THE INDIAN INSTITUTE OF METALS – DELHI CHAPTER

"MET-INFO"

INHOUSE PUBLICATION

ISSUE NO. 17 **E-VERSION** **SEP / OCT 2020**

K K Mehrotra-Chairman, Delhi Chapter

S C Suri-Editor-in-Chief (IIM-DC Newsletter)

For Private Circulation only

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E - Version

Published By

The Indian Institute of Metals

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Chairman's Message

I extend my sincere thanks to the newly constituted Executive Committee of our Chapter for once again reposing their trust in me to discharge the responsibilities of Chairman for 2020-21. I humbly accept this position with a sense of responsibility for serving the interests of our Chapter for one more year.

In the year 2019-20, our Chapter conducted a number of technical activities. The details of these activities have already been sent to you in August 2020 along with notice of AGM.

As you are aware, the flagship activity of our Chapter is MMMM event which is held once every two years. This was scheduled to be held in August 2020 for which some preparatory activities were undertaken in latter half of 2019-20. But we could not go ahead with this event because of unprecedented situation arising out of Covid-19. This has impacted the financials of our Chapter.

To tide over the financial impact of our Chapter, we are constrained to start e-version of the Met-Info in lieu of printed copy of this publication. I request members to bear with this change-over from printed version to e-version of the publication.

We could not undertake any technical activity at our Chapter's premises in the first half of 2020-21 because of impact of Covid-19. In the current situation we will be holding webinars till the situation becomes conducive to hold the technical activities at our Chapter's premises. Our focus will be to organize more and more technical activities related to contemporary and futuristic industry oriented issues.

I look forward to have suggestions and ideas from fellow members to increase the activities of Delhi Chapter. I have no doubt that with your support and active participation, our Chapter will continue to build excellence and make the Chapter more industry oriented.

K K Mehrotra
Chairman

Dr. Amol A Gokhale, President IIM

Our new President Dr. Amol A Gokhale for 2020-21

Dr. Gokhale enjoys tall stature in metallurgy in India and overseas. He did his B. Tech in Metallurgical Engineering from IIT Bombay in 1978, and M.S. and Ph. D in Metallurgical Engineering from University of Pittsburgh, USA in 1980 and 1985, respectively. He served in Defence Research and Development Organisation for 30 years, retiring as Distinguished Scientist and Director, Defence Metallurgical Research Laboratory, Hyderabad in July 2015. At DMRL, he led research on aluminium lithium alloys for aerospace applications, aluminium alloy components for torpedoes, crash resistant aluminium foams, additive manufacturing of Ni based superalloys, and other very high temperature materials for hypersonic vehicles. In August 2015, he was re-employed as Professor in the Department of Mechanical Engineering in IIT Bombay, where he teaches courses on "Processing of Aerospace Materials" and "Structural Materials". He is pursuing research in processing and oxidation behaviour of high temperature niobium alloys for rocket applications; studies on shock loaded foams, honeycombs and sandwich structures; damage assisted machining of Ni base superalloys, etc.

He has been a Life Member of IIM from 1993 and has taken part in the organisation of many IIM events at the Chapter level and at the national level. He was a member of the examination committee for 4 years in the 1990s. He was the Convener of NMD ATM 2011 held at Hyderabad. He was Vice Chairman and Chairman of IIM Hyderabad Chapter for four and two years, respectively. He was the Chairman of the International Symposium on Light Weighting held at BITS Goa as part of NMD ATM 2017 and edited a book on the same subject published by Springer Publishers. He helped streamline IIM HO administrative procedures. Leading a team of six, he played a crucial role in the creation of a package of 10 short term courses to be offered by the Institute. He also led the preparation of the revised NMD Award Scheme proposal for the Ministry of Steel, which is under consideration.

He has been the recipient of several awards from the University of Pittsburgh, Defence Research and Development Organisation, National Research and Development Corporation and the Indian Institute of Metals, and is a Fellow of the Indian National Academy of Engineering. He has been serving on the NITI Aayog committee on Rare Earth Permanent Magnets (where the recommendations were recently accepted for indigenisation of rare earth metals technology), Ministry of Defence committee on Strategic Materials Policy, Science and Engineering Research Board, various committees of Indian National Academy of Engineering, and Board of Governors of National Institute for Foundry and Forge Technology etc. He is the Chairman of the Research Council of National Metallurgical Laboratory Jamshedpur and the Chairman of the Steering Committee of Aeronautical Research and Development Board, Defence Research and Development Organisation since January 2017.

He was the Vice-President of IIM since 2017 and has been appointed as the President from 1st August 2020 for a period of one year.

