THE INDIAN INSTITUTE OF METALS
DELHI CHAPTER

IIM Metallurgy Materials Engineering

"MET-INFO"
INHOUSE PUBLICATION

ISSUE NO. 25 E-VERSION JULY 2021

K K Mehrotra-Chairman, Delhi Chapter
S C Suri-Editor-in-Chief (IIM-DC Newsletter)

For Private Circulation only

Contents of E-Version of this Issue

Photos of IIM Delhi Chapter Building

E – Version

Published By

The Indian Institute of Metals
Delhi Chapter
Jawahar Dhatu Bhawan
39, Tughlakabad Institutional Area
M B Road, Near Batra Hospital, New Delhi-110062
Tel: 011-21820057, 011-29955084
E-mail:iim.delhi@gmail.com
Website: iim-delhi.com

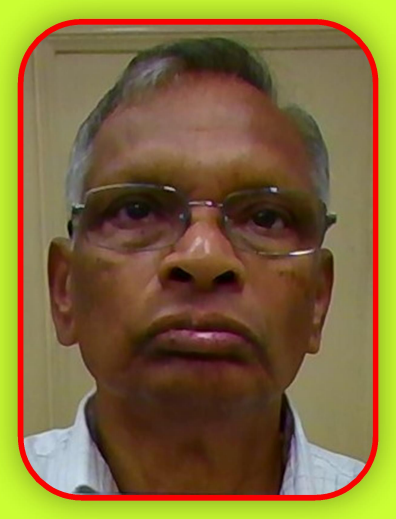
ISSUE NO. 25 E-VERSION JULY 2021

Executive Committee : 2020-21

Name	Designation	Mobile	E-mail
Shri K K Mehrotra	Chairman	9868112514 9968653355	kishorekmehrotra@gmail.com
Shri A C R Das	Vice-Chairman	9811330571 7678470803	ajoycrdas@gmail.com
Shri N K Kakkar	Secretary	9871008505	nirmalkakkar@gmail.com
Shri N Vijayan	Treasurer	9818695690	technothermaindia@gmail.com
Dr Ramen Datta	Joint Secretary	9958084110	dattaramen@gmail.com
Shri B D Jethra	Member	9818326878	jethra@yahoo.com
Shri S C Suri	Member	26949167 9650936736	scsuri.iimdc@gmail.com
Shri K L Mehrotra	Member	9810203544	klmehrotra48@gmail.com
Shri G I S Chauhan	Member	9717302437	gisc.delhi@gmail.com
Shri R K Vijayavergia	Member	9650155544	rkv.sail@gmail.com
Shri P N Shali	Member	9810708510	pnshali@gmail.com
Shri Deepak Jain	Member	9868640986	deepakjain@bis.org.in
Shri Manoranjan Ram	Member	9999303008	manoranjanram@yahoo.com manoranjan.ram@paulwurth.com
Dr Mukesh Kumar	Member	9584032329 9650080849	drmukeshkumar@gmail.com
Shri K R Krishnakumar	Member	9818277840	kuduvak059@gmail.com
Shri R K Narang	Member	9899298857	rknarang62@gmail.com
Dr Rajesh Prasad	Member	9818538085	rajesh@iitd.ac.in
Shri B R Thukral	Special Invitee	9818563381	balwantthukral@gmail.com
Shri P K Chatterjee	Special Invitee	9210844819 9958228404	parijat.chatterjee@yahoo.com

BRIEF ON TECHNICAL TALK ON WELLNESS THROUGH LIGHTING

Virtual presentation made by Shri A Narayanan, SSS Technical Services Pvt. Ltd. on 24th July 2021 to IIM Delhi Chapter Members.



Every day we wake-up to see sunlight everyday morning and we see sunset every evening, except when cloudy. Our body clock (which is present in our brain), called **circadian clock**, synchronizes with sunlight every day. When we see sunlight in the morning, our **melatonin level** will drop and cortisol level will rise. ***Meletonin,*** also called sleep hormone produces sleep. Its production increases with evening darkness promoting healthy sleep and helping to orient our circadian rhythm. ***Meletonin*** also called sleep hormone produces sleep. Its production increases with evening darkness promoting healthy sleep and helping to orient our circadian rhythm. A sensor present in our eye (called **melanopsin**) will detect the presence of blue light present in the morning sunlight which will trigger/reset the circadian clock.

Cortisol is a steroid hormone that regulates a wide range of processes throughout the body, including metabolism and immune responses. It controls the body's sugar level, influences memory formation, controls salt and water balance and influences blood pressure. A master clock in the brain coordinates all the biological clocks in a living-things.

Full night sleep boosts immune system, prevents weight gain, strengthens heart, improves mood, increases productivity, increases exercise performance, improves memory and improves concentration.

