

MINERAL-BASED INDUSTRIES



Indian Minerals Yearbook 2017

(Part- I General Reviews)

56th Edition

MINERAL-BASED INDUSTRIES

(FINAL RELEASE)

**GOVERNMENT OF INDIA
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March, 2018

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, which must be aimed at long-term national goals. In tune with the Economic Liberalisation Policy adopted in July 1991, the National Mineral Policy which was 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 subsequently, in 2008, was revised with a purpose to overhaul the development of mineral resources in the country.

The National Mineral Exploration Policy (NMEP) approved by Govt. of India in June, 2016, primarily aims at accelerating the exploration activity in the country through enhanced participation of the private sector and will benefit 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 has projected a target of 300 million tonnes of domestic steel production by 2030. The total production of finished steel for sale during 2016-17 stood at 101.81 million tonnes.

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 the intermediate product of smelting of iron ore with high-carbon fuel, such as, coke and charcoal and is the basic raw material in Foundry and Casting Industry that is engaged in manufacture of various types of castings required for engineering sector. Pig iron usually has very high carbon content of 3.5% to 4.5%. The main sources of pig iron have traditionally been the integrated steel plants of SAIL besides plants of Tata Steel and Rashtriya Ispat Nigam Ltd. The domestic production of pig iron has prompted initiation of efforts to increase pig iron manufacturing facilities in the secondary sector.

As a result of various policy initiatives taken by the Government, Private Sector did show considerable interest in setting up new pig iron units, specially in the post-liberalised period. In 2016-17, about 9.39 million tonnes pig iron was produced. The total share of SAIL, TSL, RINL, ESL, JSWL and JSPL was 9 %, whereas the total share of other producers was 91 % in the financial year 2016-17. 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 Andhra Pradesh with a capacity of 0.039 million tonnes/year.

In the last few years, combined use of hot metal and sponge iron in electric arc furnace have been in practice for production of liquid steel. Consequently, production of sponge iron too went up, substantially. The installed capacity of sponge iron in 2016-17 was 48.63 million tonnes and the production was 28.76 million tonnes. Plant-wise details as available in respect of major sponge iron units are furnished in Table-3.

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Table – 1 : Capacity and Production of Important Mineral-based Products, 2015-16 to 2016-17

Mineral-based product	Unit of quantity	Annual Installed capacity	Production	
			2015-16	2016-17 (P)
Ferrous Metals				
Sponge iron	million tonnes	48.63	22.43	28.76
Crude/liquid steel	"	128.28	89.79	97.94
Ferro-alloys				
Ferrochrome/Charge-chrome	'000 tonnes	1600	944	944
Ferromanganese	"	2750	518	518
Silico manganese	"	-	270	301
Ferrosilicon	"	250	90	90
Ferro-Molybdenum	tonnes	-	1459	1603
Ferro-Titanium	"	-	198	291
Ferro-Vanadium	"	-	937	1329
Ferro-Aluminium	"	-	3212	4345
Non-ferrous Metals				
Aluminium	'000 tonnes	1907	2355	2897
Copper #	"	1001.5	790	788
Lead (primary)	"	185	145	142
Zinc Ingots	"	871	759	672
Silver	tonnes	-	491	528
Cement	million tonnes	502.03	283.45	279.72
Fertilizers				
DAP	lakh tonnes	83.32	38.22	43.33
Complex fertilizers	"	60.71	83.79	79.24
SSP	"	110.36	43.29	42.96
Chemicals				
Aluminium fluoride	'000 tonnes	25.60	5.40	6.73
Caustic soda	"	3297	2504	2594
Calcium carbide	"	112	78.78	87.18
Soda ash	"	3086	2583	2613
Titanium dioxide pigment	"	82.50	52.78	47.88
Red phosphorus	"	1.68	0.75	0.84
Crude Throughputs in Refineries	"	247566	232865	245362

Figures rounded off.

- Sources:**
1. Ministry of Steel, Annual Report, 2017-18 and JPC Bulletins.
 2. Ministry of Commerce & Industry, Department of Industrial Policy & Promotion and Annual Report, 2017-18.
 3. Ministry of Chemicals & Fertilizers, Department of Chemicals & Petrochemicals, Annual Report, 2017-18.
 4. Ministry of Petroleum and Natural Gas, 2015-16 & 2016-17.
 5. Cement Survey, 2017.
 6. Information received from individual plants in Organised Sector.
Production relates to copper cathodes (figures rounded off).
MSMP - March 2017

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Table – 2 : Location and Capacity of Principal Pig Iron Units

(In lakh tonnes)

Sl.No.	Unit	Location	Capacity
1.	Jayaswal NECO Industries Ltd	Raipur, Chhattisgarh	6.50
2.	Vedanta Ltd	Amona, Goa	7.42
3.	Usha Martin Industries	Jamshedpur, Jharkhand	6.00
4.	JSW Steel Ltd	Vijaynagar, Dolvi & Salem	180.00
5.	Steel Authority of India Ltd	Bhilai, Bokaro, Durgapur, Burnpur, Rourkela, Bhadravati	235.00
6.	Rashtriya Ispat Nigam Ltd	Visakhapatnam, Andhra Pradesh	65.00
7.	Monnet Ispat Ltd	Raigarh, Chhattisgarh	7.00
8.	MESCO Steel Ltd	Kalinganagar, Odisha	4.50
9.	Jai Balaji Industries Ltd	Durgapur, West Bengal	5.09
10.	JSPL	Raigarh, Chhattisgarh	20.00
11.	Neelaanchal Ispat Nigam Ltd	Kalinganagar, Odisha	11.00

Source: MCDR Returns (Form-O), Website of concerned company, Iron & Steel Review, JPC Bulletin and Ministry of Steel.

Table – 3 : Capacities of Principal Sponge Iron (DRI) Plants

(In lakh tonnes)

Unit	Location	Capacity
Gas-based		
Essar Steel Ltd	Hazira, Gujarat	68.0
JSW Steel Ltd. (Salav) (formerly Welspun Maxsteel Ltd)	Salav, Raigad, Maharashtra	9.00
JSW Steel (formerly Ispat Industries Ltd)	Geetapuram, Dolvi, Raigad, Maharashtra	16.00
Coal-based		
Alliance Integrated Metallics Ltd	Bemta, Raipur, Chhattisgarh	5.00
Godawari Power & Ispat Ltd	IGC Siltara, Raipur, Chhattisgarh	4.95
Ind Synergy Ltd	Kotmar, Raigarh, Chhattisgarh	3.00
Monnet Ispat Energy Ltd	Chandkhuri Marg, Hasaud, Raipur, Chhattisgarh	3.00
Monnet Ispat & Energy Ltd	Naharpalli, Raigarh, Chhattisgarh	5.00
Prakash Industries Ltd	Champa, Janj-gir-Champa, Chhattisgarh	4.50
Rungta Mines Ltd	Karakola and Kamando, Sundergarh, Odisha	4.20
Rashmi Cement Ltd	Barbil, Kendujhar, Odisha	3.60
Tata Sponge Iron Ltd (Ipitata Sponge)	Joda, Kendujhar, Odisha	3.90
Visa Steels Ltd	KIC, Jajpur Road, Odisha	3.00

I.G.C.: Industrial Growth Centre.

Source: Sponge Iron Manufacturers' Association (SIMA) and individual plants.

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. The Working Group on Steel for the 12th plan has projected that crude steel capacity in the country would touch 140 million tonnes by 2016-17.
2. The total estimated value of exports of finished steel increased to 8.24 million tonnes in 2016-17 from 4.08 million tonnes in 2015-16 and the imports decreased to 7.23 million tonnes in 2016-17 from 11.71 million tonnes in 2015-16.

Details about capacity and production of crude steel & hot metal by main producers are furnished in Table-4.

Steel Companies Under Public Sector

Steel Authority of India Ltd (SAIL)

SAIL is a Public Sector Company that operates five integrated steel plants at Bhilai in Chhattisgarh, Bokaro in Jharkhand, Durgapur & Burnpur in West Bengal and Rourkela in Odisha. SAIL has three special and alloy steel plants viz Alloy Steel Plant at Durgapur (West Bengal), Salem Steel Plant at Salem (Tamil Nadu) & Visvesvaraya Iron & Steel Plant at Bhadravati (Karnataka). Crude steel production from SAIL plants during the year 2016-17 was 14.49 million tonnes and 14.28 million tonnes during the year 2015-16.

The expansion and modernisation programme of SAIL is underway in all steel plants to enhance the hot metal production capacity. The proposed production build-up is envisaged to the extent of 26.18 million tonnes in a phased manner for hot metal, 21.4 million tonnes for crude steel and 20.2 million tonnes for saleable steel.

Rashtriya Ispat Nigam Ltd (RINL)

Visakhapatnam Steel Plant (VSP) of RINL is the first shore-based integrated steel plant located at Visakhapatnam in Andhra Pradesh. The plant has completed expansion for doubling the capacity from 3 MTPA to 7.3 MTPA. The plant has been built to match international standards in design and engineering with state-of-the-art technology, incorporating extensive energy saving and pollution control measures.

