§ The Installed capacity of Manganese Alloys as per source available in ferro alloys IMYB Review- 2022.

[@] As per data available in silver IMYB Review- 2022 it excludes by-product recovery of silver by Hindalco Industries Ltd a t Dahej, Gujarat from imported copper concentrates

[^] : As per data available in Lead & Zinc IMYB Review 2022

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Table – 2 : Capacity of Principal Pig Iron Units

(In lakh tonnes)

Sl.No.	Unit	Location	Capacity
1.	JSW Steel Ltd	Vijaynagar, Karnataka	120
2.	Tata Steel Ltd	Jamshedpur, Jharkhand	96
3.	Rashtriya Ispat Nigam Ltd	Visakhapatnam, Andhra Pradesh	63
4.	SAIL—Rourkela Steel Plant	Odisha	44
5.	SAIL—Bokaro Steel Plant	Jharkhand	43.60
6.	SAIL—Bhilai Steel Plant	Chhattisgarh	39.25
7.	Tata Steel Ltd (BSL)	Odisha	39.19
8.	JSW Steel Ltd	Dolvi, Maharashtra	35

Source: JPC

Table-3: State-wise Capacity and Production of Sponge Iron (2021-22)

State	No.of working Units	Working Capacity	Annual Production
Total	288	49273	39200
Western Region	90	21044	16666
Chhattisgarh	69	9284	8217
Goa	3	221	217
Gujarat	9	8027	6151
Maharashtra	9	3512	2080
Eastern Region	135	21273	17188
Jharkhand	24	3443	2431
Odisha	76	12508	9675
West Bengal	35	5323	5082
Northern Region	4	537	385
Uttar Pradesh	4	537	385
Southern Region	59	6419	4961
Andhra Pradesh	5	761	438
Karnataka	38	4643	3784
Tamil Nadu	6	528	342
Telangana	10	487	397

Source : Annual statistics 2021-22, JPC

Finished Steel/Saleable Steel

Some significant facts on Indian Steel Industry are as follows:

1. The National Steel Policy (NSP) was announced in 2017. The New Steel Policy, 2017 aspires to achieve 300 million tonnes of steel making capacity by 2030.
2. As per data available in annual statistics 2021-22 of JPC, the total finished steel exports reached 13.494 million tonnes in 2021-22, registering

a growth of 25.1% over the year 2020-21 while imports have continued the declining trend of recent years and registered a decline of 1.7 % with 4.669 million tonnes in 2021-22 compared to previous year.

Details about capacity and production of crude liquid steel and production of hot metal by main producers for the year 2020-21 & 2021-22 are furnished in Table-4.

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Table – 4 : Capacity and Production of Hot Metal and Crude/Liquid Steel, 2020-21 and 2021-22 (By Principal Producers)

(In '000 tonnes)

Unit	Annual installed capacity		Production			
	Crude/Liquid steel		Hot metal		Crude/Liquid steel	
			2020-21	2021-22	2020-21	2021-22
Public Sector						
Steel Authority of India Ltd (SAIL)	20632		16581	18734	15213	17363
Rashtriya Ispat Nigam Ltd (Andhra Pradesh)	6300		4681	5774	4302	5272
Private Sector						
JSW Steel Ltd	23000		14389	16794	14780	18023
Tata Steel Ltd Group	20600		17775	19405	17204	19464
AM/NS (Essar Steel Ltd)	9600		3331	3335	6696	7295
Jindal Steel & Power Ltd	8100		5862	6068	6859	7458
Others	65831		6647	8112	38491	45419

Source: Annual Statistics 2021-22, JPC

BF/BOF/ & EAF/IF INDUSTRY

Performance of the BF/BOF & EAF/IF Industry is summarised below:

Basic Oxygen Furnace (BOF)

Presently, there are around 18 Basic Oxygen Furnace units which are available in the Indian Iron & Steel Sector with a total capacity of 66.295 million tonnes and produced 54.585 million tonnes of crude steel through BOF route in 2021-22 at 82 % of its capacity utilisation.

Electric Arc Furnace (including corex & MBF/EOF)

Crude steel produced in the Electric Arc Furnace (including corex & MBF/EOF) is mostly by recycling of steel scrap using Electric Arc Furnace (EAF). Electric Arc Furnace units, which are popularly known as mini steel plants, are significantly contributing to the production of steel in the country. Presently, in the Electric Arc Furnaces, there are 36 working units with total capacity of 36.728 million tonnes and produced 30.498 million tonnes crude steel through EAF route in the year 2021-22 at 83 % of its capacity utilisation. The recent developments in EAF technology, viz, to increase oxygen consumption, to reduce power consumption and to reduce tap time have led to increase in metal production. The development of thin slab casting has made EAF route more productive. This route enables slab strips rolling at lesser cost, facilitating production of cheaper strips/sheets than those that can be achieved through BF/BOF route.

Induction Furnace (IF)

Presently, EAF-based industries in India are yet to switch to induction furnace route. An induction furnace is an electrical furnace in which heat is generated through electromagnetic induction in an electrically conductive medium. Induction furnaces use steel melting scraps, sponge iron and pig iron/cast iron. On an average, the proportion of these items is 40% sponge iron, + 10% cast iron or pig iron and the remaining is steel melting scraps. There are presently 847 IF working units with total capacity of 51.040 million tonnes which produced 35.211 million tonnes crude steel through IF route in 2021-22 at 69 % of its capacity utilisation. These units are better than their EAF counterparts mainly because of their low cost of production and other factors mainly related to local market supply-demand conditions. Over the time, the IF sector has witnessed considerable technological upgradation with better charge-mix of DRI and refining facilities.

FERROALLOYS

The Indian Ferroalloy Industry was established during the second Five-year plan as an ancillary Industry to cater to the growing needs of the domestic Steel Industry. As a deoxidant and alloying agent, ferroalloys are in demand for crude steel and alloy steel production. Bulk ferroalloys of high-carbon category are produced by large-scale industries. The Noble ferroalloys are of low-carbon category and include ferrovanadium, ferrotungsten, ferroniobium, ferromolybdenum and ferrotitanium. There are also a number of units under the Small-scale Sector for the manufacture of ferroalloys, particularly, ferrosilicon, ferrochrome and ferromanganese.

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India is the net exporter of ferroalloys. India is an established regular exporter of high-carbon ferromanganese, silicomanganese and high-carbon ferrochrome.

The capacity of Indian Ferroalloys Industry is furnished in Table-5. The details about ferroalloys are discussed in the Review on Ferroalloy in Vol.II of this publication (IMYB).

Table – 5 : Capacity of Ferroalloys Industry

(In tonnes per annum)	
Ferroalloys	Installed capacity
Total	5150000
Bulk Ferroalloys :	5100000
Manganese alloys	3160000
Chrome alloys	1690000
Ferrosilicon	250000
Noble Ferroalloys :	50000

Source: Indian Ferroalloys Producer's Association (IFPA), Mumbai.

Bulk Ferroalloys

Bulk ferroalloys consist of principal alloys, viz, ferromanganese, silicomanganese, ferrochrome, charge chrome and ferrosilicon. The production data of different kinds of ferroalloys was not received from IFAPA as well as from other sources. However, the production data as partial coverages on ferro alloys that have been published in IBM's Monthly Statistics of Mineral Production (MSMP) in its March, 2022 have been mentioned below which does not reflect the actual entire production of ferroalloys in the country.

Ferromanganese and Silicomanganese

The total production of silicomanganese was 3,49,414 tonnes in the year 2021-22, as compared to 3,29,295 tonnes in the previous year. MOIL has a Ferro Manganese Plant of 12000 (TPY) capacity at Balaghat. The production of ferromanganese reported by MOIL was at 10,245 tonnes in the year 2021-22 as against the 8, 851 tonnes in the previous year. As part of diversification strategies, MOIL is aiming to set up new ferro alloy plants at strategic locations near their mines.

Ferrochrome and Charge chrome

Stainless and Alloy-steel Industry are the chief consumers of ferrochrome.

The total production of ferrochrome in 2021-22 was about 11,13,000 tonnes, as compared to 8,68,000 tonnes in previous year.

Noble Ferroalloys

Noble Ferroalloys are one of the vital inputs required for producing special types of steel & alloy. The total capacity of noble ferroalloys, was around 50,000 tpy and they majorly include ferromolybdenum, ferro-vanadium, ferrotungsten, ferrotitanium, ferro-silico-magnesium, ferroaluminium, ferroboration, etc. Mishra Dhatu Nigam (A Govt. of India Undertaking), produced different types of super-alloy, chiefly, cobalt, molybdenum, titanium and tungsten-based super-alloys and products.

