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An Overview of Indian Steel Industry

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Chapter - 2

An Overview of Indian Steel Industry

2.1 Introduction:

India is recorded to become the second-largest steel producer in the world by 2015. Steel production in India has increased at a compound annual growth rate (CAGR) of 6.9% over 2008–12. Easy availability of low-cost manpower and presence of plentiful reserves make India competitive in the global era. The total market value of the Indian steel sector stood at US$ 57.8 billion in 2011 and is anticipated to touch US$ 95.3 billion by 2016. Attracted by the growth potential of the Indian steel industry, several global steel players have been planning to enter the market. Intended steel capacity build-up in India is set to result in investments in the range of US$ 104.2 billion to US$ 208.3 billion by 2020. In view of the sector’s changed dynamics, globally as well as domestically, the Ministry of Steel has initiated the process of drafting a new National Steel Policy to replace the existing Policy of 2005. The Government of India is encouraging private ownership for steel operations and has therefore allowed 100 per cent foreign direct investment (FDI) through the automatic route in the Indian steel sector. Driven by rising infrastructure development and increasing capacity addition in the automotive industry, demand for steel is expected to be robust. The estimated steel consumption in airport building is also likely to grow more than 20 per cent over the next few years with more and more modern and private airports expected to be set up.

The steel industry is a diverse, global entity that produces both raw steel and finished product. It is often tied very closely with the Iron Industry, since steel is an alloy of iron. Steel played a large part in the Industrial Revolution, and the health of the steel industry continues to be tied closely to the economic progress of both industrialized and developing nations. The United States was at one time the largest supplier of steel in the world, though China, India and other nations have emerged as important forces in the industry as well.
The level of per capita consumption of steel is treated as an important index of the level of socio-economic development and living standards of the people in any country. It is a product of a large and technologically complex industry having strong forward and backward linkages in terms of material flows and income generation. All major industrial economies are characterized by the existence of a strong steel industry, and the growth of many of these economies has been largely shaped by the strength of their steel industries in their initial stages of development. The new Greenfield plants represent the latest in technology. Output has increased, the industry has moved up in the value chain and exports have raised consequent to a greater integration with the global economy. The new plants have also brought about a greater regional dispersion easing the domestic supply position notably in the western region.

2.2 Definition of Steel:

“Crude steel is defined as steel in its first solid (or usable) form: ingots, semi-finished products (billets, blooms, slabs), and liquid steel for castings. This is not to be confused with liquid steel, which is steel poured. Hot rolled (hr) products (hr long products, hr flat products, seamless tubes) are products of first transformation. These products may be further worked to produce cold rolled-, coated-, and tubular products (except seamless tubes)” - Steel Statistical Yearbook 2012.

2.3 Properties of Steel:

![Figure No. 2.1 Properties of Steel](source: CRISIL Research)
- **Luster:** It is a shiny metal, and is used in architecture, cutlery and various appliances.

- **Conductivity:** It is used in saucepans for its ability to transfer heat and electricity.

- **Malleability:** It can be rolled into thin sheets, rods, and bar or beams and used in roofing, buildings or forged into different shapes like gears and tools.

- **Ductility:** It can be stretched and drawn out into thin wires (wire fences) or pressed into various shapes (e.g. auto body panels).

- **Strength:** It is a strong metal, resistant to breakage (used in building frames, security doors, trains, ships).

- **Durability:** Is a durable and long lasting material and hence is used to construct buildings, rail lines, and bridges. Its resistance to wear makes it ideal for machines and equipment.

- **Alloying:** Stainless steel contains chromium, nickel and molybdenum that make it rust-resistant. It is used in kitchens. Manganese is added to steel to increase its toughness, while steel rods have tungsten and cobalt to keep it hard, even when heated.

- **Coating:** Steel can also be coated with substances such as tin, plastics, paint, zinc, etc.

### 2.4 Use of Steel:

Steel has the widest range of applications among metals. Steel is used in power transmission towers, natural gas pipelines, machine tools, military weapons, etc, the list is endless. Its usage ranges from industry applications to everyday tools and materials. Some of the applications of Steel are:

- **Home:** Domestic appliances such as fridges, washing machines, ovens, microwaves, sinks, radiators, cutlery, electronic equipment, razors, and pins.

- **Travel, Transport and Construction:** Car bodies, engine components, wheels, axles, trucks, transmission equipment, trains, rails, ships, anchor chains, aircraft undercarriages,
and jet engine components. Buildings, sports stadiums, railway and bus stations, reinforcing bars for concrete, bridge deck plates, piers and suspension cables, harbors, cladding and roofing, office, tunnels, security, and coastal and flood defenses.

- **Packaging:** Food and beverage cans, promotional materials, aerosols, paint and chemical containers, and bottle caps.

- **Power and Energy:** Oil and gas wells/ platforms, pipelines, electricity power turbine components, electricity pylons, and wind turbines.

- **Electrical and Magnetic:** Electromagnets, transformer cores, and electromagnetic shields.

- **Yellow Goods:** Earth-moving and quarrying equipment, cranes, and fork-lift trucks.