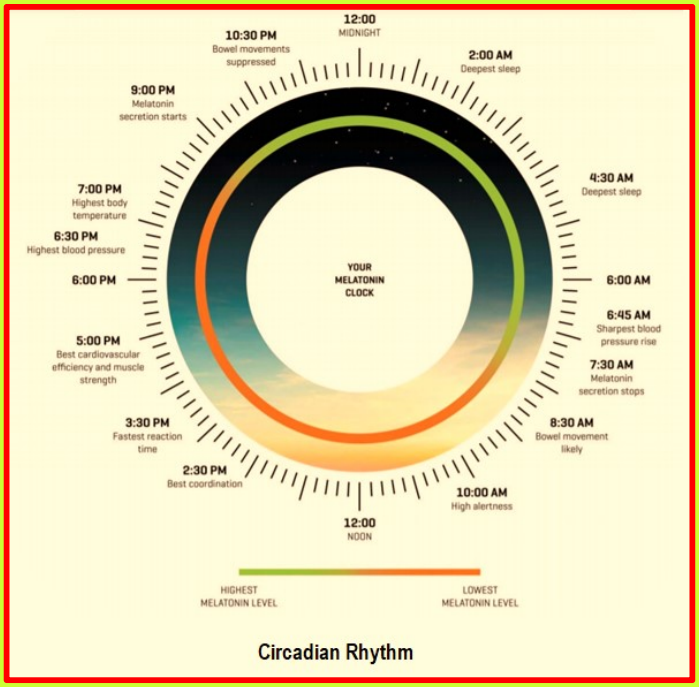
Lack of sleep can lead to one or many of dis- orders, like Asthma, Chronic kidney disease, Obesity, Hypertension, Colon cancer, Lyme disease, Fatty liver, Liver cancer, Lung cancer, Breast cancer, Arthritis, Alzheimer, Depression, Loss of productivity, Dementia, Mental fogginess, Multiple Sclerosis, Allergy, PTSD, Anxiety, Insomnia and even Infertility.

Spending more time in sun and nature is a simple step that we can implement to get our circadian rhythm better supported.

Tunable lighting is the next alternative, particularly for commercial buildings and hospitals. Increasing a patient's exposure to light is fast becoming an effective, go-to

therapy tool thanks to record advancements in LED lights and lighting controls.

Many of us now spend about 90% of our time indoor under electric light, often resulting in suffering from post-traumatic stress disorder (PTST). This leads to lack of sleep and Circadian Rhythm destruction. This way of living results in messing up of internal systems of rhythm and clocks.



Circadian Rhythm

The answer is Human Centric Lighting**. Tunable lighting**, which can mimic the sun during office hours, is white lighting that complements our natural circadian rhythms and mimics the sun. The technology adjusts to our daily rhythms by automatically changing the intensity and colour temperature of a room, space or building's interior light throughout the day. In fact, doctors, nurses and physicians are using tunable white lighting technology to address several therapeutic conditions.

What makes tunable white lighting so effective in so many health care treatments?

Many of our daily patterns and biological cycles, like when we wake up and get sleepy, are controlled by our body's circadian rhythm, which in turn is controlled by the lightness and darkness of our immediate surroundings. That's why sunlight plays the largest factor. Its blue light spectrum suppresses melatonin, the hormone that controls our sleep-wake cycles.

How light controls our bodies?

Cool-toned light emitting from a tunable white lighting system, especially at high intensity, suppresses melatonin, stimulates alertness and improves cognitive function by producing cortisol.

Warm-toned light, on the other hand, encourages melatonin secretion and helps us relax. Exposure to amber light before bed can be very helpful in getting a good night sleep.

At present, lighting in most hospitals, rehab facilities and nursing homes focus on general

illumination. But improved lighting systems can now be therapeutic for patients.

Tunable White Lighting can be used to improve classroom learning and shape behaviour in the classroom based on the task at hand. Tunable White Lighting is the next step in creating a productive learning environment for our kids. Tunable White Lighting for the classroom have the ability to change colour and temperature based on the activity to be performed. As classroom learning becomes smarter, our school light fixtures need to become smarter as well.

----------000----------

INDIAN STEEL PLANTS

Steel industries turn out to be India's Saviours amid Oxygen Short Supply

To meet the unprecedented surge in demand for medical oxygen requirement for the COVID patients all over the country, twenty-eight units located in major public and private sector steel plants supplied around 1,500 metric tonnes of medical oxygen per day across the country.

SAIL has so far supplied 35,000 tonnes of liquid medical oxygen of 99.7% purity for COVID relief from its steel plants at Bokaro, Bhilai Rourkela, Durgapur and Burnpur. For the supply of oxygen in Lucknow at Uttar Pradesh, the Oxygen Express train loaded at Bokaro Steel Plant crossed through a Green Corridor to make the train run faster so that it can reach its destination as soon as possible without any red signal.

Tata Group, for example, had announced that it will import 24 cryogenic containers to transport liquid oxygen via special chartered flights. Medical oxygen is critical to the treatment of COVID-19 patients. Tata Steel had supplied Liquid Medical Oxygen daily to various State governments & hospitals and supply capacity was ramped up to 800 tonnes a day.

JSW Steel has ramped up production and supplying 1000 tonnes of oxygen per day from its three plants spread across Karnataka (Bellary), Maharashtra (Dolvi) and Tamil Nadu (Salem).

Rashtriya Ispat Nigam Limited (Vizag Steel Plant) has also been supplying liquid oxygen to Andhra Pradesh and other states to be used in their Covid treatment facilities.

AM/NS is setting up a temporary medical centre with 250 beds at its facility at Gujarat which will get oxygen from its plant there.

Vedanta group has offered to supply oxygen of 1000 tonnes per day from its closed Sterlite copper plant at Thoothukudi in Tamil Nadu which has now being temporarily permitted by

the Supreme Court. The plant contains two oxygen plants with a combined capacity to produce 1,050 tonnes of oxygen daily.

