CHAPTER-2: HISTORICAL PERSPECTIVE OF INDIAN STEEL INDUSTRY.

2.1. Ancient development

2.2. Development in the Nineteenth Century

2.3. Development in Twentieth Century

2.3(a). Development in Pre-independence period

2.3(b). Development in Post-independence period (Up to 1980)

2.4. Steel Industry in the Secondary Sector.
2.1. In ancient India.

The tradition of iron production in India is rooted in the labyrinth of hoary antiquity. The metal is referred in Vedic Literature as "AYAS". The antiquity of the Indian process is no less astonishing than its ingenuity. The tools with which the Egyptians caved their obelisks and temples with hieroglyphics were made of Indian steel. There is no evidence to show that any of the nations of antiquity besides the Hindus were acquainted with the art of making steel. The great Indians developed their own process of extraction of iron based on Pyrotechnology. In those days, mostly limonite ore \((2\text{Fe}_2\text{O}_3, 3\text{H}_2\text{O})\), containing \(30\text{ - }40\%\) Fe crushed into small pieces (5 - 6 mm in size) and dried were used with charcoal for producing iron in small hearths / furnaces made out of mud and clay bricks. The capacity of such furnace mostly varied from 2 to 20 kg per heat. Bigger furnaces, up to 250 kg (Twin Hearth Furnace) have also been reported to exist. The iron in the early days of its invention used to be produced in solid form, some thing like sponge iron of today and used to contain some iron oxide along with metallic iron and lots of slag as inclusion. These initial products were then used to be refined in forge hearths by heating over \(1000^0\text{C}\) followed by manual hammering to squeeze out slag inclusion (product known as WROUGHT IRON). The process used to be repeated until the nugget, rod, bar or bloom became more compact with porosities welded and slag squeezed out.

Such process of iron making continued during the first millennium and well into the second millennium AD. The IRON PILLAR of Delhi, 20’5” tall and weighting about 6 tonnes, was built in about 1500 years ago. It is assumed that this pillar was made by forged welding of a large number of wrought iron pieces produced in different lots. Another example of ancient massive iron product is Konarak Beam produced about 1100 years ago. There are a number of other examples likes the iron pillar at Dhar weighing about 8 tonnes, the iron pillar at Kordachari hill, the iron tridents a Tonginath Temple (12th Century AD) and on Mount Abu etc. The big Cannon pipe at Tanjore was made out of iron rods bound by three layers of steel rings. There is another iron gun, Landa Kesab, lying in Bijapur Fort weighing about 50 tonnes.
The iron & steel industry in India was widely dispersed. One estimate states that as many as 20,000 small furnaces operated in India on regular basis. The total quality of iron & steel made in those days could then be quite significant.

Learning from the properties of iron with different carbon contents, slowly came the realization of use of steel. Since 700 BC, Indian WOOTZ STEEL was highly sought after by the Persians, Romans and others mainly for the manufactured from Wootz steel made in India. All these go to establish that India possessed high skill and technology for making iron & steel in the country, no double in very small quantum, over the last three millennia. In the 17th century AD, the travellers from Europe recorded the manufacture of steel in South India by Crucible Process at several localities including Mysore, Malabar and Golconda. Production of Wootz steel in small industrial scale was developed during this century, predating the industrial revolution in Europe. Unfortunately, there was no endeavour of documenting this technology property and later on, the Britishers did not encourage indigenous technology to grow. Thus Indian iron & steel making technology was lost so much so that a country that was pioneer in iron & steel making and used to export to other countries had to depend on an imported technology for the production of steel in commercial scale in the nineteenth & twentieth century AD.