- **Agriculture and Industry:** Farm vehicles and machinery, storage tanks, tools, structures, walkways, and protective equipment.

### 2.5 Steel for Social Cause

There is more to an assessment of sustainability of a material than just looking at the use of natural resources. The positive and negative effects of the application of any material also play a role. In this context, steel is currently in the process of positive developments. For example, in power stations new steel materials that can be exposed to higher pressures and temperatures are making a significant contribution towards increasing efficiency, thereby reducing CO₂ output to help society⁴. The development of new steels for thick-walled high-performance components for boilers and pipes has begun. Pipelines made of steel have proved the ideal solution for the bulk transport of oil and natural gas over long distances before they are used by customers. High-strength steels with superior cleanliness and greater resistance towards corrosion have found widespread use, for example, in sea-water desalination plants. There has been remarkable progress in the area of eco-efficient light-weight steel constructions, which is a classic example of the synergetic advantage that can be gained by society at large from disciplines like construction, material science, and production technology coming together.
2.6 Structure of the Indian Steel Industry:

The Indian steel industry is divided into primary and secondary sectors. The primary sector comprises a few large integrated steel providers producing billets, slabs and hot rolled coils, among others. The secondary sector comprises small units focused on the production of value added products such as cold rolled coils, galvanized coils, angles, columns, beams and other re-rollers, and sponge iron units. Both sectors cater to different market segments. On the basis of ownership, the Indian steel industry is broadly divided into private and public sector enterprises. The private sector dominates production—accounting for almost 78 percent of the finished steel output—while the public sector has higher capacity utilizations.

Figure No. 2.2
Structure of the Steel Sector
2.7 Types of Steel:

Based upon its composition, steel is classified as plain carbon steel and alloy steel.

- **Carbon Steel:** It is also known as non-alloy or plain carbon steel. It is composed simply of iron and carbon, and is the most commonly produced variant of steel (90 per cent of global steel output). It contains carbon in varying proportions (up to 1.7 per cent) along with manganese (up to 0.9 per cent) and silicon (up to 0.3 per cent). Change in the composition of carbon affects the properties of carbon steel. Mild steel is the most widely used variety of steel.

  ![Figure No. 2.3](https://www.crisilresearch.com)

  **Categories of Carbon Steel**

  - **Low Carbon**
    - Carbon content: 0.07 - 0.25
    - Properties: Easily cold worked
    - Uses: Car bodies
  - **Medium Carbon**
    - Carbon content: 0.25 - 0.50
    - Properties: Wear resistant
    - Uses: Rails and rail product
  - **High Carbon**
    - Carbon content: 0.86 - 1.2
    - Properties: Strong, wear resistant
    - Uses: Cutting tools
  - **Cast Iron**
    - Carbon content: 2.5 - 3.8
    - Properties: Easy to cast but brittle
    - Uses: Pistons and cylinders

  Source: [www.crisilresearch.com](https://www.crisilresearch.com)

- **Alloy Steel:** It comes in different grades, which have varying proportions of carbon and other elements. These elements determine the property of the steel. Different types of alloy steel have different applications. For instance, hard abrasion resistant steel is used to make industrial tools; heat resistant steel is used in high-temperature applications; and fatigue resistant steel is for mechanical applications. The composition of alloy steels depends upon application and cannot be generalized as a single commodity, i.e. it cannot be categorized as in the case of HR and CR sheets, etc. Although this category consists of high-value steel alloys, volumes of this segment are very low as compared with those of the carbon steel products. The most widely used alloy steel is **stainless steel.** It is a corrosion-resistant metal and contains chromium and nickel as major alloying elements.
2.8 The Types of Steel Products:

Steel makers primarily produce three types of steel products: flat products, long products and stainless steel. The mother product in flats is slabs, from which sheets or plates are produced. The mother products in longs are blooms and billets, from which bars, rods and structural shapes are rolled.

2.8.1 Flat Products:

**Slabs:** They are semi-finished steel products. They are obtained by the continuous casting of steel or rolling ingots on a rolling mill and cutting them into various lengths. They are used as a starting material in the production process of other flat products.

**Hot-Rolled Sheets:** Hot rolling involves passing a slab through a multi-stand rolling mill to reduce its thickness to less than 12 millimeters. Hot-rolled sheets are used in non-surface applications like automobile suspension arms, frames, wheels, and other unexposed parts in auto and truck bodies, agricultural equipment, construction products, machinery, tubing, pipes and guard rails.

**Cold-Rolled Sheets:** Cold-rolled sheets are hot-rolled sheets processed through an acid bath that removes scaling from steel's surface, and then passed through a rolling mill without reheating until the desired thickness is achieved. They can be further treated to achieve uniformity, ductility and various surface finishes and textures. They are used in surface applications like exposed automobile and appliance panels. They are usually coated or painted before sale to an end-user. Prices of cold-rolled sheets are higher than the prices of hot-rolled sheets.

