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(Part- II : Metals & Alloys)

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FERRO ALLOYS

(FINAL RELEASE)

GOVERNMENT OF INDIA
MINISTRY OF MINES
INDIAN BUREAU OF MINES

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6 Ferro-alloys

Ferro-alloys are one of the important inputs in the manufacture of alloys and special steel. They are used as deoxidizers and alloy additives in the steel manufacturing process. They impart special properties to steel. The alloys provide increased resistance to corrosion, improve hardness and tensile strength at high temperature, give wear and abrasion resistance and increases creep strength, etc. The growth of Ferro-alloys Industry is, thus, linked with the development of the Iron and Steel Industry, Foundry Industry and to some extent Electrode Industry. The principal ferro-alloys are chromium, manganese and silicon. The product series consists mainly of ferro-manganese, silico-manganese, ferro-silicon and ferro-chrome.

Ferro-alloys are classified into two main categories, viz, bulk ferro-alloys and noble ferro-alloys. Owing to high cost of power, Ferro-alloys Industry has not been operating to its full capacity in India. Ferro-alloys Industry spends 40 to 70% production cost on power consumption. The power consumption per tonne of ferro-alloys production in the country varied from 3,000 to 12,000 kWh.

At present, major portion of the ferro-alloys produced is exported. Ferro-manganese, silico-manganese, ferro-silicon, high carbon ferro-chrome and charge-chrome are exported after meeting the domestic requirements.

INDUSTRY, PRODUCTION, DEVELOPMENT AND CONSUMPTION

As per Indian Ferro-Alloys Producers' Association (IFAPA), the total installed capacity of bulk ferro-alloys Industry in India is estimated at 5.10 million tonnes per annum and for noble ferro-alloys it is 50,000 tonnes per annum. The details are given in Table- 1.

Table – 1 : Capacity of Ferro-alloys Industry in India

(In tonnes per annum)

Ferro-alloys	Installed capacity
Total	**5150000**
Bulk Ferro-alloys:	**5100000**
Manganese-alloys	3160000
Chrome-alloys	1690000
Ferro-silicon	250000
Noble Ferro-alloys:	**50000**

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

The Ferro-alloys Industry was established as an ancillary industry to cater to the growing needs of the domestic Steel Industry and is spread all over the country. Most of the ferro-alloys units have been set up in Andhra Pradesh, Chhattisgarh, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Odisha and West Bengal because of availability of the raw material as well as uninterrupted electricity supply. Recently, the Industry has further spread to the North-Eastern Region of India. In Meghalaya, a number of small units producing ferro-silicon and ferro-silico manganese have come up. The production of various ferro-alloys is given in Table-2.

The ferro-alloy units have incorporated the latest technology in order to use non metallurgical grade ores, both lumps and fines, after necessary beneficiation and agglomeration. The units have also incorporated an effective pollution control measures in the form of gas cleaning, deoxidising and waste heat recovery.

BULK FERRO-ALLOYS

Bulk ferro-alloys consist of principal alloys, viz, ferro-manganese, silico-manganese, ferro-chrome, charge-chrome and ferro-silicon. The production of different kinds of ferro-alloys was not received from IFAPA as well as from other sources. However, the data received from JPC for some of the ferro-alloys as well as partial coverage from ferro-alloys have been published in IBM's Monthly Statistics of Mineral Production (MSMP) - March, 2017 & 2018 which is being reproduced in Table-2. It may be noted that the data coverage in Table-2 is partial and does not reflect the actual production of ferro-alloys.

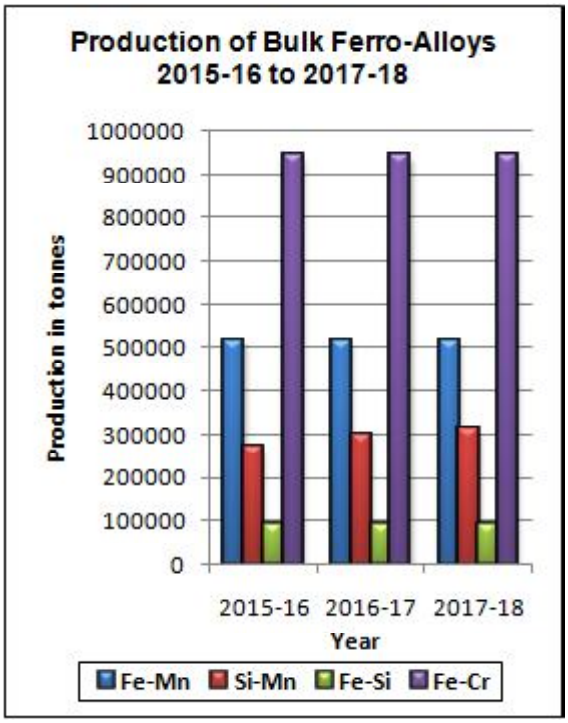

Table – 2 : Production of Ferro-alloys, 2015-16 to 2017-18

(In tonnes)

Ferro-alloys	2015-16	2016-17	2017-18
A) Bulk Ferro-alloys			
Ferro-manganese	518000	518000	518000
Silico-manganese	269920	300625	311326
Ferro-silicon	90000	90000	90000
Ferro-chrome	944000	944000	944000
Charge-chrome	NA	NA	NA
B) Noble Ferro-alloys			
Ferro-molybdenum	1459	1603	1205
Ferro-vanadium	937	1329	1331
Ferro-tungsten	NA	NA	NA
Magnesium ferro-silicon	20541	20183	15978
Ferro-aluminium	3212	4345	4423
Ferro-silicon-zirconium	NA	NA	NA
Ferro-titanium	198	291	281
Ferro-boron	NA	NA	NA
Ferro-niobium	1	NA	NA

Source: *Monthly Statistics of Mineral Production (MSMP), IBM. March, 2017 & 2018.*

Ferro-manganese/Silico-manganese

Ferro-manganese is produced as high carbon ferro-manganese with 72-82% Mn, 6-8% C and 1.5% Si, medium carbon ferro-manganese with 74-82% Mn, 1-3% C and 1.5% Si and low carbon ferro-manganese with 80-85% Mn, 0.1-0.7% C and 1-2% Si. Silico-Manganese in combination of 60-70% Mn, 10-20% Silica and about 20% carbon. Manganese in the form of ferro-manganese is added for hardening and desulphurisation of steel. Nav Bharat Ferro Alloys Ltd, Paloncha, Andhra Pradesh; Chhattisgarh Electricity Co. Ltd, Raipur, Chhattisgarh; Indsil Energy & Electro Chemicals Ltd, Raipur, Chhattisgarh; Ispat Godawari Power & Ispat Ltd (GPIL), Chhattisgarh; Monet Ispat Ltd, Raipur, Chhattisgarh; Union Ferro, Raigarh, Chhattisgarh; Prakash Industries, Raigarh, Chhattisgarh; Tirumala Balaji Alloys Pvt. Ltd, Raigarh, Chhattisgarh; Vandana Global Ltd, Raipur, Chhattisgarh; SAL Steels Ltd, Gandhidham, Gujarat; Anjaneya Ferro Alloys Ltd, Mihijam, Jharkhand; Gautam Ferro Alloys Ltd, Ramgarh, Jharkhand; Shivam Iron & Steel Co. Pvt. Ltd, Giridih, Jharkhand; Sandur Manganese & Iron Ores Ltd, Sandur, Karnataka; Indsil Electrosmelt Ltd, Palakkad, Kerala; Chandrapur Ferro Alloys Plant (formerly Maharashtra Electrosmelt Ltd), Chandrapur, Maharashtra; Nagpur Power Ind. Ltd, Kanhan, Maharashtra; Natural Sugar & Allied Ind. Ltd, Osmanabad, Maharashtra; Adhunik Meghalaya Steels Pvt. Ltd, Bymihat, Meghalaya; Meghalaya Sova Ispat Ltd, Meghalaya; Shyam Century Ltd, Meghalaya; Tata Steel Ltd, Joda, Odisha; Bhaskar Shrachi Alloys Ltd, Durgapur, West Bengal; Cosmic Ferro Alloys Pvt. Ltd, Bankura, West Bengal; Dayal Ferro Alloys Ltd, Ramgarh, West Bengal; Haldia Steels Ltd, Burdwan, West Bengal; Impex Ferro Tech Ltd, Burdwan, West Bengal; Maithan Alloys Ltd, Burdwan, West Bengal; Modern India Con-Cast Ltd, Birhampur, West Bengal; Sharp Ferro Alloys Ltd, Durgapur, West Bengal; Shri Gayatri Minerals Ltd, Bishnupur, West Bengal; Shyam Ferro Alloys Ltd, Burdwan, West Bengal; and Sova Ispat Ltd, Durgapur, West Bengal are the major producers of ferro-manganese/silico-manganese.