Indian Steel Companies Deleveraging Accelerates

India's major steel companies are taking advantage of the rise in metal prices to deleverage their balance sheets and speed up debt repayments. Large Steel companies such as Tata Steel, Steel Authority of India Ltd (SAIL) and Jindal Steel and Power Ltd (JSPL) are among the companies that have reduced debt between 28% and 31% in the recent quarters.

As steel prices remain firm amid a demand surge in global markets, Indian steel companies are expected to accelerate the pace of debt reduction in the coming years.

Tata Steel said that it has pared its debt to the tune of Rs 28,000 crore in FY21. The company reduced its debt by Rs 12,000 crore in the March quarter alone. As a result, the year-end net debt was Rs 75,389 crore which is 28% lower than FY20.

SAIL shaved off gross debt by Rs 16,150 crore in FY21, making it the second steel company after Tata Steel to carry out such an aggressive deleveraging of the balance sheet. The company's gross debt, which typically excludes cash and cash equivalents, came down to about Rs 35,330 crore at the end of FY21 compared with Rs 51,481 crore at the end FY20.

Among other companies seen cutting back debt is JSPL. The company fast-tracked its payments to its creditors. JSPL has reduced debt by Rs 20,000 crore from a peak of Rs 46,500 crore in December 2016 to Rs 25,600 crore as reported in December 2020. The company said it has surpassed its previous plans by cutting an additional Rs 2,462 crore for FY 21.

"The significant debt reduction is part of our long-term financial strategy to create a strong balance sheet. In the coming quarters, we intend to further strengthen our balance sheet and become net debt-free in the near future," JSPL Managing Director V.R. Sharma said.

The feverish rise in global steel prices is proving to be a boon for steel companies, which are making the most of it. Domestic hot-rolled coil prices, which touched Rs 56,000 per tonne in March, rallying from Rs 39,200 a tonne in March 2020, have started moving northwards again from April, against the backdrop of 10% discount from international prices.

"While we are factoring in a steady cyclical correction post Q1FY21, the extent of price increase is leading to improved estimates of deleveraging," said analysts at ICICI Securities in a client note.

Even after normalcy resumes, net debt levels of steel firms are expected to show a sharp improvement in the next two years.

Steel Authority of India Limited (SAIL)

For SAIL, good times are ahead: Soma Mondal, Chairperson

Steel Authority of India is revamping itself and has brought down debt by around Rs 10,000 crore in three months under its new Chairperson, Soma Mondal. The company has planned a Capex of Rs 8,000 crore for FY22 and is now holding a land bank that can help in expansion up to 50 Mtpa of capacity in the long run, said Mondal.

Tata Steel

Tata Steel reports, Highest Ever Consolidated Quarterly EBITDA; Net Debt Declines by >28% in FY21

Highlights:

- Consolidated EBITDA of Rs 14,290 crores and consolidated Profit after tax of Rs 7,162 crores in 4QFY21.
- Consolidated EBITDA of Rs 30,892 crores and consolidated Profit after tax of Rs 8,190 crores in FY21.
- Net debt decreased by Rs 29,390 crores to Rs 75,389 crores. Net debt to EBITDA improved to 2.44x and Net debt to equity improved to 0.98x.
- The Pellet plant and Cold Roll Mill complex at Kalinganagar is under construction. The 5Mtpa expansion project has been restarted.
- Operational parameters:-
  - Achieved highest ever quarterly crude steel production of 4.75 Mt; registered a 3% QoQ growth in 4QFY21. FY21 production stood at 16.92 Mt.
  - Steel deliveries grew 16% YoY to 4.67 Mt in 4QFY21. FY21 steel deliveries increased to 17.31 Mt despite the pandemic led disruption in 1QFY21.
  - Achieved highest ever quarterly EBITDA of Rs 12,295 crores with 40%QoQ and 2.7x YoY growth in 4QFY21. This translates into an EBITDA per ton of Rs 26,309 and an EBITDA margin of 40.9%. FY21 EBITDA was Rs 28,587 crores.
  - Tata Steel standalone also registered highest ever quarterly EBITDA at Rs 9,206 crores with 37%QoQ and 2.5x YoY growth in 4QFY21. This translates into an EBITDA per ton of Rs 27,828 and an EBITDA margin of 43.4%. FY21 EBITDA was Rs 21,952 crores.
  - Tata Steel BSL registered its highest ever quarterly EBITDA of Rs 2,583 crores which translates into an EBITDA per ton of Rs 21,648. Tata Steel Long Products also registered its highest ever quarterly EBITDA of Rs 506 crores which translates

into an EBITDA per ton of Rs 29,439 respectively. TSBSL and TSLP FY21 EBITDA increased to Rs 5,481 crores and Rs 1,154 crores respectively.

- Shareholders have approved the merger of Tata Steel BSL with Tata Steel. A joint "Scheme Petition" has been filed with the NCLT to sanction the scheme with effect from 1st April, 2019. The merger of Tata Metaliks and Indian Steel and Wire Products with Tata Steel Long Products in also underway.
- Steel deliveries at Tata Steel Europe grew 17%QoQ and 3% YoY to 2.47 Mt in 4QFY21. EBITDA improved sharply to £125 million in 4QFY21.
- Tata Steel is committed to sustainability of operations and is taking initiatives to adopt best available technologies for decarbonization and water neutrality. Tata Steel and Tata Steel Europe have been recognized as Steel Sustainability Champion for 4th consecutive year by the World Steel Association.
- The Board of Directors recommended a dividend of Rs 25 per fully paid equity share and Rs 6.25 per partly paid equity shares.

