Steel Making and Rolling (Metalworking)

Process & Applications, Rod and Bar Rolling, Hot Rolling Mill, Plate Mill, Hot Strip Mill, Rolling Mill for Steel Bars

Introduction

The steel industry has taken note of the continued growth in steel imports and a number of projects have been planned and are under implementation. It is estimated that in the next 2-3 years about 10 million tons of new steel capacity will be created. Finished steel products are broadly classified as flat products and long products. In rolling mills, intermediate steel products are given their final shape and dimension in a series of shaping and finishing operations. Most of the slabs are heated in reheating furnaces and rolled into final shape in hot– or cold–rolling or finishing mills. While some products (e.g. reinforcement bars, steel plates) only require hot-rolling, some others may require both hot– and cold–rolling (steel for cars and white-goods).

The primary rolling mill for flat products is the hot strip mill. This mill by its inherent nature is of very high capacity, generally producing a minimum of 2 million tons per year. Recent development of the thin slab casting and rolling technique has given rise to mills of lower capacity of 1 million tons per year. These mills however are coupled to the steel making casting unit and cannot be set up on a standalone basis. Standalone Rolling /Processing Mills using purchased/imported inputs for production of long & flat rolled steel products including coated sheet products. The industry is currently operating at 70 per cent utilization of processing plants, and hopes that would be able to achieve full capacity utilization by the year-end.

Rolling of steel is one of the most important manufacturing processes for steel. It is usually the first step in the processing of steel after it is made and cast either in Ingot or continuous cast product in a steel melting shop.

In India, steel making technology may be classified under three major groups, namely, BOF (45%), EAF (24%) & EIF (31%). While BOF and EAF are able to produce the stringent quality steel for high end product segment, EIF sector mostly caters to the need of construction sector.

Rolling is a metal forming process in which metal stock is passed through a pair of rolls. Rolling is classified according to the temperature of the metal rolled. Steelmaking is the second step in producing steel from iron ore. There are three primary steel making processes; open hearth steel making, oxygen steel making and electric furnace steel making. There are two main raw materials used in making of steel; hot metal which is a molten blast furnace iron and scrap which consists of the byproducts of steel fabrication and also of the worn out, broken, or discarded items containing iron or steel. Open hearth process allows high flexibility in regard to a composition of raw material.

The most appealing characteristic of the Open hearth furnace is the rapid production of large quantities of basic steel, used for example to construct high rise buildings. Basic oxygen steelmaking also known as the oxygen converter process is a method of primary steelmaking in which carbon rich molten pig iron is made into steel. Hot metal is the principal material used in the BOS (Basic Oxygen Steelmaking) process. Blowing oxygen through molten pig iron lowers the carbon content of the alloy and changes it into low carbon steel. There are three important types of Electric furnace; A.C (alternating current) direct arc electric furnace, D.C. (direct current) direct arc electric furnace and induction electric furnace.

The casting process basically involves pouring molten metal into a mold patterned after the part to be manufactured, allowing cooling and removing the metal from the mold. There are various hot mills involved in the production of steel plate mill, hot strip mill, bar and rod mills etc. Techniques of steelmaking have undergone vast changes in scale and new processes have been developed to meet the demands of speed, quantity and quality. The steel industry has had a long history of development, yet, despite all the time that has passed, it still demonstrates all the signs of longevity. Rapid rise in production has resulted in India becoming the 5th largest producer of steel.

Some of the fundamentals of the book are fusion welding processes, arc welding processes: consumable electrode, arc welding processes, width change by rolling and pressing, metallurgical defects in cast slabs and hot rolled products, primary steel making processes, open hearth steel making, oxygen steel making, electric furnace steel making, chemical formulas of steel making, optimization of primary steel making process, secondary steel making processes, methods of continuous casting of thick slabs, optimization and control of width, fundamentals of metal casting, steel making technology, basic principles of width change, types of mills used for the rolling of plates, quality assurance, testing, and inspection etc.

New ideas continue to revolutionize the steel producing process today as much as they did a hundred years ago. The present book covers latest technology of steel rolling, which will give a new path to entrepreneurs and existing units. It is hoped that this book will be resourceful to researchers, design engineers, technocrats, new entrepreneurs, institutional libraries, training institutes etc.

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Contact us

Niir Project Consultancy Services

106-E, Kamla Nagar, New Delhi-110007, India.

