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MINERAL-BASED INDUSTRIES

(FINAL 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, 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 NSP 2012 (Draft) has projected a target of 275 million tonnes of domestic steel production by 2025-26. The total production of finished steel for sale during 2014-15 stood at 92.16 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. Of the total 9.69 million tonnes production in 2014-15, the Private Sector accounted for over 90.5% of the total production for sale of pig iron in the country.

Location and capacity of principal pig iron units in Private Sector are furnished in Table-2. M/s Usha Martin Industries Ltd, M/s Jindal Steel & Power Ltd have integrated mini-blast furnaces (MBF) for manufacture of steel through Electric Arc Furnace (EAF). M/s Hospet Steel (a joint venture of Kalyani and Mukand) and M/s Southern Iron & Steel Co. Ltd had integrated their MBF with energy optimising furnace to produce steel. Besides MBF, M/s JSW Steel Ltd (formerly Jindal Vijaynagar Steel Ltd) had commissioned a Corex Plant (alternate to conventional MBF/BF) along with downstream basic oxygen furnace (BOF) for steel making to supplement production of pig iron. The scenario at present is that the Pig Iron Industry is confronted with problems of rising production cost due to price escalation of imported metallurgical coke, obsolete technologies and high level of litigations.

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 of 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 2014-15 was 48.63 million tonnes and the production was 24.24 million tonnes.

As per Sponge Iron Manufacturers Association (SIMA), the capacity of gas-based units were 12.6 million tonnes per annum. The capacity of gas-based sponge iron plant of Essar Steel Ltd, the world's largest sponge iron producer has risen to 6.8 million tpy. The coal-based sponge iron capacity, on the other hand, accounted for about 35.19 million tonnes. Plantwise details as available in respect of principal sponge iron units are furnished in Table-3.

Table – 1 : Capacity and Production of Important Mineral-based Products, 2013-14 and 2014-15

Mineral-based product	Unit of quantity	Annual Installed capacity	Production	
			2013-14	2014-15 (P)
Ferrous Metals				
Sponge iron	'000 tonnes	48630	22872	24243
Crude/liquid steel	"	109850	81694	88979
Ferro-alloys				
Ferrochrome/Charge-chrome	"	1600	944	944
Ferromanganese	"	2750	518	518
Silicomanganese	"	-	225	250
Ferrosilicon	"	250	90	90
Non-ferrous Metals				
Aluminium	"	1907	1667	2027
Copper #	"	1001.5	644.19	765.57
Lead (primary)	"	185	122.60	127.14
Zinc Ingots	"	917	766.53	732.79
Refractories	"	2015	1159	1200
Cement	million tonnes	335.50	256	276.93
Fertilizers				
DAP	lakh tonnes	83.32	36.11	34.44
Complex fertilizers	"	60.71	69.13	78.32
SSP	"	110.36	42.00	41.75
Chemicals				
Aluminium fluoride	'000 tonnes	25.60	5.40	6.73
Caustic soda	"	2939	2392	2439
Calcium carbide	"	112	78.78	87.18
Soda ash	"	2951	2392	2462
Titanium dioxide pigment	"	82.50	52.78	47.88
Red phosphorus	"	1.68	0.75	0.89
Crude Throughputs in Refineries	"	215066	222497	223242

Figures rounded off.

Sources: *1. Ministry of Steel Annual Report, 2015-16 and JPC Bulletins.*
2. Ministry of Commerce & Industry, Department of Industrial Policy & Promotion and Annual Report, 2015-16.
3. Ministry of Chemicals & Fertilizers, Department of Chemicals & Petrochemicals, Annual Report, 2015-16.
4. Basic Statistics on Indian Petroleum & Natural Gas, 2015-16.
5. Indian Refractory Makers' Association, Kolkata.
6. Information received from individual plants in Organised Sector.
 # Production relates to copper cathodes (figures rounded off).
MSMP - 2015-16
CSO New Delhi.

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

(In lakh tonnes)

Sl.No.	Unit	Location	Capacity
1.	Lanco Industries Ltd	Chittoor, Andhra Pradesh	2.25
2.	Sathavahana Ispat Ltd	Anantapur, Andhra Pradesh	2.10
3.	Jayaswal NECO Industries Ltd	Raipur, Chhattisgarh	7.50
4.	Sesa Goa Ltd	Bicholim, Goa	6.25
5.	Usha Martin Industries	Jamshedpur, Jharkhand	1.10
6.	JSW Steel Ltd	Bellary, Karnataka	7.20
7.	Kalyani Ferrous Industries Ltd	Koppal, Karnataka	1.20
8.	Kirloskar Ferrous Industries Ltd	Koppal, Karnataka	2.40
9.	KIOCL Ltd	Mangaluru, Karnataka	2.27
10.	Usha Ispat Ltd	Redi, Maharashtra	3.00
11.	JSW Ispat Steel Ltd	Dolvi, Raigad, Maharashtra	20.00
12.	Kalinga Iron Works	Barbil, Keonjhar, Odisha	1.80
13.	Kajaria Iron Castings Ltd	Durgapur, West Bengal	1.10
14.	Electrosteel Castings Ltd	Khardah, West Bengal	4.00
15.	Tata Metaliks Ltd	Kharagpur, West Bengal	3.45
16.	Sona Alloys Pvt. Ltd	Satara, Maharashtra	3.14
17.	Aparant Iron & Steel Pvt. Ltd	Sanguem, Goa	1.55
18.	Neelaanchal Ispat Nigam Ltd	Jajpur, Odisha	8.55

Source: *Development Commissioner for Iron & Steel, Ministry of Steel, Kolkata, and individual plants.*

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

(In lakh tonnes)

Unit	Location	Capacity
Gas-based		
Essar Steel Ltd	Hazira, Gujarat	68.0
Welspun Maxsteel Ltd (formerly Vikram Ispat)	Salav, Raigad, Maharashtra	9.00
JSW Steel	Geetapuram, Dolvi, Raigad, Maharashtra	16.00
Coal-based		
Action Ispat & Power Pvt. Ltd	Marakuta & Pandaripathar, Jharsuguda, Odisha	2.50
Adhunik Metaliks Ltd	Chandrihariharpur, Sundergarh, Odisha	1.80
Alliance Integrated Metallics Ltd	Bemta, Raipur, Chhattisgarh	5.00
Anjani Steel Ltd	Ujalpur, Raigarh, Chhattisgarh	1.02
API Ispat Powertech Pvt. Ltd	IGC Siltara, Raipur, Chhattisgarh	1.05
Beekay Steel & Power Ltd	Uliburu, Barbil, Odisha	1.05
Bhushan Steel & Strips Ltd	Meramandali, Dhenkanal, Odisha	2.80
Bihar Sponge Iron Ltd	Chandil, Singhbhum, Jharkhand	2.10
BMM Ispat Limited	Danapur, Karnataka	6.60
Crest Steel & Power Pvt. Ltd	IGC Borai, Durg, Chhattisgarh	1.15
Crest Steel & Powers Ltd	Joratarai, Rajnandgaon, Chhattisgarh	2.10
Deepak Steel & Power Ltd	Topadihi, Keonjhar, Odisha	1.44
Gallant Metal Ltd	Samakhilai, Kachchh, Gujarat	1.70
Global Hi-tech Industries Ltd	Gandhidham, Gujarat	1.05
Goa Sponge Iron & Power Ltd	Santana, Sanguem, Goa	1.00
Godawari Power & Ispat Ltd	IGC Siltara, Raipur, Chhattisgarh	4.95
Goldstar Steel & Alloys Ltd	Srirampuram, Vizianagaram, Andhra Pradesh	2.20

(Contd.)