2.2. Developments in the Nineteenth Century:

There are some recorded evidence to suggest that some attempts were made in late 18th century to establish iron and steel works in India based on imported technology and indigenous raw materials. Mr Jorich Marshall Stearth, a civil servant of East India Co. established an iron & steel works in 1830 at Porto Novo on Madras Coast. Iron was made based on charcoal at the rate of 40 tonnes a week only in 1853 he set up the EAST INDIA IRON Co. with three more new works at Pulampatti, Tiruwnnamalai and Beypur. In 1855 mackey & Co. of Calcutta established BIRBHUM IRON WORKS Co. There were some attempts to set up an iron producing plant in Uttar Pradesh (Kumaon Iron Works Ltd. in 1862) but various problems compelled the closure of its operation in 1864. In 1874 Burn & Co. first experimented on making iron based on coke made from Raniganj coal and this is considered to be the foreruner of the later history of modern production of iron in India.
The Barakar Iron Works, in 1875 built the first blast furnace at Kulti, W. Bengal based on usage of coke instead of charcoal. The company however went out of operation in 1879 & in 1889 it was handed over to Bengal Iron & Steel Company (BISCO). M/S Martin & Co. became the managing agent of BISCO in 1892 and modernized the company to produce 40,000 ton of pig iron per annum from two blast furnaces based on coke.

2.3. Developments in the Twentieth Century:

2.3(a): Up to 1947 (Pre Independence Period):

Early twentieth century, in 1905 – 06, BISCO attempted to manufacture steel but did not succeed due to high content of phosphorous in their Pig Iron and prohibitive cost of conversion. Good quality iron ore was found in Singhbhum in 1906 and this led to the formation of the INDIAN IRON & STEEL Co. (IISCO) by M/S BURN & Co. in 1918 at Hirapur near Asansol, W. Bengal to produce good quality pig iron for domestic use as well as export. In 1936, BISCO was merged with IISCO, M/S Burn & Co., in 1937, formed a new company, the STEEL CORPORATION OF BENGAL (SCOB) and a steel plant was built in 1939 at Napuria. Later on in 1946, Martin & Co. and Burn & Co. were formally amalgamated into M/S MARTIN BURN LTD. and in Dec. 1952, SCOB was merged with IISCO to establish the Burnpur Works, having a steel making capacity of 350000 ton per annum, based on Duplex process, a combination of side-blown convertor and open-hearth furnace. Sir Biren Mookerjee was the Chairman of the Board of Director.

JAMSHEDJI NUSSERWAJI TATA, the founder of Tata House, had a great vision of producing steel in India in commercial scale and it was solely due to his earnest effort that Tata Iron & Steel Company Ltd. was born. The first blast furnace was blown in December 1911 and the first steel ingot was rolled in February 1912. The company was originally constructed to produce 1,60,000 ton of pig iron 210,000 ton of finished steel. The plant was gradually expanded to a capacity of 0.5 MT of steel per annum and further to 0.8 MT of finished steel by 1939. Starting with Open Hearth process, the plant changed over to Duplex process during expansion.
When IISCO & TISCO were being shaped in the north, Sir M. Visvesvaraya conceived the production of iron in the state of Mysore. Construction of Bhadravati Iron & Steel Works was started in 1921 and the first blast furnace was lighted in January 1923 to produce 25,000 ton of pig iron per annum. In 1929 a cast iron pipe plant of 10,000 ton capacity was added and later on in 1956, two 25 ton Open Hearth Furnaces were set up to produce 30,000 ton of steel per annum. The name of the plant was changed to MYSORE IRON & STEEL WORKS, in the same year.

Besides the above integrated steel plants, producing both iron & steel, direct steel making from steel scrap based on electric arc furnace was started in twenties. Hukumchand Electric Steel Co. Ltd. (later known as Bharatia Electric Steel Co.) was set up in 1922 with two electric arc furnaces at Calcutta. Other electric arc furnace units were established at Kumardhubi, Lahore and Bombay but the industry was not organised and the capacity was limited till the forties.

In the meantime, steel re-rolling industry started growing to make good use of discarded steel scrap and thus to meet the local construction requirements. The first re-rolling mill was set up in 1928 at Kanpur by Singh Engineering works Ltd. A few well designed billet re-rolling mill were also installed by GUEST KEEN WILLAMS LTD. and NATIONAL IRON & STEEL Co. at Calcutta, Indian Steel Rolling Mills Ltd. at Negapatam Mukund Iron & Steel Works Ltd. at Bombay, Eagle Rolling Mills at Kumordhubi, and Indian Steel & Wire Product Ltd. at Jamshedpur. By 1946, there were 32 registered re-rolling mills with a capacity of 140000 ton per annum. There were of course, many unregistered re-rolling mills scattered throughout the country.