**Coated Sheets:** They are cold-rolled steel that have been coated with zinc or aluminum for corrosion-resistance and paintability. They are also the highest value-added sheet products because they require the greatest degree of processing and have the strictest quality requirements. They are used in exterior applications such as automobile chassis, household appliances, roofing and siding, heating and air conditioning equipment, air ducts and switch boxes, as well as in certain packaging applications, such as food containers.
Plates: They are produced by hot-rolling reheated slabs. They are used as a structural material for bridge construction, storage vessels, tanks, shipbuilding, line pipe, industrial machinery and equipment.

2.8.2 Long Products:

Billets and Blooms: They are semi-finished steel products. Blooms are basically larger billets. They are obtained by the continuous casting of steel or rolling ingots on a rolling mill. They are used as a starting material in the production process of other long products.

Bars: They are rolled from billets. Merchant bar and reinforcing bar (rebar) are two common categories of bars. Merchant bars include rounds, flats, angles, squares, and channels that are used by fabricators to manufacture furniture, stair railings, and farm equipment. Rebar is used to strengthen concrete in highways, bridges and buildings.

Special Bar Quality (SBQ) Steel: This steel is the highest quality long product. It typically requires customer approval for strength, life and other engineering parameters and is generally sold under contract to long-term customers. It is used in safety-critical applications such as axles, crankshafts, transmission gears, bearings and seamless tubes.

Wire Rods: These ring-shaped coils. They are used in the automotive, construction, welding and engineering sectors.

Wire Products: They are produced by treating wire rods with a series of dies to improve surface finish, dimensional accuracy and physical properties. They are used in fasteners, springs, concrete wire, electrical conductors and structural cables.

Structural Sections: They are shapes produced in a rolling mill from reheated blooms or billets. They include wide-flange beams, bearing piles, channels, angles and tees. They are used mainly in the construction industry.

2.8.3 Stainless Steel:

It is steel alloyed with carbon, chromium and even other elements such as nickel, molybdenum, titanium, niobium, manganese, nitrogen, copper, silicon, aluminum and
vanadium. Stainless steel has properties like resistance to corrosion in highly aggressive elements, resistance to oxidation at high temperatures, toughness and ductility at very low temperatures, strength and ease in fabrication. Overall, the construction sector is the biggest user of steel. Within the construction sector, the residential segment accounts for nearly half the demand. Transportation, capital goods and infrastructure are the other large users of the commodity.

<table>
<thead>
<tr>
<th>Sector</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrastructure</td>
<td>63%</td>
</tr>
<tr>
<td>Engineering and fabrication</td>
<td>22%</td>
</tr>
<tr>
<td>Autos</td>
<td>10%</td>
</tr>
<tr>
<td>Packaging</td>
<td>3%</td>
</tr>
<tr>
<td>Transportation</td>
<td>2%</td>
</tr>
</tbody>
</table>

Source: [www.crisilresearch.com](http://www.crisilresearch.com)

2.9 **Global Scenario of Steel:**

The current global Steel Industry is in its best position in comparing to last decades. The price has been rising continuously. The demand expectations for steel products are rapidly growing for coming years. The shares of Steel Industries are also in a high pace. The Steel Industry is enjoying its 6th consecutive years of growth in supply and demand and there are many more merger and acquisitions which overall buoyed the industry and showed some good results. The supreme crisis has led to the recession in economy of different countries, which may lead to have a negative effect on whole steel industry in coming years. However steel production and consumption will be supported by continuous economic growth. Hence, the world steel industry is today being characterized by excess capacity and poor demand. This scenario led to undesirable impact on two fronts, firstly breeding protectionism within the developed countries, and secondly dumping of cheap imports.
World steel industry witnessed major ups and downs in the last two decades and especially over the past five years; the pattern of trade has been upset by two important developments. These are the collapse of the Soviet Union and the severe financial crisis in most of South East Asian countries, including Korea and Japan. World crude steel production stood at 1547.8 million tonnes during 2012, an increase of 1.2 per cent over 2011. During 2012, Chinese crude steel production reached 716.5 mt, a growth of 3.1% over 2011. China remained the largest crude steel producer in the world, accounting for 72 per cent of Asian and 46 per cent of world crude steel production during 2012. India was the 4th largest producer during this period and recorded a growth of 4.6 per cent over 2011. India is expected to resume its high growth trend after a sluggish performance in 2011. In 2012, India’s steel use is forecast to grow by 6.9% to reach 72.5 MT and is projected to grow further by 9.4% in 2013, driven by increased infrastructure investment and higher pace of urbanization.

2.10 **Indian Steel Industry:**

The Steel Industry is a key sector in the Indian economy as it meets the requirements of a wide range of important industries such as engineering, electrical and electronics,
infrastructure, automobiles and automobile components, packaging etc. Steel is playing vital role to the development of any modern economy and is considered to be the backbone of human civilization. The per capita consumption of steel is indicator of the socioeconomic development and living standards of the people in any country. It is a product of a large and technologically complex industry having strong forward and backward linkages in terms of material flows and income generation. All major industrial economies are characterized by the existence of a strong steel industry and the growth of many of these economies has been largely shaped by the strength of their steel industries in their initial stages of development. Steel industry was in the vanguard in the liberalization of the industrial Sector and has made rapid strides since then. The new Greenfield plants represent the latest in technology. Output has increased, the industry has moved up in the value chain and exports have raised consequent to a greater integration with the global economy. The new plants have also brought about a greater regional dispersion easing the domestic supply position notably in the western region. At the same time, the domestic steel industry faces new challenges. Some of these relate to the trade barriers in developed markets and certain structural problems of the domestic industry notably due to the high cost of commissioning of new projects. The domestic demand too has not improved to significant levels.6.