Table - 3 (Concld.)

Unit	Location	Capacity
Ind Synergy Ltd	Kotmar, Mahupalli, Raigarh, Chhattisgarh	3.00
Jai Balaji Sponge Ltd	Baktarnagar, Raniganj, West Bengal	1.05
Jai Shri Balaji Steel Pvt. Ltd (HEG Ltd)	Borai, Durg, Chhattisgarh	1.20
Jayaswal NECO Industries Ltd	IGC Siltara, Raipur, Chhattisgarh	2.55
Janki Corporation Ltd	Sidiginamola, Ballary, Karnataka	1.80
Jindal Steel & Power Ltd	Kharsia Road, Raigarh, Chhattisgarh	1.37
Lloyds Metals & Engineering Ltd	Ghuggus, Chandrapur, Maharashtra	2.70
Mastek Steels Pvt. Ltd	Holakundi, Ballari, Karnataka	1.05
MGM Steels Ltd	Chintapokhari, Dhenkanal, Odisha	1.00
Monnet Ispat Energy Ltd	Chandkhuri Marg, Hasaud, Raipur, Chhattisgarh	3.00
Monnet Ispat & Energy Ltd	Naharpalli, Raigarh, Chhattisgarh	5.00
MSP Steel & Power Ltd	Jamgaon, Raigarh, Chhattisgarh	1.92
Nalwa Steel & Power Ltd	Taraimal, Raipur, Chhattisgarh	1.98
Nova Iron & Steel Ltd	Dagori, Bilaspur, Chhattisgarh	1.50
OCL Iron & Steel Ltd	Lamloi, Sundergarh, Odisha	1.20
Orissa Sponge Iron Ltd	Palaspanga, Keonjhar, Odisha	2.50
Prakash Industries Ltd	Champa, Janjgir Champa, Chhattisgarh	4.50
Rungta Mines Ltd (Kamanda Steel Plant)	Karakola and Kamanda, Sundergarh, Odisha	3.30
Sarda Energy & Minerals Ltd	IGC Siltara, Raipur, Chhattisgarh	2.10
Scaw Industries Pvt. Ltd	Gundichapara, Dhenkanal, Odisha	1.00
Shivshakti Steel Ltd	Chakradharpur, Raigarh, Chhattisgarh	1.00
Shri Bajrang Power & Ispat Ltd	Urla, Raipur, Chhattisgarh	2.10
Shri Hare Krishna Sponge Iron Ltd	Siltara, Raipur, Chhattisgarh	2.10
Shraddha Ispat Pvt. Ltd	Santona, Sanguem, Goa	0.60
Shyam Sel Ltd	Dewabdighi, Burdwan, West Bengal	1.00
Singhal Enterprises Pvt. Ltd	Taraimal, Bilaspur, Chhattisgarh	1.56
Sree Metaliks Ltd	Loidapada, Keonjhar, Odisha	1.74
S.K.S. Ispat & Power Ltd	Raipur, Chhattisgarh	2.70
Sunflag Iron & Steel Co Ltd	Bhandara, Maharashtra	1.50
Sunil Ispat & Power Ltd	IGC Siltara, Raipur, Chhattisgarh	1.15
Sunil Sponge Iron Ltd	Chiraipani, Raigarh, Chhattisgarh	1.05
Surana Industries Limited	Raichur	0.16
Tata Sponge Iron Ltd (Ipitata Sponge)	Joda, Keonjhar, Odisha	3.90
Topworth Steel & Power Pvt. Ltd	IGC Borai, Durg, Chhattisgarh	0.60
Topworth Urja Metals Ltd	Heti,Umred,Maharashtra	0.60
Vandana Global Ltd	IGC Siltara, Raipur, Chhattisgarh	2.16
Vallabh Steels Ltd	Sahnewal, Ludhiana, Punjab	1.20
Visa Steels Ltd	KIC, Jajpur Road, Odisha	3.00
Zoom Vallabh Steels Ltd	Dughda, Saraikela-Kharswan, Jharkhand	1.20

I.G.C.: Industrial Growth Centre.

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

Pelletisation

Pelletisation has emerged as an independent economic activity and is being increasingly held as viable as charge mix for sponge iron making and also for use in blast furnaces. According to Joint Plant Committee (JPC), under the aegis of M.O.S. the total production of Iron Ore Pellet Industry stood at 27.64 million tonnes during the year 2013-14 of which 1.511 million tonnes were exported. The total annual capacity of Indian Iron Ore Pellet Industry stood at 66.30 million tonnes during 2013-14. Further the details are described in the Review on Iron Ore in Vol.III of this edition of IMYB.

Finished Steel/Saleable Steel

Some significant facts on Indian Steel Industry are as follows:

1. The National Steel Policy (NSP) was announced in 2005. The NSP set a target of 110 million tonnes of domestic steel production by 2019-20. Also NSP 2012 (Draft) has projected a target of 275 million tonnes by 2025-26. 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 volume of exports of finished steel increased to 5.59 million tonnes in 2014-15 from 3.64 million tonnes in 2010-11 and the imports increased to 9.32 million tonnes in 2014-15 from 6.66 million tonnes in 2010-11.

The finished steel production for sale has grown from a mere 1.1 million tonnes in 1951 to 92.16 million tonnes in 2014-15. The growth in the Steel Sector in the initial decades since Independence was mainly in the Public Sector units set up during that period. The situation changed dramatically during the period from 1990 to 2000 with the Private Sector being the driving force in the growth story. Details about capacity and production of crude steel 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 2014-15 was 13.91 million tonnes and 13.57 million tonnes during the year 2013-14.

The expansion and modernisation programme of SAIL is underway in all its 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)

Rashtriya Ispat Nigam Ltd (RINL), a Navratna PSE is the corporate entity of Visakhapatnam Steel Plant - the country's 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 6.3 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. RINL is further implementing modernisation scheme which would further add one million tonne capacity by 2016-17 taking its overall capacity to 7.3 mtpa by 2017. The principal product of RINL include Rebars, Wire rods, Rounds & Structurals. The company also markets Billets, Blooms, Pig Iron & other by-product.

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.