Mr. T V Narendran, CEO & Managing Directory: "First half of financial year 2021 was a challenging period with the uncertainties and complexities brought on by the COVID-19 pandemic. Indian economy and domestic steel demand has been improving since then with accommodative policies, government spending and relaxation in mobility restrictions. All our segments, especially automotive, have performed extremely well due to our continuous focus on building strong customer relationships, superior distribution network, brands, and new product developments. Work on the pellet plant and CRM complex at Kalinganagar is progressing well. We have also restarted our 5 Mtpa expansion project which should be completed in FY24."

Tata Steel Mining Limited plans to double its Ferro Chrome Capacity

Tata Steel Mining Limited (TSML) is firming up plans for aggressive growth in its Ferro Chrome manufacturing capacity in India from 450,000 tonnes per annum at present to 900,000 tonnes per annum in the near future. TSML had acquired three Chromite mines in the 2020 mineral auctions, namely Sukinda Chromite Mine, Saruabil Chromite Mine and Kamarda Chromite Mine, for which leases were granted for 50 years. The mines have now been operational with an annual capacity of over 1.5 Mt making the Company the largest players in Chrome ore mining in India.

The idea behind the initiative is to use the Chromite Ore optimally to make Ferro Chrome to serve its growing base of Indian and global customers, who are in the business of manufacturing stainless steel.

D B Sundara Ramam, Vice President Raw Materials, Tata Steel, and Chairperson, Tata Steel Mining Limited, said: "We will take the organic as well as the inorganic route to augment our Ferro Chrome manufacturing capacity in India, leveraging the strength of the good quality of Chrome Ore availability. This will make TSML the top Ferro Chrome player

in India and among the top-five globally. It makes sense to focus on value addition and convert the chrome ore to ferro chrome."

Tata Tiscon completes 20 years in India as a Leader in TMT Rebar

Tata Tiscon, India's best-known rebar brand from the house of Tata Steel, completed two decades in 2020. Launched in December 2000, Tata Tiscon has grown to become the largest B2C brand in Tata Steel's portfolio with market share of 14% and revenue of ~INR 7000 crore.

Tata Tiscon Rebars are made from virgin iron ore. Hence these are free from impurities. Further, during manufacturing the steel is purified using best of intermediary processes. Lower impurity content gives it uniform properties across the length. Over the last 20 years, Tata Tiscon focused on building credibility and highlighted the importance of pure steel for home building. With a well-established network of more than 6500 dealers, Tata Tiscon sells across the length and breadth of the country and enjoys a prominent market share.

Tata Steel backs a New Global Framework for Decarbonising Heavy Industries

Tata Steel has joined a first-of-its-kind network of heavy industries and civil society groups that will provide a global framework for decarbonising heavy industries as part of the COVID-19 economic recovery plan.

Established by the international non-profit, the Climate Group and Campaign organisation Mighty Earth, The Global Framework Principles for the Decarbonisation of Heavy Industry has been developed in close coordination with industry experts.

It is the first time a set of publicly available global guidelines has provided clear steps for how heavy industries like steel, cement, and chemicals across the world can stimulate economic growth while aligning with a 1.5 C climate trajectory to align with the goals of the Paris Agreement.

Three entities of Tata Group Re-entered the Indian Steel Association (ISA) fold

In a recent apex committee meeting of the ISA, Tata Steel, Tata Steel BSL (formerly Bhushan Steel), and Tata Steel Long Products, have joined the association. Besides, Bhushan Power & Steel, which has recently been taken over by JSW Steel, has also re-entered the ISA.

"We are pleased to have Tata Steel, along with Tata BSL and Tata Steel Long Products, as well as Bhushan Power & Steel back with us, as part of the ISA. This association has, over the years, played a pivotal role in addressing and resolving critical issues that impact

our industry, and we are confident of building our collective voice and going from strength to strength," the release said, quoting Dilip Oommen, President of the Association.

Tata Steel's Jamshedpur plant recognized as World Economic Forum's Advanced 4th Industrial Revolution (4IR) Lighthouse

Tata Steel's Jamshedpur Steel Plant has been recognized as the World Economic Forum's Advanced 4th Industrial Revolution Lighthouse. With this new milestone, Tata Steel is the one of the few enterprises with three manufacturing sites in the Global Lighthouse network, with Kalinganagar Plant (India) and Ijmuiden (the Netherlands) being the other two sites.

The World Economic Forum's Shaping the Future of Advanced Manufacturing and Production has set up the Global Lighthouse Network to bridge the gap between the manufacturing units that have adopted the Fourth Industrial Revolution Technologies and those who are yet to embrace it.

Tata Steel has been on a multi-year digital enabled business transformation journey intending to be the leader in digital steel making by 2025 through adoption of digital technologies.

TRL Krosaki receives Indian Chamber of Commerce Social Impact Award for the year 2021

TRL Krosaki Refractories Limited won the coveted "Indian Chamber of Commerce Social Impact Award for the year 2021" in the Large Enterprise Category. The company's application for the award was selected for the impact it has created in prevention and management of COVID 19 in the society through its Corporate Social Responsibility activities.