The production (partial coverage) of various noble ferroalloys is furnished in Table-6.

Table – 6 : Production of Noble Ferroalloys

Ferroalloy	Quantity (in tonnes)
Ferromolybdenum	436
Ferrotitanium	416
Ferrovandium	850
Ferroaluminium	1139

Source: MSMP-March, 2022

Electrolytic Manganese Dioxide (EMD)

EMD is consumed along with natural manganese dioxide for the manufacture of dry battery cells. EMD is made of manganese and is used in making batteries and is also an input in pharmaceutical industry. MOIL has the only EMD manufacturing plant in India, located near MOIL's Dongri Buzurg mine in Bhandara district of Maharashtra, having a capacity of 1,500 tpy. The production of EMD by MOIL was 1,202 tonnes in 2021-22 as against 1,070 tonnes in 2020-21.

NON-FERROUS METALS

Aluminium

There were four companies with a total installed capacity of 4.126 million tonnes in operation. NALCO, the only Public Sector Company in aluminium & alumina segment, has an installed capacity of 0.46 million tpy at Angul, Odisha. The three companies with six plants – Aditya, Hirakud, Mahan & Renukoot of Hindalco Industries Ltd; Korba of BALCO Ltd. and Jharsuguda of Vedanta Ltd. – are in the Private Sector having a total

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installed capacity of 3.666 million tpy .

The production of aluminium in 2021-22 was 4.02 million tonnes as compared to

3.62 million tonnes in the previous year. The installed capacity and production of aluminium in 2020-21 and 2021-22 are enumerated in Table-7.

Table – 7 : Capacity and Production of Aluminium, 2020-21 and 2021-22

(In million tonnes)

Producer	Annual Capacity	Production	
		2020-21	2021-22 (P)
Total	4.126	3.62	4.01
Public Sector			
National Aluminium Co. Ltd (Angul)	0.46	0.418	0.46
Private Sector			
Bharat Aluminium Co. Ltd (Korba)	0.57	0.57	0.58
Hindalco Industries Ltd (Aditya, Hirakud, Mahan & Renukoot)	1.346	1.23	1.294
Vedanta Aluminium Ltd (Jharsuguda)	1.75	1.40	1.68

Figures rounded off.

Source: Monthly Summary on Minerals & Non Ferrous Metals, Ministry of Mines. Information received from individual plants/Annual reports / Data provided by MMS Division, IBM.

Alumina

The production of alumina (including calcined alumina) was 7.23 million tonnes in 2021-22 as compared to 6.52 million tonnes in the previous year. The details of alumina producers in the

country, their capacities and production are provided in Table-8.

Hindalco's Renukoot Integrated Smelter uses alumina produced in their plant for producing aluminium.

Table – 8 : Capacity and Production of Alumina (including calcined alumina) 2020-21 and 2021-22

(In million tonnes)

Producer	Annual Capacity	Production	
		2020-21	2021-22 (P)
Total	7.90	6.52	7.23
Public Sector			
National Aluminium Co. Ltd (Damanjodi)	2.1*	2.20	2.11
Private Sector			
Bharat Aluminium Co. Ltd	0.200#	-	-
Hindalco IndustriesLtd	3.60	2.63**	3.15**
Vedanta Aluminium Ltd (Lanjigarh)	2.000	1.69	1.97

Figures rounded off.

Source: Information received from individual plants/Annual Reports.

* (Normative capacity)

** It includes the Calcined Alumina also as produced by Utkal Alumina International Limited.

Plants remained non-operational during the year.

National Aluminium Co. Ltd

The Company has a 68.25 lakh TPA Bauxite Mines in north and central block as well as 31.50 lakh TPA Bauxite Mines in south block at Panchpatmali. The NALCO has 21.00 lakh TPY (normative capacity) Alumina Refinery located at Damanjodi in Koraput district of Odisha, and 4.60 lakh TPY Aluminium Smelter & 1200MW Captive Power Plant located at Angul, Odisha. The surplus alumina that remains after internal consumption is sold to third parties in the export market and a small portion is also sold to the domestic market. NALCO is in the process of setting up of its 5th Stream in its existing Alumina Refinery which shall add 1.0 million tonnes to its existing installed capacity of 2.1 million tonnes per year. The capacity of port facilities of NALCO at Visakhapatnam is 1.4 million tpy for alumina export / caustic soda Lye Import. NALCO has constituted JV company with M/s Mishra Dhatu Nigam Ltd named Utkarsh Aluminium Dhatu Nigam Ltd in August, 2019 for establishment of high-end aluminium alloys plant of 60,000 TPA capacity in Nellore district, Andhra Pradesh.

Vedanta Group

Vedanta Aluminium is amongst the world's top aluminium producers, and India's largest producer of aluminium, catering to discerning customers in nearly 50 countries. BALCO is a Private Sector Company with an integrated alumina/aluminium complex at Korba in Bilaspur district in Chhattisgarh. The Company has two captive bauxite mines. The Company's two alumina refineries are located at Korba, Chhattisgarh and Lanjigarh, Odisha, with an installed capacities of 2.0 lakh tpy and 20.0 lakh tpy, respectively. The total capacity of the Korba and Jharsuguda smelter is 0.57 million tpy and 1.75 million tpy, respectively with total smelter capacity of around 23 lakh tpy. The Company also has the capacities to produce ingots, wire-rods billets, bushbars and rolled products. The state-of-the-art alumina refinery at Lanjigarh, feeds the aluminium smelters at Jharsuguda and BALCO and forms a crucial link in the value chain.

Hindalco Industries Ltd

Hindalco Industries Ltd has alumina refining and aluminium production capacity of around 3.6 million tonnes and 1.3 million tonnes, respectively. Hindalco Aluminium Smelting operations are located at Renukoot in Uttar Pradesh, Aditya Aluminium in Odisha, Mahan Aluminium in Madhya Pradesh and Hiralud in Odisha.

All these facilities combined produce around 1.3 Million tons of primary aluminium in a year. Hindalco, at Renukoot, having smelting capacity of 4,10,000 tpa at present, operates across the aluminium value chain from bauxite mining, alumina refining, aluminium smelting to downstream rolling and extrusions. The integrated facility houses an alumina refinery and smelter along with facilities for production of semi-fabricated products namely conductor redraw rods, sheet and extrusions. Aditya Aluminium is a smelter-power plant complex at Lapanga in Sambalpur district of Orissa with 3,60,000 tonnes smelter supported by a 6 x 150 MW coal based captive power. Mahan Aluminium, located in Bargawan, Singrauli district, Madhya Pradesh, is an integrated aluminium smelting complex, which comprises 3,59,000 TPA of aluminium smelter supported by a 900MW power plant. The capacity of Smelter Plant of Hiralud for production of Aluminium is around 2,16,000 MTA. Aditya and Mahan Aluminium smelters are operating on state-of-the-art AP36 technology. Hindalco's plants are equipped with sophisticated rolling mills and finishing equipment. Hindalco's finished products include, alumina, primary aluminium in the form of ingots, billets & wire rods, value-added products, such as, rolled products, extrusion and foils. Hindalco is the largest manufacturer of entire range of Flat Rolled Products. The Hiralud Flat Rolled Products (FRP), produce rolled products, extrusion products and wire rods. Novelis, a wholly owned subsidiary of Hindalco, is the world's largest flat rolled aluminium producer and recycler with a rolling capacity of 4 Million MT and recycling capacity of 2.5 Million MT. Alumina refineries are located at Utkal, Renukoot, Muri and Belagavi. Hindalco. Utkal Alumina (Odisha) with an installed capacity of 2.2 million tpy alumina refining, continues to be the most economical and efficient alumina producing plant globally. The other alumina refineries capacities are around 0.700 million tonnes, 0.350 million tonnes and 0.450 million tonnes at Renukoot, Belagavi (Karnataka) and Muri (Jharkhand), respectively.

Cadmium

Cadmium (99.95 min.) is obtained as a by-product from zinc smelters of HZL at Debari, Visakhapatnam, Chanderiya and of BZL, Binanipuram. These together have an annual capacity of 913 tonnes. Out of the total annual installed capacity 913 tpy, HZL accounted for 833 tpy capacity. Binani Zinc Ltd (Edayar Zinc Ltd) reported the remaining 80 tpy capacity. HZL produces

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cadmium of high quality in its zinc smelters which is casted in the form of pencils weighing from 250 g to 500 g. The purity is 99.95% Cd (max.) at Debari; 99.97% Cd (max.). These by-products of cadmium are cast in the form of pencils weighing from 250 g to 500 g. In India, cadmium is consumed in industries like paint, glass and chemicals. No cadmium production is reported in 2021-22, however the last reported production of cadmium was 47 tonnes in 2017-18.