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 : Installed Capacity and Production of Crude Steel (By Principal Producers)

(In '000 tonnes)

Producer	Annual Installed capacity (Crude/liquid steel)	Production	
		2013-14	2014-15
SAIL			
Bhilai Steel Plant, Bhilai, Distt. Durg, Chhattisgarh.	3925	5136	4807
Rourkela Steel Plant, Rourkela, Distt. Sundergarh, Odisha.	4400	2291	2792
Durgapur Steel Plant, Durgapur, Distt. Burdwan, West Bengal.	1802	2019	2063
Bokaro Steel Plant, Bokaro, Distt. Bokaro, Jharkhand.	4360	3776	3831
IISCO Steel Plant, Burnpur, Distt. Burdwan, West Bengal.	2500	127	141
Alloy Steel Plant, Durgapur Distt. Burdwan, West Bengal.	234	122	104
Salem Steel Plant, Salem, Distt. Salem, Tamil Nadu.	180	91	125
Visvesvaraya Iron & Steel Plant, Bhadravati, Distt. Shimoga, Karnataka.	118	13	46
Total: SAIL	**17519**	**13575**	**13909**
RINL			
Visakhapatnam Steel Project, Distt. Visakhapatnam, Andhra Pradesh.	2910	3202	3296
Total: Public Sector	**20429**	**16777**	**17205**
Private			
Tata Steel Ltd, Jamshedpur, Distt. Singhbhum, Jharkhand.	9600	9155	9331
JSW Steel Ltd, Vijayanagar, Karnataka	10000	9257	10178
JSW Ispat Steel Ltd, Dolvi, Maharashtra	5000	2971	2958
ESSAR Steel Ltd, Hazira, Gujarat	8540	3245	2854
JSPL, Raigarh, Chhattisgarh.	4000	2836	3557
Other Producers **(estimated)**	**52682**	**37453**	**42896**

Figures rounded off.
Source: *Annual Report of Ministry of Steel, 2014-15, 2015-16 and individual producers.*

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 8.96 million tonnes of finished steel in 2014-15 as compared to 8.76 million tonnes in 2013-14. The production of crude steel in 2014-15 was 9.33 million tonnes as against 9.16 million tonnes in 2013-14. The Company dedicated the first phase (3 MPA) of the 6 million TPA greenfield steel project at Kalinganagar to the State of Odisha in November, 2015.

Setting up of a new integrated steel plant with 12.5 million tonnes capacity in Kalinganagar, Jajpur, Odisha by TSL is currently underway. The commercial production is expected to commence in the second half of the Financial Year 2015-16, the second phase is likely to be completed by 2018. Government of Odisha has allotted 2000 acres of land for the plant at Kalinganagar. The company has further plans to set up a 7.0 million tpy capacity integrated steel plant at Jagdalpur in Bastar region of Chhattisgarh. In the first phase, installation of a 2 million tpy capacity plant is likely to be taken up and it is expected to be completed in 3 to 5 years. Capacity expansion to 5 million tpy will be undertaken subsequently. The process of acquiring of land is under progress. 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 installed combined capacity at Karnataka, Tamil Nadu and Maharashtra plants of crude steels was of 14.3 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, from its existing operations, produce flat and long steel products. Salem Works focus only in long products and 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 and rolling with associated facilities such as coke oven, power plant, oxygen plant, etc. The slabs and HR coil produced at Vijaynagar 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 are 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 company is looking forward, Continuous Annealing Lines (CAL) of 0.95 mtpa, part of the Cold Rolling Mill Complex No. 2 phase – 1 has been commissioned during the year and the second CAL of 0.95 mtpa, which is part of phase – 2 is under trial run. The Company is in the process of commissioning the Steel Melting Shop No. 3 (SMS-3), comprising the Electric Arc Furnace along with the Billet Caster of capacity 1.5 mtpa. Currently, it is under trial run. The Bar Rod Mill No. 2 of 1.5 mtpa to process the cast products from SMS-3 is also under trial run.

The reconstruction of Blast Furnace No. 1 to increase capacity from 0.9 mtpa to 1.9 mtpa and the 0.2 mtpa Electrical Steel Project at Cold Rolling Mill No. 1 is expected to be commissioned in FY 2015-16. A service centre with a capacity of 10,000 tonnes per month to handle the products of Electrical Steel Complex at Cold Rolling Mill No. 1 is under construction.

The Vijaynagar works is also the first Indian plant with a large scale, low grade iron beneficiation process. Its 4.6 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. The plants Cold Rolling Mill-II is India's largest auto-grade steel facility with a capacity of 2.3 mtpa. The facility has been set up with aim to cater to the requirements of both domestic and global auto majors by 2020.

The Company aims to produce 34 million tonnes of steel annually with greenfield integrated steel plants coming up in West Bengal and Jharkhand. The company is looking forward to enhance the capacity of BF1 from 0.9 mtpa to 1.9 mtpa in financial year 2015-16.

Jindal Steel & Power Ltd (JSPL), Raigarh

JSPL has set up a rail & universal beam plant with capabilities to produce 121 m long, the world's longest rails and is the first in the country to manufacture large-size parallel flange beams. The company has captive coal mines at Dongamahua in district Raigarh, Chhattisgarh and coal washing unit with capacity of 6 million tonnes per year to wash 47-48% coal ash to 26%. The sponge iron plant at Raigarh, Chhattisgarh has capacity of 1.32 million tpy. Facilities at Raigarh also include following capacities - steel 3 million tonnes (Rail and structurals 0.75 million tonnes, plates 1.00 million tonnes and slabs, rounds, blooms and billets 1.25 million tonnes), hot metal 1.67 million tonnes sinter plant of 2.5 mtpa and captive power plant 623 MW.

As part of expansion projects, JSPL is setting up a 6 million tpy integrated steel plant at Angul in Odisha in the first phase. 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.

Jindal Stainless Ltd

The Company has a fully integrated Stainless Steel plant at Hisar in Haryana with a capacity of 8,00,000 tpy. It is the world's largest producer of stainless steel strips for razor blades and India's largest producer of coin blanks. The ferro-alloys plant of the Company is located at Jindalnagar, Kothavasala in district Vizianagaram, Andhra Pradesh. The plant has 40,000 tpy high carbon ferro-chrome capacity and caters to domestic markets and to other countries. The Company is also setting up a greenfield integrated stainless steel plant at Kalinganagar in district Jajpur, Odisha for production of ferro-alloys and stainless steel. The project will comprise 1.6 million tpy fully integrated stainless steel plant, a 500 MW captive power plant and 4,30,000 tpy coke oven battery. The production from ferro-chrome furnace has been stabilised.

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. It is the largest fully-integrated manufacturer of high-quality flat steel products in western India. 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 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.

JSW Ispat Steel Ltd (formerly, Ispat Industries Ltd)

JSW Steel has aquired a 45.53% majority stake in JSW 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 district Raigad, Maharashtra. The plant has a capacity to produce 3.3 million tpy of hot rolled coils (HRC). As a part of backward integration strategy, a pellet plant of 4 mtpa and coke oven unit of 1 mtpa has been installed at the complex. The Integrated Steel plant functions on the Convertor-cum-Electric Arc Furnance route (CONARC Process) to produce steel through modern Twin Shell Electric Arc Furnance.

The Expansion work at the Dolvi plant to enhance capacity from 3.3 mtpa to 5 mtpa is in progress. The project is likely to be commissioned in FY 2015-16. The proposed expansion includes setting up a Sinter plant, Billet Caster, 1.4 mtpa Bar Mill, Roll Grinding Machine, Blast Furnace capacity enhancement and de-bottlenecking of SMS and HSM.

JSW Ispat steel Ltd has plans to enhance Blast furnance capacity by "Single Block Method" of reconstruction. Also plans to install new sinter plant with 2.5 mtpa capacity and new Bar Mill with 1.4 mtpa capacity. A new Billet caster is also proposed to have with capacity of 1.5 mtpa.

The company is looking forward, continuous annealing olines (CAL) of 0.95 mtpa, part of the cold rolling mill complex no.2 phase -1 has been commissioned during the year and the second CAL of 0.95 mtpa, which is part of phase-2 is under trial run. The company is in the process of commissioning the steel melting shop no.3 (SMS-3), comprising the electric arc furnace along with the Billet Caster of capacity 3.5 mtpa.Currently, it is under trial run. It is expected to be fully commissioned in financial year 2015-16.