Corporate Social Responsibility has been a focused area of TRL Krosaki since its inception. The company aims to improve the quality of life of the communities living around its operations who are the key communities for the company. It believes in inclusive growth and strives to positively impact the lives of its key communities. It is noteworthy to mention here that, the company is one of the few companies in the country which spends more than the minimum legal mandate in CSR.

JSW Steel completes BPSL Buy

JSW Steel has completed the acquisition of Bhushan Power & Steel Ltd, (BPSL) which makes it the largest steelmaker in the country. The company has paid Rs 19,350 crore to the financial creditors of BPSL.

BPSL has an annual capacity of about 2.5 Mt in Jharsguda, taking JSW Steel past Tata

Steel's Indian capacity of 19.63 Mt a Year.

JSW Steel acquires Welspun's Steel Business for Rs 848 crore

JSW Steel has entered into agreement to acquire the high-grade steel plates and coil business of Welspun Group for Rs 848 crore. As part of the deal, it will also buy out a land parcel attached to plates and coil mills division for Rs 1.50 crore. In 2019, Welspun Group had assigned the sale to Laptev Finance.

JSW Steel's Expansion Completed

JSW Steel has started production of additional 5 Mtpa steel at its Dolvi plant in Maharashtra. The expansion at Dolvi has increased the company's steelmaking capacity to 23 Mt a year.

JSW has invested Rs 15,000 crore in doubling the capacity along with 1.5 Mtpa coke oven plant. The supporting facilities are to be commissioned progressively in coming days.

The expansion at Dolvi was to be completed last September but was delayed due to the Covid pandemic. Non-availability of required manpower and material due to the lockdown announced by the government and its subsequent extensions had hit execution of the project. Further, non-availability of foreign experts from technology and equipment suppliers due to international travel restrictions also impacted the commissioning schedule.

Hot Strip Mill Modernization at JSW Steel Vijayanagar Works

Danieli India has executed the revamping of the lower housing part of vertical edger for the existing HSM-1 at JSW Steel Vijayanagar Works, which was designed, manufactured at Danieli India design and manufacturing center, in Chennai.

Danieli Service performed a detailed mill audit, checking wear and tear conditions of the edger stand and other associated equipment, and developed an engineering solution aiming for a quick restoration of the damaged edger housing to original dimensional tolerances.

The strategic points of the good job execution which led to JSW high appreciation were:

- Detailed study and condition analysis of the area prior to shut down.
- Setting pre-condition and detailed activity schedule discussion.
- Preparation of effective spindle lifting device and schemes to speed-up dismantling and erection processes.
- Accurate execution plan with contingency to mitigate unplanned downtimes.
- Precise machining of necessary equipment at Danieli quality workshop in Chennai.

- Quick solving of unexpected issues rising from the unpredictable nature of revamping activity.

This experience enriched Danieli India's ability to better serve customers with similar on-site support through reverse engineering, process and condition analysis, solution engineering and on-site execution.

JSW's First Hot Slab from New Furnace at Dolvi Unit

JSW Steel awarded Fives to design and supply two reheating furnaces for their new hot strip mill at Dolvi works. The furnaces have the highest capacity installed in India to date – each 450 tonnes per hour – and feature high environmental performance and low fuel consumption.

JSW Steel successfully discharged the first hot slab from reheating furnace on March 31, 2021. The first furnace was ignited in January 2021.

The project manager, Fives Stein India Projects commented "Our strength was our local manufacturing capabilities and the dedication of our team to work through these difficult times. We achieved more than 85% localization and discharged the first slab in very good conditions without skewness or skid marks."

JSW Steel inks pact with JFE Steel for manufacture of CRGO Steels

JSW Steel said it has signed a memorandum of understanding (MoU) to conduct a feasibility study with JFE Steel Corporation to establish a grain oriented electrical steel sheet manufacturing and sales joint venture company in India. The plan is to complete the study within the current 2021 fiscal year and take appropriate steps to set up this JV company subject to requisite approvals.

Seshagiri Rao, Joint MD, JSW Steel and Group CFO said: "This feasibility study for a joint venture with JFE Steel for manufacturing grain oriented electrical steel sheet in India will strengthen our position as India's leading manufacturer of advanced steel products that lead to reduced CO_2 emissions and a more sustainable world".

JSPL – Highest Wealth Creator in Steel Sector in the last 1 Year

Jindal Steel & Power Ltd (JSPL) touched its 52 week and 8 year high of Rs 373.45 per share amidst the strong performance by steel sector. The steel sector has been performing strongly and has been the star performer since the beginning of 2021.

Indian steel players have increased the prices of steel by Rs 4,000-5,000 per tonne as the demand for Indian steel has increased substantially as the Chinese have stopped

supplying to Vietnam which has led to increased exports by Indian Players. Additionally, steel production by JSPL has increased by 18% y-o-y to 6.53 lakh tonnes as compared to 5.54 lakh tonnes in the previous year.

3QFY21 also saw JSPL becoming India's first private company to get the "Regular Supplier" status from Indian Railways to supply 60kg 880 grade (90UTS) Rails.

AM/NS India delivers Strong Performance in 1Q'21

AM/NS India reported strong business performance with EBITDA of $ 403m in 1Q'21 (vs. $140m in Q1'20), a growth of 188%. The company's crude steel production stood at 1.8Mt in 1Q'21 (vs. 1.7Mt in Q1'20); annualized production of 7.3Mt.