Copper

The production of copper ore at 3.56 million tonnes in 2021-22 increased by 9% as compared to

that in the previous year. The metal content in the ore produced in 2021-22 works out to 27,622 tonnes as against 25,623 tonnes in 2020-21.

Hindustan Copper Ltd produces copper metal from the ore produced at their captive mines. Vedanta Limited (formerly known as sterlite Industries (India) Ltd.) and Hindalco Industries Ltd. produce copper metal from imported copper concentrates. Details regarding capacity and production of copper are furnished in Table-9.

Production of refined copper (cathodes) in 2020-21 and 2021-22 was 363 thousand tonnes and 484 thousand tonnes, respectively.

Table – 9 : Capacity and Production of Refined Copper (Cathodes)

(In '000 tonnes)

Producer	Annual capacity	Production	
		2020-21	2021-22 (P)
Total	785	363	484
Hindustan Copper Ltd	68.5*	-	-
SSL/ Vedanta Ltd	216	101	125
Hindalco Industries Ltd	500	262	359

Figures rounded off.

Source: Monthly Summary on Minerals & Non Ferrous Metals, Ministry of Mines; Data received from MMS Division, IBM

** As per information available in the Annual Report HCL 2021-22, although the Installed Capacity is 99.5 thousand tonnes (KCC - 31 thousand tonnes & ICC - 18.5 thousand tonnes, GCP - 50 thousand tonnes), due to economic consideration the Company suspended KCC Smelter & Refinery from December 2008.*

Hindustan Copper Ltd

Hindustan Copper Ltd is a Mini Ratna Government of India Enterprise under the administrative control of Ministry of Mines. HCL is the only producer of copper ore in the country. HCL has two smelters one at Indian Copper Complex (ICC), Ghatsila, East Singhbhum district in Jharkhand and other is at Khetri Copper Complex (KCC), Khetrinagar, district Jhunjhunu, Rajasthan. The annual working installed capacity of the HCL for copper cathode production is 68,500 tpy. Refinery at ICC also has a Wire Bar Casting Plant with a capacity of 8,400 tpy and a Brass Rolling Mill that manufactures brass sheets by using copper produced at ICC. The aggregate installed capacity of wire bars is 39,400 tpy and wire rod capacity is 60,000 tpy at HCL. It also has a precious metal recovery plant for the recovery of gold, silver, selenium, tellurium and nickel sulphate and copper sulphate at Ghatsila. Though HCL has an installed capacity of 390 tonnes in respect of nickel sulphate, no production of nickel sulphate was reported since 2004-05.

The capacity of Khetri Copper Complex (KCC) smelter is 31,000 tpy. However, HCL has shut down the Khetri smelting refining plant due to economic reasons. KCC has a concentrator plant at Khetri in Jhunjhunu district, Rajasthan, having a capacity of 2.02 million tpy. KCC & ICC Ghatsila, Jharkhand with 1.55 million tpy each and Malanjkhand, Madhya Pradesh with two million tpy capacity also operate sulphuric acid plant.

Chhattisgarh Copper Ltd (CCL) established in the year 2018 is a joint venture Company between Hindustan Copper Ltd and Chhattisgarh Mineral Development Corporation Ltd. The Company was established for exploration, mining and beneficiation of copper and its associated minerals in the State of Chhattisgarh.

Gujarat Copper Project (formerly Jhagadia Copper Ltd)

Gujarat Copper Project is located at Jhagadia in Bharuch district, Gujarat. HCL acquired the assets of Jhagadia Copper Ltd and renamed it as

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GCP. It is a scrap-based electrolytic smelter that produces cathodes with a capacity of 50,000 tpy and additional 20,000 tpy of copper anodes. The plant was in technical collaboration with Outokumpu Technology (formerly Boliden Contech AB), Sweden. The precious metals like gold, silver, platinum, palladium, etc. are also recovered as part of anode slime during the refinery process. The refinery is based on ISA-Technology from Mount ISA Mines Ltd, Australia.

Vedanta Ltd (Sterlite copper)

Vedanta Limited, a subsidiary of Vedanta Resources Limited, is one of the world's foremost natural resources conglomerates, with primary operations in zinc-lead-silver, iron ore, steel, copper, aluminium, power, nickel, and oil and gas. Tuticorin smelter and refinery of Vedanta are currently not in operation. The Tamil Nadu Pollution Control Board (TNPCB) vide order, dated 9 April 2018, rejected the consent renewal application of Vedanta Limited for its copper smelter plant at Tuticorin. It directed Vedanta not to resume production operations without formal approval/consent (vide order dated 12 April 2018) and directed the closure of the plant and the disconnection of electricity (vide order dated 23 May 2018).

The Government of Tamil Nadu also issued an order dated 28 May 2018 directing the TNPCB to permanently close and seal the existing copper smelter at Tuticorin; this was followed by the TNPCB on 28 May 2018. Vedanta Limited filed a composite appeal before the National Green Tribunal (NGT) against all the above orders passed by the TNPCB and the Government of Tamil Nadu. In December 2018, NGT set aside the impugned orders and directed the TNPCB to renew the CTO. The order passed by the NGT was challenged by Tamil Nadu State Government in the Hon'ble Supreme Court.

The Company had filed a Writ Petition before the Madras High Court challenging the various orders passed against the Company in 2018 and 2013. On 18 August 2020, the Madras High Court delivered the judgement wherein it dismissed all the Writ Petitions filed by the Company. The Company has approached the Supreme Court and challenged the said High Court order by way of a Special Leave Petition (SLP) to Appeal and also filed an interim relief for care & maintenance as well as trial operation

of the plant. The matter was then listed on 2 December 2020, before the Supreme Court. The Bench after having heard both the sides on the interim relief of trial operation of the Plant, concluded that at this stage the interim relief could not be allowed. The 2,16,000 tpy copper cathode refinery of Sterlite located in Chinchpada at Silvassa in the Union Territory of Dadra & Nagar Haveli, predominantly caters to the domestic market. The technology for refineries and Continuous Cast Copper Rod Plant is of MIM, Australia and Continuous Properzi, Italy, respectively.

Hindalco Industries Ltd (Birla Copper)

The Company's copper smelters located at Dahej, Lakhigam, district Bharuch, Gujarat, has an installed capacity of 5,00,000 tpy. The copper operation consists of producing copper through smelting, refining copper from imported copper concentrates and converting refined copper cathode into continuous cast rod. It is now one of the world's largest smelter at a single location. It is based on Outokumpu Technology. The Company also produces continuous cast copper rods (CCR) with an annual capacity of 97,200 tonnes. In the process of extraction of copper metal, by-products

Lead

The total installed capacity of primary lead smelting was 2,10,000 tpy. The smelting capacity of HZL for lead is distributed between two smelters at Chanderiya (90,000 tpy) and Dariba (1,20,000 tpy). Primary lead was produced entirely by HZL at lead-zinc smelter at Chanderiya, district Chittorgarh, and Rajpura-Dariba Plant, district Udaipur, Rajasthan.

There are a number of secondary producing units in the Organised and Unorganised Sector. Lead acid batteries are the major consumer of lead metal in the country.

Zinc

HZL is the major producer of Zinc. The smelting capacity of HZL for zinc is distributed between three smelters at Debari (88,000 tpy), Chanderiya (5,85,000 tpy) and Dariba (2,40,000 tpy). Edydar Zinc Ltd's plant at Binanipuram, Kerala, has a capacity of 38,000 tpy. Thus, the smelting capacity for zinc in the country is 9,51,000 tpy.

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The primary product of Debari and Vizag smelters is high-grade zinc, while cadmium is recovered as by-product. Chanderiya smelter complex with a total capacity of 5,85,000 tpy of zinc is the world's largest single location zinc smelting complex. Besides lead and zinc, HZL

also produces silver as by-product at its Pant Nagar plant in Uttarakhand whose capacity is 800 tonnes per year. The data on total capacity and production of primary lead and zinc ingots in 2020-21 and 2021-22 are furnished in Table-10.