The reconstruction of blast furnace no.1 to increase capacity from 0.9 mtpa to 1.9 mtpa and the 0.2 mtpa electrical steel project at cold rolling mill no.1 is expected to be commissioned in financial year 2015-16. A service centre with a capacity of 10,000 tonnes per month to handle the products electrical steel complex of cold rolling mill no.1 is under construction.

Electrosteel Steels

Electrosteel Steels Limited is one of the pioneers company in the manufacturing of Ductile iron (DI) pipe. The company is 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 is a steel manufacturer in the country having integrated steel plant of 1.8 mtpa, comprising 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, 1.00 mtpa coal beneficiation plant, at Raipur & Raigarh in the state of Chhattisgarh. Approx. ₹ 7600 crore have already been invested and shall further expand its capacities from 1.8 mtpa to 2.4 mtpa with 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 a 1.1 million tonnes per annum capacity iron & steel plant located at Kalinganagar, Duburi, Jajpur district, Odisha. The NINL and Odisha Government will be setting up one million tonne 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.

Performance of the EAF/IF Industry is summarised below:

Electric Arc Furnace (EAF)

Steel produced in the Secondary Sector is mostly by recycling of steel scrap using Electric Arc Furnace (EAF). Presently, there are 47 EAF based steel plants operational in the country with an aggregate working capacity of 28.43 million tonnes per annum. The reported production of steel ingots/concast billets by EAF units in 2014-15 was estimated at 23.13 million tonnes as against 18.59 million tonnes in 2013-14.

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. Induction furnace has capability to operate on a charge up to 85% DRI (sponge iron). There are 1,321 induction furnaces with an aggregate working capacity of 36.79 million tonnes. These units reported production of about 28.28 million tonnes steel in 2014-15 as against production of 27.58 million tonnes in 2013-14.

Modernisation and Other Capital Schemes

Steel Authority of India Ltd has undertaken Modernisation & Expansion of its integrated steel plants at Bhilai, Bokaro, Rourkela, Durgapur & Burnpur and special steel plant at Salem. In the current phase, the crude steel capacity is being enhanced from 12.8 million tonne to 21.4 million tonne per annum. The indicative investment for current Phase is about ₹ 61,870 crore. In addition, ₹ 10,000 crore (approximately) has been earmarked for modernisation and expansion of SAIL mines

NEW STEEL PROJECTS

In the context of long-term demand projection of steel, the Government adopted a two-pronged strategy for increasing steel production in the country. Firstly, through modernisation and expansion of existing Public Sector steel plants in the country and secondly, by offering initiatives to Private Sector to install new steel capacities. After the announcement of the Industrial Policy in 1991 and encouraged by the various other policy initiatives of the Government, substantial interest by several entrepreneurs to set up new steel plants has been witnessed. Besides the steel PSUs, massive capacity addition is in the pipeline by private steel producers including foreign direct investors. As per the information, 301 MoUs have been signed in various states with intended capacity of around 488.66 million tonnes with an investment of over ₹ 5-10 lakh crore by 2020. Some projects were at various stages of implementation. POSCO has planned to set up 12 million tpy capacity steel plant in Odisha by using "Finex" process with direct utilisation of sinter feed iron ore (-8 mm) besides utilising the advantages of "Corex" technology, but promulgation of MMDR Act, 2015; makes its proposal infructuous and POSCO need to submit fresh proposal. Similar expansion is also coming up in secondary steel sector consisting of sponge iron, EAF, induction furnace, rolling mill, etc. With these new steel plants, contribution of Private Sector units is gradually increasing and this trend is expected to continue in future within the ambit of new laws.

National Mineral Development Corporation Ltd

NMDC is now directing its resources to diversify into steel making and other value added products. An integrated steel plant with a capacity of three million tonnes will be set up in Chhattisgarh near Nagarnar, district Bastar. 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 Bacheli and (b) 1.2 million tpy pellet plant at Donimalai in Karnataka.

Further, NMDC has acquired 50% equity in Legacy Iron Ore Ltd Australia and has signed an MoU with RINL for laying a slurry pipeline from Bailadila Complex (Chhattisgarh) to Vizag (Andhra Pradesh) via Jagdalpur to facilitate evacuation of iron ore concentrate.

KIOCL Ltd

The company is operating 350 cu m capacity blast furnace at Panambur, New Mangalore Port for production of pig iron with 2.16 lakh tpy capacity and a Ductile Iron Spun Pipe (DISP) plant of 100,000 tonnes per year capacity. The hot metal from blast furnace will be 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. 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.

Government of Andhra Pradesh has approved the draft MoU to be entered between Andhra Pradesh Mineral Development Corporation (APMDC) and KIOCL for joint exploration of iron ore deposits located in Nemkal in Anantapur district, AP. KIOCL produced 1.71 million tonnes and sold 1.62 million tonnes of pellets during 2013-14.

VISA Steel Ltd

VISA Steel is a leading player in the Special Steel (0.5 mtpa), Ferro Chrome (180,000 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 Ferro Chrome 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 Ferro Chrome 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, is operating a 4,00,000 mt per annum 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.

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.

There were about 156 units (including three 100% export-oriented units) having an estimated annual installed capacity of over 5.15 million tonnes. About 25% to 30% production is usually exported. India is an established regular exporter of silico-manganese and high-carbon ferro chrome. The capacity of ferro-alloys 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.

MOIL has constructed a plant for direct utilisation of manganese ore fines to produce ferro-manganese. The plant is having capacity to produce 10,000 tpy of ferro-manganese or 6,800 tpy of silico-manganese or any combination of these two products. It is located near Balaghat manganese mine in Madhya Pradesh. The production of ferro-managnese by MOIL was 10,045 tonnes in 2014-15 as against 10,042 tonnes in 2013-14.

Chandrapur Alloys Ltd (formerly Maharashtra Electrosmelt Ltd), a subsidiary of SAIL (w.e.f 12.7.2011), situated in Chandrapur, Maharashtra, is a major producer of ferro-manganese and silico-manganese and other ferro-alloys for captive use in SAIL's plants across the country.

The total production and consumption of ferro-manganese was 5,18,000 tonnes and 1,23,000 tonnes, respectively in the year 2014-15.

The total production and consumption of silico-manganese was 2,49,691 tonnes and 2,19,800 tonnes, respectively in the year 2014-15.

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 charge-chrome plants of Tata Steel, FACOR and Indian Metals & Ferro-alloys Ltd (IMFA) have a total charge-chrome capacity of 1,82,500 tpy. All the three plants are 100% export-oriented units. FACOR is planning to set up a 5,00,000 tpy stainless steel plant to further integrate the present ferro-chrome production. Plantwise capacity of charge-chrome is provided in Table-6.

The total production of ferro-chrome/charge-chrome in 2013-14 was about 9,44,000 tonnes, which remains same in 2014-15. Whereas, the consumption of ferro-chrome/charge-chrome in 2014-15 was reported at about 2,86,900 tonnes.

