Study Of Steel Industries In India

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Abstract - **In this research paper I have studied about steel industries of India after the beginning of steel era in India. I have compared the status of steel from the inception of steel to recent times. How is the production of steel improved in India since the establishment of steel to current times?**

Introduction:

Steel is an alloy of iron and carbon, and some other elements. Due to its high tensile strength and low cost, it is an important component used in building, infrastructures, tools, ships, trains, automobile, appliances and weapons.[i]

Iron is the base metal of steel. It is used in two crystalline forms (allotropic forms), body centered cubic (BCC) and face centered cubic (FCC), depending on its temperature. In the BCC arrangement, there is an iron atom in the center and eight atoms at the corners of each cubic unit cell; in the FCC there is one atom at the center of each of the six faces of the cubic unit cell and eight atoms at its corners. It is the interaction of the allotropes of iron with the alloying elements, primarily carbon that gives steel and cast iron into a range of unique properties.

In pure iron, the structure has comparatively little resistance to the iron atoms slipping past one another, and so pure iron is ductile or soft in nature and easily cast into different components. In steel, small amounts of carbon, other elements, and inclusions within the iron act as hardening agents that prevent the movement of dislocations.

The carbon in steel alloys can contribute up to 2.14% of its weight. By varying the amount of carbon and other alloying elements, as well as controlling their physical and chemical properties in the final steel (either as solute elements, or as precipitated phases), slows the movement of layers or dislocations that make pure iron ductile, and thus controls or enhance the qualities of steel. The qualities include hardness, quenching behavior, annealing behavior, tempering behavior, yield strength, and tensile strength of the steel. The increase in the strength of steel is only possible by reducing the ductility of steel.

History:

The identification of steel was done back 4000 years prior the beginning of the Iron Age. Comparatively harder and stronger than bronze, which was the most widely used metal, iron started to displace bronze in weaponry and tools.[ii]

Few thousand years ago, the quality of iron produced depended on the ore available as well as on the manufacturing methods. By the 17th century, iron's properties were well identified, but increasing urbanization in western side demanded a more versatile and stronger structural metal. By the 19th century, the amounts of iron being consumed by expansion of railroads provide metallurgists with the financial incentive to improve iron's brittleness and inefficient production processes.

The most important breakthrough in steel history came in 1856 when Henry Bessemer developed an effective method to reduce the carbon content in iron by using oxygen: The modern steel industry was born.

Methods to manufacture steel:

1. The Bessemer process: Bessemer named scientist designed a pear-shaped receptacle, referred as a 'converter' in which iron is heated while oxygen could be blown through the molten metal. As oxygen passed through the molten metal, it was react with the carbon releasing carbon dioxide and producing a more pure iron.[iii]

2. The Open Hearth Process: This process will use high temperatures to burn off excess carbon and other impurities, relied on heated brick chambers below the hearth. Later Regenerative furnaces used exhaust gasses from the furnace to maintain high temperatures in the below part of brick chamber.

3. Electric Arc Furnace Steelmaking: Just after the turn of the 17th century, another development occurred that had a strong influence on the evolution of steel production. Paul Heroult's electric arc furnace (EAF) was designed to pass an electric current through charged material, resulted in exothermic oxidation and temperatures up to 3272°F (1800°C), more than sufficient to heat steel production.

4. Oxygen Steelmaking: The majority of global steel production, about 66%, is produced by oxygen steel making process facilitate the development of a method to separate oxygen from nitrogen on an industrial scale in the 1960s allowed for major advances in the development of basic oxygen furnaces.

Basic oxygen furnaces blow oxygen into large quantities of molten iron and scrap steel and can complete a charge much more quickly than open-hearth methods. Large vessels holding up to 350 metric tons of iron can complete conversion to steel in less than one hour.

Incorporation of steel industries in India:

Currently a number of steel industries are there in India those are:

1. RINL (Rastriya Ispat Nigam limited): One of the most leading industries in India is Rastriya Ispat Nigam limited also named as Visag steel plant established in 1982 having headquarter in Visakhapatnam.

2. VISA Steel: VISA steel industry was established in early 2000' by Vishambhar Saran. Its headquarter is in Kolkata. It has revolutionized the steel production in India and has one of the most prominent private companies of not only in India but also in the world. It has changed according to the customer requirement and maintained the quality of steel.

3. Essar steel: It was founded by Essar group in 1998. Since then it is doing best business in India by providing a quality steel product. It has unbelievable production rate producing around 10 million metric ton every year. It has customers all over Asia and North America.
4. TATA steel: It is the largest steel plant in India and has expanded its area all over the world. It was founded on 25th August 1907 by Jamsetji Tata. It's headquarter is in Kolkata Westbengal. Annual production of steel is about 27.5 million Tones.
5. JSW steel: One of the largest steel conglomerates JSW steel was founded by Jindal group in 1982. It has headquartered in Mumbai Maharashtra. It has its branch in approximately 140 countries. It is producing steel 18 million ton per annum and has the best supplier of USA, Chile and UAE.
6. Bhusan steel: Bhusan steel is currently named as Tata Steel BSL limited after merging with TATA group. It was founded in 1987 by Brij Bhusan Singhal. After merging it has the target to produce 12 million ton annually.
7. Steel Authority of India Limited: it is an Indian state owned steel making company based in Newdelhi India. It was founded on 19th January 1954. It has net share of 75% of Indian government. It has the target to produce 50 million tons by 2025.

Production of steel:

India was the world's second largest steel producer, as of 2018. The country is slated to surpass USA to become the world's second largest steel consumer in 2019. In India, as per Indian Steel Association (ISA), steel demand to grow by over 7 per cent in both 2019-20 and 2020-21

In FY19, India produced 131.57 million tons (MT) and 106.56 MT of gross finished steel and crude steel, respectively.[iv] Exports and imports of finished steel stood at 2.45 MT and 3.35 MT, respectively, in FY20P (up to August).

India's finished steel consumption grew at a CAGR of 7.5 per cent during FY08-FY19 to reach 97.54 MT. India's steel production is expected to increase from 106.56 MT in FY19 to 128.6 MT by 2021.

The Government has taken various steps to boost the sector including the introduction of National Steel Policy 2017 and allowing 100 per cent Foreign Direct Investment (FDI) in the steel sector under the automatic route. Between April 2000 and March 2019, inflow of US$ 113.12 billion has been witnessed in the metallurgical industries as Foreign Direct Investment (FDI).

The Government has launched the National Steel Policy 2017 that aims to increase the per capita steel consumption to 160 kgs by 2030-31. The government has also promoted Policy which provides a minimum value addition of 15 per cent in notified steel products which are covered under preferential procurement.

National Mineral Development Corporation is expected to invest US$ 1 billion on infrastructure in next three years to boost iron production.

As per Economic Survey 2018-19, steel production will touch 128.6 million tons by 2021.

Note: ^National Steel Policy 2017

Conclusion: By studying the various prospect of steel in India it is expected that India would surpass the US by 2013 in steel sector. India will produce approximately 230 million tons by 2030. India has homes of various customers in steel sector it would also grow by allowing 100% FDI in India and ease the norms of establishment of new companies.

Reference

[i] Harper, Douglas. "steel" etal Online Etymology Dictionary.
[ii] Venables etal Materials science, Encyclopedia Britannica.
[iii] Turkdogan, E.T. (1996). Fundamentals of Steelmaking. London: Institute of Materials.
[iv] "GOI" National steel policy 2017.