Silico-manganese, a combination of 60-70% manganese, 16-28% silicon and 1.5 to 2.5% carbon is used as a more effective deoxidizing agent than high carbon ferromanganese in the production of various types of steels. It is also used as feedstock to produce refined alloys like medium and low carbon ferromanganese. It consumes around 4,750 to 5,250 kWh power per tonne of silico-manganese produced. Silico-manganese has emerged as a more important alloy than ferro-manganese. The country, thus, has emerged as a leading producer of silico-manganese. Silico-manganese was also produced by a number of small-scale ferro-alloy producers. The total production of ferro-manganese in 2016-17 was about 5,18,000 tonnes which remained same in 2017-18. Estimated Consumption of ferro-manganese was 50,800 tonnes in 2017-18. The production of silico-manganese (including medium carbon & low carbon silico manganese) which was about 3,00,625 tonnes in 2016-17 increased to 3,11,326 tonnes in 2017-18. In 2017-18, the total consumption of silico-manganese by all industries has been estimated at 1,22,600 tonnes in 2017-18.

Ferrro-chrome/Charge-chrome

Ferro-chrome when added to steel imparts hardness, strength and augments its stainless characteristics. Carbon content classifies the ferro-chrome alloy into high carbon (6-8%), medium carbon (3-4%) and low carbon (1.5-3%), although chromium content in all the three grades is around 60-70%. Around 2.5 tonnes chrome ore with an estimated power consumption of 4,500 kWh is required to produce one tonne of ferro-chrome. Ferro-chrome is produced by electric carbothermic reduction of chromite.

FACOR Alloys Ltd, Garividi, Andhra Pradesh; Jindal Steel & Power Ltd, Raigarh, Chhattisgarh; Standard Chrome Ltd, Raigarh, Chhattisgarh; SAL Steel, Kachchh-Bhuj, Gujarat; Balasore Alloys Ltd, Balasore, Odisha; IDCOL Ferro Chrome Plant, Jajpur Road, Odisha; Indian Metals & Ferro Alloys Ltd, Therubali, Odisha; Jindal Stainless Ltd, Duburi, Odisha; Nava Bharat Ferro Alloys Ltd, Dhenkanal, Odisha; Utkal Manufacturing Services Ltd,

Choudhwar, Odisha; Rawat Ferro Alloys, Cuttack, Odisha; Rohit Ferro Tech. P. Ltd, Bishnupur, West Bengal and Sri Vasavi Ind. Ltd, Bishnupur, West Bengal are the major ferro-chrome producers. A sizeable quantity is also produced by units in the small-scale sector.

The total production of ferro-chrome/charge chrome in 2016-17 was about 9,44,000 tonnes which remained same in 2017-18. The consumption of ferro-chrome was estimated at 14,600 tonnes in 2017-18.

Ferro-silicon

Ferro-silicon contains about 75-90% silicon and minor amounts of iron, carbon, etc. It is produced by using quartzite, iron ore, coke and electrode paste. Around 1.75 to 2 tonnes quartzite is required to produce one tonne of ferro-silicon. A very high consumption of power, i.e., 9,000 to 10,000 kWh is required to produce one tonne ferro-silicon. It is a powerful deoxidising agent and its major applications are in electrical steel used for transformers and dynamos, alloy steel for tools & automobile valves and in iron casting and mineral dressing. Ferro silicon is used by the military to quickly produce hydrogen for balloons. For this, chemical reaction of sodium hydroxide, ferro-silicon and water is utilised.

Bharat Alloys & Energy Ltd, Kurnool, Andhra Pradesh; VBC Ferro Alloys, Medak, Andhra Pradesh; SMS Smelters Ltd, Lekhi, Arunachal Pradesh; Visvesvaraya Iron & Steel Plant, Bhadravati, Karnataka; Silical Metallurgic Pvt. Ltd, Palakkad, Kerala; Jayantia Alloys, Meghalaya and Indian Metals & Ferro Alloys Ltd, Therubali, Odisha are the major producers of ferro-silicon. Small-scale producers of ferro-silicon are also in operation in Kerala and Tamil Nadu. In Meghalaya, three units have sprung up that produce ferro-silicon.

The production of ferro-silicon in 2016-17 was about 90,000 tonnes which remained same in 2017-18. The domestic consumption of ferro-silicon in the organised sector was estimated at 23,400 tonnes in 2017-18.

NOBLE FERRO-ALLOYS

Noble ferro-alloys are one of the vital additive inputs required especially in production of alloy and special steel. Noble ferro-alloys also refer to alloys used in small quantities and are relatively expensive compared to bulk ferro-alloys. These are used in the production of steel as deoxidant and alloying agents.

These high temperature alloys impart strength, resistance and stability within a temperature range from 260 to 1200 ^{o}C. These alloys are used generally in turbine engines, power plants, furnaces and all pollution control equipment. Noble ferro-alloys include ferro-vanadium, ferro-titanium, ferro-nickel, ferro-molybdenum, ferro-tungsten and ferro-niobium. In India, noble ferro-alloys are mostly manufactured through alumino-thermic process.

Ferro-nickel

The consumption and Production of ferro-nickel were not reported in the organised sector.

Ferro-molybdenum

There were five important units, namely, Mehra Ferro-alloys, Electro Ferro-alloys Pvt. Ltd, India Thermit Corporation, Dandeli Steel & Ferro-alloys Ltd and Eastern Metals & Ferro-alloys Ltd. The all India production which was 1,459 tonnes in 2015-16 increased to 1,603 tonnes in 2016-17.

Ferro-tungsten

The consumption and Production of ferro-tungsten in 2016-17 were not reported in the organised sector.

Ferro-vanadium

Production of ferro-vanadium in 2016-17 was 1329 tonnes which increased to 1,331 tonnes in 2017-18.

Others

Mishra Dhatu Nigam Ltd (MIDHANI) (A Govt. of India Enterprise), Hyderabad, produced chiefly cobalt, molybdenum, titanium and tungsten-based super-alloys.

The production details of various types of bulk ferro-alloys and noble ferro-alloys in 2015-16 to 2017-18 are furnished in Table- 2.

Information on plant-wise capacity of principal ferro-alloys in India together with general specifications of products is given in Table-3. Consumption of principal alloys by different industries is given in Table- 4.

Table – 3 : Statewise, Plantwise Capacity and Specifications of Principal Ferro-alloys Produced in India

Name and location of the plant	Product	Specifications	Installed capacity (tpy)
Andhra Pradesh			
Andhra Ferro-alloys Ltd Srinivasanagar, Distt. Vizianagaram	HC ferro-chrome	Cr: 60-65% max, Si: 2-4% max, C: 6-8% max, P: 0.040% max, S: 0.040% max	
	Silico-manganese	Mn: 60% min, C: 2.5% max, Si: 14% min, P: 0.3 % max, S: 0.035% max	20,000
FACOR Alloys Ltd Shreeramnagar, Garividi Distt. Vizianagaram	HC ferro-manganese	Mn: 70-80%, C:6-8%, Si: 1-5 % max, P: 0.35% max, S: 0.05% max, Size: 25-150 mm +/- 10%, Corresponding ISI specification: IS 1171-2011.	72,500 (For all ferro-alloys)
	HC Ferro-chrome	Cr: 60-63%, Si: 3-4%, C: 6-8%, P: 0.03-0.05% (max), S: 0.03-0.05% (max)	90,345
	Silico-manganese	Mn: 60-70%, Si: 16-20% , C: 2.0% max, S: 0.03%, P: 0.3 %, Size: 10 - 150 mm +/- 10%, Corresponding ISI specification: IS 1470-1990.	
	Ferro-silicon	Si: 60-80%, C: 0.15% max, P: 0.05%, S: 0.05% max, Al : 1-15% max, Size: 25-150 mm +/- 10%, Corresponding ISI specification: IS 1110-2011.	
	Ferro- silicon- magnesium	Mg: 4-30%, Si: 44-55 %, Al: 1.00%, Ca: 1.0-4.0%,	
	Silico-chrome	NA	
Other ferro-alloys	NA		
Deccan Ferro Alloys (P) Ltd Chintalapalem (PO), Pendurthi (SO) Vizianagaram	Silico-manganese	NA	30,000
Jindal Stainless Ltd (Ferro Alloys Division) Jindal Nagar, Kothavalasa Distt. Vizianagaram.	HC ferro-chrome	Cr: 62%, Si: 2.5%, C: 7-8%, P: 0.040%,	40,000
Sree Sarda Alloys Ltd Ravivalsa, Tekkali Mandal Distt. Srikakulam.	Ferro-chrome	NA	6,000
Metkore Alloys and Industries Ltd Srikakulam.	H C ferro-chrome	NA	25000
Siri Smetters & Energy Pvt. Ltd; Distt.Vizianagaram.	Silico-manganese	NA	8,500
Maithan Alloys Ltd. Visakhapatnam.	Ferro Alloy	NA	1,20,000 (Total)
MDA Mineral Dhatu AP Pvt. Ltd Distt.Vizianagaram.	Ferro Mn Silico Mn	NA NA	9,000 11,000

(Contd.)