Table – 5 : Capacity of Ferro-alloys Industry

(In tonnes per annum)

Ferro-alloys	Units (No.)	Installed capacity
Total	**156**	**5150000**
Bulk Ferro-alloys : Total	**119**	**5100000**
Manganese alloys	64	3160000
Chrome alloys	26	1690000
Ferro-silicon	29	250000
Noble Ferro-alloys : Total	**37(e)**	**50000(e)**

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

Table – 6 : Capacity of Charge-chrome Plants

Plant	Location	Installed Capacity (tpy)
Ferro-Alloys Corp. Ltd	Randia, Distt. Bhadrak, Odisha.	65000
Tata Steel Ltd	Bamnipal, Distt. Keonjhar, Odisha.	55000
Indian Metals & Ferro Alloys Ltd	Choudwar, Distt. Cuttack, Odisha.	62500
Total		**182500**

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.

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 950 tonnes in 2014-15 as against 923 tonnes in 2013-14. 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 26.27 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. The new Joint Venture Company is named "Angul Aluminium Park Ltd" and has plans in place to set up an aluminium downstream & ancillary complex over an area of 200 acres. BALCO, with stake holding between Sterlite Industries (India) Ltd & Govt. of India (49%) has an installed capacity of 3.45 lakh tpy at Korba. The three companies with four plants in the Private Sector have a total capacity of 21.67 lakh tpy in operation. One unit at Korba of BALCO and a plant of MALCO have suspended operations, and thereby, accounted for a total of 1.40 lakh tpy of non-operational capacity.

The production of aluminium in 2014-15 was 20.27 lakh tonnes. The installed capacity and production of aluminium in 2013-14 and 2014-15 is enumerated in Table-7. The projected aluminium production at the end of 12th Plan Period is estimated to be 4.7 million tonnes.

Table – 7 : Capacity and Production of Aluminium, 2013-14 and 2014-15

(In '000 tonnes)

Producer	Annual Capacity	Production	
		2013-14	2014-15 (P)
Total	**2627**	**1667**	**2027**
Public Sector			
National Aluminium Co. Ltd (Angul)	460	316	327
Private Sector			
Bharat Aluminium Co. Ltd (Korba)	345*	253	326
Hindalco Industries Ltd	1282	556	836
Madras Aluminium Co. Ltd	40#	-	-
Vedanta Aluminium Ltd (Jharsuguda)	500	542	537

Figures rounded off.
***Source:** Information received from individual plants/ Annual reports*
**Korba Plant-1 (BALCO) capacity of 100 thousand tonnes per year is non-operational.*
 # Plant is closed, since December 2008

During the year under review, except Vedanta Ltd all other smelters reported higher production as compared to the previous year. Two more plants viz. Aditya and Mahan of Hindalco Industries started reporting production during the year.

Alumina

The production of alumina was 40.24 lakh tonnes in 2014-15. NALCO, accredited as one of the largest producers of alumina in Asia with an installed capacity of 22.75 lakh tpy. In further addition of capacity undertaken in the third phase of expansion, the total capacity is expected to touch 2.98 million tonnes. The details of alumina producers in the country, their capacities and production are provided in Table-8.

GMDC has plans to set up a 0.75 million tpy alumina plant and a company, namely, Gujarat Alumina & Bauxite Ltd has been formed. The viability report of the project has been prepared and formalities for acquiring land were in progress.The Company has a 50,000 tpy bauxite calcination plant located at village Gadhshisha in Gujarat.

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.

Table – 8 : Capacity and Production of Alumina, 2013-14 and 2014-15

(In '000 tonnes)

Producer	Annual Capacity	Production	
		2013-14	2014-15(P)
Total	**6560**	**3780**	**4024**
Public Sector			
National Aluminium Co. Ltd (Damanjodi)	2275	1913	1826
Private Sector			
Bharat Aluminium Co. Ltd	200#	Nil	Nil
Hindalco Industries Ltd	3000	1343	1220.80
Madras Aluminium Co. Ltd	85#	Nil	Nil
Vedanta Aluminium Ltd (Lanjigarh)	1000*	524	977

Figures rounded off.
Source: Information received from individual plants/ Annual Reports.
 # Plants remained non-operational during the year.
** Proposed expansion to 5 thousand tonnes per year.*

National Aluminium Co. Ltd

The present capacity of bauxite mines of 4.8 million tpy is being expanded to 6.3 million tpy in second phase expansion. NALCO's expansion activities are as per schedule. The company's augmented alumina refinery capacity enhanced from 21 lakh tonnes to 22.75 lakh tonnes per year during the year. 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-amperage 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. The company set up wind power plants of capacities 50.4 MW & 47.6 MW at Gandikota (Andhra Pradesh) & Jaisalmer (Rajasthan) during the year. 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. NALCO is planning to set up 1.0 million tonne alumina refinery in Kachchh district of Gujarat, based on supply of bauxite from Kachchh region by Gujarat Mineral Development Corporation (GMDC). The company plans to set up a 14 MW wind power project in mined out area of its working bauxite mines in Damanjodi area of Odisha.

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 present capacity of the Korba smelter is 3.45 lakh tpy. The Korba-I plant of BALCO with smelter capacity of 1,00,000 tpy is not operational, while the 2,45,000 tpy Korba-II plant is presently operating. 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 and construction of coal-based 1200 MW captive power plant along with two coal mines viz. Chotia & Gare Palma Blocks, in the state of Chhattisgarh.

Environment clearance for the 211 million tonnes coal block has been received and second stage of forest department clearance is under progress.

Hindalco Industries Ltd

Hindalco Industries Ltd is Asia's largest integrated primary producer of aluminium. With the completion of brownfield expansion, the capacity of Renukoot aluminium smelter has risen to 3,45,000 tpy and that of alumina refinery to 7,00,000 tpy.

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. The Hindalco's primary aluminium (metal) capacity augmented to around 13,00,000 tpy from 5,62,000 tpa during the year 2014-15. This increase was primarily on occount of production from Mahan and Aditya smelter initiated during the year 2014-15. In addition to aluminium, Renukoot (Uttar Pradesh), Intergrated Aluminium Complex also produces semi-febricated products viz. conductor redraw rods, sheet, extrusion, etc. The Alupuram (Kerala) smelter is closed but extrusion unit currently operates at a capacity of 8,000 tpy. 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 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 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 Flat Rolled Products facilities at Hirakud (Odisha) and Mauda (Maharashtra) are being developed to produce world class, can body stock and ultra thin gauge foils, respectively.

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.

The Company has 55 kg per year capacity of gallium recovery at Renukoot. It has two captive power plants at Renusagar and Hirakud with total generation capacity of about 1109 MW.

Hindalco's three greenfield projects are well on their way towards full capacity utilisation. Utkal Alumina (Odisha), 1.5 million tpy alumina refining project along with 90 MW captive co-generation plant completed during the year. Utkal alumina sourcing bauxite from Baphlimali Bauxite Deposit in Odisha.The company has set up 3.60 lakh tpy aluminium smelter at Bargawan along with 900 MW captive power plant at Mahan in Madhya Pradesh, based on captive coal consumption from district Sidhi, Madhya Pradesh. The other integrated aluminium project, namely, Aditya Alumina & Aluminium Project, alumina refinery at Koraput, 3.60 lakh tpy aluminium smelter at Lapanga, Odisha along with 900 MW captive power plant commissioned during the year. A joint venture agreement on bauxite mines was signed with OMC. Another greenfield project, viz. Jharkhand Aluminium Project at Sonahatu, 55 km from Ranchi, entails setting up a 7.20 lakh tpy aluminium smelter with 1650 MW captive power plant. It is supported by 5 million tpy captive coal mine of Auranga Coalfields in Jharkhand with Tata Power. Land acquisition was in progress, and for other clearances application was filed. The project is likely to be commissioned in mid-2015. Hindalco's plans to expand alumina refinery capacity at Belgaum from 3.5 lakh tpy to 6.5 lakh tpy are on hold, awaiting Government's approval relating to bauxite mines. The capacity of Aluminium semis in 2014-15 is given in table 9.