Commenting on the company's performance, Dilip Oommen, CEO, AM/NS India said, "Our business continues to grow strongly with demand generated from domestic and export markets. The Steel industry in India remains attractive and increasing demand is giving the industry the required fillip."

The near term plans involve debottlenecking existing operations to achieve 8.6 Mt capacity. In the medium term, the plan is to grow capacity at the Hazira complex in Gujarat to 14Mt. An additional pallet plant of 6 Mt capacity equipped with state of technology is fully ready in Paradeep at Orissa; will functioning shortly.

In the first phase of the expansion, the company is planning to add an additional 3-5 Mt its existing 7Mt capacity by the end of the current fiscal.

ArcelorMittal Nippon Steel India initiates Feasibility Study for 12-Mtpa Steel Project in Odisha

AM/NS India along with the Odisha government has initiated a feasibility study for its proposed 12 Mtpa integrated steel plant in the Kendrapara district of the state with an investment of Rs 50,000 crore.

AM/NS India is a 60:40 joint venture (JV) company between Mittal's Luxembourg-based ArcelorMittal and Nippon Steel of Japan.

"The company has initiated, in coordination with the government of Odisha: a feasibility study, securing relevant permissions, land acquisition, developing logistics infrastructure and other enabling conditions to plan for the project construction."

Vedanta Limited's Strong Financial Performance in Q4 FY 2021 and Full Year 2020-21

Vedanta Limited achieved all time high EBITDA and PAT for Q4FY2021 for all of their divisions. The highlights for their iron ore and steel division are as under:

- **Iron Ore:**
    - Production of saleable ore at Karnataka at 5 million tons, up 15% Y-o-Y
    - Iron ore sales in Goa at 2.1 million tonnes in FY2021
    - Continued engagement with the Stakeholders for resumption of Goa mining
- **Steel:**
    - Steel production at 1.19 Mt, down 4% due to covid lockdown
    - EBITDA Margin at $95/t, up by ~23%

India to Manufacture Containers in Bhavnagar, eyes Rs 1,000 crore Investment

Eyeing indigenous production of containers amid a global surge in demand, the Centre is looking to develop Bhavnagar in Gujarat as a container hub and has set up pilot projects for its manufacturing, Union Minister Mansukh Mandaviya said.

The initiative aimed at attaining self-reliance in container production eyes Rs 1000 crore investments from private players and looks to create one lakh jobs.

"India requires about 3.5 lakh containers every year. There is no container production in India and we have to depend mainly on China which is a global producer. Now we want to develop Bhavnagar in Gujarat as a container hub and we have selected 10 places there for its production on a pilot basis," Ports, Shipping and Waterways Minister Mansukh Mandaviya said. The initiative has been taken to realise the dream of Prime Minister Narendra Modi of 'Atmanirbhar Bharat', Mandaviya said.

He said existing re-rolling and furnace industries are being encouraged to expand and take up this as demand for containerized cargo is increasing in India and globally. He said one container costs about Rs 3.5 lakh and once the production picks up, India would not be require to import it.

There had been reports recently that non-availability of containers has resulted air-lifting of cargo by some players.

Arjas Steel Private Ltd. orders KOCKS RSB® 5.0

Arjas Steel Private Ltd. (formerly known as Gerdau Steel India Ltd.) has placed an order with Friedrich KOCKS GmbH & Co KG, Hilden, Germany, for the supply of a Reducing and Sizing Block (RSB®) 300++/4 in 5.0 design.

The integrated steel plant of Arjas Steel Private Ltd. is located in Tadipatri (Andhra Pradesh, India) and has a yearly capacity of 300,000 tons of special steel – long products, which are processed in automotive, railways and other related industries.

As part of the rolling mill modernization project the RSB® will produce straight round bars within a size range of Ø 16.0 to 65.0 mm, as well as hexagonal bars from Ø 18.5 to 40.5 mm onto the cooling bed. In a future stage the KOCKS block will also finish round sections down to Ø 13.0 on a new BIC-line.

The modernization project offers Arjas Steel Private Ltd. the possibility to strengthen its market position and become one of the leading special steel producers in India with main focus on the automotive industry. The commissioning in scheduled for the mid of 2022.

Posco willing to set up an Integrated Steel Plant in Odisha with an Investment of $ 12 billion

South Korea ambassador Shin Bongkil recently indicated that Posco wants to set up an integrated steel plant in Odisha with an investment of $ 12 billion.

The Indian Chamber of Commerce in association with IPICOL, organized the Round table on South Korea & Odisha on Promoting Bilateral Business Opportunities on 19 April 2021 at Bhubaneswar. Odisha is in the process of implementing a strategy document, Vision 2030 which aims to ensure that 50% of the primary metal produced in the State value added with Odisha.

Dr. Young Scaon Park, director, KOTRA told that the Korean companies are very eager to work in the areas of Renewable Energy, Water Treatment & Smart City Projects. B2B meetings will be organized in the month of September 2021 for exploring opportunities in Smart City Projects.

