RESEARCH & DEVELOPMENT IN IRON & STEEL SECTOR

In 2019-20, India's crude steel capacity was 142.3 MT and production was 109.137 MT as against a production of 110.92 MT in 2018-19. Since 2018-19, India had attained the position of 2nd largest steel producer in the world, after China. The Per Capita steel consumption in India as per 2019-20 data was 74.7 kg as against the world average of 229.3 kg.

There are primarily 2 routes of steel production:

- BF/BOF route also called the Oxygen route
- Electric route comprising of Electric Arc Furnace and Electric Induction Furnace.

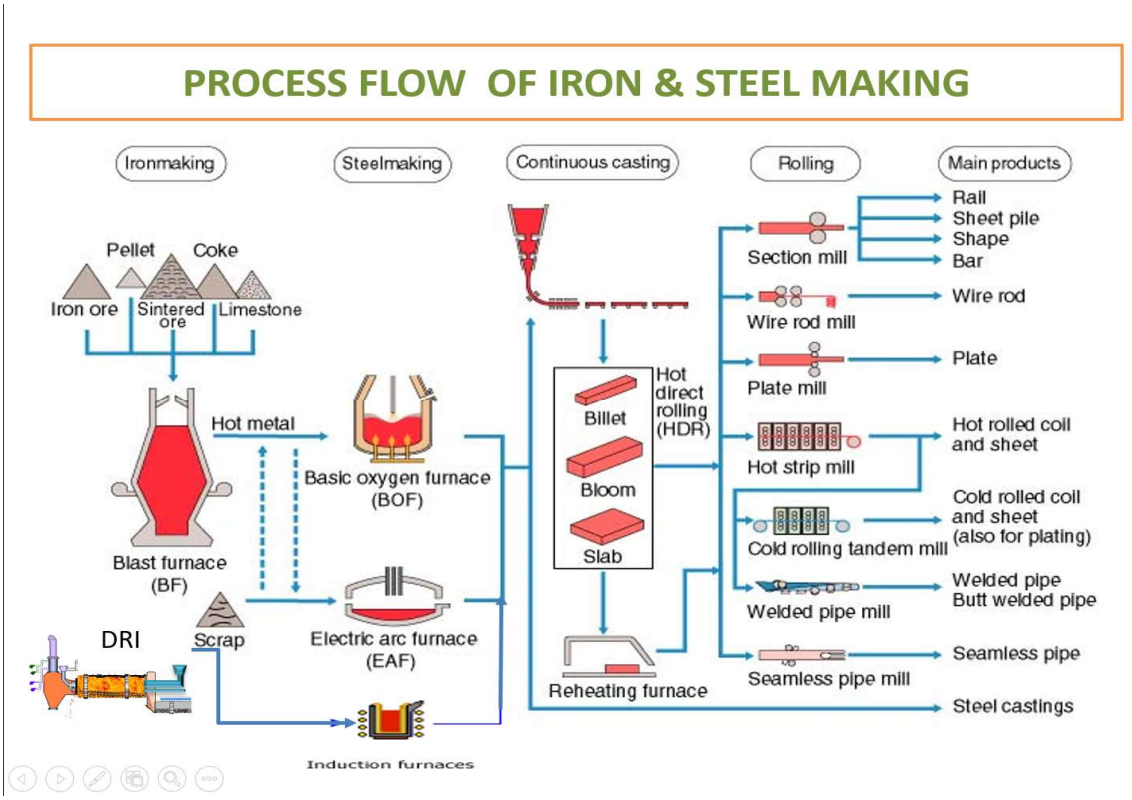
As per 2019-20 data, about 55% steel is produced through the Electric Furnace route of which about 26% steel is produced through the Electric Induction Furnace (EIF) route and 29% from Electric Arc Furnace (EAF) route. About 45% steel is produced through the conventional integrated route of BF-BOF route as against the world average of around 70%.

The structure of the Indian Iron & Steel Sector is given below:

- Blast Furnace (BF): 60
- Basic Oxygen Furnace (BOF): 18 units
- Electric Arc Furnace (EAF): 50
- Electric Induction Furnace (EIF): 999
- Rolling Mills: 1222
- Direct Reduced Iron units: 312

The Indian steel industry comprises of large producers (= > 1 MTPA) which contribute around 63% of the total production as against smaller producers (< 1 MTPA) which contribute around 37% of the total production in the country.

The layout of the process followed for iron & steel making is given below:



India is the world's largest producer of Direct Reduced Iron (DRI) or Sponge Iron. During 2019-20, total production of sponge iron is 37.1 MT of which 85% are coal based plants and 15% are gas based plants.