Recycling: Aluminium is recyclable without any loss of properties and comsumes 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 10 lakh tpy alumina refinery associated with 75 MW captive power plant at Lanjigarh in district Kalahandi, Odisha

Table – 9 : Capacity for Aluminium Semis During 2014-15

(In tonnes)

Producer/product	Annual installed capacity
HINDALCO	
Rolled product	205000
Extruded products	31000
Conductor redraw rods	56400
Aluminium foils	40000
Aluminium wheels (No. of pieces)	-
NALCO	
Aluminium wire rods	100000
Aluminium billets	30000
Aluminium strips (smelter)	26000
Aluminium strips (RPU)	52000
Rolled products	45000
MALCO	
Rolled products	12000
Properzi rods	36000
Bus bars	-
Aluminium wire rods	32850
BALCO	
Extruded products	8000
Rolled products	72500
Properzi rods	111500
Foil product	600
Conductors	1200
Aluminium wire rods	43200
JINDAL ALUMINIUM Ltd	
Extruded products	100000

Source: *Information received from individual plants/Annual Reports.*

and 5 lakh tpy capacity aluminium smelter and 1215 MW captive power plant at Jharsuguda. In addition, Vedanta Aluminium has plans to expand its alumina refining capacity from 10 lakh tpy to 50 lakh tpy, subject to Government approval by increasing the capacity of the current alumina refinery from 10 lakh tpy to 20 lakh tpy through de-bottlenecking and by constructing a 30 lakh tpy alumina refinery and an associated 210 MW captive power plant. The construction of alumina refinery project is on hold and awaiting approvals. Work on setting up another 12.5 lakh tpy aluminium smelter in Jharsuguda, Odisha is under progress.

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. The production of cadmium was 69 tonnes during the year 2014-15 as compared to 228 tonnes in the year 2013-14. 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. The capacity and production of cadmium during 2013-14 and 2014-15 are furnished in Table-10.

Table – 10 : Capacity and Production of Cadmium During 2013-14 and 2014-15

(In tonnes)

Producer	Annual capacity	Production	
		2013-14	2014-15 (P)
Total	**913**	**228**	**69**
HZL	833	184	-
Edayar Zinc Ltd (formerly BZL)	80	44	69

Copper

HCL, a Public Sector Company, was the only integrated primary refined copper producer till 1997 and has annual installed capacity of 51,500 tonnes per year. The other two producers of primary copper based on imported concentrates are Hindalco Industries Ltd and Sterlite Industries of Vedanta Group, having annual capacities of 500 thousand tonnes and 400 thousand tonnes of refined copper, respectively. The HCL has acquired the assets of Jhagadia Copper Ltd. (renamed as GCP) has a total capacity of 50,000 tpy. The total installed capacity is thus 1,001.5 thousand tpy. Details regarding capacity and production of copper are furnished in Table-11.

Production of refined copper (cathodes) in 2013-14 and 2014-15 was 644.19 thousand tonnes and 765.56 thousand tonnes, respectively.

Table – 11 : Capacity and Production of Copper

(In '000 tonnes)

Producer	Annual capacity	Production*	
		2013-14	2014-15(P)
Total	**1001.5**	**644.19**	**765.56**
Hindustan Copper Ltd**	51.5	17.00	15.24
Sterlite Industries (India) Ltd.	400	294.44	362.37
Hindalco Industries Ltd	500	332.75	387.95
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. Trial runs for recovering cobalt, nickel & copper powder from converter slag are presently underway. A pilot plant with a capacity to produce one tonne nickel cathode per month was also set up at ICC. The plant is currently being scaled up to a production capacity of 5 tonnes per month of nickel cathodes. 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 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 operates a sulphuric acid plant.

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.

Sterlite Industries (India) Ltd (SIIL)

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 smelters 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), silver (150 tpy) and selenium ( ). The entire requirement of copper concentrates is met through imports supported by the Company's two copper mines in Australia.

Gujarat Copper Project (formerly Jhagadia Copper Ltd)

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.

Recycling of Copper

As per the licences granted by Central Pollution Control Board as on 13.5.2010 there were 35 units operating in different states with a combined capacity of 2.42 lakh tpy for handling different types of scrap.

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.

Zinc

India has a total installed zinc capacity of 8,61,000 tpy distributed between HZL smelters at Debari, Visakhapatnam, Chanderiya, Dariba and Binani Zinc Ltd's (BZL) plant at Aluva in Kerala. HZL's Dariba hydro-zinc smelter with 2,10,000 tpy capacity was commissioned in March, 2010. BZL has an annual installed capacity of 38,000 tonnes zinc along with 80 tonnes cadmium and about 53,000 tonnes sulphuric acid.

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 2013-14 and 2014-15 are furnished in Table-12.

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

(In tonnes)

Producer	Lead capacity (tpy)	Production		Zinc capacity (tpy)	Production	
		2013-14	2014-15 (P)		2013-14	2014-15 (P)
Hindustan Zinc Ltd	185000	122595	127142	823000	749168	732792
Edayar Zinc Ltd (formerly Binani Zinc Ltd.)	–	–	_	38000	17362	_
Total	**185000**	**122595**	**127142**	**861000**	**766530**	**732792**

ABRASIVES

Natural abrasives, which include calcite, emery, diamond, zircon, corrundum, 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 metorites, 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.

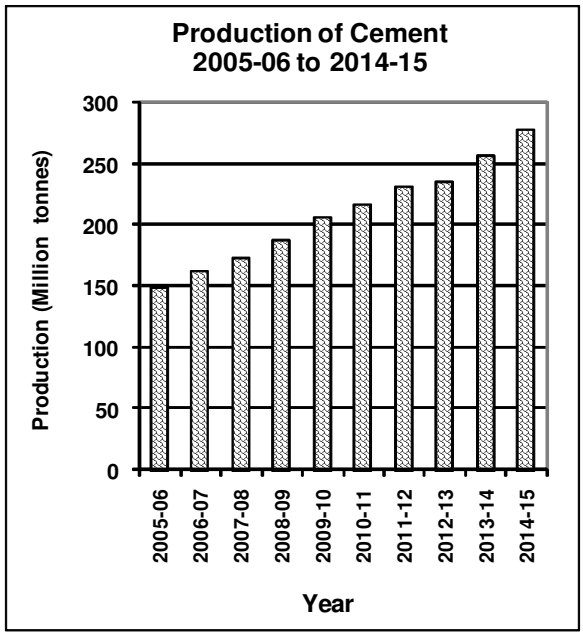
CEMENT

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 delicencing of the Industry and Policy Reforms initiated in 1991. In

2014-15, 209 number of large cement plants were in operation with an annual installed capacity of about 350 million tonnes, in addition to mini/white cement plants with total estimated capacity of about 6 million tonnes per annum. Most of these capacities are modern and based on the energy efficent dry process technology. The number of plants and capacity are more in the southern region (Andhra Pradesh, Tamil Nadu, Karnataka and Kerala) of the country. CCI, a public sector undertaking operates three units at Bokajan, Rajban and Tandur units, the remaining seven of its units are non-operational due to various reasons. The CCI was revived in light of Public Sector Policy under the National Common Minimum Programme (NCMP) and accordingly, the restructuring/revival plan duly approved by the Government has been taken up for implementation. Technology upgradation of Tandur unit and expansion of Bokajan has been taken up for implementation as part of the sanctioned scheme. Besides, there are 5 large cement plants owned by various State Government Undertakings and as many as 112 plants with a million tonnes or more capacity. The total production of cement (all kinds) in 2014-15 was about 276.93 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. Cement Industry which was branded as the biggest contributor to environment pollution, now meets better pollution standards and contributes to environmental cleanliness by consuming fly ash from thermal power plants and slag produced by steel manufacturing units.