The integrated steel plants are faced with the choice between upgrading existing plants or increasing their efficiency by other means and going in for Greenfield investments. If the Indian industry has to strengthen its global presence, it will obviously have to overcome some of the major constraints and challenges lying in the project management. Project management is the discipline of organizing and managing resources, i.e., people, in such a way that the project is completed within defined scope, quality, time and cost constraints. A project is a temporary and onetime endeavor undertaken to create a unique product or service that brings about beneficial change or added value. This property of being a temporary and a onetime undertaking contrast with processes, or operations, which are permanent or semi-permanent ongoing functional work to create the same product or service over and over again. The management of these two systems is often very different and requires varying technical skills and philosophy, hence requiring the development of project management.
Iron and Steel industry characteristically is a heavy industry. All its raw materials are heavy and colossal. They encompass iron-ore, coking coal and limestone. Location of this industry is thus governed by its proximity to raw materials, predominantly coking coal. The finished products in turn are also heavy and need efficient transport system for their distribution. The Chhotanagpur Plateau bordering West Bengal, Bihar, Orissa and Madhya Pradesh, therefore has been the natural nerve-center of this industry. Iron and Steel Industry is also a basic or key. It forgoes the heavy machines and tools industry. Umpteen light, medium and small cottage industries depend on it, as a re-index of modernization and industrialization of a country. The industry also necessitates enormous investment, staple infrastructure, principally able means of up-to-date transport and communication, not leaving out plentiful fuel or power supply. However it does not directly create enough jobs, adjusting with huge investments. It demands incessant updating of technology, "R and D" (Research and Development) support, and most importantly a long-awaiting time before it begins to produce dividends. All these contemplations made the government to enter this key industry in a large scale on its own, notwithstanding its natural shortcomings or limitations. Vishakpatanam Steel plant has the advantage of importing quality coking coal from abroad and is at ease in exporting its products straight to the world market. In 1997-98, it had produced 2.2 million tones of pig iron. The plant has been able to uphold international standards of competence. In the same year it had exported almost 0.8 million tones of steel and pig iron, fetching foreign exchange of 600 crores.

The rapid pace of growth of the industry and the observed market trends called for certain guidelines and framework. Thus was born the concept of the National Steel Policy, with the aim to provide a roadmap of growth and development for the Indian steel industry. The National Steel Policy (NSP) was announced in November 2005 as a basic blueprint for the growth of a self-reliant and globally competitive steel sector. The long-term objective of the National Steel Policy is to ensure that India has a modern and efficient steel industry of world standards, catering to diversified steel demand. The focus of the policy is to attain levels of global competitiveness in terms of global benchmarks of efficiency and productivity. The National Steel Policy seeks to facilitate removal of procedural and policy bottlenecks that affect the availability of production inputs,
increased investment in research and development, and creation of road, railway and port infrastructure. The Policy focuses on the domestic sector, but also envisages a steel industry growing faster than domestic consumption, which will enable export opportunities to be realized.

2.11 **History of Steel:**

The art of steelmaking was known to Indians since ancient times as is evident from the famous iron pillar in Delhi, which dates back to AD 350. The first attempt to produce iron and steel on modern lines was made in 1830 at Porto Novo (Tamil Nadu). But this mill was closed down in 1866. A humble beginning of the modern steel industry was reached in India at Kulti in Bengal in 1870\(^9\). But the conception of larger production became visible with the establishment of steel plant in Jamshedpur in Bihar in 1907. It started production in 1912, and then came Burnpur and Bhadravathi Steel plants in 1919 and 1923 respectively. It was, however, only after Independence that the Steel industry was able to find a strong foothold. Excluding the Jamshedpur plant of the Tatas, all are in the public sector and looked after Steel Authority of India Ltd (SAIL)\(^10\). The Indian steel industry is more than 100 years old now. Till 1990, it operated under a regulated environment with insulated markets and large-scale capacities reserved for the public sector. Production and prices were determined and regulated by the Government. SAIL and Tata Steel were the main producers, the latter being the only private player. The industry took its first faltering steps in 1907 with the setup of the first integrated steel plant in Jamshedpur by TISCO. Since, then the Indian steel industry has emerged as one of the core sectors in the Indian economy with a very significant impact on economic growth\(^11\).

It is generally believed that the original crucible steel making technique was developed primarily in India leading to wootz steel. The use of iron was well established in south Indian megalithic cultures by at least about 1100 BC at sites such as Hallur in Karnataka. It is significance for the evolution of the South Indian process of wootz crucible steel. Furthermore, the process of wootz crucible steel making seems to have been one which was so much more associated with the South Indian part of the subcontinent including Sri
Lanka and was not really well known from the Northern Indian context. The megalithic site of Kodumanal, CA 300 BC\textsuperscript{12}, in Tamil Nadu may have been a site for ferrous crucible processing. There is a preliminary identification of a sample of high carbon steel of the composition of wootz of around 1.5% carbon from megalithic Andhra Pradesh. These are tentatively the earliest known identifications for high-carbon crucible steel in the world.