Table- 3 (Contd.)

Name and location of the plant	Product	Specifications	Installed capacity (tpy)
Nav Bharat Ventures Ltd Distt. Khammam	Silico Mn Ferro Mn	NA	1,25,000
Anjaney Alloys Ltd, Atchutapuram Distt. Visakhapatnam	Ferro alloys	NA	120,000
M.B.SMELTERS Pvt. Ltd, Hindupur, Distt. Anantapur	Ferro silico manganese HC ferro-manganese	NA NA	NA 4000
Chhattisgarh Hira Group of Industries Jain Carbides & Chemical Ltd (i) Unit-1, Urla, Distt. Raipur.	HC ferro-manganese	Mn: 70-75%, Si: 1.5% (max), C: 6-8% (max), P: 0.40% (max), S: 0.05% (max)	7,000
	Silico-manganese	Mn: 60-65%, Si: 13-17% (max), C: 2.5% (max), P: 0.35% (max), S: 0.03% (max)	20,000
(ii) Unit-2, Urla, Distt. Raipur	HC ferro-manganese Silico-manganese	 Mn: 60-65%	14,000 12,000
(iii) Hira Ferro Alloys Ltd Urla, Distt. Raipur.	HC ferro-manganese	Mn: 70-75%, Si: 1.50% max, C: 6-8 %, P: 0.30% max, S: 0.05% max	60,500
	Silico-manganese	Mn: 60-65%, Si: 14-17%, C: 2.0% max, P: 0.35% max, S: 0.05% max	
(iv) Alok Ferro-Alloys Ltd Raipur.	Silico-manganese	NA	18,000
INDSIL Energy & Electrochemical Ltd Raipur, Chhattisgarh	HC ferro-manganese	N A	25,000
	Silico-manganese	Mn: 55% (min), Si: 23-27%, C: 0.1 % (max)/0.2%, (max)/0.3% (max), S: 0.02% (max), P:0.15% (max)	21,500
Sarda Energy & Minerals Ltd (Formerly Raipur Alloys & Steel Ltd)	Ferro-manganese Silico-manganese	– –	66,000 –
Chhattisgarh Electricity Co. Ltd Siltara, Raipur.	HC ferro-manganese	Mn: 70-75%, Si: 1.5-2.0%, C: 6.0-8.0%, P: 0.35-0.40%, S: 0.05 (max)	36,000
	Silico-manganese	Mn: 60-65% , Si: 15-20%, C: 2.0-2.5%, P : 0.3-0.35 %, S: 0.05% (max)	NA
Nav-chrome Ltd Urla Industrial Area Distt. Raipur.	HC ferro-manganese Silico-manganese HC ferro-chrome	NA NA NA	21,560 14,700
Deepak Ferro Alloys Ltd	Ferro-manganese		5,000
VA Power & Steel Pvt. Ltd Distt.Raigarh	Ferro-silicon Silico-manganese	NA NA	8,100 14,400

(Contd.)

Table- 3 (Contd.)

Name and location of the plant	Product	Specifications	Installed capacity (tpy)
Urla Industrial Area Distt. Raipur.	HC ferro-manganese MC ferro-manganese LC ferro-manganese Silico-manganese Ferro-silicon	Std. Specified	 5,000
	Ferro-chrome		5,000
	LC ferro-chrome HC ferro-chrome	NA Cr: 60-70%, Si: 2 to 4%, S : 0.05%, C: 6 to 8%	
	Silico-chrome Others		
Jindal Steel & Power Ltd Kharsia, Distt. Raigarh.	HC Ferro-chrome	Cr: 60-66%, C: 6 to 8%, Si: 4% (max), P: 0.050 (max), S: 0.050 (max),	36,000
	Silico-manganese	Mn: 60%, Si: 15%, P: 0.3% max	
Sai Chemical Pvt Ltd, Tadesara, Distt. Rajnandgaon	Silico-manganese	NA	10,200
MSP Spong Iron Ltd, Manuapali, Jamgaon, Raigarh (Chhattisgarh)	Silico-manganese	NA	42057
Goa			
Karthik Alloys Ltd Cuncolim, Distt. South Goa.	Silico-manganese	Mn:All graded Sio_2:98-99% Cao:30% Mgo_2:50%	25,500
Gujarat			
Essel Mining & Industries Ltd Vapi, Distt. Valsad.	Ferro-vanadium	V: 50%, C: 0.1% (max), S and P: 0.05% each, Al: 1.5%	400
	Ferro-molybdenum S: 0.08%, P: 0.06%,	Mo: 60%, C: 0.1%, Al: 0.5%	1,200
	Ferro-titanium	NA	600
Electro Ferro-Alloys (Pvt.) Ltd Ahmedabad, Gujarat.	Ferro-molybdenum Ferro-silico-zirconium	NA	300
Baroda Ferro-Alloys Distt. Panchmahals.	HC ferro-chrome	NA	3500
Sal Steel Ltd, Gandhidham, Distt. Kachchh	Silico mangenese	NA	61890
Sahjanand Ferro Alloys Distt.Vadodara.	NA	NA	3,000
Haryana			
Haryana Ferro-Alloys Ltd Gohana Road, Distt. Rohtak.	–	–	2,500
Jammu and Kashmir			
Shree Sitaram Industries Pvt. Ltd Phase II, SIDCO Complex, Bari Brahmana.	Ferro-chrome	NA	3,325
Jharkhand			
Anjaneya Ferro Alloys Ltd, Mihijam Distt. Jamtara	Ferro-alloys	NA	41,850
Bihar Foundry & Casting Ltd (Unit Gautam Ferro Alloys)	Silico-manganese	Si: 14%, Mn : 60%	34,000
Castron Technologies Ltd, Bokaro Industrial Area,	Ferro-manganese Silico-manganese	NA NA	14,400

(Contd.)

Table- 3 (Contd.)