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GALVANIZING INDUSTRY IN INDIA - PAST, PRESENT & FUTURE

L. Pugazhenthy, Executive Director
India Lead Zinc Development Association &
Past President, The Indian Institute of Metals

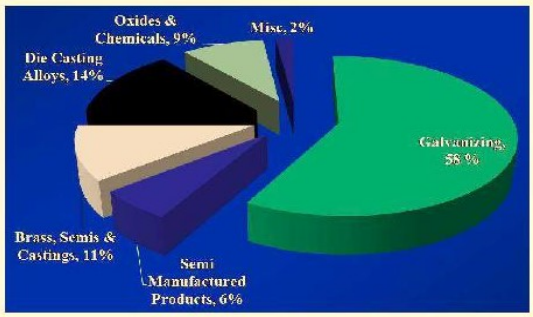
INTRODUCTION

Galvanizing industry is an important downstream activity in our economy, playing a significant role in preventing corrosion of steel products and structures. The galvanizing industry had a humble beginning in post-independent India, expanded in the nineties, has come a long way and is poised for a greater role in the coming years in meeting India's ever-growing demand, besides catering to the export markets.

GLOBAL & INDIAN SCENARIOS

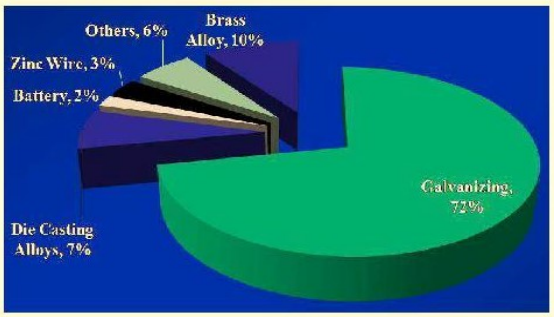
Of all the coated materials in the world, Zinc-coated steel products would easily be the largest share; zinc is applied through hot dip galvanizing, electro galvanizing, thermal spraying, electroplating, zinc anodes, zinc-containing paints as well as powders. Even among zinc-coated steel sheets, there are galvanized, galvalume, galvannealed, galfan, color-coated sheets etc.

(Fig-1) End Uses of Zinc - World



2019 World Zinc Production (13.5 Mt)

(Fig-2) End Uses of Zinc - India



Zinc Production 2019-2020 (0.688 Mt)

Out of 13.5 Mt of Zinc produced globally, 58% goes for galvanizing (Fig-1); in India, out of 0.688 Mt of zinc produced during 2019-20, 72% has gone to the galvanizing sector (Fig-2).

WHY GALVANIZE ?

Steel is the most widely used engineering and construction material. But unfortunately it corrodes gradually, the corrosion losses in India amount to 3 to 4% of our GDP every year. Hence there is an imperative need for protecting exposed steel structures; public

infrastructure, created with huge outlays, are permanent national assets and hence they need to be protected for a long service life. Zinc, well known for its excellent corrosion resistance, is the most widely applied coating material of choice:

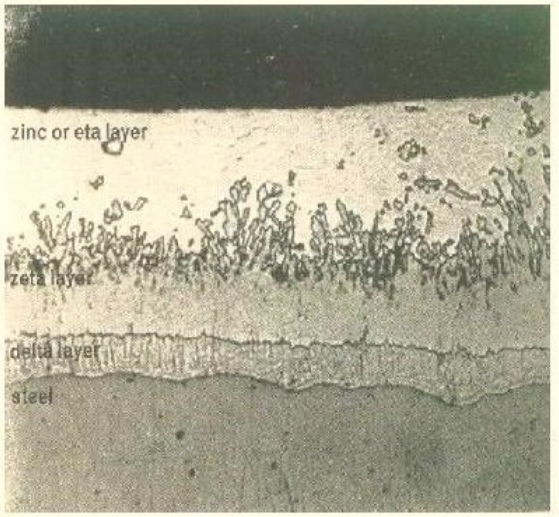
Zinc has the following inherent advantages:

- excellent corrosion resistance
- great natural affinity for steel
- long maintenance free life
- life directly proportional
- metallurgicallly bonded coating
- high wear & abrasion resistance
- good in pH range 6 to 12.5
- paintable, for aesthetic appeal
- weldable, use recommended touch ups &
- most economical, life cycle cost

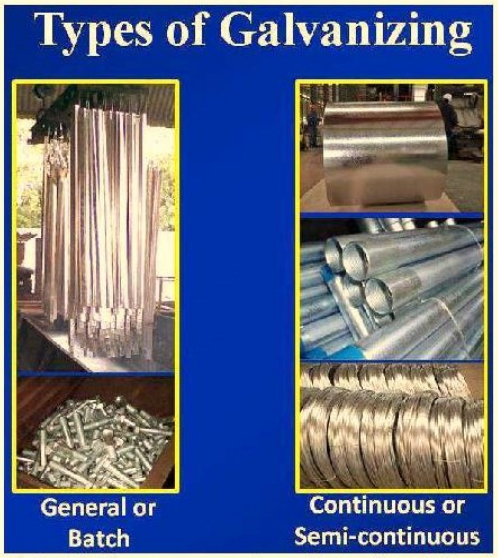
(Fig-3) A factory controlled metallurgical reaction of zinc and steel that provides "barrier" and "sacrificial protection" from corrosion

Hot Dip Galvanizing

Hot dip galvanizing is a process wherein well-cleaned steel products are dipped in molten zinc for a specified immersion time; the steel-zinc reaction leads to a metallurgically bonded coating. This coating gives both barrier as well as sacrificial protection, a value added property incidentally.



(Fig-4) Photomicrograph of a section through a typical hot dip galvanized coating.