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 additional cement capacity requirement during 12th Plan is projected at 139.7 million tpy by 2017 and about 1035 million tonnes by 2027. The annual capacity and production of cement by the end of 12th Plan are estimated at 479.3 million tonnes 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 Andhra Pradesh, Jasidih in Jharkhand and Ballabhgarh 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 refractories 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 2014-15 of all types of refractories was 1,200 thousand tonnes as compared to 1,159 thousand tonnes in 2013-14. 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. BRL's merger with SAIL is under progress. 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.

The estimated annual installed capacity of different kinds of refractories and production is highlighted in Table-13.

Table – 13 : Annual Installed Capacity and Production of Refractories 2012-13 to 2014-15 (By Types)

(In '000 tonnes)

Refractory item	Annual capacity	Production		
		2012-13	2013-14	2014-15
Fireclay (bricks & shapes)	560	262	234	265
High alumina (bricks & shapes)	554	299	235	219
Silica refractories (bricks & shapes)	58	66	581	50
Basic refractories	454	214	190	199
Special products (incl.cc)	46	60	64	61
Others (incl.Monolithics/ castables/precast)	343	382	379	407
Total (rounded)	**2015**	**1285**	**1683**	**1200**

Source: *Indian Refractory Makers' Association (IRMA) Journal.*

CERAMIC & GLASS INDUSTRY

Ceramic Industry

Ceramic Industry in India is about 100 years old. India ranks 3rd in world in terms of production of ceramics and 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-wares, 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. Today, there are sophisticated and modern plants in the country which produce glass containers, float glass, etc. by the use of latest technology.

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%), automative (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 2014-15 was 6.56 million tonnes as against 6.80 million tonnes in 2013-14.

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 24.39 lakh tonnes against the total installed capacity of 29.39 lakh tonnes. 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 as on 31.3.2015 was 29.51 lakh mtpa. The production of soda ash during the year 2014-15 was 24.62 lakh tonnes.

Bleaching Powder (Chlorinated lime)

Seven units were engaged in the production of stable bleaching powder. There were three units engaged in the manufacture of liquid bleaching powder.

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 as on 31.3.2015 was 1.12 lakh mtpa. The production of calcium carbide during the year 2014-15 was 0.87 lakh tonnes.

Nickel Sulphate

Ghatsila copper smelter of HCL produces nickel sulphate as a by-product from electrolytic copper spent solutions. The annual capacity of HCL smelter for the production of nickel

sulphate is 390 tonnes. However, no production has been reported since 2004-05 onwards. Jhagadia Copper Ltd (formerly SWIL Ltd) has plans to recover nickel sulphate at its copper metal plant at Jhagadia, district Bharuch, Gujarat. The Thoothukudi plant of sterlite has developed innovative method to produce pure commercial grade nickel sulphate from electrolyte by solvent crystallisation. The pilot-scale trials are in progress.

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

Sterlite Industries (India) Ltd is setting up a 13,000 tpy aluminium fluoride plant as a joint venture of Sterlite Ind. (part of Vedanta Group) & Maya Rasayan Ltd. The aluminium fluoride produced by the Company will be utilised in the aluminium smelters of Vedanta Group. Other 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 2014-15 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 85,600 tpy produce titanium dioxide pigment. IREL has not reported synthetic rutile production in recent years. Kerala Mineral & Metals Ltd (KMML) has plans to set up a 500 tpy titanium sponge plant with DMRL technology with plans to further expand the capacity to 1000 tpa. KMML has proposals to augment its total capacity of titanium dioxide to 60,000 tonnes per annum.

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

RSMML has set up a beneficiation plant for processing 9 lakh tonnes of low-grade ore per annum at Jhamarkotra, Rajasthan. 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 as on 31.3.2015 was 1.68 thousand tpy. The production of red phosphorus during the year 2014-15 was 0.89 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.

Presently, there are around 159 fertilizer plants in operation in the country. It comprised of 30 Urea, 12 DAP and 20 Complex fertilizer plants. Besides, 104 medium and small scale units are in operation manufacturing Single Super Phosphate (SSP).

As per Fertilizer Association of India, the total installed capacity of P_2O_5 almost stood at 6.84 million tonnes of which the capacity of SSP plants was around 1.62 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.

Though the bulk of rock phosphate is used in the manufacture of water soluble phosphatic fertilizers, small quantities of suitable grades are also used directly in acidic soils. When a phosphatic fertilizer is soluble in water, the product is called water soluble phosphate. If it is soluble in water but does so in 2 per cent neutral ammonium citrate, the product is called citrate soluble phosphate. The sum total of the water soluble and citrate soluble values is termed as 'available phosphates'. A fertilizer in which phosphate is not soluble either in water of 2 per cent neutral ammonium citrate is termed insoluble. The sum of the available phosphate and the insoluble phosphate is termed as 'total phosphate'. The major criterion for the agronomic effectiveness of phosphatic fertilizer is the water soluble P_2O_5 content of fertilizer. Generally, those fertilizers which contain all or most of the P_2O_5 in water soluble form are agronomically more efficient than those having partially water soluble P_2O_5. However, it has recently been found that phosphatic fertilizers having 80 per cent or more water soluble P_2O_5 are generally as efficient as those containing almost all of its phosphate in a water soluble form. The only exception where

phosphatic fertilizer containing citrate soluble P_2O_5 or even water insoluble P_2O_5 is effective as those containing fully water soluble P_2O_5 is in the case of acid soils, but provided the fertilizer should be suitably applied.

Different types of straight and complex fertilizers are manufactured from rock phosphate such as SSP, DAP, nitrophosphate, urea ammonium phosphate. In the category of straight fertilizer, which contributes 16% of total P_2O_5 in the country during the year 2014-15 and the remaining 84% was contributed by complex fertilizers. The SSP is still an important fertilizer source 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 fertilizer plant operators in the country have fully absorbed and assimilated the latest technological developments incorporating environment-friendly process technology and are in a position to operate and maintain the plants at their optimum levels in accordance with international standards in terms of capacity utilisation, specific energy consumption and pollution standards. The Fertilizer Industry is carrying out debottlenecking and energy saving schemes in the existing plants to enhance capacity and to reduce specific energy consumption. Companies are also planning to convert existing naptha-based fertilizer plants to liquified natural gas (LNG)/natural gas (NG)-based ones.

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.*

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.