Name and location of the plant	Product	Specifications	Installed capacity (tpy)
Shivam Iron & Steel Co. Ltd, Ferro Alloys Division, Jambad, Udnabad, Giridih	Ferro-manganese Silico-manganese	NA	37,400
Dayal Ferro Alloys Ramgarh Cantt.,Hazaribagh	Silico-manganese	NA	10,000
Jamshedpur Mineral & Chemicals Distt. Saraikela-Kharaswan.	Ferro-manganese	NA	4,800
Karnataka			
Sandur Manganese & Iron Ores Ltd Vyasanakere, Distt. Ballari	HC ferro-manganese Silico-manganese Ferro-silicon	NA	29,100 36,000 24,000
Dandeli Steel & Ferro Alloys Ltd Dandeli, Distt. Uttar Kannada.	Ferro-manganese MC ferro-manganese	Mn: 70-75%, C: 0.1%, Si: 2.4%, P : 0.15%, S: 0.05%, Size: 37 mm Mn: 70-75%, C: 1.5%, P: 0.25%, Si: 2%, S: 0.05%	6,000
S.R. Chemicals & Ferro-Alloys KIADB Honaga, Distt. Belagavi.	LC Ferro-manganese	Mn: 70%, C: 0.1%, P: 0.12%	25
Thermit Alloys (Pvt.) Ltd N-7, Industrial Estate Distt. Shivamogga	Ferro-manganese Silico-manganese Ferro-chrome Ferro-silicon Silico-chrome	NA NA NA NA NA	 1,200
Padmavati Ferrous Ltd Dist. Ballari	Ferro-manganese Silico-manganese Ferro-silicon	Mn: 24 to 48% Fe:4 to 30%	5,000 5,000 2,000
Kerala			
The Silical Metallurgic Ltd Wayalur, Distt. Palakkad.	Silico-manganese	Mn: 70-75%	3,600
INDSIL Electrosmelts Ltd Pallatheri, Distt. Palakkad.	Silico-manganese Ferro-silicon	NA NA	NA NA
INDSIL Hydro Power & Manganese Ltd Distt. Palakkad, Kerala	Silico-manganese	Mn: 55% (min), Si: 23-27%, C: 0.1 % (max)/0.2% (max)/0.5% (max), S: 0.02% (max), P: 0.15% (max)	14,400
Shri Laxmi Electro Smelters (Pvt.) Ltd Industrial Development Area Erumathala, P.O. Aluva- 683 105.	Ferro-silicon	NA	NA
Madhya Pradesh			
MOIL Ltd (formerly Manganese Ore India Ltd) Ferro-manganese Plant Bharweli (Manjhara), Distt. Balaghat.	HC ferro-manganese	Mn:78±1%, P: 0.35% (max), C: 6.8%	10,000
Jalan Ispat Castings Ltd Industrial Area Meghnagar, Distt. Jhabua.	Silico-manganese	Mn: 60-65%, Si: 15-20%, C: 2% (max), P: 0.35%	12,000
Crescent Alloys Pvt. Ltd Seoni.	Ferro-silicon Ferro-manganese	N.A. N.A.	4,500 (Total)
S.R Ferro Alloys, Jhabua	Silico- manganese	NA	8,639

(Contd.)

Table- 3 (Contd.)

Name and location of the plant	Product	Specifications	Installed capacity (tpy)
Maharashtra			
Chandrapur Ferro Alloy Plant, (Erstwhile Maharashtra Electrosmelt Ltd) Distt. Chandrapur- 442 401.	HC ferro-manganese	Mn: 70-74 % and 74-78% , Si: 1.5% (max), C: 6.8%, P: 0.43%. (max)	50,000
	MC ferro-manganese	Mn : 70-74% and 74-78% , Si: 2% max, C: 1 - 3% , P: 0.4% max	1,800
	LC ferro-manganese	Mn: 70-74% and 74-78% , Si: 2% (max), C: 1.5% max, P: 0.4% max.	NA
	Silico-manganese	Mn: 60-65% and 65% Min, Si: 15-20%, C: 2 % max, P: 0.35% max	32,765
Nagpur Power & Industries Ltd P.O. Khandelwal Nagar Distt. Nagpur.	Silico-manganese	Mn: 60-65%, P: 0.35%	NA
	HC ferro-manganese	Mn: 70-75%, P: 0.4%	NA
Bharat Pulverising Mills Ltd Andheri, Mumbai.	Ferro-molybdenum	NA	200
	Ferro-tungsten	NA	(Total)
	Ferro-vanadium	NA	
Sunbel Alloys Co. of India Ltd Thane-Belapur, Mumbai.	Ferro-molybdenum	NA	300
	Ferro-silicon	NA	(Total)
	Ferro-tungsten	NA	
	Ferro-vanadium	NA	
Natural Sugar and Allied Ind. Ltd, Sainagar, Ranjani, Distt. Osmanabad.	HC Ferro-manganese	Mn: 70-75%, Si: 2-2.5%, P: 0.4%, C: 6-8%	16,500
	Silico-manganese	Mn: 60-65%, Si: 13-15%, P: 0.3%,C: 2-2.5%	16,500
Mahavir Ferro Alloys Paonakhari, Distt- Bhandara	Ferro Alloys	NA	100
Minex Metallurgical Co. Ltd Distt. Nagpur	Ferro titanium	NA	250
Meghalaya Maithan Alloys Ltd, Distt. Rio Bhoi.	Ferro-manganese	NA	28,000
Odisha			
Ferro Alloys Corporation Ltd Ferro Chrome Plant Randia D. P. Nagar Randia, Distt. Bhadrak.	HC ferro-chrome/ Charge-chrome	Cr: 60-64%, Si: 3-4%, C: 6-8%, P: 0.03-0.05% (max), S: 0.03-0.05% (max)	75,000
Tata Steel Ltd, Ferro Manganese Plant, Joda, Distt. Keonjhar	HC ferro-manganese	Mn: + 70%, C: 6-8 %, Si :0.3-2%, P: 0.2-0.4%,	50,400 -
	Silico-manganese	Mn: 46-48%,	65,000
	Ferro-chrome	Si: 14.56%, P: 0.197%	
Tata Steel Alloys Ltd, Ferro Alloy Plant Cuttack.	Ferro-chrome		50,000
Tata Steel Ltd, Charge-chrome Plant Bamnipal, Distt. Keonjhar.	Ferro-chrome	NA	65,000
	Charge-chrome	Cr: 60% (min), Si: 4% (max) , C: 8% (max), P: 0.03% (max), S: 0.03% (max)	55,000
	Ferro-manganese	Mn: 46 to 49%	50,400
Balasore Alloys Ltd, Balgopalpur, Distt. Balasore. (Formerly Ispat Alloys Ltd)	HC ferro-chrome	Cr: 60-63% ,Si: 3.5% (max) Grade I C: 8.0% (max), Cr: 57-60% S: 4.0% (max) Grade II, C: 8.0% (max)	150,000

(Contd.)

Table- 3 (Contd.)

Name and location of the plant	Product	Specifications	Installed capacity (tpy)
Jeypore Sugar Co. Ltd,	HC ferro-chrome	Cr: 60-65%,	22,000
(Ferro-manganese Plant) Distt. Rayagada.		P: 0.055%, C: 2%, S: 0.05%, Si: 4%, Fe: Balance	
	Silico-manganese	Mn: 60-65%, Si: 15-18%, C: 2% max.	22,000
J. B. Ferro Alloys, At Tanto P.O.Bhadrashahi, Keonjhar.	LC ferro-manganese	NA	200
IDCOL Ferro Chrome & Alloys Ltd Jajpur Road, Distt. Jajpur.	HC ferro-chrome	Cr: 62-65%, Si: 1.5 to 8%, C: 8% (max)	18,000
Indian Metals & Ferro Alloys Ltd (IMFA)	HC ferro-chrome/ Charge-chrome	Cr: 60%	62,500
Indian Metals & Ferro Alloys Ltd (IMFA), Therubali, Distt. Rayagada.	Ferro-silicon HC ferro-chrome	Si: 70-75%, Cr: 60%	61,000 116,400
Superb-Metal Alloys (Pvt.) Ltd Rairangpur, Distt. Sundergarh.	Ferro-columbium Ferro-molybdenum Ferro-tungsten Ferro-vanadium	NA	300 (Total)
Jabamayee Ferro Alloys Ltd Sukinda, Distt. Jajpur	HC Ferro-chrome	NA	15660
M M Minerals & Alloys Pvt Ltd Jamirdiha, Distt. Mayurbhanj.	HC Ferro-chrome	NA	25000
T S Alloys Ltd. Anantapur, Cuttack.	Ferro-chrome	NA	59400
Stork Ferro and Mineral Industries Pvt Ltd Somnathpur, Distt. Balasore	Silico manganese Ferro manganese Ferro-chrome	NA NA NA	25,000 29,700 25,000
Aarti Steel Ltd, Ghantikhal, Distt. Cuttack.	Ferro-chrome	NA	25,000
Kalinga Ferro Ispat Pvt.Ltd Mandia, Distt. Jajpur	HC Ferro-chrome	NA	8052
Puducherry			
The Silical Metallurgic Ltd	Ferro-silicon Ferro-silicon-magnesium	– –	10,560 1,800
VSK Ferro Alloys Ltd Thuthipet.	Ferro-silicon	Si: 72.3%, C: 0.15%, S: 0.051%, Mn: 0.55%, P: 0.042%, Fe: 26.13%	3,000
Snam Alloys (Pvt.) Ltd Kariamanikam, Distt. Puducherry.	Ferro-silicon Ferro-silicon-magnesium	NA	12,000

(Contd.)

Table- 3 (Contd.)