(Fig-5) Even among hot dip galvanizing, there are two types: batch galvanizing & continuous galvanizing

Galvanizing – Past

Post- independent India obviously laid more emphasis on agriculture, irrigation, dams, power, transport, defence etc. The country had a very tight "licensing raj" with industrial licences as well as import licenses, till 1991. India also had severe foreign exchange crunch; conservation of foreign exchange and import substitution were the priorities in the Govt. of India. India was totally import dependent for many commodities, including Zinc and Lead.

Galvanizing of steel sheets began in Jamshedpur in the then Tata Iron & Steel Company Ltd, the earlier avatar of Tata Steel, in the early sixties they were cut sheets dipped in a molten zinc, extracted and passed through steel rollers.

Tinplate Company of India, a subsidiary of TISCO also had similar cut sheet galvanizing lines. Indian Iron & Steel Co.Ltd. (IISCO) Burnpur also had a similar cut sheet galvanizing line.

In the late sixties the modern day high speed Sendzimir lines for continuous galvanizing of steel sheets were set up by Hindustan Steel Ltd (the predecessor of SAIL) at Rourkela and Bokaro. In the mid-eighties many thin gauge sheet galvanizing lines were licensed and came up across the country; such sheets, being lighter, were preferred in the hilly regions of J & K, HP, North East etc. for roofing, paneling, sheds etc.

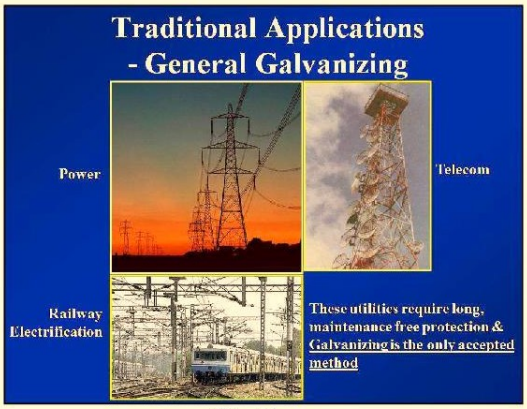
(Fig-6- Sheet Galvanizing)

Many State Electricity Steel Boards (Punjab, Orissa, Kerala, Tamil Nadu) had their own captive galvanizing units for steel structurals used for substation structures, power transmission etc. For galvanized nuts & bolts, Guest Keen Williams (GKW) had a centrifuge galvanizing plant in Howrah, West Bengal. Govt of India set up a structural galvanizing unit in TriveniStructurals at Allahabad. Indian Railways also had a captive galvanizing plant at Raipur for galvanizing of railway electrification towers, Kamani Engg Corpn as well as Richardson &Cruddas set up multi locational general galvanizing units in India for domestic as well as export markets.

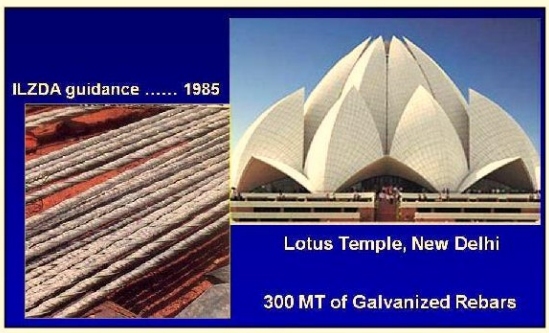
In the seventies and eighties, there were a number of tube galvanizing units in India such as Indian Tube Company, Bharat Steel Tubes, Zenith Steel Pipes, Gujarat Steel Tubes, Ambica Steel Tubes etc. Their products had a ready market in India for drinking water pipes, irrigation, sprinkler irrigation etc., India was also a major exporter of galvanized ERW tubes; some of the above companies used to secure Export Performance Awards given by EEPC (Engg. Export Promotion Council) year after year.

India also had a number of continuous steel wire galvanizers such as Usha Martin Block (Wire Ropes), Special Steels Ltd, Industrial Cables India, Devidayal Wires, Hindustan Wires, Deccan Wires etc. These galvanized wires were mainly used for making wire ropes, barbed wire, cable armour etc., the above companies were also exporting their products to many overseas countries.

There were also a number of small units in India for galvanizing of steel buckets, pipe fittings, nuts & bolts with primitive technologies in Howrah, Ludhiana, Kanpur etc.,



(Fig-7)



(Fig-8)

In general galvanizing, the galvanized steel structures were mainly used in traditional applications like power, railway electrification & telecom, giving a long maintenance free life (Fig-7).

In 1985, the Lotus Temple (Fig-8), using about 300 tonnes of galvanized rebars – India's first example - came up, taking the cue from the Opera House at Sydney. ILZDA was instrumental in introducing this concept. Even today the temple looks bright and beautiful without any concrete cracking, rust stains etc.