Email: npcs.ei@gmail.com , info@entrepreneurindia.co

Tel: +91-11-23843955, 23845654, 23845886

Mobile: +91-9811043595

Fax: +91-11-23841561

Website :

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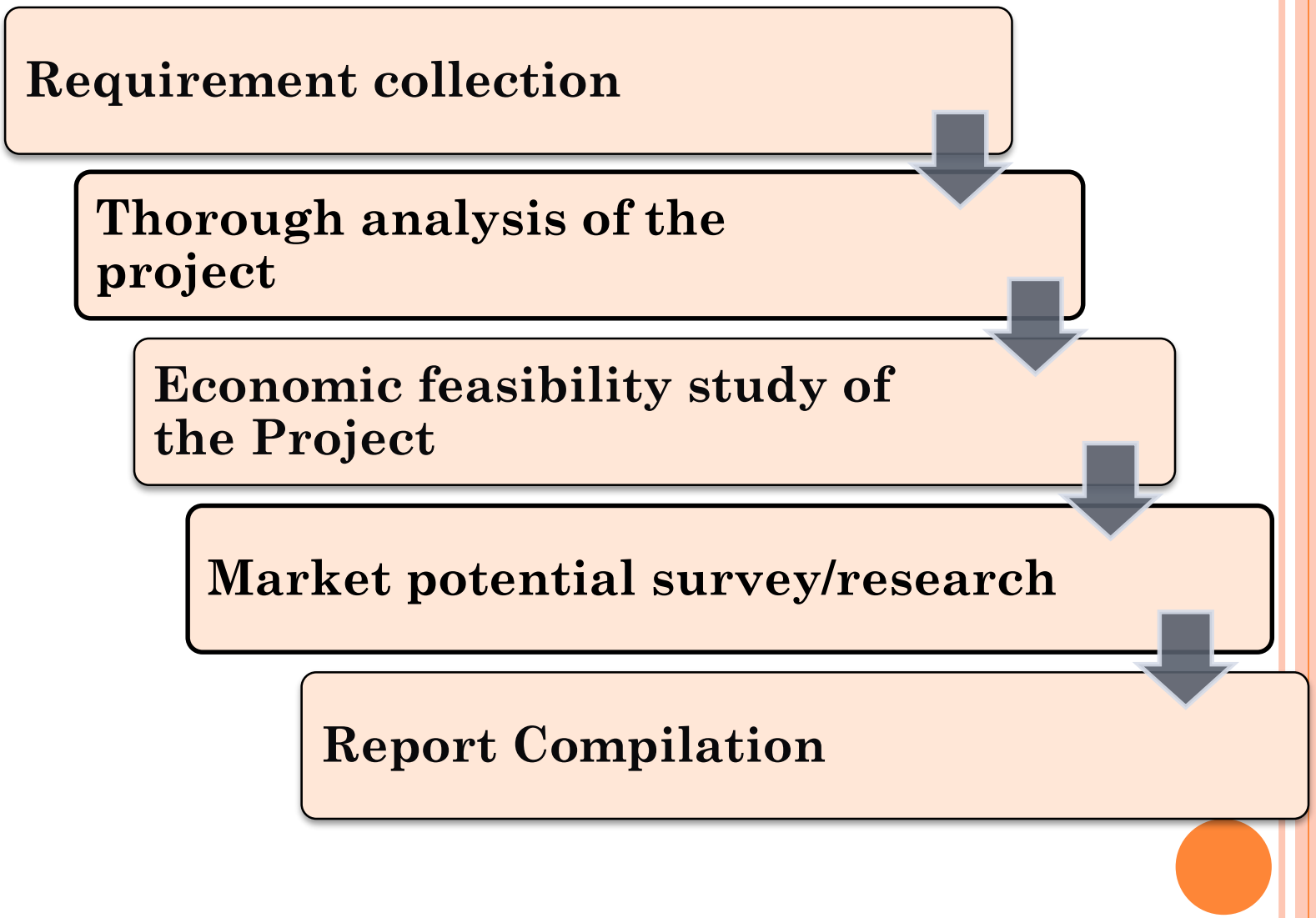

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Contact us

Niir Project Consultancy Services

106-E, Kamla Nagar, New Delhi-110007, India.

Email: npcs.ei@gmail.com , info@entrepreneurindia.co

Tel: +91-11-23843955, 23845654, 23845886

Mobile: +91-9811043595

Fax: +91-11-23841561

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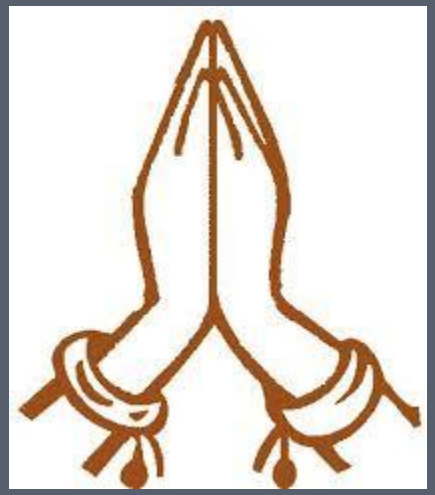

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