Neelachal Ispat Nigam Ltd (NINL)

NINL, a Joint Venture Company promoted by MMTC and Government of Odisha, is the largest exporter of saleable pig iron in the country and is the leading supplier of LAM coke to most of SAIL's plants. It has set-up 1.1 million tpy integrated steel plant at Kalinganagar-Duburi in district Jajpur, Odisha. Other operating facilities of NINL include a coke oven battery (0.81 million tpy), a sinter plant (1.71 million tpy), slag granulation plant (0.3 million tpy), a gas-based captive power plant with total 62.5 MW capacity and an ammonium sulphate plant (12,750 tpy). Expansion and addition of facilities in Phase-2, presently under implementation, comprise pig iron for sale (153 thousand tpy), a BOF & a ladle furnace of 110 t capacity each, continuous billet caster and a bar & rod mill. The production capacity after Phase-2 is expected to be: pig iron for sale (153 thousand tpy), wire rods (0.3 million tpy), billets for sale (175 thousand tpy) and straight, rounds & square bars (0.4 million tpy). NINL, in addition, owns a captive iron ore mine which is under development with a 2.5 million tpy raw material handling system (RMHS), which is automated and operated from central control room to provide consistent quality of raw materials for blast furnace & sinter plant.

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Steel Companies Under Private Sector

The Private Sector continued to play a dominant role in the production of steel and have been pivotal in the growth of Steel Industry in the country. The performance of major Private Sector producers is summarised below:

The Private Sector units consist of both major steel producers on one hand and relatively smaller

& medium scale units, such as, sponge iron plants, mini-blast furnace units, electric arc furnaces, induction furnaces, re-rolling mills, cold rolling mills and coating units on the other. They not only play an important role in production of primary and secondary steel, but also contribute substantial value addition in terms of quality, innovation and cost-effectiveness.

Table – 4 : Capacity and Production of Hot Metal and Crude/Liquid Steel, 2015-16 and 2016-17 (By Principal Producers)

(In '000 tonnes)

Unit	Annual installed capacity		Production			
	Hot metal	Crude/Liquid steel	Hot metal		Crude/Liquid steel	
			2015-16	2016-17	2015-16	2016-17
Public Sector						
Bokaro Steel Plant (Jharkhand)	4585	4360	3700	3410	3392	3154
Bhilai Steel Plant (Chhattisgarh)	4700	3925	5317	5041	5058	4737
Rourkela Steel Plant (Odisha)	2120	4400	3042	3094	2730	2932
Durgapur Steel Plant (West Bengal)	2088	1802	2170	2318	1975	2042
IISCO Steel Plant, Burnpur (West Bengal)	550	2500	1431	1810	871	1394
Visvesvaraya Iron & Steel Plant (Karnataka)	205	118	60	54	42	39
Salem Steel Plant (Tamil Nadu)	–	180	–	–	120	108
Alloy Steel Plant, Durgapur (West Bengal)	–	234	–	–	91	88
Rashtriya Ispat Nigam Ltd (Andhra Pradesh)	3400	6300	3975	4043	3641	3962
Private Sector						
JSW Steel Ltd (Karnataka)	–	10000	–	–	8385	9655
Tata Steel Ltd (Jharkhand)	–	12500	10655	13059	9960	11688
JSW Ispat Steel Ltd /JSW Steel Ltd (Maharashtra)	–	5000	–	–	4294	6851
Essar Steel Ltd (Gujarat)	–	10000	–	–	3685	5392
Jindal Steel & Power Ltd (Chhattisgarh)	1670	8600	–	–	3177	3445
Jindal Stainless Ltd	–	1800	–	–	1258	1391
Bhushan Steel Ltd	–	5600	–	–	3078	5601
Bhushan Power & Steel Ltd (Odisha)	–	2500	–	–	1832	3324

Figures rounded off.

Source: Ministry of Steel, Annual Report, 2017-18.

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Tata Steel Ltd (formerly TISCO)

The Company has been rechristened as Tata Steel Ltd (TSL). The Company has an integrated steel plant located at Jamshedpur, Jharkhand, with annual crude steel making capacity of 9.7 million tonnes and variety of finishing mills. TSL has produced 11.12 million tonnes of finished steel in 2016-17 as compared to 9.53 million tonnes in 2015-16. The production of crude steel in 2015-16 was 9.96 million tonnes as against 11.69 million tonnes in 2016-17.

The Company is planning to initiate second phase of expansion at Kalinganagar plant in Odisha to double its capacity to 6 million tpy. The first phase of Kalinganagar project started commercial production in May, 2016. The Government of Odisha has allotted 2000 acres of land for the plant at Kalinganagar. The Company initially plans to set up a 7.0 million tpy capacity integrated steel plant at Jagdalpur in Bastar region of Chhattisgarh, but subsequently decided against the project due to delay in land allocation. The Company also signed an MoU with the Government of Jharkhand for setting up of a 12 million tonnes per year integrated steel plant at Saraikela in phases. The above projects are, however, subjected to raw material linkages and requisite approvals.

JSW Steel Ltd

JSW Steel Ltd's combined installed capacity of its plants at Karnataka, Tamil Nadu and Maharashtra of crude steel was 18 million tpy with value added products constituting 1.8 million tpy spread across six locations; Toranagallu (Vijayanagar Works), Salem (Salem Works), Vasind, Tarapur (downstream units), Dolvi and Kalmeshwar (Maharashtra). Vijayanagar Works existing operations produce flat and long steel products; Salem Works has its focus only in long products while the downstream units produce CR/galvanised, colour-coated, value-added flat products. All the existing operating facilities have been accredited with OHSAS-18001, ISO-9001: 2000

and ISO - 14001. Vijayanagar Works has integrated operations from beneficiation plant to 1 million tpy Cold Rolling Mill Complex. The Salem Works has an integrated manufacturing facility with an overall crude steel capacity of 1 million tpy, comprising sinter plant, blast furnace, EOF, billet caster, bloom caster & rolling with associated facilities, such as, coke oven, power plant, oxygen plant, etc. The slabs and HR coil produced at Vijayanagar Works are further processed in downstream units at Vasind and Tarapur into value-added HR plates, CR, galvanised, galvalume and colour-coated products.

The Company has enhanced the total capacity to 10 million tpy at Vijayanagar Works. Two subsidiaries of the Company – M/s JSW Bengal Steel Ltd and M/s JSW Jharkhand Steel Ltd – have been incorporated to set up greenfield steel plants with 10 million tpy capacity each in West Bengal and Jharkhand, respectively. The Company is in possession of required land in West Bengal, while in Jharkhand, it has obtained a mining lease for iron ore.

The Vijayanagar works is also the first Indian plant that underakes large-scale, low-grade iron beneficiation process. Its 4.62 MTPA coke manufacturing unit is also the largest such facility in a single location. The Company has a manufacturing capacity of 9.2 MT of pellets annually at Vijayanagar.

JSW Steel has acquired a majority stake in Ispat Steel w.e.f. 21.12.2010. It has set up one of the largest integrated steel plants in the Private Sector in India at Dolvi in Raigad district, Maharashtra. The plant has a capacity to produce 5 million tonnes of Steel per annum. The Integrated Steel plant functions on the Convertor-cum-Electric Arc Furnace route (CONARC Process) to produce steel through modern Twin Shell Electric Arc Furnace. JSW, Dolvi also having a sinter plant of capacity 4.74 MTPA. The expansion work at the Dolvi plant to enhance capacity from 3.3 MTPA to 5 MTPA has completed recently.

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The Company aims to produce 44 million tonnes of steel annually with Greenfield integrated steel plants coming up in West Bengal and Jharkhand (of 10 MTPA each) by 2030. Company also plans to expand its Vijaynagar works to 20 MTPA, Dolvi works to 10 MTPA and salav to 3 MTPA.

Jindal Steel & Power Ltd (JSPL)

JSPL having manufacturing facilities for steel products in three locations; Raigarh in Chhattisgarh, Angul in Odisha and Patratu in Jharkhand. JSPL has set up a rail & universal beam plant with capabilities to produce 121 m long single piece rail and is the first in the country to manufacture large-size parallel flange beams. The sponge iron plant at Raigarh, Chhattisgarh has capacity of 1.37 million tpy. Facilities at Raigarh also include a Sinter plant of 2.84 MTPA and Steel melt shop of 3.25 MTPA.

Under the 'Make in India' vision, JSPL has successfully completed Angul Greenfield project with installation of 4 MTPA Blast Furnace, the largest ever built in India. Other plants being set up are: 6 million tpy integrated steel plant at Patratu, Jharkhand and 7 million tpy steel plant at Raigarh, Chhattisgarh. It has planned to implement these projects in phases. The present plant at Raigarh is also under expansion to 7 million tpy (3 million tpy through EF route and 4 million tpy through BOF route) comprising 3 million tpy flat products and 4 million tpy long products. It will also have 6 million tpy gas-based DRI plant with matching coal gasification unit and 4 million tpy hot metal capacity.