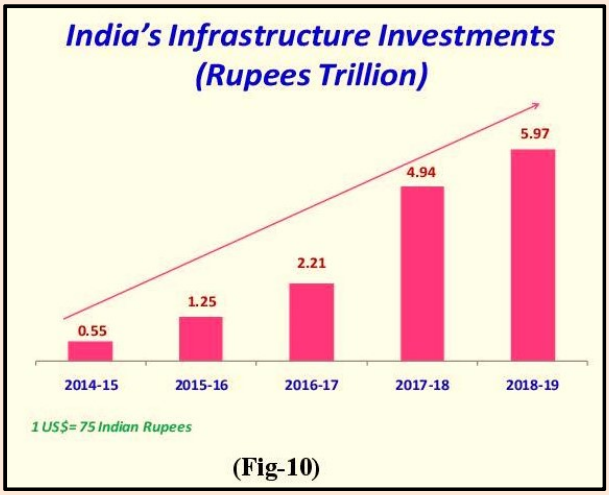

(Fig-9)

India also started the process of standardization for the galvanizing industry, very early based on overseas standards like BIS, JIS, ASTM etc., Indian Standards Institution (ISI), which has now become Bureau of Indian Standards (BIS), played a catalytic role from the sixties and it is continuing its work now, aligning many Indian Standards with ISO (International Standards Organization) standards.

Galvanizing – Present

Today, India has many galvanizing units which are competitive, energy efficient & eco-friendly in their

operations. Improvements have taken place in heating & temperature control, ETP, metal economy, minimization of process wastes like zinc ash, Zinc dross, flux regeneration etc. There are also a couple of big units where you can see enclosed covers over the galvanizing bath so that splashings are minimized, heat conserved and there is safety for the workers (Fig-9).



(Fig-10)

It is well known that, a couple of years ago, India was the second fastest growing economy in the world. As per the World Steel Association, India is also the second largest steel producer in the world. Thanks to the impressive GDP growths and the increasing investments in infrastructure, galvanized steel consumption also has been on the rise (Fig-10).

	2017-2018	2018-2019	2019-2020
GP/GC/galvalume	7.0	6.9	7.5
Color Coated Sheets	1.6	1.8	2.2

(Source: JPC)

Zinc Production – India

Year	Production (tonnes)
2015-2016	758939
2016-2017	671988
2017-2018	791461
2018-2019	695321
2019-2020	688000

(Source: HZL)

Zinc is the main input for galvanizing of steel products and structures. Hindustan Zinc Ltd, the only Zinc producer in the country, has been meeting 80% of India's demand. Production of Zinc for the last few years is as follows:

About 30% zinc goes in the sheet sector, 20% in pipes, 15% in general and 5% in wire. In the sheet sector, the capacity for GP/GC/Galvalume is 9.6 million tones and for color coated steel sheets it is 2.8 million tonnes. The production (in million tonnes) for the last three financial years are as follows:

Concrete being porous, absorbs moisture, CO_2, chloride ions due to capillary action, which attack the base steel leading to corrosion. Volume expansion of rust leads to concrete cracking, rust stains etc., Galvanized rebar is a proven method for rebar corrosion particularly in coastal areas, corrosive locations, immersed structures, petrochemical complexes etc., During the last few years, more and more galvanized rebars were used in commercial & residential constructions, guest houses, railway coach washery etc. in Mumbai, Mangalore, Vizag, Ahmedabad etc.

After the launch of National Highway Development Programme (NHDP), the usage of galvanized guardrails/ crash

barriers picked up significantly across the country; the highway expansion programme will continue in the future as well.

In the recent years, the usage of galvanized high mast lighting columns has become popular in more cities and towns of India; airports, sea ports, railway yards, traffic junctions, bus terminals, stadiums etc. have been using such high mast lighting columns widely.

(Fig-11)

Due to the expansion of power & telecom sectors, the application of galvanized cable trays picked up momentum and this also will grow in the years to come.

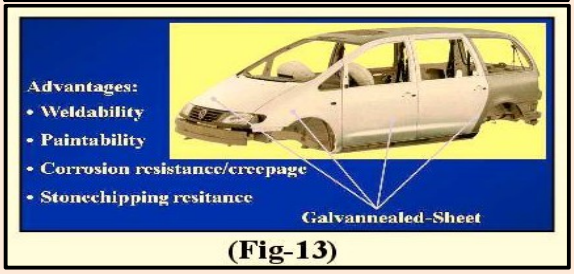
Investment in solar energy and wind energy have been on the rise during the last few years; the steel structures supporting the solar panels are always hot dip galvanized, because they are totally maintenance free for several decades in remote areas.

Galvanizing – Future

(Fig-12)

In order to ensure a long maintenance free life and to maintain its integrity, any structure exposed to the atmosphere, especially public infrastructure, should be galvanized. There are a number of potential applications where hot dip galvanizing should be adopted: steel railings, foot over bridges, traffic sign posts, bus terminals, platform structures etc.

Automobiles used in coastal zones and corrosive locations should use galvanized or galvannealed sheets for their bodies, a practice widely used in many overseas countries (Fig-13). Galvanized Steel Sheets are already used in bus body building in India.



(Fig-13)

India has announced a number of infrastructure projects like Sagarmala, Bharatmala, Power for All, rural electrification, complete railway electrification, 100 smart cities, remaining highway expansion, power programmes, telecom growth, migration to 5G etc., where plenty of steel structures will be used & hence there is an immense opportunity for galvanizing.