Table – 10 : Capacity and Production of Primary Lead and Zinc Ingots

(In tonnes)

Producer	Lead capacity (tpy)	Production		Zinc capacity (tpy)	Production	
		2020-21	2021-22 (P)		2020-21	2021-22 (P)
Hindustan Zinc Ltd	210000	214399	191185	913000	715445	775808
Edayar Zinc Ltd. (formerly, Binani Zinc Ltd.)	-	-	-	38000	-	-
Total	210000	214399	191185	951000	715445	775808

ABRASIVES

Natural abrasives, which include calcite, emery, diamond, zircon, corundum, novaculite, pumice, etc. are generally sold as dressed stones. Synthetic abrasives include borazon, ceramic, dry ice, glass powder, silica carbide, etc. Commercial abrasives are manufactured in many shapes as bonded or coated abrasives including belt discs, wheels, sheets, blocks, rods and loose grains. A large number of units exist in the Unorganised sector. However, important producers of coated abrasives were: Grindwell Norton Ltd, Mora, Uran, district Raigad, Maharashtra; Flexoplast Abrasives (India) Ltd, Aurangabad, Maharashtra; Associated Abrasives Ltd, Nashik, Maharashtra; Carborundum Universal Ltd, Chennai, Tamil Nadu; Cutfast Abrasives Tools Pvt. Ltd, Chennai, Tamil Nadu; and John Oakey and Mohan Ltd, Ghaziabad, Uttar Pradesh. Important producers of bonded abrasives (grinding wheels) are Associated Abrasives Ltd, Nashik, Maharashtra; Carborundum Universal Ltd, Chennai, Tamil Nadu; Cutfast Abrasives Tools Pvt. Ltd, Chennai, Tamil Nadu; and K.L. Thirani & Company Ltd, Kolkata, West Bengal.

Silicon Carbide (SiC)

Silicon Carbide (SiC) is a synthetic material most commonly produced by the so called Archein process in electrical resistance furnaces. SiC does not occur naturally except in some types of pre-solar meteorites, along with diamonds. SiC can be produced either in black colour or green colour

depending on the raw material. SiC products have applications in metallurgical refractories, abrasives, slurry wire sawing, and for technical ceramics.

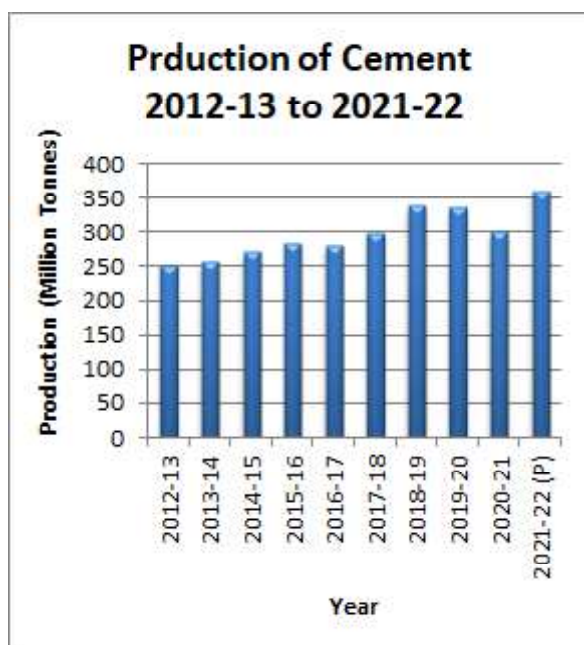
Major producers of silicon carbide are: Grindwell Norton Ltd, Renigunta, Andhra Pradesh and at Bengaluru, Karnataka; Indian Metals & Carbide Ltd, Therubali, Odisha; Carborundum Universal Ltd, Tiruvottiyur, district Chennai, Tamil Nadu; and Speedfam (India) Pvt. Ltd, Navi Mumbai, Maharashtra.

CEMENT

The Cement Industry which is one of the key infrastructure industries recorded exponential growth pattern in successive years since the introduction of partial decontrol in 1982, total decontrol in 1989 and post delicensing of the Industry and Policy Reforms initiated in 1991. As per DIPP, with more than 590 million tonnes per annum of cement production capacity, India is the second largest cement producer in the world and accounts for over 8 percent of global installed capacity. The capacity utilization of Indian Cement Industry during the last 10 years has fallen from 83% to 60%. The continuous downward trend of capacity utilization is indicative of the idle capacity of over 230 million tonne which is growing year by year. The cement industry comprises about 150 integrated large cement plants, 116 grinding units, 62 mini cement plants and 5 clinkerization units. The total production of cement in 2021-2022 was about 360 million tonnes as compared to around 300 million

MINERAL-BASED INDUSTRIES

tonnes in the previous year. The Cement Industry produces a variety of cement, such as, Ordinary Portland Cement (OPC) Portland Pozzolana Cement (PPC), Portland Blast Furnace Slag Cement (PBFC), Oil Well Cement, White Cement, etc. to suit a host of applications. Cement consumption is expected to reach 450.78 million tonnes by the end of FY2027.



ASBESTOS-CEMENT PRODUCTS

The installed capacity of asbestos-cement pressure pipes in the Organised Sector was about 1,49,640 tpy. Production capacity of asbestos cement sheets was not available. By virtue of the high tensile strength and bonding properties with cement, it is used in the manufacture of fibre cement products.

Industries that deal with asbestos-cement products include Everest Building Products Ltd which has units located at Kymore in Madhya Pradesh and at Podanur in Tamil Nadu. Similarly, Hyderabad Industries Ltd has three plants at Sanatnagar, RangaReddy district in Andhra Pradesh; Jasidih in Jharkhand; and Ballabgarh in Haryana. Ramco Industries Ltd has three plants at Arakkonam, district Vellore, Tamil Nadu; Karur in district Dharwad, Karnataka; and Maksi in district Shajapur, Madhya Pradesh. Southern Asbestos Cement Ltd has two plants at Karur in district Dharwad, Karnataka; and Arakkonam, district Vellore in Tamil Nadu. Shree Pipes Ltd Hamirgarh, district Bhilwara, Rajasthan; Malabar Building Products Ltd, Malakunnathukavu, district Thrissur, Kerala; Konark Cement and

Asbestos Industries Ltd at Bhubaneswar in Odisha; Shri Digvijay Cement Co. Ltd, Digvijaynagar, Ahmedabad in Gujarat; Uttar Pradesh Asbestos Ltd, Mohanlalganj, district Lucknow, Uttar Pradesh; Assam Asbestos Ltd, Bonda, Narangi, district Guwahati, Assam; Utkal Asbestos Ltd, Dhenkanal in Odisha; and Visaka Asbestos, Pattacheru (Medak) in Andhra Pradesh are some of the other industries that produce asbestos cement products.

Besides, Swastik Industries, Pune, in Maharashtra; Kalani Asbestos, a Division of Kalani Industries Pvt. Ltd, Pitampur, district Dhar in Madhya Pradesh; Tamil Nadu Asbestos (Pipes), a unit of Tamil Nadu Cement Corp. Ltd, Mayanur, district Tiruchirapalli in Tamil Nadu; and Ganga Asbestos Cement Ltd, Raebareli in Uttar Pradesh produced only asbestos pressure pipes. The present status of all these asbestos cement units is not available with Indian Bureau of Mines.

REFRACTORY INDUSTRY

Refractory Units fall under Medium and Small-scale Sectors. Steel Industry is the biggest group of customers of this Industry, which consumes about 70% of total refractory production, followed by 12% in cement, 5-6% in non-ferrous, 3% in glass and balance in other industries. There are more than 100 refractories in India, out of which around 14 are major, 33 are medium-sized and the rest are relatively smaller in respect of production. The estimated annual installed capacity of all types of refractory was 2,015 thousand tonnes and the production in 2020-21 of all types of refractories was 1,264.06 thousand tonnes as compared to 1,208.92 thousand tonnes in 2019-20. Bharat Refractories Ltd (BRL), a Government of India Undertaking, has four units that are engaged in the manufacture and supply of various kinds of refractories to the integrated steel plants and to smaller steel plants. The important refractory producers are Calderys India Refractories Ltd, Associated Ceramic Ltd, Dalmia Bharat Ltd, IFGL Refractories Ltd, Orient Refractories Ltd, TRL Krosaki Refractories Ltd, Vesuvius India Ltd, Maithan Ceramic Ltd, National Refractories, etc.

With the modernisation and renovation of steel plants, the requirements for various types of refractories have undergone revolutionary changes. The stress is now on for more sophisticated products like precast monolithics. The domestic Refractory Industry, taking cue of this change, has acquired the

technical know-how for production of sophisticated refractories, such as, magnesia carbon bricks, new generation sliding-gate plate refractories, for ladles, gunning materials and castables. Manufacture of carbon bonded silicon carbide crucible and clay graphite foundry products is continuously done with constant upgradation for production of improved products. The use of these special refractories has brought down the consumption of refractories per tonne of steel production. However, the customers are benefited by way of improved performance, lower shutdown time and savings on energy. The specific consumption of refractories at present in integrated steel plants varies from 8 to 10 kg/tonnes of crude steel as compared to 6–8 kg/tonnes of crude steel in advanced countries. Refractories play important role in the efficient performance of different manufacturing process of steel, aluminium, glass, cement, petrochemical, industries and improves the quality of the products. It is apt to mention here that the marketing of refractories is totally different presently in companies in comparison to the situation that existed 30 years back as the users decide the prices of refractories on the total performance basis.