Essar Steel Limited (ESL)

A state-of-the-art hot rolled coil steel plant was set up at Hazira, Gujarat with 10 million tonnes capacity per annum supported by a 20 MTPA pellet facility. It is the largest fully-integrated manufacturer of high-quality flat steel products in western India. The Company's operations include 8 million tpy and 12 million tpy beneficiation plants at Bailadila in Chhattisgarh and Dabuna in Odisha. Essar has the world's second largest slurry pipeline of 267 km and

also 253 km to transport beneficiated iron ore slurry to the pellet plants namely, 8 million tpy pellet complex at Visakhapatnam, Andhra Pradesh and 6 million tpy plant at Paradip, Odisha. The Essar Steel Complex at Hazira in Surat district, Gujarat houses the world's largest gas-based single location sponge iron plant with a capacity of 6.8 million tpy. The complex also houses 1.4 million tpy cold rolling plant, 4.6 million tpy electric arc furnace, 4.6 million tpy continuous caster and 3.6 million tpy hot strip mill. Outstanding performance has been observed in the 3 DRI-HBI modules of the company.

The Company has plans to double the capacity of pelletisation at Paradip, Odisha from 6 MTPA to 12 MTPA. The scheme also includes installation of pellet plant and iron ore beneficiation plant. The Company has plans to set up a steel plant of 3.2 million tonnes per annum capacity at Bastar, Chhattisgarh, (In the first phase, a 1.6 million tpy steel plant with a captive power plant is to be set up), 3 million tonnes per annum in Jharkhand and 6 million tonnes per annum in Karnataka.

Electrosteel Steels

Electrosteel Steels Limited is one of the pioneer Companies that manufactures of Ductile Iron (DI) pipe. The Company is in the process of setting up 2.51 MTPA Greenfield Steel and DI pipe plant based on iron ore processed through Blast Furnace (BF), Basic Oxygen Furnace (BOF), Continuous Casting (CC), Hot Rolling Mill Route.

Monnet Ispat and Energy Limited

Monnet Ispat & Energy Ltd having integrated steel plant of 1.8 MTPA, which include 0.8 MTPA sponge iron, 0.7 MTPA blast furnace, 0.50 MTPA rebar mill, 0.2 MTPA structural mill, 230 MW power plant, 0.75 MTPA sinter plant, 1.20 MTPA pelletisation plant and 1.00 MTPA coal beneficiation plant at Raipur & Raigarh in the State of Chhattisgarh. The Company has reportedly invested ₹ 7,600 crore in its diversification activities and further proposes to expand its capacities from 1.8 MTPA

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to 2.4 MTPA with incorporation of additional facilities of coke oven, blast furnace, sponge iron, power, cement grinding unit, lime dolomite plant, rolling mill, slag crushing & automisation plant, etc.

Neelachal Ispat Nigam Limited (NINL)

NINL has an iron & steel plant with 1.1 million tonnes per annum capacity located at Kalinganagar, Duburi and Jajpur districts, Odisha. In addition, NINL along with Odisha Government have plans for setting up one million tonnes steel plant at Kalinganagar, Jajpur, Odisha. The other product of the Company that is sold in the domestic market is granulated slag which is consumed by several cement plants.

National Mineral Development Corporation Ltd

NMDC is now directing its resources to diversify into steel making and other value-added products. The Company has plans to set up an integrated steel plant with three million tonnes capacity in Chhattisgarh near Nagarnar, Bastar district, construction work for the project is in progress. NMDC is in the process of expanding its business through forward integration in both greenfield and brownfield projects by setting up (a) 2.0 million tpy pellet plant in Chhattisgarh with 2 MTPA beneficiation plant at Bachel and (b) 1.2 million tpy pellet plant at Donimalai in Karnataka. Construction work for the project is in progress.

Further, NMDC had participated in the Legacy Iron's right issue in August 2014. Post right issue, NMDC's equity in Legacy Iron has increased from 48.82% to 78.56%. NMDC has acquired 50% equity in Legacy Iron Ore Ltd Australia. NMDC has signed an MoU with RINL for laying a slurry pipeline from Bailadila Complex (Chhattisgarh) to Vizag (Andhra Pradesh) via Jagdalpur to facilitate transmission of iron ore concentrate.

KIOCL Ltd

The Company operates a 350 cu m capacity blast furnace at Panambur, New Mangaluru Port for production of pig iron with 2.16 lakh tpy capacity and a Ductile Iron Spun Pipe (DISP)

plant of 1,00,000 tonnes per year capacity. The hot metal from blast furnace is the main feed stock for the DISP plant. The Company is also in the process of selecting a joint venture equity partner for an integrated steel plant to be set up in Karnataka with initial capacity of 1.5 MTPA and expandable to 5 MTPA with equity participation. The Company also operates a 3.5 million tpy pellets plant at Mangaluru with hematite ore purchased from NMDC. Also, under the 'Make in India' initiative of Govt. of India, KIOCL produced high-grade pellets out of imported high-grade ore procured from Brazil. It has signed an MoU with Kerala State Industrial Development Corporation Ltd (KSIDL) for setting up of iron ore mining, beneficiation and pelletisation plant in Kerala.

VISA Steel Ltd

VISA Steel is a leading player in the special steel (0.5 MTPA), ferrochrome (1,80,000 tpa) and metallurgical coke (0.4 million tpa) business in India. The Company is setting up an integrated 1 million tpa special steel plant and 2,50,000 MTPA ferrochrome plant at Kalinganagar Industrial Complex in Odisha. The first phase of 0.5 million tpa special steel long product plant is fully operational. The facilities include a 2,25,000 tpa pig iron plant, 3,00,000 tpa sponge iron plant, 5,00,000 tpa steel melt shop (with EAF, LRF and VD) & 5,00,000 tpa rolling mill (bar & wire rod mill). VISA Steel is also operating 1,80,000 tpa ferrochrome plant and a 75 MW captive power plant. VISA Sun Coke Limited, a joint venture Company between VISA Steel Limited and Sun Coke Energy, USA operates a 4,00,000 MTPA heat recovery coke plant and associated steam generation units at Kalinganagar in Odisha. VISA Steel has signed an MoU with the Government of Chhattisgarh for setting up a 2.5 million integrated carbon steel plant at Korarlia, district Raigarh.

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

Blast Furnace/Basic Oxygen Furnace (BF/BOF)

Presently, there are around 58 Blast Furnace and 17 Basic Oxygen Furnace units with an

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installed capacity of 79.91 million tonnes and 50.85 million tonnes, respectively. The reported production crude steel by BF/BOF route was 42 million tonnes.

Electric Arc Furnace (including corex & MBF/EOF)

Steel produced in the Electric Arc Furnace (including corex & MBF/EOF) is mostly by recycling of steel scrap using Electric Arc Furnace (EAF). Presently, there are more than 48 EAF based steel plants that are operational in the country with an aggregate working capacity of around 37.81 million tonnes per annum. The reported production of steel ingots/concast billets by EAF units in 2016-17 was estimated at 28.96 million tonnes as against 24.60 million tonnes in 2015-16 (Table-5).

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, in India, EAF based industries are yet to switch over to induction furnace route. An induction furnace is an electrical furnace in which heat is generated through electro-magnetic 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 ground induction furnaces with an aggregate working capacity of 39.62 million tonnes. These units reported production of about 26.97 million tonnes steel in 2016-17 as against production of 26.80 million tonnes in 2015-16.

FERRO-ALLOYS

The Indian Ferro alloy 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, Ferro-alloys are in demand for crude steel & alloy steel production.

Bulk ferro-alloys of high carbon category were produced by large-scale industries. The noble ferro-alloys are of low carbon category and include ferro-vanadium, ferro-tungsten, ferro-niobium, ferro-molybdenum and ferro-titanium. There are also a number of units under the Small-Scale Sector for the manufacture of ferro alloys, particularly ferro silicon, ferro chrome and ferro manganese.

India is the net exporter of ferro-alloys. About 25% to 30% production is usually exported. India is an established regular exporter of high carbon ferro manganese, silico manganese and high-carbon ferrochrome. The capacity of Ferro-alloys Industry is furnished in Table-5. The details about ferro-alloys are discussed in the Review on Ferro-alloys in Vol.II of this publication (IMYB).

Bulk Ferro-alloys

Ferro-manganese and Silico-manganese

The country's total installed capacity for ferro manganese is around 42 lakh tonnes.

The total consumption for bulk ferro- alloys accounts for over 98 % of all ferro-alloys. Also about 80 % of total ferro-alloys production is used in steel making, while the balance is used for the manufacture of castings, super alloys, aerospace and other special applications.

The total production and estimated consumption of ferro manganese was 5,18,000 tonnes and 79,200 tonnes, respectively in the year 2016-17

The total production and estimated consumption of silico manganese was 3,00,625 tonnes and 1,61,400 tonnes, respectively in the year 2016-17.

Ferro chrome and Charge chrome

The total combined capacity of ferro chrome and charge chrome is around 16 lakh tpy. Stainless and Alloy-steel Industry are the chief consumers of ferro-chrome.

The total production of ferro chrome/charge chrome in 2016-17 was about 9,44,000 tonnes, which remains same as in 2015-16. Whereas, the consumption of ferro chrome/charge chrome in 2016-17 was reported at about 15,900 tonnes.