India is planning to go in a big way for clean, renewable energy, massive investments and more FDIs are likely to flow into the country. Steel structures used in wind energy and solar energy are hot dip galvanized. By 2022 India aims at 175 GW (Fig-14) of renewable energy. This will be further increased in the coming years. The priority is to shift from fossil fuels to natural resources like solar and wind. Roof top solar panels are also being used widely in hospitals, hotels, colleges, schools, commercial buildings, malls, railways etc., ultramega solar parks have also come across the country and more are likely.

(Fig-14)

The latest development in India is the launch of Continuous Galvanized Rebar Plant first in the country, setup by a mini steel plant in Punjab, in association with International Zinc Association, with the support of Hindustan Zinc Ltd.

CONCLUSION

With the increasing investments in infrastructure, construction & automobile sectors, alongwith more domestic steel and zinc production, higher economic growth, infrastructure investments etc., India is poised for a quantum jump in the application of hot dip galvanizing, thus minimizing corrosion losses. The financial savings made can be wisely used for more & more infrastructure or social projects.

With galvanizing, your 'FIRST COST IS THE LAST COST'.

IMPERATIVES FOR INDIAN STEEL INDUSTRY IN A POST-COVID-19

Source: Steel Tech

Introduction

India has been one of the fastest growing large economies in the world over the last few years propelled by domestic consumption and strong macroeconomic drivers. In 2019, India overtook the United Kingdom to become the world's fifth largest economy at USD 2.94 trillion. As per projections by the International Monetary Fund, India was expected to be a USD 5 trillion economy by 2024 and thus become the world's fourth largest. However, the COVID-19 outbreak and overall economic slowdown before the pandemic is likely to delay the transition to this number.

India's growth in the global steel industry context has been strong despite significant headwinds during the present decade. Steel is critical for economic growth in a developing country like India, with per capita consumption of steel, an important index for socio-economic development, still considerably lower than that in developed economies. The year 2019 was a significant one for the Indian steel industry, as India became the world's second largest producer and consumer of crude steel. In 2019, global crude steel production reached 1,869.9 million tonnes (Mt), while India's crude steel production was111.2 Mt after China's 996.3 Mt. India also witnessed significant capacity consolidation under the Insolvency & Bankruptcy Code (IBC) and through the acquisition of steel assets by leading players. With scope for greater economies of scale and penetration in value-added steel products, India was expected to become a more significant player in the global steel industry dynamics by 2030.

Indian Steel Industry in 2019-20

India's finished steel consumption grew at CAGR of 5.4% in the past five years to 100.07Mt in 2019-20 (FY20). The growth of the steel sector has been primarily driven by the construction and infrastructure sector, which consumes more than 60 percent of total production.

However, in terms of per capita finished steel consumption, India lags far behind many other nations, let alone the leading steel producing countries across the globe. Indian percapita finished steel consumption was 70.9 kg in 2018, whereas the global average percapita finished steel consumption was 224.5 kg.

Crude steel production capacity in India reached 143.98 Mt in FY20 with crude steel production estimated at 109.22 Mt, growing at a CAGR of 4.2% over the past five years. The capacity utilisation of the Indian steel industry is estimated to be 76% during FY20.For a significant part of 2019-20, the Indian steel industry was adversely impacted by domestic slowdown in steel intensive sectors like automotive, capital goods, construction and infrastructure. The demand and prices for steel products thus witnessed a steady decline till September 2019. After the end of the monsoon and the festive season, demand revived significantly started towards November 2019 and continued until February 2020. However, the onset of COVID-19 pandemic is seen to have severely affected the Indian steel industry from March 2020.

India remained a net exporter in 2019-20 with finished steel exports rising to 8.35 Mt vis-à-vis imports of 6.76 Mt. Vietnam was the largest buyer of Indian steel at 2.3 Mt, with hot-rolled coil (HRC) being the most exported product. Import of finished steel was from South Korea, Japan and Indonesia.

Integrated players such as JSPL, JSW Steel, Tata Steel, SAIL, Essar Steel, and Rashtriya Ispat Nigam Limited (RINL) account for 57% of the total crude steel

production. These integrated producers are seen to have managed to withstand the demand and supply dynamics in India and globally.

The steel sector has been significantly impacted by insolvency proceedings under the Insolvency and Bankruptcy Code, 2016 (IBC). Since its inception, the code has undergone various amendments aimed at improving the efficacy of the framework. The metal cases have yielded healthy recoveries till FY20 and insolvency proceedings for several large steel companies such as Electrosteel Steels, Bhushan Steel and Essar Steel were resolved. The year 2019 also marked the entry of Arcelor Mittal and Nippon Steel in a joint venture mode for the acquisition of Essar Steel. A few accounts have been under continuous litigation, such as Bhushan Power and Steel which is awaiting the final verdict of the Supreme Court, thus delaying the resolution process. Quicker resolution of these insolvency proceedings is likely to improve efficiencies and enhance domestic pricing power for the players.

Impact of COVID-19 on the Indian Steel Industry

The impact of COVID-19 on the Indian steel industry was evident from the second half of March 2020. Crude steel production declined to 7.38 Mt in March 2020 vis-à-vis 9.56 Mt during February 2020. Finished steel consumption also decline to 6.70 Mt in March 2020 vis-à-vis 7.83 Mt during February 2020.