Post-liberalization, technological profile of the Indian Steel Industry has undergone substantial change. With setting up of new large modern steel plants based on state-of-the-art technologies and modernization/ expansion of existing steel plants, there is a upward trend in efficiency parameters of operation viz. productivity, energy efficiency, environment friendliness etc.

The Indian Iron & Steel industry needs to pursue research for development & adoption of such technologies which are relevant to natural resource endowment of the country, which minimize damage to the environment, optimize resource utilization, facilitate achievement of global standards of productivity & efficiency and development of front end & strategic steel based materials. Against this backdrop,

the issue of utmost importance is the R&D intervention to find out techno-economic solutions to use indigenous raw material resources. Another area that requires attention is the product development to develop and produce high performance steel indigenously.

R&D efforts by the Indian steel companies out of their own corpus have mainly concentrated on improving internal processes related to saving costs and improving efficiency. Process improvements such as beneficiation and pelletization of iron ore have received good response in the industry.

Adoption of Technologies such as continuous casting together with thin slab casting as well as dedicated technologies for harnessing waste heat are drawing the attention of the steel companies. These have led to improved productivity and energy efficiency in the Indian steel industries. However, there are certain constraints in raw material quality, particularly high Alumina in Indian iron ore and high ash in Indian coal, which adversely affect the techno economic performance of the whole industry. To address these constrains and also to sustain the projected high growth rate, there is an urgent need for concerted R&D and technology intervention in the iron and steel sector.

Product development is yet another challenging area being faced by the steel industry in India. While large varieties of value added steel products are now being produced indigenously, the country is dependent on import for several high performance and value added steel products like electrical steel, automotive grade steel and steels for specialized use in defence, space and nuclear applications. The technology in such high-value products is closely held by the companies in the US, Japan & Korea, who do not part with such technologies easily. Not only huge R&D investments to develop such technologies are needed but efforts are also required for technological collaborations with such companies for acquiring high-end technologies possessed by them.

The steel companies like SAIL, Tata Steel, JSW Steel and Essar Steel have accomplished some significant work in the area of raw material beneficiation, agglomeration and product development. However, the major focus of work in these companies generally relates to incremental technology development to address the present and short term needs of various production units. As a matter of fact, barring some commendable product development efforts, their contributions towards disruptive technology development have not been noteworthy. The actual investment on R&D by the large steel companies in India is considerable less than their global counterparts. Secondary Steel sector has limited capacity for undertaking research and development.

Ministry of Steel is therefore, supporting the R&D efforts of the sector by providing financial assistance for R&D projects for the benefit of the steel sector. Ministry of Steel has introduced an R&D scheme viz. “Promotion of R&D in Iron & Steel Sector”, for providing financial assistance for the R&D projects identified for funding by Ministry of Steel. The budget allocated for the scheme is around Rs 5-10 crore per year. R&D Project Proposals are invited from reputed Academic Institutions/ Research Laboratories and Indian Steel Companies for pursuing R&D projects for the benefit of the Iron & Steel Sector in the country.

A Project Approval and Monitoring Committee (PAMC) under the Chairmanship of Additional Secretary & Financial Adviser and members comprising Joint Secretary, Ministry of Steel, Director IIT Kharagpur, Director IMMT, Director NML and other members, is the decision making body for approval of R&D projects, monitoring of ongoing projects and for overall direction. Technical Division (TD) of the Ministry of Steel works as the Secretariat of the PAMC to scrutinize the research proposals, obtain views of experts and monitor the progress of the projects for reporting to the PAMC.

The PAMC has approved 39 R&D projects in which Rs 144.03 crore has been released from Ministry of Steel's budget, till March 2021. This includes Rs 5.52 crore released in 3 projects under IMPRINT scheme of MHRD. Major projects covered under the R&D scheme of Ministry of Steel, include exclusive R&D initiatives to upgrade Indian low grade iron (including BHQ/BHJ) and Indian coking/non-coking coal. Through the completed projects processes/ technologies have been developed in laboratory/ pilot scale for beneficiation & agglomeration of iron ore & coal for the benefit of the iron & steel sector. Process has also been developed in laboratory scale for production of low Phosphorus steel in laboratory scale Induction Furnace, for which industrial trials have also been carried out. Feasibility of smelting reduction of iron ore/fines using hydrogen plasma has been explored in laboratory/ pilot scale. Process has also been developed for utilisation of Mill Scale in Tunnel Kiln for Production of DRI. The list of the R&D projects funded from Ministry of Steel’s budget and their status is given in the website as **Annexure-1.** The Grant released under the scheme since inception is given in the website at **Annexure-2**.

Ministry of Steel invites R&D Proposals from reputed Academic Institutions, Research Laboratories and Steel Companies for pursuing R&D projects for the benefit of the Iron & Steel Sector. Last date for receipt of R&D Proposals for FY 2021-22 is 31st July 2021. The details are given in the website.

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