Table – 5 : Capacity of Ferro-alloys Industry

	(In tonnes per annum)
Ferro-alloys	Installed capacity
Total	5150000
Bulk Ferro-alloys : Total	5100000
Manganese alloys	3160000
Chrome alloys	1690000
Ferro silicon	250000
Noble Ferro-alloys : Total	50000^(e)

Source: Indian Ferro-alloys Producers' Association (IFAPA), Mumbai.

Noble Ferro alloys

Noble Ferro-alloys are one of the vital inputs required for producing special types of steel & alloy. The total capacity of noble ferro-alloys, was 50,000 tpy ferro molybdenum, ferro vanadium, ferro tungsten, ferro titanium, ferro silico magnesium, ferro aluminium, ferro boron, etc. Mishra Dhatu Nigam (A Govt. of India Undertaking), with a capacity of 2,729 tpy produced different types of super-alloy, chiefly cobalt, molybdenum, titanium and tungsten-based super-alloys and products.

New ferro-alloys plants are in the anvil and some existing ones are on expansion mode. These plants are:

1. Coastal Ferro-alloys is setting-up a Ferro Manganese plant of 352,000 tpa at Haldia in West Bengal.
2. Metsil Exports is setting-up a 62,380 tpa plant at Medak in Telangana.
3. Sri Hari Ferro Alloys is setting-up a 25,882 tpa plant at Nizamabad in Telangana.

MINERAL-BASED INDUSTRIES

4. Balasore alloys, Odisha, is expanding the existing plants to 150,000 tpa and setting up a 400,000 tpa FeCr plant at Kalinganagar, also in Odisha.

5. Sarda Metals & Alloys is setting-up 150,000 tpa plant at Vizianagram in AP.

5. Sasya Green Energy Pvt. Ltd is setting-up a plant at Nellore in AP.

7. Andhra Ferro Alloys is expanding their plant at Vizianagaram in Andhra Pradesh from 20,000 tpa to 30,000 tpa.

8. Utkal manufacturers are doubling the capacity of their Charge Chrome Plant at Jajpur in Odisha.

9. Visa Bao Steel is expanding their Ferro Chrome plant in Odisha from 150,000 tpa to 250,000 tpa.

10. MOIL had planned to set-up a plant in Chhattisgarh (106,000 tpa) in joint venture with SAIL.

The production of various noble ferro-alloys is given in Table-6, as below:

Ferro-alloy	Quantity (in tonnes)
Ferro-molybdenum	1 603
Ferro-titanium	291
Ferro-vanadium	1 329
Ferro-aluminium	4 345

**Table – 6 : Production of Noble Ferro-alloys
Electrolytic Manganese Dioxide (EMD)**

EMD is consumed along with natural manganese dioxide for the manufacture of dry battery cells. There are two units, one owned by MOIL in Bhandara district of Maharashtra, having a capacity of 1,000 tpy and the other by the then Union Carbide Ltd (now Eveready Ltd) at Thane, Maharashtra, having a capacity of 2,500 tpy. MOIL has undertaken capacity expansion of the existing EMD plant to 2,000 tpy in view of the good demand for EMD in the

domestic market. The production of EMD by MOIL was 731 tonnes in 2016-17 as against 612 tonnes in 2015-16. The Company has plans to set-up 10,000 tpy capacity electrolyte manganese metal (EMM) plant and 5,000 tpy capacity potassium permanganate plant to engender diversification and production of value-added products.

NON-FERROUS METALS

Aluminium

There were four companies with a total installed capacity of 41.0 lakh tpy in operation. NALCO, the only Public Sector Company in aluminium & alumina segment has an installed capacity of 4.60 lakh tpy at Angul. BALCO has an installed capacity of 5.70 lakh tpy at Korba. The three companies with six plants in the Private Sector have a total capacity of 36.0 lakh tpy in operation. One unit at Korba of BALCO and a plant of MALCO have suspended operations.

The production of aluminium in 2016-17 was 2.90 million tonnes. The installed capacity and production of aluminium in 2015-16 and 2016-17 is enumerated in Table-7. The projected aluminium production at the end of 12th Plan Period is estimated to be 4.7 million tonnes.

Alumina

The production of alumina was 4.58 million tonnes in 2016-17. 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. The production of alumina by the end of 12th plan period is projected at 13.3 million tonnes.

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Table – 7: Capacity and Production of Aluminium, 2015-16 and 2016-17

(In million tonnes)

Producer	Annual Capacity	Production	
		2015-16	2016-17 (P)
Total	4.06	2.35	2.90
Public Sector			
National Aluminium Co. Ltd (Angul)	0.46	0.37	0.39
Private Sector			
Bharat Aluminium Co. Ltd (Korba)	0.57	0.33	0.42
Hindalco Industries Ltd	1.28	1.13	1.27
Vedanta Aluminium Ltd (Jharsuguda)	1.75	0.52	0.82

Figures rounded off.

Source: Information received from individual plants/Annual reports

MALCO Plant is closed, since December 2008, hence it is removed from the table.

Table – 8: Capacity and Production of Alumina, 2015-16 and 2016-17

(In million tonnes)

Producer	Annual Capacity	Production	
		2015-16	2016-17(P)
Total	6.55	4.17	4.58
Public Sector			
National Aluminium Co. Ltd (Damanjodi)	2.27	1.92	2.03
Private Sector			
Bharat Aluminium Co. Ltd	0.20 [#]	Nil	Nil
Hindalco Industries Ltd	3.00	1.28	1.34
Madras Aluminium Co. Ltd	0.08 [#]	Nil	Nil
Vedanta Aluminium Ltd (Lanjigarh)	1.00 [*]	0.97	1.21

Figures rounded off.

Source: Information received from individual plants/Annual Reports.

[#] Plants remained non-operational during the year.

^{*} Proposed expansion to 4 million tonnes per year.

National Aluminium Co. Ltd

The company has a 68.25 lakh tpa Bauxite Mine & 22.75 lakh tpa Alumina Refinery located at Damanjodi in Koraput distt. of Odisha and 4.60 lakh tpa Aluminium Smelter & 1200 MW Captive Power Plant located at Angul, Odisha. The surplus alumina that remains after internal consumption sold to third parties in the export market and small portion sold to the domestic market. Upgradation of capacity of aluminium smelter from 4.6 lakh tonnes to 5.67 lakh tonnes per year under current-ampereage upgradation project is under progress. NALCO plans to set-up 5 lakh tonnes per year smelter and 1050 MW power plant at Sundergarh district in Odisha state. NALCO has been granted mining lease over Gudam and KR Konda bauxite resources in Andhra Pradesh and Pottangi in Odisha. Based on bauxite resources, the company plans to develop a 42 lakh tpy bauxite mine and 14 lakh tpy alumina refinery complex in Andhra Pradesh. The company has port facilities at Visakhapatnam to export alumina at the rate of 1.4 million tpy.

Bharat Aluminium Co. Ltd (Vedanta Group)

The Government of India disinvested its 51% equity in BALCO along with the transfer of management control in favour of M/s Sterlite Industries (India) Ltd. BALCO is now a Private Sector Company with an integrated alumina/aluminium complex at Korba in Bilaspur district in Chhattisgarh. The Company has two captive bauxite mines, one at Mainpat and other at Kawardha. The total capacity of the Korba smelter has been enhanced to 5.70 lakh tpy from 3.45 lakh tpy. The production of Korba-I plant of BALCO with smelter capacity of 245,000 tpy is stable during the year and the new Korba-II smelter with 325,000 tpy commissioned during the year. Majority of the bauxite required for BALCO's

smelter are acquired from its two captive mines in the state of Chhattisgarh. In addition, BALCO is proposing to install 3.25 lakh tpy aluminium smelter within the existing premises of Korba Aluminium Complex

Hindalco Industries Ltd

Hindalco Industries Ltd. having total aluminium production capacity is around 1,282 thousand tonnes. Hindalco's plans to expand alumina refinery capacity at Belgavi from 3.5 lakh tpy to 6.5 lakh tpy are on hold, awaiting government approval related to bauxite mines.

Hindalco Aluminium smelting operations are located at Renukoot (Uttar Pradesh), Aditya Aluminium (Odisha), Mahan Aluminium (Madhya Pradesh) and Hirakud (Odisha). Newly installed smelters at Aditya Aluminium and Mahan Aluminium operating on state-of-the-art AP36 technology. In addition to aluminium, Renukoot (Uttar Pradesh), Intergrated Aluminium Complex also produces semi-fabricated products viz. conductor redraw rods, sheet, extrusion, etc. Hindalco's plants are equipped with sophisticated rolling mills and finishing equipment. The plants are located at Hirakud (Odisha), Belur (West Bengal), Mouda (Maharashtra), Renukoot (Uttar Pradesh) & Taloja (Maharashtra). Hindalco's finished products include, alumina, primary aluminium in the form of ingots, billets and wire rods, value added products such as rolled products, extrusion, and foils. Hindalco is the largest manufacturer entire range of Flat Rolled Products. The Hirakud Flat Rolled Products (FRP), produce rolled products, extrusions products and wire rods. Hindalco has a conductor redraw capacity of 56,400 tpy at Renukoot plant and sheet rolling capacity of 2,05,000 tpy spread over at Renukoot (80,000 tpy), Belur (45,000 tpy), Taloja (50,000 tpy) and Mauda (30,000 tpy) plants. The company also has two plants for aluminium

MINERAL-BASED INDUSTRIES

extrusion with capacity of 31,000 tpy (comprising units at Renukoot with 23,000 tpy capacity and Alupurum (Kerala) 8,000 tpy capacity.