The price and supply of imported raw materials are subject to international demand and supply situation and most of the refractory makers are completely dependent on imported raw materials, especially for making high-end products. Refractory production in India during 2019-20 & 2020-21 is furnished in Table-11.

Table – 11: Refractory Production in India, 2019-20 and 2020-21

Item	Production (In tonnes)	
	2019-20	2020-21
Total	1208926	1264064
Fireclay Bricks & Shapes	197803	197148
High Alumina Bricks & Shapes	230319	225911
Silica Bricks & Shapes	79259	65437
Basic Bricks & Shapes	180299	173386
Monolithics/ Castables/ Pre-cast Blocks	392837	470256
Special Products (incl cc)	60802	61964
Others	67607	69962

Source: IRMA Journal volume LIV No.3 September 2021

CERAMIC & GLASS INDUSTRY

Ceramic Industry

Ceramic Industry in India is about 100 years old. The main product segments in ceramic industry are the Wall tile, Floor tile, Vitriified tile and Industrial tile segments. Ceramic products are made from clay and felspar and are manufactured in Large and Small-scale Sectors with wide variations in type, range, quality and standard. Ceramic items have properties, such as, glassy smooth finish, high thermal shock resistance, poor thermal electrical conductivity, high abrasion resistance, acid resistance and weather resistance. During the last two decades, there has been a phenomenal growth in the field of ceramics to meet specific demands of the industry, such as, high alumina ceramics, cutting tools and other structural ceramics. The state-of-the-art technology of international standards are adopted for production of high quality, ceramic goods in the country. The major industries include Kajaria Ceramics, Somani Ceramics, Asian Granite India, Orient Ceramics & Industries, Nitco, Regency Ceramics, Euro Ceramics, Bell Ceramics, RAK Ceramics etc. Ceramics Technological Institute (CTI), Bengaluru, a National Level Institute for R&D in BHEL, offers the much-needed technical support for product development by enabling the Indian Ceramic Industry to adopt a modernised technology for development of new and advanced ceramics. Areas of research are nano-technology, separation technology, microwave processing, etc.

Ceramic Tiles

Following the development and growth of the Building Industry, ceramic glazed tiles producing industries too flourished considerably during the last decade. Indian tiles are competitive in the international market and are chiefly exported to East and West Asian countries. In India, both traditional methods of manufacturing (tunnel) as well as the latest single fast firing methods are in vogue in manufacturing of ceramic tiles.

Sanitarywares

The basic raw materials for sanitaryware are felspar, ball clay, kaolin and quartz. The major manufacturers of sanitaryware include Hindustan Sanitaryware Industries Ltd, Parryware Roca Bathroom Products, Cera Sanitaryware, Neycer India, Kohler India, Toto, RAK Ceramics India, Duravit Sanitaryware Pvt. Ltd, Golf Ceramics, etc.

Potterywares

Potterywares include crockery and tableware and its manufacturers are a part of an age old handicraft industry in the country. Produced both in the Large-scale and the Small-scale Sectors, there were 16 units in the Organised Sector with a total installed capacity of about 43,000 tpy, while in the Small-scale Sector, there were over 1,400 plants with a capacity of 3 lakh tpy. Out of these, over 600 units are located in Uttar Pradesh. The present status of all these Potterywares units is not available with Indian Bureau of Mines.

Glass Industry

The Glass Industry includes manufacturing unit that makes glass products, such as, glass containers and hollow-ware, tablewares, flat glass (including float, sheet, figured, wired and safety, mirror glass), speciality glass (such as, electronics, optics, lighting, ophthalmic lenses) vacuum flasks, refills, laboratory glasswares, fibre glass, kitchen glassware, glass bangles, etc. Principal raw materials used in the manufacture of glass are silica sand, soda ash, calcite, dolomite, etc.

Glass Industry comes under the category of delicensed industry and manufacturing units are spread all over India. The large-scale producers are located mostly in Mumbai, Kolkata, Bengaluru, Hyderabad and in Gujarat and are equipped mostly with modern melting furnace technology. The Medium and Small-scale Industries, on the other hand, include cottage industries that still use outdated technology for production of glass products. The share of Organised Sector in the Glass industry is dominant at about 55% whereas, the Unorganised Sector accounts for about 45%. There is considerable scope and demand for glass fibre products, particularly due to growth in Petrochemical Sector, solar products, Packaging Industry and allied products. Glass Industry in India remained in the form of Cottage Industry till the beginning of 20th century. First glass plant in India was set-up in August 1908 by freedom fighter & Bharat Ratna Lokmanya Bal Gangadhar Tilak at Talegaon in the State of Maharashtra. Glass Industry in India has made a steady progress since then, particularly after independence. Firozabad, known as glass city of India, continues to be a place of master craftsmen and entrepreneurs, where traditional processes are still used for production of a wide variety of glass items. About 70% of the

total glass production in the Unorganised Sector in the country is contributed by Firozabad Glass Industry.

Glass Containers and Hollow-ware

Glass containers are ideal packaging medium, but are increasingly being replaced by other packaging materials like plastic, PET, aluminium and tetrapack. The major producers include Hindustan National Glass & Industries, Piramal Glass, Haldyn Glass Gujarat, La Opala RG, Mohan Meakin, Gujarat Glass, Associated Glass Industries (AGI), etc.

Laboratory Glasswares

There were six units in this Sector which manufacture neutral glass tubing, laboratory glasswares and chemical process equipment. The installed capacity of neutral glass tubing was 46,600 tpy. The data on production are not available. The demand for neutral glass tubing has not picked up due to sizeable switch over from glass items to plastic items.

Flat Glass

Silica sand, dolomite, limestone are some of the mineral ingredients used in the manufacture of flat glass. The term flat glass includes float glass, sheet glass or plate glass, figured and wired glass. These are further processed into mirror, toughened glass, laminated glass, double glazing, etched glass, glass doors, etc. The total capacity of Flat Glass Industry in India is about 1.2 million tonnes annually for which the major producers are Saint Gobain Glass, Asahi India Glass, Gujarat Guardian Glass, Gold Plus Glass and Hindustan National Glass. There has been growing acceptability of the Indian flat glass products in the global market.

Fibre Glass (Glass-reinforced plastic)

Silica sand, limestone, kaolin, fluorspar, dolomite, etc. are some of the important minerals used in manufacturing fibre glass. Fibre glass is highly capital and technology-intensive industry. Fibre glass is lighter than aluminium but stronger than steel. Moreover, being an inorganic material, it does not pose any health hazard.

GRANITE INDUSTRY

Major production of granite in raw as well as processed form is generally from Andhra Pradesh, Rajasthan, Karnataka, Tamil Nadu and Gujarat. Granite is used in monuments, building slabs, tiles, surface plates, etc. Over 160 varieties of granite with

exotic colours/shades have been identified as products that could be exported after processing.

Granite is a minor mineral as defined under Section 3(e) of MMDR Act, 1957, and as per Section 15 of MMDR Act, 1957, all powers to make rules and grant of Mineral Concessions for minor minerals have been entrusted with concerned State Government. Granite Conservation and Development Rules, 1999; were notified separately on 1.6.1999 for ensuring systematic/scientific exploitation and conservation of granite resources of the country. The deposits are dispersed widely across all parts of the country.

Granite is a Non-scheduled Industry and the processing of granite is a phenomenon that was started in 1930s. The mining and processing techniques of granite adopted in the country have improved over the years. Looking at its export potential, the Government of India has been encouraging setting up of 100% EOU in this Sector to promote export of value-added granite products. Exports of granite are freely allowed. The export of Granite Blocks/ Tiles (polished) during 2019-20 was 190 thousand tonnes as compared to 213 thousand tonnes during previous year.

CHEMICALS

Caustic Soda (Sodium hydroxide)

Caustic soda is a basic inorganic chemical prepared by electrolysis of salt brine and is consumed in Textile, Organic chemicals, Alumina, Paper & Pulp, Soaps & Detergents, Inorganic chemicals and for water treatment. These sectors accounted for almost 76.1% of the demand in the country.