Prolonged lockdown since March 2020 has led to significant domestic demand contraction during Q1, 2020-21 (FY21). Domestic steel consumption reduced by 90.9% y-o-y during April 2020 to 0.7 Mt as key consuming sectors like construction, automotive, and engineering (constituting more than 80% of domestic steel demand) were closed down. Domestic crude steel production contracted by 69.5% y-o-y in April 2020 to 2.75 Mt as per provisional figures.

Steel companies were permitted to operate under the essential services' category during the lockdown period with reduced manpower and social distancing norms. However, inventory pileups and oversupply considerations led to production cuts with an estimated ~85%[15] y-o-y reduction in industry capacity utilization during April 2020. Integrated steel players have kept their blast furnaces operational at lower capacity while secondary steel producers with induction or electric arc furnaces have generally remained completely shut during the lockdown. Secondary steel producers have not reported any significant production due to demand and working capital challenges. Finished steel production by secondary steel producers is estimated at 0.12 Mt with a contraction of 97% y-o-y during April 2020.

Integrated players have primarily focused on export of finished steel products and semis to China, Southeast Asia and the Middle East. Realisations from exports have fared typically ~15%[17] lower than domestic price realisations leading to margin erosion. Steel

producers have also been adversely affected by restrictions across inbound and outbound supply chains such as closure of ports, logistical issues and labor shortages. Various analyst report estimates indicate a significant decline in domestic steel demand during FY21. Demand from construction and infrastructure sectors is likely to be muted in H1'FY21 with the lockdown in Q1'FY21 and the subsequent monsoon season during Q2'FY21. Moreover, demand from automobile and consumer durables is likely to be affected due to the likely lower discretionary spends by buyers. Demand for automobile may increase in certain segments of personal vehicles due to social distancing and health concerns arising from public transport.

Thus, domestic demand augmentation and capability development to meet challenges in a post-COVID world are critical needs for recovery and growth of the steel industry going forward.

Domestic Steel Demand Augmentation

Growth of the Indian steel industry has been historically driven by domestic consumption. The National Steel Policy (NSP) 2017 articulates the long-term vision for the Indian Steel sector with a clear focus to increase domestic steel consumption, improve quality of steel production, and enhance adoption of technology to tread towards a globally competitive steel industry. Government of India also introduced the Domestically Manufactured Iron and Steel Products (DMI&SP) policy in 2017 for providing preference to domestically manufactured iron and steel products in government procurement. There are provisions in the policy for waivers to all such procurements, where specific grades of steel are not manufactured in the country, or the quantities as per the demand of the project cannot be met through domestic sources.

The principle of Life Cycle Cost was also introduced, under General Financial Rules 2017, as a pre-requisite for sanctioning the design of government projects. This principle is expected to reduce the life cycle cost in the long run, which is likely to encourage the use of steel in the projects.

Some of the key sectors driving steel consumption in India are construction and infrastructure, engineering, automotive, capital goods, and consumer durables.

Construction and Infrastructure

Economic Survey 2018 indicated that about USD 4.5 trillion worth of investments are required in India till 2040 to develop infrastructure. The infrastructure investments are primarily across roads and bridges, railways, ports, airports, telecommunications, oil and gas pipelines, power generation and transmission and water. Economic Survey 2019-20 indicates that India needs to spend about USD 1.4 trillion or approximately

INR 100 lakh crore over the next five years on infrastructure to become a USD 5 trillion economy.
The government has initiated flagship initiatives such as Pradhan Mantri Awas Yojana (PMAY), Atal Mission for Rejuvenation and Urban Transformation (AMRUT), Jal Jeevan Mission (JJM), Ujwal DISCOM Assurance Yojana (UDAY), Pradhan Mantri Ujjwala Yojana (PMUY) etc. in various sectors to enhance their capacity and output thus providing opportunities for increased usage of steel in construction and infrastructure. The government has also established the National Infrastructure Pipeline with a projected total infrastructure investment of INR 102 lakh crore during the period FY 2020to 2025 in India. Such initiatives are likely to significant drive demand for steel products such as rebars, structural, pre-engineered buildings, steel roofing's and sheds, scaffolding systems, pipes etc.

Automotive

The Indian automotive market is the fourth largest automotive market in the world and is a major consumer for steel products. The automotive sector saw robust growth during the last decade because of increase in disposable income and economic growth. Slowdown in the auto sector during FY20 has impacted steel demand and prices. Introduction of a vehicle scrappage policy is expected to boost the domestic automotive sector and increase steel demand. Moreover, the mobility landscape in India is evolving with vehicle technologies and thus is the usage of steel. Emission regulations and higher safety norms are likely to drive demand for light weight Indian cars. The demand for Advanced High Strength Steel (AHSS) and Ultra High Strength Steel (UHSS) is expected to increase in the near future. Steel makers have already achieved 20 percent reduction in weight on account of UHSS and plant to achieve a further 20 percent on top of it by using UHSS. Usage of alloy and special steel is likely to grow with increase in domestic automotive demand. It is expected that commercial vehicles will be a key automotive segment for growth with increase in axle loads. Substitution is also occurring in some grades of alloy steel with micro-alloy steels, particularly in long products.