Besides the above steel making and re-rolling units in the private sector and state sector, the Defence & Railways in the Govt. sector also set up small scale steel making facilities to meet their captive demand. METAL & STEEL FACTORY, Ishapore set up a 20 ton open hearth furnace and 33 ton electronic arc furnace in 1902, to produce 12,000 ton of steel per annum. Similarly East India Railway erected a factory at Jemshedpur in 1898. The Central Indian Railway had set up a 2 ton side blown converter at Aimer in 1906 to produce steel for castings.
Production of saleable steel in India was around 1000 ton in the year of 1911-12. By the year 1943-44, the production of saleable steel increased by 100 folds to 1 million ton a year. The annual import of finished in those days of British rule was proportionality very high at about 0.8 – 1.2 mt until 1929 – 30. Export of finished steel during the above years was quite normal; generally well within 5,000 ton per annum with a few years of inceptions.

2.3(b). Developments after Independence: (1947 onwards):

The Independent India, under the leadership of Pandit Jawaharlal Nehru, soon realized the importance of industrialization for reaching the economic goal. The major landmark in industrialisation came with the Industrial Policy Resolution of April 1956. The Planning Commission was set up in March 1950 and Five Year Plan was started to develop the country on sound and guided lines. The first five-year plan, April 51 to March 56, laid emphasis on irrigation and power, transport and communication, agriculture and community development and social services. In Dec. 1953, an agreement was reached between the Govt. of India and the West German Combine, Kruppdemag, for providing financial and technical assistance in setting up an integrated steel plant at Rourkela with an initial capacity of 0.5 Mt (which was later revised to 1.0 Mt) of ingot steel. In Jan. 1954, Hindustan Steel Limited (HSI) was formed to build Rourkela Steel Plant.

In the meantime, the demand projection for 1960 – 61, as reported by the Technical Mission, showed a gap of 4.0 Mt of ingot steel. This induced the Govt. of India to sign and agreement with the then USSR in Feb. 1955 for the establishment of an integrated iron & steel plant with an initial capacity of 1 Mt of Ingot Steel at Bhilai. Simultaneously, the GOI initiated discussion with United Kingdom which ended into a contact between the GOI and the Indian Steel Works Construction Co. Ltd. (ISCOM) in Oct. 1956 for setting up the third integrated Steel Plant of 1 Mt ingot steel capacity at Durgapur.
The Second Five Year Plan, April’56 to Mar’61 witnessed intense activity in the steel sector with three steel plants under construction in the public sector. Besides TISCO & IISCO were allowed to expand their capacity to 2 Mt & 1 Mt respectively. In total, the second plan period envisaged an ingot steel production of 6 Mt or a finished steel production of 3.9 Mt. The basic objectives of the second plan were to create a socialistic pattern of society resulting in increases in the national income and employment as in greater equality in income & wealth.

The second plan period however, failed to achieve the target steel production and it was realised that steel planning should be taken up well in advance. The steel planning up to 1970 – 71 was, therefore taken up ten years ahead from 1962 and NCAER made the following projection for the terminal years 1965 – 66 and 1970 – 71.

Table: 2.1

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<th>ITEMS</th>
<th>1965 - 66</th>
<th>1970 – 71</th>
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<tbody>
<tr>
<td>1. Mild Steel, Ingot (Mt)</td>
<td>9.735</td>
<td>18.287</td>
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<td>2. Mild Steel, rolled (Mt)</td>
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<td>3. Alloy &amp; Special Steel Ingot (Mt)</td>
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<td>4. Alloy &amp; Spl. Steel, finished (Mt)</td>
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<tr>
<td>Foundry &amp; Pig iron (Mt)</td>
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<td>3.462</td>
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Source: Reappraisal of Steel Demand, Vol. 1 NCAER. 1963

Based on the above projections, the expansion of three integrated steel plant in the public sector was envisaged to be carried out during the 3rd Five Year Plan (April’ 61 to March’ 65). The Government decided to expanded R.S.P. to 1.8 Mt, B.S.P. to 2.5 Mt and D.S.P. to 1.6 Mt of ingot steel per annum. In addition, a second stage expansion of Bhilai Steel Plant to 4.0 Mt of ingot steel was also conceived special products were added during these expansions, like tin plate and galvanized sheet at Rourkela, wire rod at Bhilai and skelp at Durgapur. The first stages of expansion of these plants, by 3.9 Mt in total were completed by 1967-68.