A significant quantity of caustic soda is used in the manufacture of other inorganic chemicals and dyestuffs, in metallurgical operations and in petroleum refining. In the year 2021-22, the total installed capacity of caustic soda was 41.51 lakh tonnes as compared to 38.98 lakh tonnes in the previous year. The production of caustic soda during 2021-22 was 34.63 lakh tonnes as compared to 29.64 lakh tonnes in the previous year. The major Indian producers are Gujarat Alkalies & Chemicals, Grasim Industries, Nirma, Shriram Alkali & Chemicals, Reliance Industries, Aditya Birla Chemicals (India), etc.

Soda Ash

Soda ash is an important chemical used widely as a raw material in the manufacture of glass and glassware, sodium silicate, textile, paper & pulp, in

metallurgical industries, desalination plants and in the preparation of a host of chemicals. Soda ash is an essential ingredient in the manufacture of detergent, soap, sodium salts and dyes. The major soda ash producers are Tata Chemicals, Gujarat Heavy Chemicals Ltd, Nirma, Saurashtra Chemicals, DCW, etc. The manufacture of soda ash in India started in 1932 at Dhrangadhra in Gujarat with installed capacity of 50 tpd.

In the year 2021-22, the total installed capacity of soda ash was 36.14 lakh tonnes which was same as in the previous year. The production of soda ash during 2021-22 was 30.78 lakh tonnes as compared to 26.38 lakh tonnes in the previous year.

Calcium Carbide

Calcium carbide is used in the manufacture of flammable acetylene gas for Rubber, Synthetic and Plastic Industry. It is used as a raw material for manufacturing various rubber goods. It is self-reinforcing filler. It is also used for cutting & welding of metals besides its use in manufacturing various chemical substances. The major Indian producers are Birla Carbide, TECIL, ICML and Panyam.

In the year 2021-22, the total installed capacity of calcium carbide was 1.12 lakh tonnes which was same as in the previous year. The production of calcium carbide during 2021-22 was 0.98 lakh tonnes as compared to 0.86 lakh tonnes in the previous year.

Synthetic Cryolite (Na₃AlF₆)

Navin Fluorine chemical Ltd, Bhestan, Gujarat, is an important producer of synthetic cryolite. Other producers are Tanfac Industries Ltd, Cuddalore, Tamil Nadu; (Aditya Birla Group) and Adarsh Chemicals and Fertilizers Ltd, Udhna, Gujarat. GMDC, Gujarat has a beneficiation plant at Village Kadipani that produces 96% CaF₂ acid-grade & 90% CaF₂ metallurgical-grade concentrate. The acid-grade finds use in aluminium fluoride, synthetic rutile and fluorine chemicals.

Aluminium Fluoride

Aluminium fluoride, with the molecular formula AlF₃, is an inorganic compound that is used in a variety of industrial processes, most notably in the production of aluminium. It is a colourless solid that can be made synthetically or can be naturally found as the minerals, rosenbergite and oskarssonite. The important units that produce aluminium fluoride include Navin Fluorine Industries, Maya

Rasayan Ltd, Mumbai, Tanfac Industries Ltd, SPIC and Aegis Chemical Industries Ltd.

Titanium Dioxide

Titanium Dioxide (TiO₂) is a chemically inert white pigment used in a wide range of consumer products from paints, paper and toothpaste to plastics and cement. The key raw materials used in the production of TiO₂ are ilmenite and rutile found mainly in coastal regions of Tamil Nadu, Kerala, Andhra Pradesh and Odisha. Anatase and rutile are the two major types of TiO₂ which are manufactured by the sulphate and chloride process, respectively. The 4 key players in the Indian Titanium Dioxide Industry are Kerala Minerals and Metals Limited (KMML), Travancore Titanium Products Limited (TTPL), Kilburn Chemicals (VVTi Pigments Ltd) and Kolmak Chemicals Ltd.

In the year 2021-22, the total installed capacity of Titanium Dioxide was 82.50 thousand tonnes which was same as in the previous year. The production of Titanium Dioxide during 2021-22 was 56.96 thousand tonnes as compared to 51.22 thousand tonnes in the previous year.

Sulphuric Acid

Sulphuric Acid is primarily being used as a feedstock for the synthesis of nitrogenous and phosphatic fertilizers against the backdrop of its abundant demand from the fertilizer industry. Besides, the growing consumption of Sulphuric Acid in the water treatment process and metal processing is anticipated to contribute well to propel its demand in the forecast period. Sulphuric Acid can be produced by either the smelter or sulfur route. The annual capacity of sulphuric acid in the year 2022-23 is around 16.470 million tonnes. There are several organised and unorganised players operating in the country's Sulphuric Acid market, making it highly fragmented. Hindustan Zinc Limited is one of the largest manufacturer of Sulphuric Acid operating in the domestic market. They produce 98 % concentrated Sulphuric Acid at their production facilities in Chanderia (Installed Capacity – 0.6 Million Tonnes annually), Debari (Installed Capacity – 0.3 Million Tonnes annually) and Dariba (Installed Capacity – 0.6 Million Tonnes annually) in the state of Rajasthan. In addition, sulphuric acid is also recovered at HCL, Hindalco & Sterlite.

Phosphoric Acid

Important units that produce phosphoric acid of various grades, such as, pharma-grade, food-grade, technical-grade, analytical reagent grade, etc. include Gujarat State Fertilizer & Chemicals Ltd, Vadodara, Gujarat; Fertilizers and Chemicals Travancore Ltd, Udyogmandal, Kerala; Fertilizers and Chemicals Travancore Ltd, Cochin II, Kerala; Coromandel International Ltd, Vizag (A.P.); Coromandel International Ltd, Ennore (A.P.); Green Star Fertilizers Ltd, Tuticorin, Tamil Nadu; IFFCO Ltd, Paradeep Odisha ; Krishna Phoschem Ltd, Meghnagar (M.P.); Madhya Bharat Agro Products Ltd, Sagar (M.P.); Paradeep Oshos. Ltd, Paradeep, (Odisha); Patel Phoschem Ltd, Udaipur (Raj.); Rashtriya Chemicals & Fertilisers Ltd, Trombay (Maharashtra). As on 01.11.2023, the total manufacturing capacity of phosphoric acid (as P₂O₅) is around 23.73 lakh tonnes per annum. The production of phosphoric acid (as P₂O₅) in the year 2021-22 is estimated around 17.53 lakh tonnes. The important uses of phosphoric acid are in the manufacture of phosphatic fertilisers, agricultural feed, waxes, polishes, soaps & detergents, and in waste water treatment, tea-leaf processing, sugar refining, as well as anodising & stabilising agent.

Ferro-phosphorus (FeP)

Ferro-phosphorus is obtained as a by-product during steel manufacturing, during the production of yellow phosphorus or is smelt by phosphate rock & ferro-rock in blast furnace. It is used as an ingredient in high strength low-alloy steel, foundry products, as de-oxidiser in Metallurgy Industry & as a brake liner with 23% minimum phosphorus and 1% maximum carbon. Ferrophosphorus is also used as a dyeing agent and as an additive in metallic paints.

Red Phosphorus

Star Chemicals (Bombay) Pvt. Ltd and United Phosphorus Ltd, Gujarat, are the leading manufacturers and suppliers of red phosphorus in the country. It is mainly consumed in the Match Industry for making strike plate of match box. Besides, in Agriculture Industry, it is used as fumigant and in the making of pesticides. Red phosphorus finds application in the manufacture of phosphoric acid, semi-conductors and also as flame retardant for polymers. It is also used in pharmaceuticals for synthesis of drugs. In the year 2021-22, the total installed capacity of Red

MINERAL-BASED INDUSTRIES

Phosphorus was 1.68 thousand tonnes which was same as in the previous year. The production of Red Phosphorus during 2021-22 was 1.15 thousand tonnes as compared to 1.07 thousand tonnes in the previous year.

Borax

Borax is used as a component of glass, ingredient in enamel glazes, pottery & ceramics. The main manufacturers of borax is Borax Morarji Ltd with an installed capacity of 24,000 tpy at Dahej, GIDC in the State of Gujarat. The plant uses imported crude sodium borate concentrates (rasorite) and crude calcium borate (colemanite) as these are not produced indigenously. Indo-Borax & Chemical Ltd also operates borax and boric acid plants at Pithampur, Madhya Pradesh. As a thumb rule, for one tonne production of boric acid about 2 tonnes of boro-gypsum is produced. However, boro-gypsum does not have ready market for its disposal.

CHEMICAL FERTILIZERS

In India, the Agricultural Sector plays a vital role in the economic development of the country as securing food for 1.4 billion plus population is a mammoth task. To maximise agricultural output, it is imperative that better agricultural methods, and greater, but judicious use of fertilizers be put to effect. The application of fertilizers is well known for over a hundred years, but the use of chemical fertilizer started in the beginning of this century. The first phosphate fertilizer plant in India was commissioned in 1906. Since then, the Phosphatic Fertilizer Industry has grown considerably, but, the growth has not been able to keep pace with the ever increasing demand.