Name and location of the plant	Product	Specifications	Installed capacity (tpy)
Punjab			
Mehra Ferro-Alloys Verka, Amritsar.	Ferro-molybdenum Ferro-vanadium Ferro-titanium Ferro-tungsten Ferro-boron	NA	300 (Total)
Sikkim			
Akshay Ispat & Ferro Alloys Ltd, Mamring, Namchi, Distt. South Sikkim.	Ferro-silicon	NA	6,000
Telangana			
VBC Ferro Alloys Ltd	Ferro-silicon	–	10,000
Village Rudraram Patancheru Mandal Distt. Medak.	Ferro-chrome Silico-manganese/ Ferro-manganese	– –	27,000 31,500
Shree Raghvendra Ferro Alloys Pvt. Ltd, Nalgonda	Silico-manganese	NA	15000
Nava Bharat Ventures Limited Paloncha, Distt. Khammam,	HC Silico-manganese HC ferro-manganese	NA	1,25,000
Uttar Pradesh			
The India Thermit Corp. Ltd Fazalganj, Distt. Kanpur.	Ferro-molybdenum Ferro-titanium Ferro-chrome Ferro-boron Chromium metal LC ferro-manganese Ferro-vanadium	NA	300 (Total)
Hindustan Ferro-Alloys Hamirpur.	Ferro-siIicon	NA	3,200
West Bengal			
Bhaskar Shrachi Alloys Ltd, Durgapur	Silico-manganese	Si: 15%	24,000
Cosmic Ferro Tech. Ltd, Bishnupur, Distt. Bankura.	HC ferro-manganese	Mn: 66-71%, Si: 1.4% C: 6.5-7%, P: 0.3%	45,375
	Silico-manganese	Mn: 61-65%, Si: 15.5% C: 1.9%, P: 0.28%	
Sri Gayatri Minerals Pvt. Ltd, WBIIDC Growth Centre, Bishnupur, Bankura.	HC silico-manganese	Mn: 60-65% & 65% min, Si: 15% min & 16% min, C: 2% max, P: 0.3 max, S: 0.03 max	24,000
Industrial Metals & Ferro Alloys Jamuria, Burdwan.	LC ferro-titanium LC ferro-chrome	NA NA	20 20
Hira Concast Ltd, Salanpur Burdwan.	Silico-manganese Ferro-manganese	NA NA	11,455 15,225

(Contd.)

Table- 3 (Concld.)

Name and location of the plant	Product	Specifications	Installed capacity (tpy)
Karthik Alloys Ltd (I & II) Durgapur.	MC silico-manganese	Mn: 54-56%, C: 0.2-0.5% Si: 22-25% P: 0.15-0.2, S: 0.05%	19,000
	LC silico-manganese	Mn: 53-55%, C: 0.15-0.2% Si: 25-28% P: 0.15-0.2%, S: 0.05%	NA
Maithan Alloys Ltd, Burdwan.	Ferro-manganese Silico-manganese Ferro-chrome	NA	94,600 (Total)
Monnet Ferro Alloys Ltd Burdwan.	Silico-manganese	NA	12,500
Shyam Ferro Alloys Ltd Palitpur Road, Burdwan. Dewandighi (Katwa Road)	HC silico-manganese HC ferro-manganese HC ferro-chrome	NA	104,957 (Total)
Srinivasa Ferro Alloys Ltd Durgapur, Burdwan.	HC ferro-manganese	Mn: 70-74%, 74-76% Si: 1.5% max, C: 6-8%,, P: 0.25, 0.30 and 0.40 max, S: 0.03 max	10,800
	HC silico-manganese	Mn: 60-65% & 65% min Si: 15% min & 16% min C: 2% max, P: 0.3% max, S: 0.03% max	23,400
	LC silico-manganese	NA	5,400
Shri Vasavi Industries Ltd WBIIDC Industrial Growth Centre, Bishnupur, Distt. Bankura.	HC ferro-chrome	Cr: 58-60%, Si: 2-4%, C: 8% max, P: 0.05% max S: 0.05% max	45,000 (16MVA 1No. & 12MVA 1 No.)
Modern India Con-Cast Ltd, WBIIDC Industrial Growth Centre, Bishnupur, Distt. Bankura.	Bulk ferro-alloys	–	22,000
Rohit Ferro Tech. Ltd Bishnupur, Distt. Bankura	HC ferro-chrome	Cr: 60% (min), C: 8% (max) Si: 3.5% (max), P: 0.03% (max) S: 0.04% (max)	45,375
Sharp Ferro Alloys, Durgapur	HC silico-manganese	NA	42,500
Nilkantha Ferro Ltd, Bankura	HC silico-manganese Silico-manganese Slag	NA NA	39,960 40,200
Lalwani Ferro Alloysa Ltd, Kolkata	Silico-manganese HC ferro mangenese	NA NA	48,780 69,285
Ispat Damodar Pvt. Ltd, Sponge Iron Plant Nabagram, PS-Neturia Digha, Purulia.	Ferro-alloys	NA	40,000
Sonic Thermal Pvt. Ltd, Ferro Alloys Plant Namobandh, Sitarampur Bankura.	Silico-manganese	NA	39,500
Shree Ambry Ispat Pvt. Ltd, Basdebpur, Distt. Bankura.	Ferro-manganese Silico-manganese Ferro-silicon	NA NA NA	22,600 17,400 7,600

Note: *HC : High carbon. MC: Medium carbon. LC: Low carbon*
Source: *Information collected by IBM*

Table – 4 : Consumption* of Principal Ferro-alloys, 2017-18 (P)

(In tonnes)

	Consumption
Ferro-chrome	14600
Ferro-manganese	50800
Ferro-silicon	23400
Silico-manganese	122600

Note: *1) *Includes actual reported consumption and/or estimates made whereever required and paucity of data, hence consumption may not be complete*

ENVIRONMENTAL ASPECTS AND FUTURE SCOPE

Studies reveal that depending on the ferro-alloy manufactured, waste generation per day in 35 tpd and 50 tpd ferro-silicon and ferro-chrome plants may be in the following range:

Silica fines: 7 to 8 tonnes/day

Fe-Cr slag (fined boulder): 40 tonnes/day

Charcoal & coke fines: 7 to 8 tonnes/day

To utilise the waste from ferro-alloys industries, a typical Fe-Si or Fe-Cr manufacturing unit can provide material for 10 small-scale units for manufacturing bricks and each unit can produce 2,400 bricks per day. Other units which can be set up are board-and-briquette-making units. The utilisation of waste materials for converting them into building materials will result in bringing down the building material cost, and therefore, lead to conservation of natural resources like clay and sand.

Domestic vanadium sludge is used for producing ferro-vanadium by Essel Mining & Industries Ltd, Gujarat.

The implementation of the Kyoto Protocol by the European Union provides significant opportunities for Ferro-alloys Industry in India to implement CO_2 reduction technologies, which could be traded in terms of carbon credits. Installation of an electricity generation facility driven by CO-rich furnace gas is an obvious means by which CO_2 saving could be achieved.

WORLD REVIEW

The major ferro-alloys producing countries were China, South Africa, India, Russia and Kazakhstan. Estimated world production of bulk ferro-alloys of chromium, manganese and silicon was about 39.30 million tonnes produced in 2014. The markets for the bulk alloys like high carbon ferro-manganese, silico-manganese, ferro-silicon and high carbon ferro-chrome showed varied responses to the fluctuations in steel and stainless steel production which seem to have influence as per the different circumstances that prevailed in different markets.

World production of various ferro-alloys in principal producing countries is furnished in Table- 5.