The Government during the same sixties also conceived the installation of a fourth integrated steel plant at Bokaro. The United States Steel Corporation in 1963,
suggested installation of a 1.4 Mt flat product plant with provision for expansion to 4.0 Mt in ten years and it was strongly hoped that US Govt. would show interest in the project, which did not finally come true. Instead, the then USSR expressed readiness to help. In March 1966, it was decided to install the second flat product plant at Bokaro with an initial capacity of 1.7 Mt going up to 4 Mt in the second stage with agreement was concluded with TYAZHPROMEXPORT of USSR in May 1966 for supply of equipment and materials for the 1st stage of the plant. HEC, MAMC, BHEL, Instrumentation Ltd. and other indigenous manufacturers were also engaged to supply a large part of the plant and equipment. The entire construction was taken up by HSCL and the work was started in April 1968. Indigenisation of establishment of integrated steel plants was first attempted with Bokaro Steel Limited.

In June 1979, an agreement was signed between the Governments of India and the then USSR to build the fifth integrated steel plant in the public sector, the first part based steel plant of India, at Visakhapatnam under Rashtriya Ispat Nigam Ltd. (RINL).

The USSR agreed to provide technical and financial support in building the 3.0 Mt capacity (liquid steel) Visakhapatnam Steel Plant in two overlapping stages. The construction was started in 1980 and the first blast furnace (3200 Cu.m) was commissioned in March 1990 and first converter heat was tapped in Sept. 1990.

During this period, the second stage of expansion of Bhilai Steel Plant to 4.0 Mt stage was also completed (1985-86). Thus between the fourth and seventh plan period, India increased the steel capacity in the public sector by 8.5 Mt only, a rather slow progress for a country like India.

2.4. Steel plants under secondary sector:

So far we have discussed the growth of integrated steel plants in India mainly based on blast furnace route of iron making, mostly in the public sector. What has not been talked of, is the growth of steel making capacity in the private sector mostly based on electric arc furnace route.
Electric arc furnace steel making based on 100% scrap charge was first started in India in 1902 at the Ordnance Factory, Cossipore. Long after in 1922, Hukumchand Electric Steel Co. (later known as Bharatia Electric Steel Co.) went for electric arc furnace steel making. In 1956, Ministry of Commerce & Industry Constituted a committee to consider the future lines of expansion of electric arc furnaces in the country. According to their report, submitted in April 1957 the then number of installed electric arc furnaces was 23 and their capacity along with six open-hearth units was estimated at 150,000 T/Y of crude steel only. Until the early 60’s the electric arc furnaces in India were mainly used for production of steel castings and alloy and special steels. In 1966, in order to bridge the gap between the demand and availability of structural steel for construction purpose without heavy investment from the Govt. side, the EAF industry was allowed to produce mild steel ingots. Being encouraged by the Governments delicensing policy, new EAF units were installed in the country to produce mild steel alone. In 1970, the Government again brought the industry under licensing regulation, mainly to have a control on steel scrap and electric power on regional basis. Simultaneously, the Government also introduced liberalised industrial policy to encourage industrial growth. The policy stipulated the total capital cost of concerned industrial unit not to exceed Rs. 1 Crore. As a result, many entrepreneurs jumped into the fray of setting up small capacity electric arc furnace to meet the shortfall in steel availability. The installed capacity of EAF units jumped from 500,000 T/Y in 1967 – 68 to 3 Mt/Y by 1973 – 74.

The mini steel industry had a spectacular growth from the decades of the seventies. 212 plants were licensed bringing the licensed capacity to about 6.6 Mt in 1986 – 87. Out of these 212 units, only 172 projects materialised. There were however a number of units operating in the unorganized sector for which precise data are not available. According to an estimate of the Steel Furnace Association of India (SFAI), the population of EAFs in the seventies went up to 164, mostly in small of 3 – 20 tonnes each.