At present, there are 33 large size urea plants in the country manufacturing urea, 21 units producing DAP & other Complex fertilizers and 102 units for production of SSP.

As per Fertilizer Association of India, as on 01.11.2023 the total installed capacity of Urea, DAP, Complex fertilizer and SSP stands at 313.02 lakh tonnes, 74.52 lakh tonnes, 85.97 lakh tonnes and 123.15 lakh tonnes, respectively. In the year 2021-22, the production of total nutrients ($N+P_2O_5$) was 18.58 million tonnes. The imports and consumption of total nutrients ($N+P_2O_5+K_2O$) in the year 2021-22 were 9.82 million tonnes and 29.79 million tonnes, respectively. India is the second largest consumer and third largest producer of finished fertilizers in the

world. India is net importer of fertilizers, both finished products as well as raw materials

Different types of straight and complex fertilizers are manufactured from rock phosphate, such as, SSP, DAP, nitrophosphate, urea ammonium phosphate etc.

In the absence of commercially exploitable resources of potash in the country, the entire demand of potassic fertilizers is met through imports. The capacity and production of different types of fertilizers are provided in Table-12.

The principal list of fertilizer plants is furnished in Table-13.

Types of fertilizers produced in India are detailed below:

A) Straight Nitrogenous Fertilizers:

- 1) Ammonium Sulphate (AS)
- 2) Calcium Ammonium Nitrate (CAN)
- 3) Ammonium Chloride
- 4) Urea

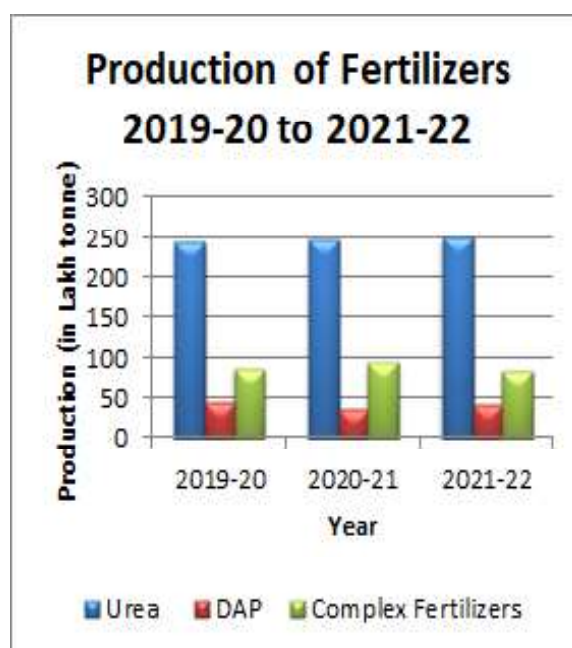
B) Straight Phosphatic Fertilizers:

- 1) Single Super Phosphate (SSP)
- 2) Triple Super Phosphate (TSP)

C) NP/NPK Complex Fertilizers:

- 1) Urea Ammonium Phosphate
- 2) Ammonium Phosphate Sulphate
- 3) Diammonium Phosphate (DAP)
- 4) Mono ammonium Phosphate (MAP)
- 5) Nitro phosphate
- 6) Nitro phosphate with Potash
- 7) NP/NPK

Source: Department of Fertilizers.



MINERAL-BASED INDUSTRIES

Table – 12 : Installed Capacity and Production of Various Types of Fertilizers

(In lakh tonnes)

Products	No. of Units	Installed Capacity* (as on 01.11.2023)	Production	
			2020-21	2021-22
Urea	33	313.02	246.05	250.72
DAP	21	74.52	37.74	42.22
Complex Fertilizers		85.97	93.21	83.27
SSP	102*	123.15	49.35	53.34

Source: Annual Report 2021-22 and 2022-23, Department of Fertilizer. Fertilizer statistics*

Table – 13 : Principal Fertilizer Plants

Sl. No.	Plant	Location
Public Sector		
1.	National Fertilizer Ltd	Nangal and Bhatinda (Punjab), Panipat (Haryana),Vijaipur-I & II (Madhya Pradesh)
2.	Brahmaputra Valley Fertilizer Corp. Ltd	Namrup- II and III (Assam)
3.	Fertilizers & Chemicals Travancore Ltd	Udyogmandal and Cochin-I & II (Kerala)
4.	Rashtriya Chemicals & Fertilizers Ltd	Thal Vaishet,Trombay I & IV and Trombay V (Maharashtra)
5.	Madras Fertilizers Ltd	Manali (Tamil Nadu)
6.	Steel Authority of India Ltd	Rourkela (Odisha),Bhilai (Chhattisgarh),Bokaro (Jharkhand),Durgapur (West Bengal),IISCO,Burnpur-Kulti (West Bengal)
7.	Hindustan Urvarak & Rasayan Ltd*	Gorakhpur (Uttar Pradesh),Barauni (Bihar),Sindri (Jharkhand)
8.	Ramagundam Fertilizers & Chemicals Ltd*	Ramagundam (Telangana)
9.	Rashtriya Ispat Nigam Ltd	Visakhapatnam (Andhra Pradesh) (Visakhapatnam Steel Plant)
Private Sector Large Units		
8.	Gujarat State Fertilizers & Chemicals Ltd	Vadodara and Sikka I & II (Gujarat)
9.	KRIBHCO Fertilisers Ltd	Shahjahanpur (Uttar Pradesh)
10.	Yara Fertilisers India	Babrara (Uttar Pradesh)
11.	Matix Fertilizers & Chemicals Ltd	Panagarh (West Bengal)
12.	Coromandel International Ltd.	Vizag and Kakinada (Andhra Pradesh), Ennore ,(Tamil Nadu)
13.	Krishna Phoschem Ltd	Meghnagar (Madhya Pradesh)
14.	Gujarat Narmada Valley Fertilizers & Chemicals Ltd	Bharuch (Gujarat)
15.	Greenstar Ferts. Ltd.	Tuticorin (Tamil Nadu)
16.	Madhya Bharat Agro Product Ltd	Sagar II (Madhya Pradesh)
17.	Mangalore Chemicals & Fertilizers Ltd	Mangalore (Karnataka)
18.	Nagarjuna Fertilizers & Chemicals Ltd	Kakinada I & II (Andhra Pradesh)
19.	Tuticorin Alkali Chemicals & Fertilizers Ltd	Tuticorin (Tamil Nadu)
20.	Indorama India Pvt.Ltd	Jagdishpur (Uttar Pradesh), Haldia (West Bengal)
21.	Mahadhan Agri Tech Ltd	Taloja (Maharashtra)
22.	Shriram Fertilisers & Chemicals	Kota (Rajasthan)
23.	Southern Petrochemical Industries Corporation Ltd	Tuticorin (Tamil Nadu)
24.	Chambal Fertilizers & Chemicals Ltd	Gadepan I, II & III Kota (Rajasthan)
25.	Kanpur Fertilisers & Chemicals	Kanpur (Uttar Pradesh)
26.	Paradeep Phosphates Ltd	Paradeep (Odisha), Zuari Nagar (Goa)
27.	Hindustan Chemicals Co.	Surat (Gujarat)
Co-operative Sector		
28.	Indian Farmers Fertiliser Co-operative Ltd	Kalol and Kandla (Gujarat), Aonla I & II, Phulpur I & II (Uttar Pradesh), Paradeep (Odisha)
29.	Krishak Bharti Co-operative Ltd	Hazira (Gujarat)

PAPER & PAPER BOARD INDUSTRY

The Indian Paper Industry accounts for about 5% of the world's total production of paper. There are around 912 units which are manufacturing pulp, paper, paper board and newsprint with an installed capacity of nearly 29.11 million tonnes out of which 5.51 million tonnes are lying idle. As on date around 538 mills are in operation and with a total operating capacity of around 25.28 million tonnes, the industry has almost achieved pre-covid levels of production. The total production for the year of 2021-22, stood at 22.43 million tonnes exhibiting an increase of 3.4% on YoY basis. In the year 2021-22, the total capacity utilisation stood at around 89% and the total consumption of paper, paperboard, and newsprint stood at 21.07 million tonnes. Our per capita paper consumption has increased to 15-16 kg, largely propelled by increase in demand of packaging papers. However, looking at the average per capita consumption of 52 kg at the international level, we have a headroom for increasing the consumption to at least about three times the present rate. In the year 2021-22, the global share of the country in contribution of paper, paper board and newsprint production is 5.6%. In terms of production, India is placed at No. 5 in the global paper producing nations. Global average growth of production of paper, paperboard and newsprint is around 1%, whereas in India average growth of this industry is about 3-4 %. Thus, India offers one of the very few markets in the world that exhibits growth potential for paper and paper board. During the year 2021-22, 2.17 million tonnes of paper, paper board and newsprint were imported and about 3.53 million tonnes of paper, paper board and newsprint were exported. The Indian Paper Industry is in a fragmented structure, consisting of small, medium and large paper mills having capacity ranging from 5 to 1,650 tonnes per day. The Sector uses wood, agro residues and waste paper as input substrates for production. Presently, in the total production, the share of wood, agro and waste paper based mills stand at 19.26%, 5.84% and 74.9%, respectively. The Newsprint Sector in the country is governed by the Newsprint Control Order (NCO), 2004. At present, there are 125 mills registered under the Schedule to the NCO. However, due to prevalent market conditions, only 79 mills are under production with an operating capacity of 2.22 million tonnes, which

accounts for 67% of the total capacity of 3.30 million tonnes registered under the schedule. Minerals like china clay, limestone, talc, salt, sulphur, etc. besides coal as fuel are used for purposes, such as, filler, coating & surface sizing, etc., in this Industry and also play vital role in quality control.