It remains a matter for speculation whether Huntsman knew about the Indian crucible steel making. In an authoritative book on Steel Making before Bessemer (1984) K. C. Barraclough\textsuperscript{13} describes the history of the crucible steel process in Britain but makes no mention of the Indian process. P. T. Craddock\textsuperscript{14}, the British Museum, London has observed that there is circumstantial evidence for a number of transfers of technology including crucible steel making at the dawn of the European Industrial Revolution.

\section*{2.12 The Beginning of the Iron Age in India:}

Iron-smelting technology in India, which evolved into a sophisticated crucible steelmaking (Wootz steel) capability, may have also originated in the Caucasus. The Sanskrit word Ayas, which occurs in the sacred Hindu scriptures of the Vedas (conventionally dated about ca 1500 BC), is very similar to the Indo-European or Indo-Germanic word for iron, eisen, from which the word iron itself derives. Iron seems to have been used in India from about the late second millennium BC. The forging of wrought iron reached its zenith in India in the first millennium AD\textsuperscript{15}. Francis Buchanan and Verrier Elwin have given detailed reports on iron smelting furnaces in India in the 18th to early 20th century\textsuperscript{16}. A tribe, known as the Agarias specialized in iron smelting. Agaria means a person who worked with fire. The art of iron smelting was kept as a tribal secret for generations. Concurrent with the production of iron the manufacture of crucible steel seems to have occurred in Southern India by 300 BC\textsuperscript{17}. 
2.12.1 Delhi Iron Pillar: The ‘Rustless’ Wonder

The pillar, made up of nearly seven tones of 98 per cent wrought iron of pure quality, is 7.21m (23 feet 8 inches) high, with 93 cm buried below the present floor level, and has a diameter of 41cm (16 inches). The pillar has been brought here evidently from somewhere, else, as no other relics of the fourth century are found at the site. There is a strong local tradition that it was brought here by Anangpal, the Tomar king who is credited with the founding of Delhi in 1020 A.D\textsuperscript{18}. The pillar is believed to have been made by forging together a series of disc-shaped iron blooms and has been the subject of much speculation due to the fact that it has withstood significant corrosion over so many centuries. In the olden days a popular pastime of tourists to the Delhi Iron Pillar was to hug it, although more recently it has been cordoned off to protect it from the corrosive effects of sweat. There are other such well-preserved monumental iron pillars such as the one at Dhar in Central India. But remarkably, there are also such examples in humid regions more prone to corrosion such as the iron pillar at Kodachadri in coastal Karnataka, which gets a heavy monsoon.

2.12.2 Crucible Steel Making: A South Indian Forte

It is generally believed that the original crucible steel making technique was developed primarily in India leading to wootz steel. The use of iron was well established in south Indian megalithic cultures by at least about 1100 BC\textsuperscript{19} at sites such as Hallur in Karnataka. The South Indian megalithic and Iron Age cultures are characterized by the fact that there is a fair deal of uniformity in the material culture over a fairly large region stretching from Adichanallur in the southernmost tip of the peninsula to the Vidarbha region just below the Vindhyas. With Benjamin Huntsman redeveloping the process of crucible steel manufacture in 1740 to make cast steel bars, Sheffield in England acquired an international reputation for steel making\textsuperscript{20}. In fact from the 14th century onwards Sheffield was renowned for the manufacture of quality knives. In the Canterbury tales of Geoffrey Chaucer the miller carried a Sheffield knife. Within 100 years, Sheffield was producing 20,000 tons of crucible steel per year, which provided \textit{40\%} of European steel production at this time.
<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1100 BC</td>
<td>Iron from megalithic sites such as Hallur in Karnataka</td>
</tr>
<tr>
<td>326 BC</td>
<td>King Porus presented Alexander 30 lbs of Indian iron</td>
</tr>
<tr>
<td>300 BC</td>
<td>Crucible processes at Kodumanal, Tamil Nadu related to steel</td>
</tr>
<tr>
<td>300 BC</td>
<td>Kautilya showed knowledge of minerals, including iron ores, and the</td>
</tr>
<tr>
<td></td>
<td>art of extracting metals in ‘Arthashastra’.</td>
</tr>
<tr>
<td>100 BC</td>
<td>Roman accounts of Seric iron pointing to Chera region of South India</td>
</tr>
<tr>
<td>AD 320</td>
<td>A 16 meter iron pillar erected at Dhar</td>
</tr>
<tr>
<td>AD 400-420</td>
<td>Gupta Iron pillar (later moved to Delhi)</td>
</tr>
<tr>
<td>12th century AD</td>
<td>Export of iron and steel from Malabar by Jewish merchants</td>
</tr>
<tr>
<td>13th century AD</td>
<td>Iron beams used in the construction of the Sun temple Konarak, Orissa</td>
</tr>
<tr>
<td>17th century AD</td>
<td>Tavernier’s accounts of export of 20,000 pounds of wootz steel from</td>
</tr>
<tr>
<td></td>
<td>Golconda in Andhra Pradesh to Persia Manufacture of cannon and</td>
</tr>
<tr>
<td></td>
<td>firearms</td>
</tr>
<tr>
<td>AD 1830</td>
<td>Suspension bridge built over the Beas at Saugor with iron from</td>
</tr>
</tbody>
</table>
|            | Tendulkhema (MP); J. M. Heath built iron smelter at Porto Novo, Madras
|            | Presidency                                                             |
| AD 1870    | Bengal Iron Works established at Kulti                                |
| AD 1907    | Tata Iron & Steel Company formed                                      |
| AD 1914    | Howrah Bridge in Calcutta built from 80,000 tonnes of Tata Steel     |
| AD 1918    | Mysore Iron Works at Bhadravati                                      |
| AD 1954    | Hindustan Steel Limited formed to construct three integrated steel    |
|            | plants at Rourkela, Durgapur and Bhilai                              |
| AD 1960    | Alloy Steels Plant installed at Durgapur                              |
| AD 1972    | Steel plant at Bokaro                                                 |
| AD 1978    | Steel Authority of India Limited formed                              |
| AD 1990    | Visakhapatnam Steel Plant set up Liberalization of Indian economy and |
|            | the construction of private sector steel plants                      |
| AD 2004    | Acquisition of overseas steel plants by Tata Steel                   |