Table – 5 : World Production of Ferro-alloys, 2015 to 2017
(By Principal Countries)

(In tonnes)

Country	Ferro-alloys	2015	2016	2017
Albania	FeCr	43350	44411	59000
Armenia	FeMo	5576	6526	6588
Austria	FeMo	4000	4000	4000
	FeNi	2500	2500	2500
	FeV	8000	7000	8000
Bosnia & Herzegovina	Fe-Alloys	18716	28138	30473
Czech Republic[e]	FeV	6200	6300	6600
Finland	FeCr	457000	469000	415000
France[e]	FeMn	126000	126000	126000
	FeSiMn	65000	65000	65000
	FeSi	45000	45000	45000
	Si-Metal	100000	80000	80000
	Other Fe-Alloys	60000	60000	60000
Georgia	FeMn	4500	4500	4500
	FeSiMn	217289	244228	284034
Germany	FeCr	17800	17800	17800
	Si-Metal	29953	29940	31915
	Other Fe-Alloys	8200	8200	8200
Greece	FeNi	89129	87880	86140
Iceland	FeSi	121556	128019	116811
Italy	FeSiMn	82000	90000	91000
Kosovo	FeNi	39200	22800	23000
Macedonia	FeNi	17699	10603	7175
	FeSi	46047	24431	21000
Norway	FeMn	350000	380000	300000
	FeSiMn	315000	315000	315000
	FeSi (a)	243813	249475	240813
	Si-Metal	150000	150000	150000
Poland	FeMn	-	-	66
	FeSi	77754	77682	65732
	Other Fe-Alloys	460	12517	24800
Romania	FeSiMn	30000	30000	30000
Russia	Spiegeleisen	7000	7000	7000
	FeCr	363286	268439	436280
	FeSiCr	4200	4200	4200
	FeMn	155700	124200	167100
	FeSiMn	188895	203216	52095
	FeMo	4660	4881	4726
	FeNi	20000	20000	20000
	FeSi	1057909	935912	840764
	FeV	12277	12392	12588
	Si-Metal	48000	48000	48000
	Other Fe-Alloys	34000	34000	34000

(Contd.)

(Table-5 Contd)

Country	Ferro-alloys	2015	2016	2017
Slovakia	FeMn	24500	35000	42115
	FeSiMn	27100	35700	40265
	FeSi	38200	30900	52436
	Other Fe-Alloys	5700	4300	4000(e)
Spain	FeMn	126200	126000(e)	126000(e)
	FeSiMn	134000	134000(e)	134000(e)
	FeSi(e)	80000	80000	80000
	Si-Metal	30000	30000	30000
Sweden	FeCr	82616	81102	114101
Turkey	FeCr	82560	80000(e)	80000(e)
	FeSiCr(e)	3000	3000	3000
Ukraine	FeMn	100209	184310	211124
	FeSiMn	750181	876756	875031
	FeNi	95209	84025	74459
	FeSi	114826	126297	118371
	Other Fe-Alloys	19360	106244	87094
Egypt	FeSi*(b)	54767	56000	56000
	Other Fe-Alloys(b)	12000	12000*	12000
South Africa	FeCr	3686000	3700000*	3700000
	FeMn	595000	600000*	600000
	FeSiMn	210000	210000*	210000
	FeSi	91000	90000*	90000
	FeV	15000	16000*	16000
	Si-Metal	57000	60000*	60000
Zimbabwe	FeCr	190837	170000*	170000
Canada	FeNb	5385	6213	6300
	FeSi*	38000*	38000*	38000
	FeV	800	600*	800
	Si-Metal*	30000*	27000*	27000
Dominican Republic	FeNi	-	33203	43894
Mexico	FeMn	67919	84529	90010
	FeSiMn	139363	134251	148142
USA	FeSi & Si-Metal	424000	425000	425000
Argentina	FeSiMn	11000	10000	10000
	FeSi	11000	11000	11000
Brazil	FeCr	155421	(c) 150240	(c) 171531
	FeSiCr	36092	-	-
	FeSiMg*	20000	20000	20000
	FeMn(d)	129000	124000	133074
	FeNi(e)	30300	44538	43800
	FeNb	51874	44390	58690
	FeSi*	200000	200000	200000
	Si-Metal	150000	110000	110000
	Other Fe-Alloys*	40000	40000	40000

(Contd)

Tabe- 5 (Concld.)

Country	Ferro-alloys	2015	2016	2017
Chile	FeMo*	14500	14500	14500
Columbia	FeNi	104773	105976	116016
Venezuela	FeMn	12000	12000	12000
	FeSiMn*	14000	14000	14000
	FeNi*	50000	50000	50000
	FeSi*	80000	80000	80000
Bahrain	FeSiMn	15000	15000*	15000*
Bhutan	FeSi*	104500	106000	109000
Burma	FeNi	65466	64462	62367
China	Fe-Alloys	36664000	35588000	32887000
	Si-Metal	1953500	2101000	2200000*
India	FeAl (f)	3212	4345	4423
	FeCr (f)	944000	944000	944000
	FeSiMg (f)	20541	20183	15978
	FeMn (f)	518000	518000	518000
	FeSiMn (f)	269920	300625	311326
	FeMo (f)	1459	1603	1205
	FeSi (f)	90000	90000	90000
	FeTi (f)	198	291	281
	FeV (f)	937	1329	1331
Indonesia	FeSiMn*	20700	20000	6000
	FeNi*	182000	411000	714000
Iran	FeCr*(g)	8000	8000	8000
	FeSi*(g)	50000	50000	50000
Japan	FeMn	465952	473740	456460
	FeNi	396969	333448	312324
	Other Fe-Alloys	73651	77453	79809
Kazakhstan	FeCr	1414476	1525222	1640299
	FeSiCr	74609	94467	110497
	FeSiMn	164189	135885	137006
	FeSi	86984	68779	59926
	Other Fe-Alloys	1662	-	-
Korea, Rep. of	FeMn*	355000	355000	355000
	FeSiMn*	196000	196000	196000
	Other Fe-Alloys*	4200	4200	4200
Korea, Dem.P.R.	Fe-Alloys*	16000	23000	30000
Australia	FeMn & FeSiMn (b)	278000	222000	245000
	Si-Metal*	51000	51000	49000
New Caledonia	FeNi	228484	261420	269961

Source: *World Mineral Production, 2013-2017 BGS*

Note: *FeAl : Ferro-aluminium; FeCr : Ferro-chrome; FeSiCr : Ferro-silico-chrome; FeSiMg : Ferro-silico-magnesium; FeMn : Ferro-manganese; FeSiMn : Ferro-silico-manganese; FeMo : Ferro-molybdenum; FeNi : Ferro-nickel; FeNb : Ferro-niobium; FeSi : Ferro-silicon; FeTi : Ferro-titanium; FeV : Ferro-vanadium*
**Ferro-silicon & silicon metal*

Notes:

(1) In addition to the countries listed, Bahrain and Chile also produce ferro-chrome

(2) In addition to the countries listed, Saudi Arabia also produces ferro-manganese and ferro-silico-manganese

(a) Sales

(b) Years ended 30th June of that stated

(c) Including ferro-silico-chrome

(d) Including ferro-silico-manganese

(e) Nickel content

(f) Years ended 31st March following that stated

(g) Years ended 20th March following that stated

(h) Included with óther ferro-alloys'

FOREIGN TRADE

Exports

In 2017-18, exports of ferro-alloys increased to 19,55,757 tonnes valued at ` 14,328 crore from 15,41,794 tonnes valued at ` 10,128 crore in the previous year. In terms of quantity, exports of ferro-silico-manganese were (42%) followed by ferro-chrome (40%), ferro-manganese (16%), ferro-silicon (1%). The other ferro-alloys together accounted for remaining (1%) which is negligible of exports in 2017-18. Exports were mainly to China (13%), Korea, Rep. of, Chinese Taipei/Taiwan & Japan (11% each), UAE (9%), Italy (5%), Iran & Indonesia (4% each) and Thailand (3%) (Tables-6 to 25).