Hindalco's foil unit located at Silvassa (Dadra & Nagar Haveli) has an installed capacity of 30,000 tpy and produces foils with thickness varying from 9 microns to 200 microns. Kollur plant in district Medak (Andhra Pradesh) has capacity of 4,000 tpy and produces an array of high-quality foils, from cigarette and blister foil to lidding foil in thicknesses from 50 to 7 microns.

Utkal Alumina (Odisha), 1.5 million tpy alumina refining project along with 90 MW captive co-generation plant were completed during the year. Utkal alumina is sourcing bauxite from Baphlimali Bauxite Deposit in Odisha. The company has set up 3.60 lakh tpy aluminium smelter at Bargawan. The other integrated aluminium project, namely, Aditya Alumina & Aluminium Project, alumina refinery at Koraput, 3.60 lakh tpy aluminium smelter was set-up at Lapanga, Odisha. A joint venture agreement on bauxite mines was signed with OMC. Another greenfield project, viz. Jharkhand Aluminium Project at Sonahatu, entails setting up a 7.20 lakh tpy aluminium smelter.

Recycling: Aluminium is recyclable without any loss of properties and consumes only 5% of the total energy requirement compared with primary metal production. At present, in the Organised Sector, only Hindalco operates 25,000 tpy capacity recycling plant at Taloja in Maharashtra.

Vedanta Group

Vedanta Aluminium Ltd (VAL) has 1.0 million tpy alumina refinery associated with 75 MW captive power plant at Lanjigarh in district Kalahandi, Odisha. The company plans to increase the capacity of the Lanjigarh refinery significantly to 4.0 million tpy to promote Lanjigarh as a self sustained manufacturing unit in terms of cost advantage and resource availability. The company

has 1.75 million tpy aluminum smelter and 1215 MW captive power plant supported by highly modern infrastructure at Jharsuguda, Odisha. In addition to this, construction of 1.1 mtpy aluminium smelter expansion project at Jharsuguda is under process. The company intends to expand the fully integrated aluminium smelting capacity to around 2.6 mtpa in near future. With the setting-up of the Jharsuguda - II smelter of 1.25 million tpy, the total smelter capacity of vedanta in Odisha enhanced to 1.75 million tpy.

Further, Vedanta Aluminium entered into an agreement with the Orissa Mining Corporation (OMC) regarding the establishment of the alumina refinery, an aluminium smelter and associated captive plants in the Lanjigarh and Jharsuguda of Odisha.

Ashapura Group

Ashapura Group is one of the significant global players in respect of bauxite & bentonite. Ashapura Minchem has plans for setting up an Alumina Complex at Ratnagiri, Maharashtra. The project has been granted 'Mega Project' status by Maharashtra Government and the proposed project will have 5 lakh tpy alumina refinery and 1.5 lakh tpy aluminium smelter and a 330 MW captive power plant. The Company intends to export alumina to Middle East countries.

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. A Production of 35 tonnes cadmium was reported as a byproduct of zinc smelting by HZL in 2016-17 as compared to nil production in the previous year. 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.

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Copper

The production of copper ore at 3.85 million tonnes in 2016-17 decreased by 2% as compared to that in the previous year. The metal content in the ore produced in 2016-17 works out to 33,673 tonnes as against 34,535 tonnes in 2015-16

Hindustan Copper Ltd produces copper metal from the ore produced at their captive mines.

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-11.

Production of refined copper (cathodes) in 2015-16 and 2016-17 was 790 thousand tonnes and 788 thousand tonnes, respectively.

Table – 11: Capacity and Production of Copper

(In '000 tonnes)

Producer	Annual capacity	Production*	
		2015-16	2016-17 (P)
Total	1001.5	790	788
Hindustan Copper Ltd**	51.5	17	8
Vedanta Ltd	400	384	403
Hindalco Industries Ltd	500	389	377
Jhagadia Copper Ltd (formerly SWIL)	50	-	-

Figures rounded off.

* *Relates to Copper cathodes.*

** *Metal capacity. However, the cathode capacity of HCL is 49,500 tonnes.*

Hindustan Copper Ltd

Hindustan Copper Ltd is a Mini Ratna Government of India Enterprise under the administrative control of the Ministry of Mines. Copper is produced at two smelters of HCL at Indian Copper Complex (ICC), Ghatsila, East Singhbhum district in Jharkhand and Khetri Copper Complex (KCC), Khetrinagar, district Jhunjhunu, Rajasthan. The aggregate capacity of the two smelters for copper cathode production is 51,500 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. The company inaugurated the first facility to produce nickel at ICC, Ghatsila in August, 2016. The capacity of the plant is 50 tonnes per annum. The plant is currently being scaled up to a production capacity of 5 tonnes per month of nickel cathodes. HCL also initiated actions to recover metals and materials like precious metal, magnetite, silica sand and micronutrient from the copper ore tails. A Pilot Plant of 200 TPD capacity

MINERAL-BASED INDUSTRIES

has been commissioned at KCC. Based on the results, HCL also planning to set-up commercial plant at Malanjkhanda and Khetri. The Company has prepared action plan to expand its mining capacity from the existing level of 3.4 million tonnes/annum to 12.4 million tonnes per annum by 2016-17.

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 Malanjkhanda, Madhya Pradesh with two million tpy capacity also operates a sulphuric acid plant.

HCL has acquired plant and machinery of Jhagadia Copper Ltd located at district Bharuch, Gujarat from Acril, Mumbai. Commercial production from the plant has started during the year 2015-16.

Continuous Cast Copper Wire Rods Project, (TCP) Taloja, Maharashtra: This project has a capacity of 60,000 tpy continuous cast copper wire rods (CCWR). The plant is based on the Southwire SCR-2000 technology of the USA, which uses natural gas as fuel and imported copper cathodes.

Vedanta Ltd. (Sterlite copper)

It is India's largest Non-ferrous Metals and Mining Company with interests and operations in aluminium, copper, zinc, lead & power. The smelter and refinery of Sterlite Industries (India) Ltd are located at Thoothukudi in coastal belt of Tamil Nadu and Silvassa, Dadra & Nagar Haveli and has a total installed capacity of 4 lakh tpy each. The unit is based on 'ISASMELT' technology from MIM, Australia, using imported concentrates. A Cathode Refinery of 2,05,000 tpy capacity and 90,000 tpy Copper Rod Plant have been built at

Thoothukudi with a view to undertaking export operations from the nearby port. The 1,80,000 tpy copper cathode refinery of Sterlite is located in Chinchpada at Silvassa in the Union Territory of Dadra & Nagar Haveli which predominantly caters to the domestic market and also has a 1,50,000 tpy rod mill. The copper anodes at Sterlite are refined into cathodes at Silvassa for domestic markets, while anodes are refined to cathodes at Thoothukudi itself for exports. The technology for refineries and Continuous Cast Copper Rod Plant is of MIM, Australia and Continuous Properzi, Italy, respectively. The imported copper concentrates for smelters are obtained from captive mines in Australia through long-term contracts with producers in Chile and Indonesia, as also through spot purchases. The Company is the largest producer of Continuous Cast Copper Rods (CCR) in India. The CCR plants have total annual capacity of 2,68,000 tpy. The Company has sulphuric acid plant of 1.3 million tpy and phosphoric acid plant of 2,30,000 tpy.

Hindalco Industries Ltd (Birla Copper)

The Company's three 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 are recovered and include sulphuric acid (1.67 million tpy), phosphoric acid (1,80,000 tpy), di-ammonium phosphate (DAP) & complex fertilizers (4,00,000 tpy), gold (15 tpy) and silver (150 tpy). The entire requirement of copper concentrates is met through imports.

Gujarat Copper Project (formerly Jhagadia Copper Ltd) **Zinc**

It is located at Jhagadia in Bharuch district, Gujarat. HCL has acquired the assets of Jhagadia Copper Ltd (renamed as 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.

As per the estimates made in the published Market Survey on Copper by IBM, production of 1,06,573 tonnes of copper has been reported as secondary copper in the Organised Sector.

Lead

The total installed capacity of lead smelting was 1,85,000 tpy excluding secondary lead which was 24,000 tpy. Primary lead was produced entirely by HZL at lead-zinc smelter at Chanderiya, district Chittorgarh, and Rajpura-Dariba Plant, district Udaipur, Rajasthan.

Secondary lead capacity is held by the Indian Lead Pvt. Ltd at its two units at Thane in Maharashtra and Kalipark in West Bengal. The installed capacity of these two plants is 24,000 tpy. There are a number of other secondary producing units in the Organised and Unorganised Sector.