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

(In lakh tonnes)

Products	No. of Units	Total Installed Capacity	Production	
			2013-14	2014-15 (P)
Urea	30	215.97	227.15	225.85
DAP	12	83.32	36.08	34.44
Complex Fertilizers	20	60.71	69.13	78.32
SSP (in P_2O_5 content)	104	16.2	6.76	4.32

Source: *Indian Fertilizer Scenario, 2015 & Fertilizer's Statistics, 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

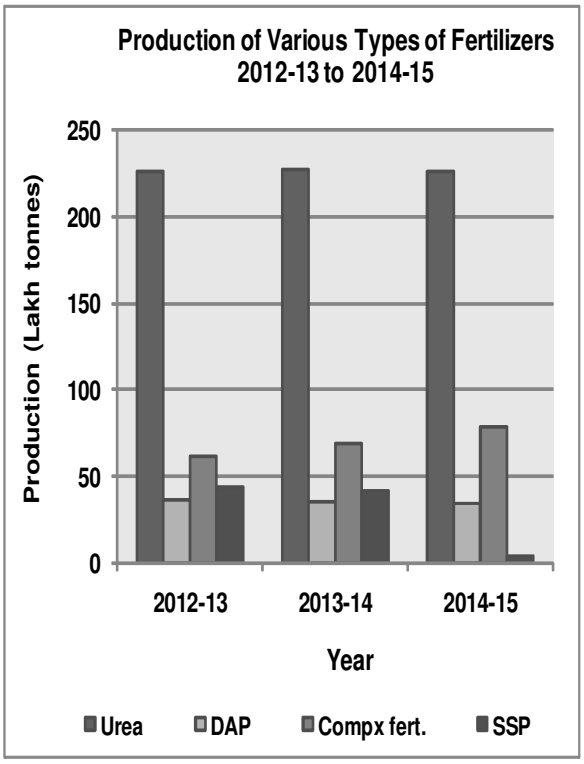
The Indian Paper Industry accounts for about 3% of the world's total production of paper. There are about 750-800 units of manufacturing pulp, paper, paper board. The estimated capacity to produce paper, paper board & news print is around 18.40 million tonnes during the year 2014-15, whereas the domestic production was 14.49 million tonnes. The consumption of paper, paper board & news print was about 16.51 million tonnes. The per capita consumption of paper in India is 13 kg, which is far behind the global average of 57 kg. The Indian Paper Industry is in a fragmental structure, consisting of small, medium and large paper mills, having capacities ranging from 5 to 800 tonnes per day. Paper Industry is based on 24% by Wood/Bamboo & Chemical- based Industry, 11% by Agro-residue (Baggage/wheat straw) and the remaining 65% by waste paper recycled fibre-based Industry. 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. Import of pulp and paper products is likely to show a growing trend. 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.

With large number of residential and commercial projects underway, the outlook for Indian Paint Industry appears brighter.



PETROLEUM REFINERIES

There were 22 refineries operating in the country (19 in Public/Joint Sector and 3 in Private Sector).

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

The total refining capacity in the country as on 1.4.2015 is around 215 million tpy. The total crude throughput increased to 223.24 million tonnes in 2014-15 from 222.50 million tonnes in 2013-14. Production of petroleum products from crude oil was 221.14 million tonnes in 2014-15. Import of petroleum crude during the same period was 189.435 million tonnes. During 2014-15, crude oil production in the country was at 37.46 million tonnes, while the natural gas (utilised) production was at 33,656 million cubic metres (m cu m). Natural gas is also being imported to bridge the gap between demand and supply of natural gas. The imports during 2014-15 stood at 14.09 million tonnes.

Table – 16 : Installed Capacity and Crude Throughputs in Refineries

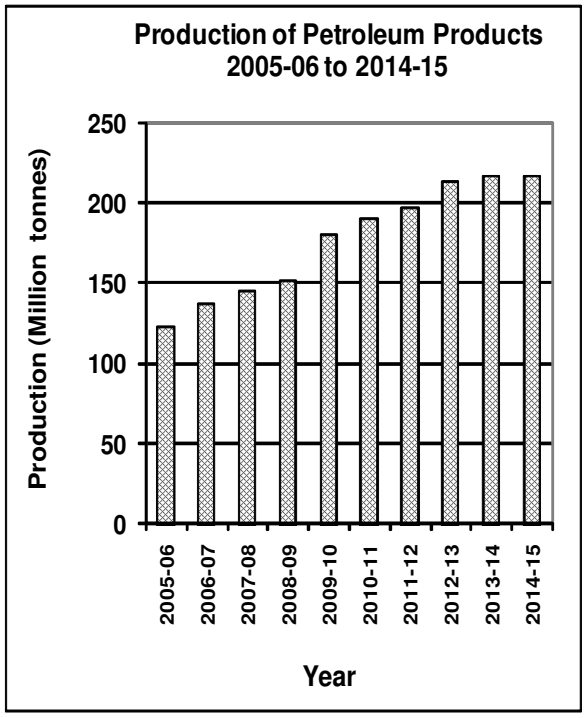
(In '000 tonnes)

Refinery	Annual installed capacity (as on 1.4.2015)	Refinery Crude throughput		
		2012-13	2013-14	2014-15
Total	**215066**	**219211**	**222498**	**223241**
Public/Joint Sector	**120066**	**120301**	**119548**	**121182**
IOCL, Guwahati, Assam	1000	956	1019	1006
IOCL, Barauni, Bihar	6000	6344	6478	5944
IOCL, Koyali, Gujarat	13700	13155	12960	13285
IOCL, Haldia, West Bengal	7500	7490	7952	7650
IOCL, Mathura, Uttar Pradesh	8000	8561	6641	8515
IOCL, Dibgoi, Assam	650	660	651	591
IOCL, Bongaigaon, Assam	2350	2356	2328	2403
IOCL, Panipat, Haryana	15000	15126	15098	14191
BPCL, Mumbai, Maharashtra	12000	13077	12684	12821
BPCL (formerly KRL), Kochi, Kerala	9500	10105	10285	10356
HPCL, Mumbai, Maharashtra	6500	7748	7785	7408
HPCL, Vizag, Andhra Pradesh	8300	8028	7776	8770
CPCL, Manali, Tamil Nadu	10500	9105	10065	10251
CPCL, Nagapattinam, Tamil Nadu	1000	640	559	531
MRPL, Mangaluru, Karnataka	15000	14415	14589	14632
NRL, Numaligarh, Assam	3000	2478	2613	2777
ONGC, Tatipaka, Andhra Pradesh	66	57	65	51
Joint Venture	**15000**	**10636**	**14721**	**13527**
Bharat Oman Refineries Ltd, Bina	6000	5732	5450	6209
HPCL, Bhatinda	9000	4904	9271	7318
Private Sector	**80000**	**88274**	**88229**	**88532**
RPL, Jamnagar, Gujarat	33000	32613	30307	30867
RPL (SEZ), Jamnagar, Gujarat	27000	35892	37720	37174
Essar Oil Ltd, Vadinar, Gujarat	20000	19769	20202	20491

Source: *Indian Petroleum and Natural Gas Statistics, 2015-16, Ministry of Petroleum & Natural Gas, Economics and Statistics Division, Government of India.*

Excluding other inputs from refinery crude throughput

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 this Vol-III, IMYB.



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.

There are more than 5,000 foundry units out of which 90% can be classified as MSME's with an annual installed capacity of approximately 15 million tonnes per annum, against which the production was 10 million tonnes in the year 2014-15. However, the majority of the foundry unit falls under the category of Small-scale Industry.

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.

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.