2.13 **Current Scenario of Indian Steel Industry:**

The current scenario of the Indian steel industry indicates that there is huge growth potential in this industry. India has become the second best in terms of growth amongst the top ten steel producing countries in the world and a net exporter of steel during 2013–14. Steel production in India recorded a growth rate of 4.8 per cent in February 2014 over February 2013\(^1\). The cumulative growth during April–February, 2013–14 stood at 4.2 per cent over the corresponding period of the previous year.

Steel contributes to nearly two per cent of the gross domestic product (GDP) and employs over 500,000 people. The total market value of the Indian steel sector stood at US$ 57.8 billion in 2011 and is expected to touch US$ 95.3 billion by 2016\(^2\). The infrastructure sector is India’s largest steel consumer, thereby attracting investments from several global players. Owing to this connection with core infrastructure segments of the economy, the steel industry is of high priority right now. Also, steel demand is derived from other sectors like automobiles, consumer durables and infrastructure; therefore, its fortune is dependent on the growth of these user industries. In order to realize the growth potential in the steel industry of India, it is essential to ensure that the industry can remain competitive. One of the major aspects in this regard is the availability of inputs. Shortage of inputs like coke has led to increase in costs earlier. Moreover proper infrastructure facilities like transport infrastructure, power etc. are of prime importance in maintaining the competitiveness of the industry. Most developed countries have regulations that are aimed to protect the domestic steel industry. The Indian steel industry has comparatively much lesser protection through regulations. Proper regulatory measures should be adopted by the government to protect the domestic steel industry. The Indian iron and steel industry is nearly a century old, with Tata Iron & Steel Co (Tata Steel) as the first integrated steel plant to be set up in 1907. It was the first core sector to be completely freed from the licensing regime (in 1990-91) and the pricing and distribution controls.

The New Industrial policy adopted by the Government of India has opened up the iron and steel sector for private investment by removing it from the list of industries reserved for public sector and exempting it from compulsory licensing. Imports of foreign
technology as well as foreign direct investment are freely permitted up to certain limits under an automatic route. This, along with the other initiatives taken by the Government has given a definite impetus for entry, participation and growth of the private sector in the steel industry. While the existing units are being modernized/expanded, a large number of new/Greenfield steel plants have also come up in different parts of the country based on modern, cost effective, state-of-the-art technologies.

2.14 Market Size of Indian Steel Industry:

India’s real consumption of total finished steel grew by 0.6 per cent year-on-year in April–March 2013-14 to 73.93 million tonnes (MT), according to Joint Plant Committee (JPC)\(^2\), Ministry of Steel. Construction sector accounts for around 60 per cent of the country's total steel demand while the automobile industry consumes 15 per cent. India became net steel exporter in 2013–14 and is likely to maintain the momentum in 2014-15 as producers are looking to dock more overseas shipment to tide over subdued domestic consumption. Total steel exports by India during 2013–14 stood at 5.59 MT, as against imports of 5.44 MT\(^2\). During the period, Steel Authority of India (SAIL) clocked a 30 per cent growth in exports and aims to more than double the shipments to 1 MT in 2014–15. Rashtriya Ispat Nigam Ltd (RINL), which exported 1 lakh tonne steel last fiscal, aims to treble that in the current fiscal. Iron ore export from India has showed a 253 per cent increase during the period October–December 2013, at 3.75 MT as against 1.06 MT in the corresponding period of the previous year, on the back of the opening of new mines in Chhattisgarh, Madhya Pradesh and Rajasthan, as per the Federation of Indian Mineral Industries (FIMI)\(^2\).