PAINT & ALLIED PRODUCTS INDUSTRY

The Paint & Allied Products Industry comprises paints, enamels, varnishes, pigments, synthetic resins, printing inks, etc. Approximately, 65% of the production is contributed by the Organised Sector. The per capita consumption of paint in India is around 4 kg.

The Indian Paint Industry is expected to grow at a rate of 12–13% annually. India is self-sufficient in the production of paints. Barytes, bentonite, calcite, china clay, mica powder, rutile, talc/steatite/soapstone, ochre, silica & dolomite powder are some of the important minerals consumed in the Paint Industry.

PETROLEUM REFINERIES

There were 23 refineries operating in the country (20 in Public/Joint Sector and 3 in Private Sector). India is the fourth largest refiner in the world. While production is largely in the hands of publicly owned companies, India's largest refineries are privately owned, notably the world's largest refinery is Reliance-owned Jamnagar refinery located on the western coast of Gujarat.

Installed capacity and Refinery-wise Crude Oil processed are provided in Table-14.

The total refining capacity in the country as on 01.04.2022 is around 251.22 million tpy. The total crude throughput increased to 241.77 million tonnes in 2021-22 from 221.77 million tonnes in 2020-21. Production of petroleum products from crude oil was 254.31 million tonnes in 2021-22 as against 233.51 million tonnes in 2020-21. Import of petroleum crude was 220.03 million tonnes in 2021-22 as against 188.18 million tonnes in 2020-21. During 2021-22, crude oil and condensate production in the country was at 29.69 million tonnes, while the natural gas production was at 34.02 billion cubic metres (BCM).

The details of capacity expansion and development are reflected in the Review on Petroleum and Natural Gas in Vol-III, IMYB, 2022.

MINERAL-BASED INDUSTRIES

Table – 14: Installed Capacity and Refinery-wise Crude Oil Processed

(In '000 tonnes)

Refinery	Annual installed capacity (as on 1.4.2022)	Refinery Crude throughput		
		2019-20	2020-21	2021-22 (P)
Total	251220	254386	221773	241703
Public/Private Sector & Subsidiaries	143920	144716	127504	138081
IOCL, Digboi, Assam	650	664	605	708
IOCL, Guwahati, Assam	1000	892	849	730
IOCL, Barauni, Bihar	6000	6516	5469	5620
IOCL, Koyali, Gujarat	13700	13075	11603	13474
IOCL, Haldia, West Bengal	8000	6463	6759	7305
IOCL, Mathura, Uttar Pradesh	8000	8948	8926	9123
IOCL, Bongaigaon, Assam	2700	2045	2450	2639
IOCL, Panipat, Haryana	15000	15038	13181	14849
IOCL, Paradeep, Odisha	15000	15778	12508	13217
BPCL, Mumbai, Maharashtra	12000	15017	12941	14437
BPCL (formerly KRL), Kochi, Kerala	15500	16515	13282	15402
HPCL, Mumbai, Maharashtra	9500	8065	7374	5558
HPCL, Visakhapatnam, Andhra Pradesh	8300	9115	9050	8410
CPCL, Manali, Tamil Nadu	10500	10161	8243	9040
CPCL, Narimanam, Tamil Nadu	0	-	-	
Numaligarh Refinery Ltd, Numaligarh, Assam	3000	2383	2707	2624
MRPL, Mangaluru, Karnataka	15000	13953	11475	14871
ONGC, Tatipaka, Andhra Pradesh	70	87	81	75
Joint Venture	19100	20155	16262	20437
Bharat Oman Refineries Ltd, Bina [@]	7800	7913	6190	7410
HPCL Mittal energy Ltd (HMEL), Bathinda [#]	11300	12242	10072	13027
Private Sector	88200	89515	78008	83186
RIL, Jamnagar, Gujarat	33000	33019	34100	34757
RIL, Jamnagar (SEZ), Gujarat	35200	35876	26841	28264
Nyara Energy Ltd (NEL), Vadinar, Gujarat	20000	20620	17067	20164

Source: Indian Petroleum and Natural Gas Statistics, 2021-22, Ministry of Petroleum & Natural Gas, Government of India.

[@]: Bharat Oman Refineries Ltd (BORL) is a Joint Venture Company promoted by BPCL and Oman Oil Company Ltd (OOCL).

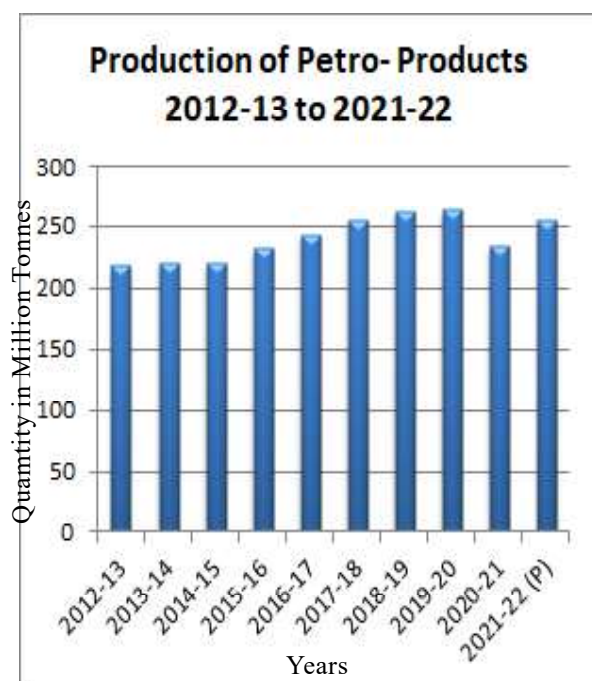
[#]: HPCL Mittal Energy Ltd is a Joint Venture Company promoted by HPCL and Mittal Energy Investment Pvt. Ltd.

Note: (i) CPCL and BRPL are subsidiaries of IOCL; NRL of BPCL; and MRPL of ONGC.

(ii) Crude throughput in terms of crude oil processed.

(iii) Total may not tally due to rounding off.

(iv) CPCL refinery is under shutdown due to limitation in meeting required product specification.



FOUNDRY

The Indian Foundry Sub-sector is the key feeder to the Engineering Industry. Foundry Industry, on the advice of National Manufacturing Competitiveness Council (NMCC), New Delhi, under Department of Industrial Policy & Promotion, Ministry of Commerce and Industry, has prepared

draft Vision Document 2020 in which it is envisaged that there must be doubling of production with enhanced energy efficiency, technological modernisation and greenfield expansion to realise the goals envisioned.

Indian Foundry Industry is the third largest in the world. This Industry is now well established in the country and is spread across a wide spectrum consisting of large, medium, small and tiny sectors.

Typically, each foundry cluster is known to cater to specific end-use markets. The Coimbatore cluster is famous for pump-sets castings; Kolhapur and Belgaum cluster for automotive castings; Rajkot cluster for diesel engine castings and Butala–Jalandhar cluster mainly for machine parts and agricultural implements. Advanced countries like USA, Japan, Germany are unlikely to add much capacity due to stringent pollution control norms there. India can thus have a dominant presence in this field and can become an important casting supplier to the world.

Although intermediate mineral-based products like pig iron, scrap of metals and ferroalloys, etc. are main inputs for foundry, minerals like bentonite, coke, coal, fireclay, fluorite, iron ore, limestone, silica sand, zircon flour, etc. are also being consumed by the Foundry Industry.