Engineering and Capital Goods

India's capital goods sector contributes to 12 percent of India's manufacturing output and1.8 percent to GDP. The engineering and capital goods sector comprises machine tools, textile machinery, earth moving and mining machinery, plastic machinery, process plant machinery, dies & press tools, printing machinery, metallurgical machinery, food processing machinery, and engineering goods. The sector is import dependent because of low domestic technology and operating scale. The heavy engineering segment in particular has experienced low capacity utilisation due to lower domestic demand and imports from China. Issues related to input materials like electrical steel, for manufacturing of electrical equipment, have further slowed sector growth.

The government formulated the National Capital Goods Policy in 2016 to drive indigenisation and promote domestic manufacturing. It also envisages India to be a net exporter with exports reaching 40 percent of production by 2025. The policy is expected to play a pivotal role in the growth of the manufacturing sector and steel demand growth in manufacturing, thus aligning to the vision of 'Make in India'.

Defence

About 60% of India's defence related requirements are currently met through imports. In order to focus on indigenous production, the Government of India introduced a Defence Production Policy in 2019. Opening up of the defence sector for private participation is likely to fast track technology transfer and indigenous production. The foreign direct investment (FDI) cap was recently raised from 49% to 74% via the automatic route to promote indigenisation of defence production under the government's 'Make in India' initiative. Growth in the defence sector provides an opportunity for domestic steel players to cater to the high-end special steel segment e.g. nickel based super alloys, super austenitic stainless steels, high nitrogen steel etc.

Import Substitution for Steel Products

The government has highlighted the need for local manufacturing and consumption of locally produced steel products. Auto grade steel comprises a significant share of this import substitution potential. Few grades of electrical steel may continue to be imported in the near future, given the lack of feasibility of indigenous production due to low economies of scale. There is also an opportunity for import substitution in case of alloy and special steel. Alloy and special steel primarily caters to automotive, railways, defence, oil & gas, and engineering sectors. Government of India also plans to come up with a vision document and policy for alloy and special steel in the near future focusing on 100 percent localisation of alloy steel products, including import substitution and export of at least 10-15 percent of the total domestic production of alloy steel.

The government also notified the Steel Import Monitoring System (SIMS) with effect from November 2019, which provides advance information about steel imports to the government and other industry stakeholders, including producers and consumers. The platform is positioned as a single access point for all importers and exporters to evaluate trade utilisation for all Free Trade Agreements (FTAs) and Preferential Trade Agreements (PTAs) with partner countries. COVID-19 has triggered the need for protecting the domestic steel industry through adoption of safeguard measures incompliance with World Trade Organization (WTO) guidelines. Caution needs to be exercised on import substitution, as this may make specific steel products expensive for the steel end-user industries. Reducing the import duties on steel categories until those product categories can be produced cost-effectively in India, may also be evaluated.

Capability development imperatives for the Indian Steel Industry

It would not be difficult to achieve the ambition of creating 300 Mt steel capacity by 2030 provided some of the key enablers for industry capability enhancement are appropriately addressed.

Product Portfolio Enhancement

Progress in the development of steel products across the globe has primarily been around the improvement of mechanical properties and durability. Advanced technology and growing research have enabled global steel producers to shift from thick mild steel sections to thin alloy steel products in pursuit of lighter materials with higher strength. Following the footsteps of international players, Indian domestic players have also shown a significant transformation in development of steel products. Emerging applications will need considerable technological upgrades, better quality control, and significant investments in research by steel producers. It may require collaboration with foreign producers for improvement of process and quality.

Raw Material Availability

A relatively slow process of iron ore mine allocation along with intermittent mining bans across a few states has impacted the domestic steel sector over the last few years. 2020 and 2030 will be important years for the iron ore mining sector with significant impact on steel production due to expiry of merchant and captive leases respectively under the Mines and Minerals (Development & Regulation) Act 2015. In this regard, significant progress was made for auction of 20 iron ore leases in Odisha before the end of March 2020. Recent reforms pertaining to single licensing policy, removal of captive and non-captive distinction and stamp duty rationalisation are important steps to facilitate raw material availability. High import dependency of coking coal/coke is another ongoing concern for the Indian steel industry due to constraints related to coking coal availability and production in India. We have been talking about taking Coking Coal Mine Leases abroad, since last 3/4 decades. Now is the time to fast-track this process so that adequate coking coals, both in terms of quantity and quality, are available for Indian Steel industry by 2030 Timely steps will have to be taken to make the optimal quantity available for the sector and also to improve indigenous production through the use of new mining technologies.

Logistics Infrastructure

An aspiration of achieving a steel production capacity of 300 Mt by 2030 would demand a logistics infrastructure to move ~1200 Mt (including raw materials and finished goods) by then. This will be a key challenge given that India is currently ranked 44th on LPI

(Logistics Performance Index) by World Bank. India will have to not only address current issues around rake availability, track congestion, road infrastructure etc. but also evaluate innovative solutions such as slurry pipes, inland waterways, efficient use of land near ports / railway lines for blending / storage etc. to address the logistics challenge.