2.15 Steel Production in India:

The Indian steel industry has achieved significant milestones in terms of growth in capacity, production and exports to become a major player in the global steel industry. Between 2008 and 2013, India’s steel production has grown at a compound annual growth rate (CAGR) of about 7 percent\(^2\). While plant closures and privatization are rare in India, the private sector is considered to be the engine of growth in the steel industry and technological changes and modernization are taking place in both the public and the
private sector integrated steel plants in India. The Indian steel industry got a giant importance in the recent past when the Tata Steel purchased the Corus steel.

The Indian steel industry is characterized by a mix of old and new technologies exhibiting poor to excellent techno-economic performance parameters. The origin of the modern iron and steel industry in India dates back to pre-independence era when the Tata Iron & Steel Co Ltd (TISCO) was set up in 1907 at Jamshedpur. At the time of independence in 1947, the country had three ore based steel plants (TISCO, IISCO, and VISL) and a few Electric Arc Furnace (EAF) based mini steel plants, between 50-70s, large integrated steel plants were set up in the public sector at Bhilai (BSP), Durgapur (DSP), Rourkela (RSP) and Bokaro (BSL), and Steel Authority of India (SAIL) came into being as the largest steel producer in the country. Plants like Rourkela Steel Plant (RSP) adopted the state-of-the-art technologies of the time, namely the LD steel making. Another green-field public sector plant i.e Visakhapatnam Steel Plant (VSP) was set up in the 90s with quite a few modern technologies and practices of the day.

2.16 Production, Consumption and Growth of Steel

The table below indicates the production and consumptions in the country: the trend in production for sale, import, export and real consumption of total finished steel (alloy + non-alloy)

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Finished Steel (alloy + non-alloy) (million tonnes or mt)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Production</td>
</tr>
<tr>
<td>2007-08</td>
<td>56.08</td>
</tr>
<tr>
<td>2008-09</td>
<td>57.16</td>
</tr>
<tr>
<td>2009-10</td>
<td>60.62</td>
</tr>
<tr>
<td>2010-11</td>
<td>68.62</td>
</tr>
<tr>
<td>2011-12</td>
<td>73.42</td>
</tr>
<tr>
<td>2012-13</td>
<td>56.72</td>
</tr>
</tbody>
</table>

Source: JPC; Revised Figures
Crude steel production has shown a sustained rise since 2007-08 along with capacity. Data on crude steel production, capacity and capacity utilization during the last five years and April-December 2012-13, are given in the table below:

Table No. 2.5
Crude Steel Production

<table>
<thead>
<tr>
<th>Year</th>
<th>Capacity(mt)</th>
<th>Production(mt)</th>
<th>Capacity utilization (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007-08</td>
<td>59.85</td>
<td>53.86</td>
<td>90</td>
</tr>
<tr>
<td>2008-09</td>
<td>66.34</td>
<td>58.44</td>
<td>88</td>
</tr>
<tr>
<td>2009-10</td>
<td>75.00</td>
<td>65.84</td>
<td>88</td>
</tr>
<tr>
<td>2010-11</td>
<td>80.36</td>
<td>70.67</td>
<td>88</td>
</tr>
<tr>
<td>2011-12</td>
<td>89.29</td>
<td>73.79</td>
<td>83</td>
</tr>
<tr>
<td>2012-13</td>
<td>91.66</td>
<td>58.33</td>
<td>85</td>
</tr>
</tbody>
</table>

Source: JPC; Revised figures

Crude steel production grew at a CAGR of 7.7 per cent during the last five years ending 2011-12, which incidentally marked the end of the 11th Five Year Plan also. Such growth in production was driven by capacity expansion from 59.85 mt in 2007-08 to 89.29 mtpa in 2011-12 (provisional), a growth of 9.5 per cent (on a CAGR basis) during the 11th Plan. The Total production for sale of total finished steel at 73.42 mt, in 2011-12 as against 56.08 mt in 2007-08 at average annual growth rate of 6.9 per cent in CAGR terms during the 11th Plan, while real consumption of steel at 70.92 million tones during 2011-12 grew by 8.7 per cent on CAGR basis during the 11th Plan. With growth in production for sale lagging behind real consumption growth, India has turned into a net importer of finished steel since 2007-08 with rise in imports (by 6.7 per cent on CAGR basis during the 11th Plan). Exports, on the other hand, have declined (by 5.1 per cent during the 11th Plan) to ensure greater domestic availability during this period28.

India is also an important producer of pig iron. Post-liberalization, with setting up several units in the private sector, not only imports have drastically reduced but also India has turned out to be a net exporter of pig iron. The private sector accounted for 91 per cent of
total production for sale of pig iron in the country in 2011-12 (provisional). The domestic availability situation of pig iron is given in the table below:

**Table No. 2.6**

**Total Production and Export and Import**

<table>
<thead>
<tr>
<th>Year</th>
<th>2007-08</th>
<th>2008-09</th>
<th>2009-10</th>
<th>2010-11</th>
<th>2011-12</th>
<th>2012-13</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Production for sale</strong></td>
<td>5284</td>
<td>6207</td>
<td>5884</td>
<td>5684</td>
<td>5783</td>
<td>4601</td>
</tr>
<tr>
<td><strong>Import</strong></td>
<td>11</td>
<td>8</td>
<td>11</td>
<td>9</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td><strong>Export</strong></td>
<td>560</td>
<td>350</td>
<td>362</td>
<td>358</td>
<td>491</td>
<td>156</td>
</tr>
<tr>
<td><strong>Consumption</strong></td>
<td>4621</td>
<td>5870</td>
<td>5531</td>
<td>5296</td>
<td>5386</td>
<td>4387</td>
</tr>
</tbody>
</table>

Source: JPC Figures.