HZL and Edayar Zinc limited are the primary producer of Zinc. The smelting capacity of HZL for zinc is distributed between three smelters at Debari (88,000 tpy), Chanderiya (5,25,000 tpy) and Dariba (2,20,000 tpy). Edyar Zinc Ltd's plant at Binanipuram, Kerala with capacity of 38,000 tpy. Thus, the smelting capacity for zinc in the country is 8,71,000 tpy.

Debari zinc smelters of HZL have capacities of 88,000 tpy. 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 5,25,000 tpy of zinc is the world's largest single location zinc smelting complex. Besides lead and zinc, HZL also produces silver, cadmium and sulphuric acid as by-products. The annual installed capacities for these by-products are: 518 tonnes silver, 913 tonnes cadmium ingots, and 1.74 million tonnes sulphuric acid. The Visakhapatnam zinc smelter, apart from utilising imported concentrates also undertakes processing of sludge that contains about 16% zinc, and that which are produced by the existing zinc smelters at Debari and Aluva.

Besides, there are secondary zinc producing units in the Unorganised Sector with capacity of 45,000 tpy. However, production related data from these units is not available.

The data on total capacity and production of primary lead and zinc ingots in 2015-16 and 2016-17 are furnished in Table-12.

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Table – 12 : Capacity and Production of Primary Lead and Zinc Ingots

(In tonnes)

Producer	Lead capacity (tpy)	Production		Zinc capacity (tpy)	Production	
		2015-16	2016-17 (P)		2015-16	2016-17 (P)
Hindustan Zinc Ltd	185000	145257	142231	833000	758944	672010
Edayar Zinc Ltd. (formerly Binani Zinc Ltd.)	-	-	-	38000	-	-
Total	185000	145257	142231	871000	758944	672010

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 & 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 Archean 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 black or green 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, Telangana 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.

MINERAL-BASED INDUSTRIES

As per Cement Survey 2017, the total annual installed capacity of cement in 2017 was 501.86 million tonnes. Most of these capacities are modern and based on the energy efficient dry process technology. The number of plants and capacity are more in the southern region (Andhra Pradesh, Tamil Nadu, Karnataka and Telangana) of the country. The total production of cement (all kinds) in 2016-17 was about 279.72 million tonnes.

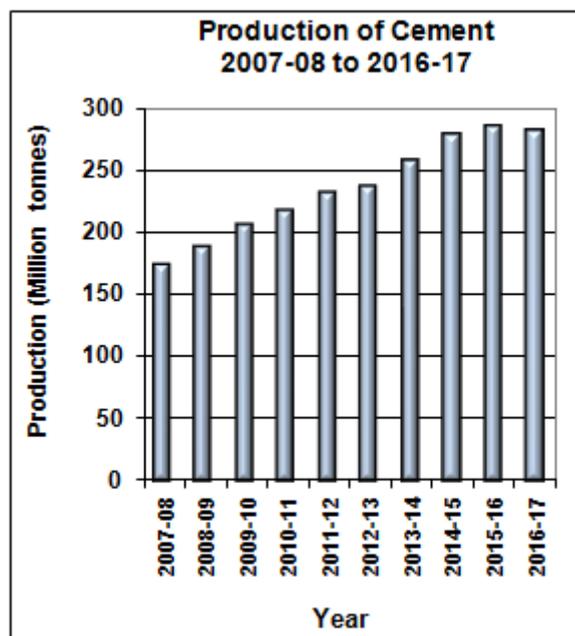
The Cement Industry produces a variety of cement such as Ordinary Portland Cement (OPC) Portland Pozzolana Cement (PPC), Portland Blast Furnace Slag Cement (PBFC), Oil Well Cement, White Cement, etc. to suit a host of applications.

The Working Group on Cement Industry constituted by the erstwhile Planning Commission for the 12th Plan period has projected a demand growth for cement at the rate of 10.75% per annum based on expected GDP growth rate of 9%. The cement capacity requirement during 12th Plan is projected at 479.3 million tpy by 2017 and about 1035 million tonnes by 2027. The annual production of cement by the end of 12th Plan are estimated at and 407.4 million tonnes, respectively, with 85% capacity utilisation.

ASBESTOS-CEMENT PRODUCTS

The installed capacity of asbestos-cement pressure pipes in the Organised Sector was 1,49,640 tpy. Production capacity of asbestos cement sheets was not available.

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 Telangana, 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, Pattencheru (Medak) in Andhra Pradesh.

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. This Industry has been facing recession mainly because of shift in demand from conventional refractories to sophisticated refractories. 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 refractory producers in India, out of which around 14 major, 33 medium sized and 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 2016-17 of all types of refractories was 1,136 thousand tonnes as compared to 1,138 thousand tonnes in 2015-16. Bharat Refractories Ltd (BRL), a Govt. of India Undertaking, has four units that are engaged in the manufacture & supply of various kinds of refractories not only to the integrated steel plants but also to smaller steel plants. The Salem Refractory Unit of Burn Standard Co. Ltd (BSCL) became a wholly owned subsidiary of SAIL w.e.f. December 16th 2011. The Unit has now been named as SAIL Refractory Co. Ltd (SRCL).

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 shut down time and savings on energy. The specific consumption of refractories at present in integrated steel plants varies from 8 to 10 kg/tonne of crude steel as compared to 6-8 kg/tonne of crude steel in advanced countries.

The price and supply of imported raw materials are subjected 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.

TRL Krosaki refractories Ltd, Belpahar plant having the manufacturing capacity of 2,47,890 million tpy, which includes Basic bricks, Dolomite, High Alumina, Silica, Castable, Precast prefired shapes, etc. TRL Krosaki refractories Ltd, has commissioned a state-of-the-art new Taphole clay plant of 18,000 tpa capacity at Belpahar in Odisha in 2012. The plant will produce both tar-based/resin based clay for blast furnaces.

CERAMIC & GLASS INDUSTRY

Ceramic Industry

Ceramic Industry in India is about 100 years old. India ranks 8th in world in terms of production of ceramics production, which is around 2.5 % of global output (as per Morbi Ceramic association). The 750 million sq metres of ceramic tiles were estimated to be produced in 2014-15 as against the global production of about 11,913 million sq m. 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 and 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 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, etc. The per capita consumption of ceramic tiles in the country was about 0.50 sq m which is comparatively lower as compared to 2.6 sq m in China and 5-6 sq m in Europe. 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. There were 14 units in the National Sector, which accounted for 40% of production of ceramic tiles. Besides, there are about 200 units in Regional Sector, which accounted for 60% of production of ceramic tiles. The domestic ceramic Tile Industry has been growing at about 15% per annum. 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

Sanitarywares are ceramic products used for sanitation purposes, like wash basins. The basic raw materials for sanitaryware are felspar, ball clay, kaolin and quartz. There were 7 units with installed capacity of 143 thousand tpy in the Organised Sector, while around 210 plants with a capacity

of 53,000 tpy exist in the Small-scale Sector. Some units have either been closed or merged with the other existing ones. This Industry has been reporting a growth rate of about 10% per annum. 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.

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 glass ware, glass bangles, etc. Principal raw materials used in the manufacture of glass are silica sand, soda ash, calcite, dolomite, etc.

Glass Industry comes under delicensed and manufacturing units are spread all over India. The large-scale producers are located mostly at 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 in 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.

The production of of Glass sheet and Fiber Glass was 52,780 thousand square metres and 69,123 tonnes in 2016-17, respectively.

The per capita consumption of glass in India is about 1.1 kg, which is on the lower side when compared to 15 kg in China. Indian Glass market is estimated to increase at a CAGR of 15% in future. Most of the glass demand in India comes from container glass which accounts for 50% of country's glass consumption by value. The market share of Indian Glass industry consists of architectural (45%), automotive (15%), value added glass (15%), mirrors (10%) & furniture segment (15%).

Glass Containers and Hollow-wares

About 43 units in the Organised Sector are engaged in the manufacture of glass containers and hollow-wares, with an installed capacity of around 9305 tonnes per day. Glass containers are ideal packaging medium, but are increasingly being replaced by other

packaging materials like plastic, PET, aluminium and tetrapack. The per capita consumption of container glass in India is 1.8 kg as compared to 27.5 kg in USA & 9 kg in China. The major producers include Hindustan National Glass & Industries, Piramal Glass, Haldyu 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 5473 tonnes per day, out of which the installed capacity of major producers was 5235 tonnes per day (i.e. 96% of total installed capacity). Hindustan National Glass and Industries Ltd, (HNG) has a new plant being set-up at Naidupeta in Andhra Pradesh and is undertaking expansion of capacity at its Nashik (Maharashtra) plant to increase to 4395 tonnes per day. The major consumers of flat glass are Architectural (80%) and Automotive (15%). The per capita consumption of float glass in India is 0.88 kg as against 12 kg in China, 9 kg in Thailand, 13 kg in Malaysia and 4 kg in Indonesia. There has been growing acceptability of the Indian flat glass products in the global market.

Vacuum Flasks and Refills

There were eight units in the Organised Sector that manufacture vacuum flasks and refills, with an installed capacity of 36 million numbers per annum.

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. There are five units with production capacity of 55,000 tpy, while the production hovered around 39 thousand tonnes. Presently, India exports about 80% of its glass fibre production.

