Ferrous and Non-Ferrous Metals
Production with Casting and Forging

The Casting and Forging product is playing a greater role in our everyday lives and is essential than it has ever been. The Casting and Forging industry fortunes is largely dependent on the level of activity within the construction (building and non-building) and automotive sectors. Ferrous and non ferrous metals and its alloys accounts for a large portion of all metal production. Metal ingots and billets are formed by a casting process. The Casting process has traversed a long path and impacted human civilization for nearly five millennia. For any metal casting process, selection of right alloy, size, shape, thickness, tolerance, texture, and weight is very vital. Casting process involves melting the metal to be used, pouring it into a mould, letting it cool and then knocking out the casting.
On the other hand, forging is one of the oldest known metal working processes. Forging technology occupies a very important place among all the manufacturing processes as it produces parts with excellent properties and with minimal wastage. Forging involves the use of machinery with a hammering or pressing action to convert basic shapes into a pre-determined form. Forging has the capacity to refine the grain structure and improve the physical properties of the metal. Forging products are consistent, without the defects of porosity, inclusion or voids, and finishing operations like machining, coining, sizing, straightening or surface treatments can also be easily done.
This handbook gives a concise description of the fascinating on the state-of-the-art technology of the casting and forging process of metals and metal alloys. This book contains precise details on production of ferrous and non ferrous metals, its casting and forging process along with their alloys. It is hoped that this book will find very helpful to all its readers who are just beginners in this field and will also find useful for existing industries, technocrats, technical institutions, etc.
Market Outlook

Global consumption of primary aluminium ingots during the period January to December 2015 (CY2015) increased to ~57.7 million metric tonnes (MMT) from ~54.3 MMT in CY2014, reflecting a growth rate of ~6.4%. However, consumption growth during H2CY2015 was lower, at ~4.2%. Primary aluminium demand during the second half was adversely impacted by consumption of the prevailing stock of semi-finished and finished products in the market. Consumption growth of primary aluminium metal remained at a similar level of ~4.2% in the first quarter of the current calendar year as well.
Aluminium Production Cycle

- **Bauxite**: 4-5 tonnes
- **Alumina**: 2 tonnes
- **Aluminium**: 1 tonne
- **End-use Products**

**Steps**: Refining, Smelting, Manufacturing, Recycling
Non-Ferrous Metals Market is expected to grow at a CAGR of 4.91% by the period 2016-2020.

Global non-ferrous metals market and is expected to reach 107 million metric tons by 2020. The growth in this region is attributed to the increasing consumption of non-ferrous metals in India, China, and Japan.

Global consumption of primary Aluminium ingots during the period January to September 2015 increased to ~42.9 million metric tonnes (MMT) from ~40.4 MMT. Global aluminum casting market will grow at a CAGR of nearly 6% by 2020.
Aluminium Production and Consumption

Indian Primary Aluminium Production and Demand, % y-o-y

Production
Demand

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During 2015, copper was one of the fastest growing segments in the global non-ferrous metals market.

Demand for aluminium has grown at a CAGR of 6.5% between 2010 and 2015

• Other non-ferrous metals grew at an average of 2.5% during the same period

• Much of the growth represents the Chinese investment boom and increased intensity of use of aluminium in the rest of the world
Demand of Zinc, Copper, Aluminium and Lead
During CY2015, apparent global zinc consumption increased to ~13.89 MMT from ~13.78 MMT in CY2014, reflecting a marginal growth rate of ~0.8%. The tepid growth witnessed was largely on account of a slow economic growth in China and ade-growth of consumption in the USA. Going forward, demand growth for refined zinc is expected to remain subdued in CY2016 on the back of an unfavourable demand outlook in major zinc-consuming economies. Nevertheless, the recent infrastructure push in China would support overall growth to an extent.
Zinc Prices

CRC US ($/st)

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Driven by rising infrastructure development and growing demand for automotives, steel consumption is expected to reach 104 MT by 2017. It is expected that consumption per capita would increase supported by rapid growth in the industrial sector, and rising infra expenditure projects in railways, roads & highways, etc.

India’s crude steel production grew by 7.4 per cent year-on-year to 95.6 Million tonnes (MT) in 2016. Total production of crude steel during February 2017 grew by 8.5 per cent year-on-year to 8.08 MT.

India’s steel exports grew 150.0 per cent year-on-year to 0.75 MT in February 2017, while steel imports declined 46 per cent year-on-year to 0.49 MT. Total consumption of finished steel grew by 3.4 per cent year-on-year to 76.22 MT during April 2016-February 2017.
## Growth in Steel Consumption

<table>
<thead>
<tr>
<th>Country</th>
<th>2014 (in million tonne)</th>
<th>2015*</th>
<th>2016*</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>710.8</td>
<td>▼ 0.5</td>
<td>▼ 0.5</td>
</tr>
<tr>
<td>US</td>
<td>106.9</td>
<td>▼ 0.4</td>
<td>▲ 0.7</td>
</tr>
<tr>
<td>India</td>
<td>75.3</td>
<td>▲ 6.2</td>
<td>▲ 7.3</td>
</tr>
<tr>
<td>Japan</td>
<td>67.5</td>
<td>▼ 2.4</td>
<td>▲ 1.1</td>
</tr>
<tr>
<td>S Korea</td>
<td>55.4</td>
<td>▲ 2.7</td>
<td>▲ 2.0</td>
</tr>
<tr>
<td>Russia</td>
<td>43.1</td>
<td>▼ 6.7</td>
<td>▼ 1.6</td>
</tr>
</tbody>
</table>

*Projected growth rate

Source: World Steel Association
Global copper mine production this year is expected to grow 1.4 percent to 19.2 million tonnes, rising another 2.1 percent to 19.61 million tonnes in 2017.
CHAPTER 1

- Production of Ferrous Metals
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Niir Project Consultancy Services
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New Delhi-110007, India.

Email: npcs.ei@gmail.com, info@entrepreneurindia.co
Tel: +91-11-23843955, 23845654, 23845886, 8800733955
Mobile: +91-9811043595
Fax: +91-11-23845886
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Contact us

Niir Project Consultancy Services
106-E, Kamla Nagar, Opp. Spark Mall,
New Delhi-110007, India.

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

Tel: +91-11-23843955, 23845654, 23845886, 8800733955

Mobile: +91-9811043595

Fax: +91-11-2385886

Website: www.entrepreneurindia.co, www.niir.org

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