Besides achieving the rank of the 4th largest global crude steel producer in 2012 (provisional), India has also made a mark globally in the production of sponge iron/direct reduced iron (DRI). Courtesy a mushrooming growth of coal-based sponge iron units in key mineral-rich pockets of the country, domestic production of sponge iron increased rapidly, enabling the country to achieve and maintain the number one position in the global market. With a series of mega projects, either being implemented or at the proposal stage, which once operational will re-write the structure of the steel industry and its dynamics; and a domestic economy carrying forward the reform process further, the future of the Indian steel industry is definitely optimistic.

**Table No. 2.7**

**Production of Public and Private Sector in India**

<table>
<thead>
<tr>
<th>Years</th>
<th>2007-08</th>
<th>2008-09</th>
<th>2009-10</th>
<th>2010-11</th>
<th>2011-12</th>
<th>2012-13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Sector</td>
<td>17.09</td>
<td>16.37</td>
<td>16.71</td>
<td>16.99</td>
<td>16.48</td>
<td>12.51</td>
</tr>
<tr>
<td>Private Sector</td>
<td>36.77</td>
<td>42.07</td>
<td>49.13</td>
<td>53.68</td>
<td>57.31</td>
<td>45.82</td>
</tr>
<tr>
<td>Total Production</td>
<td>53.86</td>
<td>58.44</td>
<td>65.84</td>
<td>70.67</td>
<td>73.79</td>
<td>58.33</td>
</tr>
<tr>
<td>Share of Public Sector (%)</td>
<td>32</td>
<td>28</td>
<td>25</td>
<td>24</td>
<td>22</td>
<td>21</td>
</tr>
</tbody>
</table>

Source: JPC Figures.

Above table no. 2.7 indicates the total production and contribution of steel from 2007-08 to 2012-13 by public and private sector. Last five year we analyses mix trend in production. Above
table gives clear indication of increasing trends/contribution of private sector compare to public sector in Indian Steel Industry.

2.17 Government Initiatives

The Government of India has allowed 100 per cent FDI through the automatic route in the Indian steel sector. It has significantly reduced the duty payable on finished steel products and has streamlined the associated approval process.

The government is taking steps to increase industrial activity in Uttar Pradesh (UP). Addressing a Conference on ‘Demand for Steel in India: The End User Perspective,’ the Union Minister of Steel, Mr Beni Prasad Verma said, in order to increase supply of steel to rural consumers, companies like SAIL and RINL have set up 521 and more than 100 rural dealers respectively in remote parts of UP. In order to provide thrust on research and development (R&D), the Ministry of Steel is encouraging R&D activities both in public and private steel sectors, by providing financial assistance from Steel Development Fund (SDF) and Plan Scheme of the Central Government. Under the SDF scheme, 82 R&D projects have been approved with total project cost of Rs 677 crore (US$ 111.92 million) wherein SDF assistance is Rs 370 crore (US$ 61.17 million). Under the Plan Scheme, eight projects were approved with a total cost of Rs 123.27 crore (US$ 20.38 million) wherein Government assistance is Rs 87.28 crore (US$ 14.43 million) 29.

2.18 Road Ahead

The future of the Indian steel industry is bright. The government plans to increase infrastructure spending from the current 5 per cent GDP to 10 per cent by 2017, and the country is committed to investing US$ 1 trillion in infrastructure during the 12th Five-Year plan. “Taking 15 per cent as steel component in the total investment, then it can generate additional demand worth US$ 75 billion of steel in the next few years or US$ 15 billion worth of additional demand a year or in terms of quantity, an additional demand of 18.75 MT per annum,” as per Mr C S Verma, Chairman, SAIL 30. The sector is expected to see an investment to the tune of about Rs 2 trillion (US$ 33.06 billion) in the coming years, as per domestic giant, Tata Steel.
References:
2. National Steel Policy 2005,
4. Crisil India Research
5. Annual Report 2013-14 www.steel.gov.in
9. World Steel Association or WSA; data provisional J. D. Verhoeven and A. Pendray, Muse, 1998
22. Pradeep Mehta (Ed) Towards a Functional Competition Policy for India, Edited by,
25. Ministry of Steel – India,
27. Indian Steel Industry Outlook 2014.
28. www.tatasteel.com/

Webiliography:
1. www.steel.gov.in
2. www.mca.gov.in/
3. www.cci.gov.in/
4. www.indianchamber.org/
8. http://www.icra.in/
9. www.creasilresearch.com
10. http://jpcindiansteel.nic.in
11. http://pib.nic.in/
14. www.jpcindiansteel.nic.in
15. www.pib.nic.in.
16. www.steel.nic.in
17. http://www.iimahd.ernet.in/library/