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 in all parts of the country. Major production of

granite in raw as well as in processed form is generally from Andhra Pradesh, Rajasthan, Karnataka, Tamil Nadu and Gujarat.

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. The total value of granite production during 2013-14 was ₹ 8,218 crore as against ₹ 6,676 crore during 2012-13. Exports of granite are freely allowed. The total granite export during 2015-16 was 5.67 million tonnes as against 6.56 million tonnes in 2014-15.

CHEMICALS**Caustic Soda (Sodium hydroxide)**

Caustic soda is a basic inorganic chemical prepared by electrolysis of salt brine and is used in the manufacture of pulp and paper, viscose rayon, textile, vanaspati & other chemicals and in aluminium extraction. A significant quantity of caustic soda is used in the manufacture of other inorganic chemicals and dyestuffs, in metallurgical operations and in petroleum refining. The production of caustic soda was 25.94 lakh tonnes against the total installed capacity of 32.97 lakh tonnes in 2016-17. The major Indian producers are Gujarat Alkalies & Chemicals, Grasim Industries, DCM Shriram Consolidated, DCW, Reliance Industries, Aditya Birla Chemicals (India), etc. NALCO and GACL have plans to set-up a proposed caustic soda plant of 2.7 lakh tonnes per annum capacity at Dahej in Gujarat as joint venture with Gujarat Alkali and Chemicals Ltd (GACL).

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.

RSPL Jamnagar Greenfield Soda Ash Plant, Gujarat is a project that involves construction of a greenfield soda ash plant with a production capacity of 5,00,000 tonnes of light soda ash per year at village Kuranga in Dwarka, district Jamnagar.

The installed capacity of soda ash was 30.86 lakh tonnes. The production of soda ash during the year 2016-17 was 26.13 lakh tonnes.

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 installed capacity of calcium carbide was 1.12 lakh mtpa. The production of calcium carbide during the year 2016-17 was 0.87 lakh tonnes.

Synthetic Cryolite (Na_3AlF_6)

Navin Fluorine Industries, 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 500 tpd

fluorite beneficiation plant at village Kadipani that produces 96% CaF_2 acid-grade & 90% CaF_2 metallurgical grade concentrate. The acid-grade finds use in aluminium fluoride, synthetic rutile & fluorine chemicals.

Aluminium Fluoride

The important units that produce aluminium fluoride include Navin Fluorine Industries, Maya Rasayan Ltd, Mumbai, Tanfac Industries Ltd, SPIC and Aegis Chemical Industries Ltd. The installed capacity of aluminium fluoride was about 25,600 tpy. The production of aluminium fluoride during the year 2016-17 was 6,730 tonnes.

Titanium Dioxide

Four plants that reported an installed capacity of 243 thousand tpy produce synthetic rutile, while other four plants with total installed capacity of about 74,800 tpy produce titanium dioxide pigment. IREL has not reported synthetic rutile production in recent years. The estimated production of synthetic rutile and TiO_2 pigment as reported by IREL was 1,00,000 tonnes and 60,000 tonnes in 2015-16.

Sulphuric Acid

There were 140 (130 sulphur based and 10 smelter gas based) units with an annual capacity of more than 12 million tonnes that manufacture sulphuric acid in the Organised Sector based on sulphur as a raw material. In addition, sulphuric acid is also recovered at HCL, Hindalco & Sterlite and at HZL & BZL during lead-zinc smelting.

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 Company, Vadodara, Gujarat; Fertilizers and Chemicals Travancore Ltd (FACT), Udyogmandal, Kochi,

Kerala; Sterlite Industries India Ltd (Vedanta); HCL, Khetri, Rajasthan; HZL, Udaipur, Rajasthan; Southern Petrochemical Industries Corp. Ltd, Thoothukudi, Tamil Nadu; EID Parry (India) Ltd, Ennore, Tamil Nadu; Star Chemical Ltd, Mumbai, Haldia, West Bengal; Ballarpur Industries Ltd, Karwar, Karnataka; Hindalco Industries Ltd, Dahej, Gujarat; and Paradeep Phosphates Ltd, Paradeep, Odisha. The important uses of phosphoric acid are in the manufacture of phosphatic fertilizers, 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% min. phosphorus and 1% max. carbon. Ferro-phosphorus is also used as a drying 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. The installed capacity of red phosphorus was 1.68 thousand tpy. The production of red phosphorus during the year 2016-17 was 0.84 thousand tpy.

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. National Peroxide Ltd, Kalyan, Maharashtra, has 1,200 tpy combined installed capacity that produces other boron compounds, namely, sodium perborate-tetrahydrate and monohydrate. Indo-Borax & Chemical Ltd also operates borax and boric acid plants at Pithampur, Madhya Pradesh. The capacity of the plant, however, is not available. 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.

Besides the above listed chemicals, activated bleaching earth, fluorochemicals, alumina ferric and sodium silicofluoride were the other mineral-based products.

CHEMICAL FERTILIZERS

In India, the Agricultural Sector plays a vital role in the economic development of the country as securing food for 1.2 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 has been known well over a hundred years, but the use of chemical fertilizer started in the beginning of this century. The first phosphate fertilizer plant in India went on stream 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.

MINERAL-BASED INDUSTRIES

Presently, there are around 170 fertiliser plants are operation in India. This is comprised of 31 units manufacturing urea, 19 DAP & Complex fertilizers, 109 SSP and 10 ammonium sulphate in India.

As per Fertilizer Association of India, the total installed capacity of P_2O_5 almost stood at 7.28 million tonnes. The major raw materials for Single Super Phosphate (SSP) are rock phosphate and sulphur. Besides containing 14%-16% phosphorous, Single Super Phosphate (SSP) also contains 11%-12% sulphur and 16%-21% calcium. This provides an advantage in the form of improving agricultural productivity since large areas in the country are deficient in sulphur and calcium.

Different types of straight and complex fertilizers are manufactured from rock phosphate such as SSP, DAP, nitrophosphate, urea ammonium phosphate. In the year 2016-17, the consumption of straight fertilizer and complex fertiliser contributed about 9% and 91% of total P_2O_5 in the country. However, the trend is towards the production of complex fertilizers having the total P_2O_5 in water soluble form along with other nutrients.

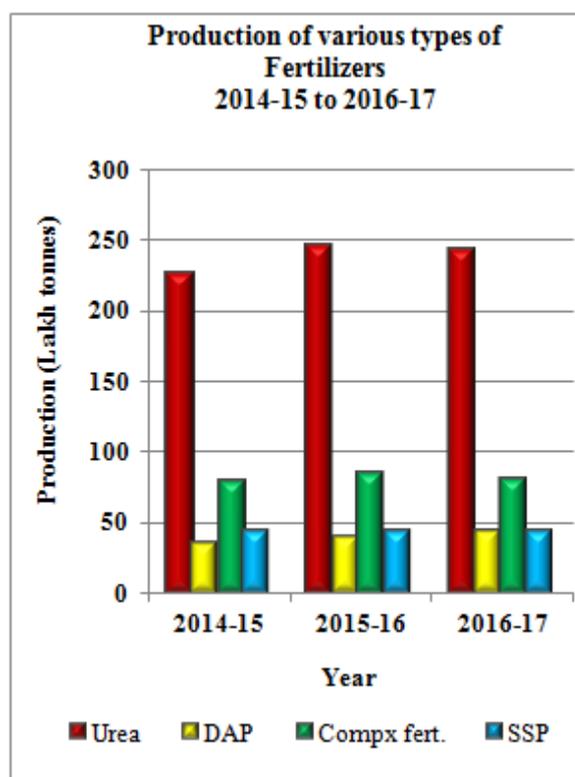
In the absence of commercially exploitable resources of potash in the country, the entire demand of potassic fertilizers is met through imports. The capacity and production of different types of fertilizers are provided in Table-14.

As per the Working Group Report on Fertilizer Industry for 12th Plan period, the all India demand forecast of fertilizer products by the end of the year 2017-18 would be 33.75 million tonnes of urea, 12.76 million tonnes of DAP, 11.84 million tonnes of NP/NPKs and 6.48 million tonnes of Single Super Phosphate (SSP). The principal list of Fertilizer Plants is furnished in Table-15.