Source: Steel Tech

STEEL PRODUCTION, PIG IRON, SPONGE IRON, FINISHED STEEL PRODUCTION, EXPORT/IMPORT AND CONSUMPTION OF STEEL IN THE LAST FIVE FINANCIAL YEARS

('000 tonnes)

SL. NO.	ITEM	2016-17	2017-18	2018-19	2019-20	2020-21
I.	**CRUDE STEEL PRODUCTION**					
	SAIL,TSL Group,RINL,AM/NS,JSWL,JSPL					
	Oxygen Route	39603	41747	47412	46735	43947
	EAF Route	15883	17639	21295	21647	21106
	Other Producers					
	Oxygen Route	2291	5645	2043	1838	1138
	EAF Route	13187	8879	7181	6719	8301
	IF Route	26972	29221	32990	32198	29052
	TOTAL	**97936**	**103131**	**110921**	**109137**	**103545**
	% share of Other Producers	41.0%	36.9%	36.2%	35.7%	36.1%
II.	**PIG IRON PRODUCTION**					
	SAIL,TSL Group,RINL,AM/NS,JSWL,JSPL	905	726	1663	1193	1413
	Other Producers	9437	5002	4751	4227	3464
	TOTAL	**10342**	**5728**	**6414**	**5421**	**4877**
	% share of Other Producers	91.2%	87.3%	74.1%	78.0%	71.0%
III.	**SPONGE IRON PRODUCTION**					
	Gas Based	4854	6458	6899	6564	6175
	Coal Based	23908	24053	27806	30539	28201
	TOTAL	**28762**	**30511**	**34705**	**37102**	**34376**
	% share of Coal Based	83.1%	78.8%	80.1%	82.3%	82.0%
IV.	**FINISHED STEEL (Production) (Alloy/Non-Alloy) :**					
	SAIL,TSL Group,RINL,AM/NS,JSWL,JSPL	61927	69143	61283	61286	55322
	Other Producers	58213	57712	40004	41336	40882
	TOTAL	**120140**	**126855**	**101287**	**102621**	**96204**
	% share of Other Producers	48.5%	45.5%	39.5%	40.3%	42.5%

('000 tonnes)

SL. NO.	ITEM	2016-17	2017-18	2018-19	2019-20	2020-21
V.	**EXPORT OF FINISHED STEEL**					
	Non-Alloy Steel	7584	8727	5773	7589	9945
	Alloy/SS Steel	658	893	588	766	839
	TOTAL	**8243**	**9620**	**6361**	**8355**	**10784**
	% share of Alloy Steel	8.0%	9.3%	9.2%	9.2%	7.8%
	Non-Flat Steel	1062	2782	983	934	1407
	Flat Steel	7180	6839	5378	7421	9377
	TOTAL	**8243**	**9620**	**6361**	**8355**	**10784**
	% share of Flat Steel	87.1%	71.1%	84.5%	88.8%	87.0%
VI.	**IMPORT OF FINISHED STEEL**					
	Non-Alloy Steel	5364	5637	5946	4790	2914
	Alloy & Stainless Steel	1860	1846	1889	1978	1839
	TOTAL	**7224**	**7483**	**7835**	**6768**	**4752**
	% share of Alloy Steel	25.7%	24.7%	24.1%	29.2%	38.7%
	Non-Flat Steel	990	751	1053	741	581
	Flat Steel	6235	6732	6782	6026	4172
	TOTAL	**7224**	**7483**	**7835**	**6768**	**4752**
	% share of Flat Steel	86.3%	90.0%	86.6%	89.0%	87.8%
VII.	**AVAILABILITY OF FINISHED STEEL**					
	Non-Alloy Steel	91136	83915	95017	94701	83900
	Alloy & Stainless Steel	9653	8400	7744	6333	6272
	TOTAL	**100789**	**92315**	**102761**	**101034**	**90172**
	% share of Alloy/SS Steel	9.6%	9.1%	7.5%	6.3%	7.0%
	Non-Flat Steel	49745	48380	52277	52554	47899
	Flat Steel	51044	43935	50485	48480	42274
	TOTAL	**100789**	**92315**	**102761**	**101034**	**90172**
	% share of Flat Steel	50.6%	47.6%	49.1%	48.0%	46.9%
VIII.	**CONSUMPTION OF FINISHED STEEL**					
	Non-Alloy Steel	76969	82409	91075	93477	88667
	Alloy & Stainless Steel	7073	8298	7633	6694	6225
	TOTAL	**84042**	**90708**	**98708**	**100171**	**94891**
	% share of Alloy Steel	8.4%	9.1%	7.7%	6.7%	6.6%
	Non-Flat Steel	48642	48117	49271	51720	51354
	Flat Steel	35400	42590	49437	48451	43537
	TOTAL	**84042**	**90707**	**98708**	**100171**	**94891**
	% share of Flat Steel	42.1%	47.0%	50.1%	48.4%	45.9%

Source: JPC

GALVANIZED STEEL PROTECTS INDIAN CARS-CHENNAI CORROSION SURVEY CONFIRMS MUMBAI RESULTS

Abstract

A second car corrosion survey was conducted by IIT Bombay during the month of March 2018 to measure the extent of visible corrosion taking place on different parts of the car body. 500 vehicles of various makes and models were inspected in the warm & humid coastal region of Chennai, India, all within 1 kilometre from the seashore. The corrosion survey included car parking lots, and vehicles parked along the beach front in open and sheltered areas. The Cars were inspected for any visible paint blisters, surface rust and perforations.

This new car corrosion survey was a follow up to a similar one done in the Mumbai area in the summer of 2015 and reported earlier. The Chennai results confirmed that visible signs of corrosion can be seen on non-galvanized cars 5 years old or older, and that the Chennai coast was a more corrosive location than Mumbai. Numerous corrosion perforations were noted on cars that were manufactured from non-galvanized steel. No perforations were noted on any of the cars manufactured using galvanized steel.