Table – 6 : Exports of Ferro-alloys : Total (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**1541794**	**101280507**	**1955757**	**143284849**
China	281148	21804119	260427	19273609
Korea, Rep. of	217651	15515388	213833	16061463
Japan	156051	9916314	206701	15333602
Chinese Taipei/ Taiwan	174307	11773015	207530	15013870
UAE	67739	3786735	170032	12939420
Italy	89831	4795123	100712	6464670
Iran	35274	2138437	78334	5847094
Indonesia	41461	2692052	70187	5078436
Thailand	45687	2607458	67678	4715387
USA	21752	1638935	55758	4534247
Other countries	410893	24612931	524565	38023051

Table – 7 : Exports of Ferro-Boron (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**91**	**14608**	**103**	**14677**
South Africa	82	13247	78	11459
Slovenia	-	-	23	2910
Turkey	1	118	1	198
Brazil	7	940	1	110
UAE	1	294	-	-
Indonesia	++	9	-	-

Table – 8 : Exports of Ferro-Chrome (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**706756**	**52675081**	**791863**	**60038253**
China	265524	21012454	259855	19236998
Korea, Rep. of	192048	13830417	183321	13667043
Chinese Taipei/ Taiwan	107584	8007401	116111	8919092
Japan	57865	4481903	72820	5998342
USA	14744	1032919	39679	3092628
Italy	12845	878969	22734	1858059
Netherlands	21057	1066798	23481	1549020
Indonesia	1167	103986	17568	1185310
Mexico	8592	580279	14505	1121254
Thailand	3043	226372	9080	735682
Other countries	22287	1453583	32709	2674825

Table – 9 : Exports of Charge-Chrome (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**1**	**362**	**1**	**136**
Nepal	-	-	1	136
Uganda	1	362	-	-

Table – 10 : Exports of Ferro-Manganese (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**127368**	**7317747**	**307108**	**24302484**
UAE	30366	1582712	98823	8156712
Iran	11797	797807	37235	2953206
Indonesia	14721	939240	24779	1881373
Netherlands	8185	497215	14414	1209010
Italy	3765	215602	13150	987170
Chinese Taipei/ Taiwan	6856	365021	12060	839598
Japan	6011	332441	10927	800572
Korea, Rep. of	1315	68627	9485	763090
Pakistan	9257	467464	9517	656692
Turkey	2576	184877	7763	652329
Other countries	32519	1866741	68955	5402732

Table – 11 : Exports of Ferro-Molybdenum (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**162**	**121113**	**506**	**440840**
Oman	99	69143	303	268926
Netherlands	20	16570	90	90134
Belgium	20	13968	40	30741
Thailand	-	-	14	16006
Turkey	-	-	10	8221
Pakistan	5	3701	7	6443
South Africa	-	-	5	4402
Bangladesh	++	10	4	4361
Philippines	2	1327	3	3406
Indonesia	2	2070	4	2299
Other countries	14	14324	26	5901

Table – 12 : Exports of Ferro-Nickel (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**++**	**107**	**++**	**2**
USA	-	-	++	2
Ivory Coast/ Cote-D Ivoire	++	107	-	-

Table – 13 : Exports of Ferro-Niobium (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**13**	**19545**	**3**	**4679**
Malaysia	9	15707	2	2750
Pakistan	1	1165	1	1426
Indonesia	1	2194	++	503
South Africa	2	360	-	-
Chile	++	119	-	-
Other countries	246848	14466151	257331	17563674

Table – 14 : Exports of Ferro-Phosphorus (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**43**	**4968**	**162**	**16559**
Sweden	42	4838	120	14843
Oman	-	-	40	1642
Saudi Arabia	-	-	2	74
Japan	++	1	-	-
Italy	1	129	-	-

Table – 15 : Exports of Ferro-Silico-Chrome (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**8**	**858**	**-**	**-**
Nigeria	8	830	-	-
Uganda	++	28	-	-

Table – 16 : Exports of Ferro-Silico-Magnesium (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**9249**	**856923**	**10078**	**951910**
Turkey	1602	142045	2192	214601
USA	1566	136309	2264	192977
Mexico	1572	160194	892	85846
Iran	626	62289	675	71459
Saudi Arabia	819	74125	608	55127
South Africa	275	26015	496	48568
Brazil	375	32556	417	37614
Korea, Rep. of	292	25421	348	33629
Oman	332	30353	335	32429
Sri Lanka	172	17312	219	23744
Other countries	1618	150304	1632	155916

Table – 17 : Exports of Ferro-Silico-Manganese (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**672039**	**37948700**	**818015**	**54608451**
Japan	91759	5082732	122585	8516704
Chinese Taipei/ Taiwan	59541	3369568	78995	5218662
UAE	36261	2097008	69025	4588643
Thailand	41108	2285688	54371	3630865
Italy	71276	3580758	63422	3506746
Pakistan	30519	1637230	47844	3089507
Iran	21501	1160890	35801	2445546
Bangladesh	29554	1597740	35171	2244665
Indonesia	25178	1599073	27397	1962507
Malaysia	18494	1071862	26073	1840932
Other countries	246848	14466151	257331	17563674

Table – 18 : Exports of Ferro-Silicon (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**18381**	**1354987**	**20650**	**1815140**
Brazil	1953	173419	1807	163948
Bangladesh	4073	263043	1767	153576
Oman	681	50694	1644	140540
USA	574	65645	1143	119977
Korea, Rep. of	654	57795	965	92792
UAE	598	40685	1083	91718
Slovenia	967	92153	845	82861
Turkey	1675	71352	1654	82086
Iran	349	33889	851	75627
Pakistan	448	32986	733	66962
Other countries	6409	473326	8158	745053

Table – 19 : Exports of Ferro-Titanium (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**299**	**46063**	**564**	**110740**
UK	146	19581	182	34589
Belgium	-	-	75	13579
Korea, Rep. of	35	5606	60	13041
USA	-	-	47	9545
Netherlands	35	4478	55	8529
South Africa	9	2480	38	7859
Oman	20	4022	38	7746
Turkey	-	-	21	4149
Peru	3	722	14	3483
Iran	5	1065	8	2031
Other countries	46	8109	26	6189

Table – 20 : Exports of Ferro-Tungsten (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**11**	**12638**	**6**	**5845**
Pakistan	1	2143	5	2450
Finland	-	-	1	1884
Ireland	-	-	++	803
Thailand	-	-	++	523
UAE	-	-	++	185
Netherlands	10	10396	-	-
Turkey	++	99	-	-

Table – 21 : Exports of Ferro-Vanadium (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**460**	**493144**	**213**	**410524**
Netherlands	180	198865	80	189130
Belgium	170	177534	50	88803
Oman	10	9936	42	64473
USA	23	25046	20	41069
UAE	20	20298	15	18264
Turkey	1	984	2	3253
Pakistan	++	594	1	1296
Bangladesh	-	-	1	1094
Mauritius	5	5186	1	1081
Malaysia	1	808	1	799
Other countries	50	53893	++	1262

Table – 22 : Exports of Ferro-Columbium (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**3**	**6262**	**5**	**9965**
Peru	2	4290	4	8248
Malaysia	1	1766	1	1201
Pakistan	++	206	++	516

Table – 23 : Exports of Ferro-Zirconium (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**58**	**11240**	**++**	**24**
Iran	50	6727	++	24
UAE	1	143	-	-
Brazil	6	3567	-	-
Indonesia	1	803	-	-

Table – 24 : Exports of Ferro Selenium (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**++**	**860**	**++**	**1333**
Malaysia	++	855	++	1333
UAE	++	5	-	-

Table – 25 : Exports of Ferro-alloys (Others) (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**6852**	**395108**	**6480**	**553044**
Iran	313	23829	3036	240727
South Africa	740	87274	650	82987
Italy	1031	65249	913	60291
Saudi Arabia	170	26739	286	39064
Bangladesh	154	18696	234	25203
Brazil	95	13959	118	23212
Turkey	150	11769	140	14993
Bahrain	75	10012	101	14025
Japan	276	11122	315	11519
UAE	23	1382	188	10252
Other countries	3825	125077	499	30771

Imports

Imports of ferro-alloys increased by 16% to 5,44,266 tonnes in 2017-18 from 4,68,245 tonnes in the previous year. In terms of value, the ferro-alloys imports increased to ` 6,616 crore in 2017-18 from ` 5,101 crore in 2016-17. In terms of quantity, imports of ferro-silicon accounted for about 35% followed by ferro-nickel (29%), ferro-manganese (23%), ferro-chrome (7%), charge-chrome (3%), Other ferro-alloys together accounted for remaining 4% of imports in 2017-18. Imports were mainly from Bhutan & Malaysia (17% each), followed by Indonesia (10%), China & South Africa (8% each), Russia (5%), Brazil, Japan & Macedonia (4% each) and Korea,Rep. of (3%) (Tables-26 to 43).