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 – 14: Installed Capacity and Production of Various Types of Fertilizers

(In lakh tonnes)

Products	No. of Units	Production	
		2015-16	2016-17 (P)
Urea	31	245	242
DAP	19	38.22	43.33
Complex		83.79	79.24
SSP	109	43.29	42.96

Source: Annual Report, Ministry of Fertilizer 2016-17 & Indian Fertilizer Scenario, 2015

** Fertilizer's Statistics, Fertilizer Association of India 2015-16.*

Table – 15: Principal Fertilizer Plants

Sl. No.	Plant	Location
Public Sector		
1.	National Fertilizer Ltd	Nangal-II and Bhatinda (Punjab), Panipat (Haryana), Vijaipur, Vijaipur Expansion (Madhya Pradesh)
2.	Brahmaputra Valley Fertilizer Corp. Ltd	Namrup- II and III (Assam)
3.	Fertilizers & Chemicals Travancore Ltd	Udyogmandal and Cochin-II (Kerala)
4.	Rashtriya Chemicals & Fertilizers Ltd	Trombay and Trombay IV, V and Thal (Maharashtra)
5.	Madras Fertilizers Ltd	Chennai (Tamil Nadu)
6.	Steel Authority of India Ltd	Rourkela (Odisha)
7.	Hindustan Fertilizer Corp. Ltd	Khetrinagar (Rajasthan)
Private Sector Large Units		
8.	Gujarat State Fertilizers Co. Ltd	Vadodara and Sikka I & II (Gujarat)
9.	Shriram Fertilizers & Chemicals	Kota (Rajasthan)
10.	DIL (Duncan Industries Ltd)	Kanpur (Uttar Pradesh)
11.	Zuari Agro Chemicals Ltd	Zuari Nagar (Goa)
12.	Coromandal Fertilizers Ltd	Visakhapatnam and Kakinada (Andhra Pradesh), Ennore (Tamil Nadu)
13.	Mangalore Chemicals & Fertilizers Ltd	Mangaluru (Karnataka)
14.	Gujarat Narmada Valley Fertilizers Company Ltd	Bharuch (Gujarat)
15.	Southern Petrochemicals Industrial Corp.	Thoothukudi (Tamil Nadu)
16.	Tata Chemicals Ltd	Haldia (West Bengal), Babrala (Uttar Pradesh)
17.	Punjab National Fertilizers and Chemicals Ltd	Nangal (Punjab)
18.	Deepak Fertilizers & Petrochemicals Corporation	Taloja (Maharashtra)
19.	Tuticorin Alkali	Thoothukudi (Tamil Nadu)
20.	Indo-Gulf Fertilizers & Chemicals Corp. Ltd	Jagdishpur (Uttar Pradesh)
21.	Nagarjuna Fertilizers & Chemicals Ltd	Kakinada I & II (Andhra Pradesh)
22.	Godavari Fertilizers & Chemicals Ltd	Kakinada (Andhra Pradesh)
23.	Hin. Ind. Ltd	Dahej (Gujarat)
24.	Chambal Fertilizers & Chemicals Ltd	Gadepan I & II (Rajasthan)
25.	KSF Ltd	Shahjahanpur (Uttar Pradesh)
26.	Paradeep Phosphates Ltd	Paradeep (Odisha)
Co-operative Sector		
27.	Indian Farmers' Fertilizers Co-operative Ltd	Kalol and Kandla (Gujarat), Aonla I & II, Phulpur I & II (Uttar Pradesh), Paradeep (Odisha)
28.	Krishak Bharti Co-operative Ltd	Hazira (Gujarat)

Paper & Paper Board Industry

The Indian Paper Industry accounts for about 4% of the world's total production of paper. There are around 850 units which are manufacturing pulp, paper, paper board and newsprint with an installed capacity of nearly 24 million tonnes out of which 3 million tonnes are lying idle. The total operating capacity is around 20 million tonnes. The Indian Paper Industry is in a fragmented structure, consisting of small, medium and large paper mills having capacity ranging from 10 to 1500 tonnes per day. These units use wood and agro residues as well as recovered paper as raw material. The production share of these units is around 24%, 11% and 66%, respectively. The production of paper and paper board was about 17.37 million tonnes in the year 2016-17 as compared to 17.33 million tonnes in the previous year. During the year 2016-17, 2.73 million tonnes of paper and paper board was imported and about 1.00 million tonnes of paper and paper board was exported. The newsprint sector in the country is governed by the Newsprint Control Order (NCO), 2004. At present, there are 124 mills registered under the Schedule to the NCO. However, only 35 are producing newsprint making the operating installed capacity 0.99 million tonnes per annum. Out of 124, 89 mills have discontinued or closed their operations. The domestic production of newsprint dropped from 1.20 million tonnes in 2015-16 to 1.02 million tonnes in 2016-17. Nearly half of the newsprint demand in the country is met by imports. 1.58 million tonnes of newsprint was imported in 2016-17, which is 6% higher from a 1.49 million tonnes in the previous year. The export of newsprint from the country is negligible. The per capita consumption of paper in India is 13 kg, which is far behind the global average of 57 kg. As a thumb rule, in Paper Industry, cost of energy is nearly 25% of cost of production. Hence, energy management is an important aspect in this Sector. 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 will grow at the 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 Paint Industry.

The production of Paints of all kinds and Printing Ink during 2016-17 was 4,81,034 tonnes and 1,21,930 tonnes respectively.

PETROLEUM REFINERIES

There were 23 refineries operating in the country (20 in Public/Joint Sector and 3 in Private Sector). India has emerged as second largest refiner in Asia after China.

Installed capacity and crude throughputs of refineries are provided in Table-16.

The total refining capacity in the country as on 01.12.2017 is around 248 million tpy. The total crude throughput increased to 245 million tonnes in 2016-17 from 233 million tonnes in 2015-16. Production of petroleum products from crude oil was 244 million tonnes in 2016-17 as against 232 million tonne in 2015-16. Import of petroleum crude was 214 million tonnes in 2016-17 as against 203 million tonne in 2015-16. During 2016-17, crude oil production in the country was at 37 million tonnes, while the natural gas production was at 32 million cubic metres (m cu m).

India has a near self-sufficiency in the refinery sector. The details of capacity expansion and development are reflected in the Review on Petroleum and Natural Gas in Vol-III, IMYB.

MINERAL-BASED INDUSTRIES

Table – 16: Installed Capacity and Crude Throughputs in Refineries

(In '000 tonnes)

Refinery	Annual installed capacity (as on 01.12.2017)	Refinery Crude throughput		
		2014-15	2015-16	2016-17(P)
Total	230066	223241	232865	245362
Public/Joint Sector	135066	121182	127087	137388
IOCL, Guwahati, Assam	1000	1006	904	864
IOCL, Barauni, Bihar	6000	5944	6545	6526
IOCL, Koyali, Gujarat	13700	13285	13820	13994
IOCL, Haldia, West Bengal	7500	7650	7776	7689
IOCL, Mathura, Uttar Pradesh	8000	8515	8860	9230
IOCL, Digboi, Assam	650	591	562	533
IOCL, Bongaigaon, Assam	2350	2403	2442	2486
IOCL, Panipat, Haryana	15000	14191	15282	15638
BPCL, Mumbai, Maharashtra	12000	12821	13371	13541
BPCL (formerly KRL), Kochi, Kerala	9500	10356	10712	11820
HPCL, Mumbai, Maharashtra	6500	7408	8013	8510
HPCL, Vizag, Andhra Pradesh	8300	8770	9220	9335
CPCL, Manali, Tamil Nadu	10500	10251	9100	9725
CPCL, Nagapattinam, Tamil Nadu	1000	531	544	531
MRPL, Mangaluru, Karnataka	15000	14632	15532	15965
NRL, Numaligarh, Assam	3000	2777	2520	2683
ONGC, Tatipaka, Andhra Pradesh	66	51	67	86
IOCL, Paradip, Odisha	15000	-	1817	8230
Joint Venture	15000	13527	17116	16882
Bharat Oman Refineries Ltd, Bina	6000	6209	6402	6360
HPCL, Bhatinda	9000	7318	10713	10521
Private Sector	80000	88532	88662	91093
RPL, Jamnagar, Gujarat	33000	30867	32428	32823
RPL (SEZ), Jamnagar, Gujarat	27000	37174	37133	37351
Essar Oil Ltd, Vadinar, Gujarat	20000	20491	19101	20919

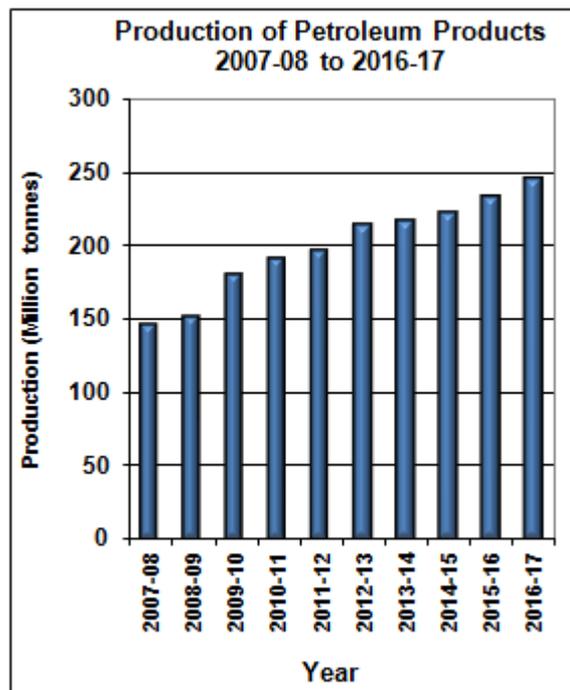
Source: Ministry of Petroleum and Natural Gas, Annual Report, 2017-18.

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 achieving the vision.

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 sector.

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 ferro-alloys, 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.

The production of steel castings and C.I. castings in 2015-16 was 464376 tonnes. The production of stamping & forging in the organised sector in 2015-16 was 480541 tonnes.