Capital Requirement

National Steel Policy (NSP) 2017, estimates a capital investment of ~INR 10 lakh crore to achieve the steel capacity of 300 Mt by 2030. While the NCLT proceedings currently underway are expected to release some liquidity into the banking system, sustained measures will be required to address this challenge not only to increase the liquidity but also to reduce the cost of capital.

Sustainability and Resource Efficiency

Increasing focus on sustainability, emission reduction, and zero waste is expected to continue to drive the global steel industry towards a circular steel economy and environment-friendly "green" steel making processes. Steel/scrap recycling and conversion of wastes and pollutants into by-products are the means by which the Indian steel industry can work towards a cleaner and more sustainable future.

Quality Improvement

India has brought around 85-90% of the products under Quality Control Orders (QCO)and it is expected that soon all products would be covered under QCO. It is also expected that the quality standards in India are harmonized with the key trading countries and administers the same quality standards on imported goods as well to enable a level playing field.

Viability of Secondary Producers

Secondary steel producers are playing a key role in capacity creation. There is a need to create favourable policy environment for them to ensure a strong performance in the coming years. Reduced input costs through duty / RoE (Return on Equity) reduction on power tariffs and coordinated efforts across ministries (coal, mining, railways, power etc.)could be some of the measures that may go a long way in supporting this section.

Digitalisation and Technology Automation in the Indian Steel Industry

Digital capability development is a critical need for the growth of the Indian steel industry in a post-COVID world. Leading global steel producers are also investing in manufacturing and digital technologies to move towards closed loop steel platforms and create new value. Digitalisation is expected to disrupt steel value chains and the value

creation paradigms for steel producers going forward. Automation, analytics, digital supply chain, digital commerce have the potential to enable the steel producers to manage risks and volatility, ensure sustainability, and drive profitability across the value chain.

Many global steel manufacturers are embracing digital as a means to achieve efficient and cost-effective operations. Global steel players are focusing their efforts on data capture, data visualisation, and predictive analytics. A few examples of usage of digital in the industry are mentioned below:

- A leading South Korean steel maker, is developing smart steel factories which can monitor and control manufacturing process in real time, using IoT, Big Data, and AI.

- A leading Russian steel manufacturer is focusing on process automation, data analysis, and data modelling. Another Russian steel manufacturer, has created the country's largest industrial data lake to enable data analytics, predictive maintenance, and monitor quality.

- A leading German steel and metals distributor, has achieved significant sales through digital channels by digitalising its supply and service chains.

- A leading producer of long steel in Latin America is monitoring its steel mills online to enable predictive maintenance enabled by IoT and predictive analytics.

- A leading global steel and mining company is using big data analytics for real-time quality control and predictive maintenance, apart from employing digital twin as a means to simulate and analyse blast furnace operations.

Indian steel manufacturers are also embarking on digital transformation, though they are currently at different stages of maturity. Some of the leading Indian steel producers are undertaking digital transformation, driving the way they manage customers, monitor blast furnace and downstream mill operations, or move raw materials like iron ore from mines to manufacturing plants. Steel producers have developed 'smart connected plants comprising process automation and control, IT/OT convergence (IIoT), big data and analytics-driven predictive maintenance, robotics and mechanisation, energy management, digital supply chains, e-procurement etc. IT/OT convergence is a challenge in some of the older steel plants in India and needs focused efforts pertaining to retrofitting and sensorisation for data capture. Producers have also deployed digital project management tools to track the ongoing expansion programme. Automation and virtualisation of business processes using analytics, robotics and artificial intelligence(AI) on a cloud platform is expected to be critical to manage businesses in a post-COVID world, since it allows for operations to run through remote control centers. Rapid prototyping capability through support of ecosystem partners, agile workface and

operations, AI and data-led decision making are likely to be the critical traits for future ready steel organisations. Digital initiatives are likely to help steel companies reduce cost of operations through efficiency enhancement and drive EBITDA impact.

As the steel sector adopts newer technologies, the need for skill development and training would become more acute. The COVID-19 crisis heightens the importance to ensure that workforce is operating safely, engaged with the work, and connected together. Indian steel companies will need to reconsider the three dimensions of work: the work (what), the workforce (who), and the workplace (where). Steel producers may need to plan today on the 'future of work' about what talent, skills, new processes, and risk responses plans this new way of operating will require.

Conclusion

In spite of challenges faced by the steel sector, it has managed to come out stronger at the end of 2019. The next decade holds the promise for a period of significant growth and focused efforts from industry players are required to achieve this growth, including strengthening domestic competitiveness.

Performance of Indian steel industry

Item	April-May 2020-21* (mt)	April-May 2019-20 (mt)	% change*
Crude Steel Production	9.011	18.489	-51.3
Hot Metal Production	7.745	12.434	-37.7
Pig Iron Production	0.372	1.041	-64.3
Sponge Iron Production	1.946	6.333	-69.3
Total Finished Steel (alloy/stainless + non-alloy)			
Production	6.138	17.718	-65.4
Import	0.946	1.174	-19.4
Export	1.714	0.974	75.9
Consumption	5.091	16.184	-68.5

Source: JPC; *provisional; mt=million tonnes