Table – 26 : Imports of Ferro-alloys : Total (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**468245**	**51012884**	**544266**	**66164515**
Indonesia	17730	3382604	56400	8365100
Brazil	19766	7016221	23608	7661583
Bhutan	102845	5621073	94133	7651317
Malaysia	35063	1981242	91235	6105545
China	39898	4166814	45281	4042987
Russia	37097	3326171	28364	3821614
South Africa	77149	3973037	45148	3632975
Korea, Rep. of	20177	2070305	14039	3288382
Japan	10034	2502013	22567	3064065
Macedonia	6286	1532833	20658	2913488
Other countries	102200	15440571	102833	15617459

Table – 27 : Imports of Ferro-Boron (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**1349**	**181830**	**1223**	**165544**
China	1349	181830	1219	164977
Hong Kong	-	-	4	567

Table – 28 : Imports of Ferro-Chrome (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**73433**	**8004752**	**38792**	**5772151**
Russia	8043	1434554	15664	2707917
Kazakhstan	12615	1349465	6096	842317
Turkey	9327	897520	4163	584174
Oman	12640	829279	5956	528619
Brazil	2037	345391	2511	463902
China	9969	1764298	1046	238383
Albania	3456	367905	1394	157373
South Africa	13783	705128	1049	72806
Germany	291	83687	256	61948
Sweden	60	7109	260	37396
Other countries	1212	220416	397	77316

Table – 29 : Imports of Ferro-alloys Charge-Chrome (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**11151**	**549561**	**15468**	**997214**
South Africa	9751	463613	14968	960190
Oman	1000	54998	500	37024
UAE	400	30950	-	-

Table – 30 : Imports of Ferro-Manganese (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**109605**	**6197334**	**123910**	**9085573**
Malaysia	22129	1183407	67386	4405367
South Africa	50545	2382591	25164	2003296
Korea, Rep. of	19307	1456377	12598	1402344
Japan	-	-	1980	237685
France	3876	190335	4912	221845
China	276	25588	1923	201476
Norway	6581	521739	2519	158713
Australia	1746	112014	2792	139918
Spain	3460	224391	1093	127302
Brazil	618	36058	2187	118646
Other countries	1067	64834	1356	68981

Table – 31 : Imports of Ferro-Molybdenum (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**1026**	**741934**	**1753**	**1607055**
Korea, Rep. of	472	494871	1147	1389007
Austria	278	94291	471	137564
China	48	30625	63	52120
USA	38	15117	72	28364
Canada	38	6982	-	-
Brazil	111	69791	-	-
Kazakhstan	1	440	-	-
Chile	40	29817	-	-

Table – 32 : Imports of Ferro-Nickel (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**62768**	**17396666**	**155318**	**24901795**
Indonesia	17642	3368345	56400	8365100
Macedonia	6286	1532833	20658	2913488
Brazil	8485	3027390	13134	2668988
Dominican Rep.	4722	2730506	8070	2619764
Japan	9919	2391374	20441	2582321
Albania	-	-	18868	2265985
Colombia	5713	2470755	5425	1318431
Myanmar	-	-	3380	861646
New Caledonia	8346	1610679	3187	541244
Greece	-	-	3890	471238
Other countries	1655	264784	1865	293590

Table – 33 : Imports of Ferro-Niobium (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**1783**	**3737118**	**2815**	**5165317**
Brazil	1392	2944205	2271	4078753
Canada	306	637489	475	962308
China	16	32746	26	57886
UAE	36	54325	18	27614
Netherlands	5	11856	10	13850
Singapore	-	-	10	13215
Chinese Taipei/ Taiwan	-	-	3	7497
Russia	8	11843	2	4194
UK	1	611	-	-
USA	13	30951	-	-
Other countries	6	13092	++	++

Table – 34 : Imports of Ferro-Phosphorus (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**3098**	**62679**	**3899**	**92568**
China	2267	45226	2563	54210
Bhutan	-	-	177	18367
Vietnam	802	14703	1148	17493
Sweden	16	1781	9	2236
UK	3	667	2	262
Canada	10	302	-	-

Table – 35 : Imports of Ferro-Silico-Chrome (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**25**	**2967**	-	-
Kazakhstan	25	2967	-	-

Table – 36 : Imports of Ferro-Silico-Manganese (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**1623**	**86025**	**2913**	**179334**
Malaysia	-	-	2350	146682
South Africa	-	-	396	20904
Saudi Arabia	-	-	150	9930
France	20	1777	10	1124
USA	-	-	3	505
Switzerland	-	-	4	189
Korea, Rep. of	++	44	-	-
Zambia	55	2321	-	-
Germany	198	9907	-	-
Bahrain	250	12014	-	-
Other countries	1100	59962	++	++

Table – 37 : Imports of Ferro-Silico-Magnesium
(By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**1623**	**86025**	**2913**	**179334**
Malaysia	-	-	2350	146682
South Africa	-	-	396	20904
Saudi Arabia	-	-	150	9930
France	20	1777	10	1124
USA	-	-	3	505
Switzerland	-	-	4	189
Korea, Rep. of	++	44	-	-
Zambia	55	2321	-	-
Germany	198	9907	-	-
Bahrain	250	12014	-	-
Other countries	1100	59962	-	-

Table – 38 : Imports of Ferro-Silicon
(By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**195086**	**12618930**	**190552**	**15697226**
Bhutan	102845	5621073	93338	7577440
China	23033	1604947	34469	2642195
Malaysia	12933	797763	21489	1552362
Norway	7077	815070	9696	1147494
Russia	28341	1804656	12542	969149
France	5217	629969	5688	556482
South Africa	3042	420397	3539	488765
Brazil	6534	499124	3398	316954
Canada	356	46079	648	77822
Kuwait	1367	80885	2191	75039
Other countries	4341	298967	3554	293524

Table – 39 : Imports of Ferro-Titanium (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**2722**	**579422**	**1963**	**509721**
UK	1363	281279	1000	260774
Canada	1043	234338	781	215498
Estonia	20	3322	81	17511
Russia	219	45920	50	10973
China	15	4905	49	4725
UAE	-	-	2	240
Netherlands	24	4207	-	-
Tajikistan	24	2535	-	-
USA	14	2916	-	-

Table – 40 : Imports of Ferro-Vanadium (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**311**	**372113**	**718**	**1489369**
Korea, Rep. of	32	41615	194	484485
China	149	179779	113	251126
Japan	81	106324	132	239479
Russia	-	-	88	127134
Latvia	9	7637	58	99121
South Africa	-	-	32	87014
Netherlands	-	-	20	56525
Czech Republic	8	12896	16	44306
Switzerland	-	-	16	43529
Chinese Tapiei/ Taiwan	-	-	13	33893
Other countries	32	23862	36	22757

Table – 41 : Imports of Ferro-Tungsten (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**3**	**5266**	**3**	**4746**
Brazil	-	-	3	4512
USA	-	-	++	234
China	3	5266	-	-

Table – 42 : Imports of Ferro-Zirconium (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**339**	**45224**	**461**	**57211**
China	314	42120	461	57211
France	25	3104	-	-

Table – 43 : Imports of Ferro-alloys (Others) (By Countries)

Country	2016-17		2017-18	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
All Countries	**3578**	**398475**	**3301**	**329537**
China	2230	228964	2880	276013
Argentina	96	9904	240	22127
Austria	-	-	59	16440
Brazil	589	94262	104	9828
Japan	12	2496	8	2074
Canada	425	36142	2	1128
Netherlands	-	-	1	1029
Germany	-	-	4	644
USA	11	816	3	188
Russia	++	555	++	56
Other countries	215	25336	++	10

FUTURE OUTLOOK

Depending on the process of steel making and the type of steel being manufactured, the requirement of different ferro alloys varies widely.

Indian Ferro-alloys Industry has immense potential and capability to compete in the international market. On the positive side, India produces some of the finest ferro alloys in the world. Therefore, Indian ferro alloys are preferred in Europe. Thus, India has very good opportunity for exports. There is a need to encourage the Indian Ferro-alloys Industry for setting up captive power plants and also allocate coal linkages for the same. The prospects for the Ferro-alloys Industry are bright provided innovations are made in the process technology & plant equipment design, and new cost-effective product mix is frequented at.

India is expected to show strong growth in usage of steel in the coming years because of its robust economy, massive infrastructure needs and expansion of industrial production. India is expected to become one of the leading steel consuming nations in the next decade. In this scenario, the Ferro-alloys Industry estimates that the consumption of Ferro-alloys will increase domestically and internationally in the coming years. Some of the Ferro Alloy Producers have already gone for expansion and some new units are coming up.

As per the National Steel Policy, 2017, Ferro-alloy is a power intensive industry. Hence, captive power generation in the ferro-alloys plants will be extensively supported. Since the demand for ferro-alloys is likely to grow along with steel production in the country, the industry may be encouraged to set up larger units to achieve adequate economies of scale. Efforts will be made to provide necessary raw materials linkages and stable supply of power to grow Ferro-alloys units on priority.