Introduction

Until the mid-1970's in North America, it was quite a common sight to see rusty cars being driven on city streets and highways. While the corrosion was primarily due to de-icing salts that were used liberally on the roads during the winter months, the major reason for the rusting was that car bodies were made of painted cold rolled steel and provided no protection at paint damage sites, and in underbody crevice areas that trapped mud and aggressive chloride ions from the use of de-icing salts. As a result, perforations were commonly seen on two or three year old cars on the structural sill panels, fenders, doors, hoods, deck lids and floor pans.

However, since the introduction of zinc coated (galvanized) steel in North America in the early 1980's for outer body panels, inner panels and structural underbody components, the perforation problems vanished, and car companies started to provide consumers with corrosion warranties against cosmetic and perforation corrosion.

The decision to use galvanized steel was made after extensive testing in the laboratory and on the Proving Grounds of General Motors, Ford & Chrysler in Michigan and in Arizona in the USA. One of the authors was, in fact, deeply involved in the testing effort and several years ago started to push Indian car manufacturers to transition from uncoated

cold rolled steel to galvanized steel for Indian made cars and SUVs.

By the year 2000, twelve global automotive companies launched several models of their vehicles in the Indian market, with most of them eventually setting up stamping and assembly plants in India. India is currently the sixth largest producer of passenger cars (over 4 million units in 2019) after China, Japan, North America, Germany and South Korea. In the next few years, India will likely overtake South Korea and Germany and become the fourth largest global producer of cars. However, despite this growing global reputation, Indian car buyers do not benefit from the corrosion warranties typically provided in Western economies, mainly because very little, if any, galvanized steel is used in the manufacture and assembly of the car bodies in India.

Indian car bodies are typically made of stamped cold rolled steel components, spot welded together and painted in an assembly line. However, if steel is not adequately protected by zinc or other sacrificial metallic coatings, it will corrode when exposed to the atmosphere. The use of galvanized steel body panels and underbody structural components to prevent corrosion is the norm in Europe, North America, Japan and Korea, and in these countries, vehicle life is greatly enhanced. It should be noted that the cost of using galvanized steel is quite insignificant compared to the cost of premature repair and replacement of cars.

India has a coastline that stretches over 7500 kilometres and while no de-icing salts are used on the roads and highways, the chloride ions are nevertheless present due to air and wind-borne saltwater sea spray from the surrounding ocean. In the summer of 2015, the IIT Bombay conducted a study to evaluate the corrosion performance of automotive body panels in the challenging warm and humid coastal area of Mumbai at three locations (Juhu, Gorai & Powai). These areas were chosen because of the presence of aggressive chloride ions in combination with significant industrial pollution. The results of this car corrosion survey were published by IIT Bombay.

Using an inspection procedure similar to the corrosion performance survey carried out in Michigan in the 1990s (Reference 1,2), IIT Bombay focused on the inspection of all the major exterior body panels of over 500 cars. Inner body panels and under body panels were excluded from the corrosion survey, even though it is well established that inner & underbody panels suffer more serious corrosion damage.

The Mumbai corrosion survey results (Reference 3) showed good correlation between the level of corrosion failure in the automotive body and the age of the vehicle. Cars older than 5 years had more serious levels of corrosion at rocker (sill) panels, hood, trunk and doors. Paint blistering and surface rust represented most of the visible corrosion, but no perforations were noted.

The Chennai survey was also conducted by IIT Bombay researchers using the same inspection team that performed the Mumbai survey.

Corrosion Survey Method

Location: Places close to the sea, such as East Coastal Road, Egmore and Mahabalipuram were chosen for the survey. The two primary reasons for selecting these locations were the high density of cars in this region and its close proximity to the seacoast. The area represented a combination of aggressive chloride salt and a high humidity corrosion prone environment. The parked cars which were evaluated had to be owned by local residents. For this reason, cars from the nearby housing society parking lots were inspected.

Vehicle Age: The survey was carried out in March 2018. The cars evaluated were typically 5-15 years old and represented all Indian manufacturers. The 5 to 15 year time period also represented a time when there was a dramatic increase in the introduction of different vehicle makes and models in the Indian market.

Models Surveyed: One of the essential features of this study was to survey cars that were used by an average Indian family. For this purpose, car models that typically fell below Rs. 10 lakh cost were considered. Under this category, all car models, across several manufacturers (Maruti, Hyundai, Honda, etc) and segments (sedan, hatchback) were inspected. In addition, several car models utilizing galvanized steel panels were also inspected using the same methodology to evaluate the benefits of using galvanized steel instead of non-galvanized steel.

Type of Survey: The survey was a “closed car” or “parking lot” survey. Only the external body panels were inspected since vehicle owners were unavailable to open the doors or raise the hoods and deck lids. This meant, of course, that the inner panels and under body panels could not be assessed for corrosion damage. The procedure used was the same as the SAE parking lot survey conducted in Michigan, USA in the mid 1980’s and in the Mumbai survey of 2015.

Corrosion Defect Categories

While tabulating the corrosion damage results, all incidents of corrosion were placed in one of the three following categories:

- **Blister:** A blister was defined as any visible bubbling of the paint on the exterior car body.
- **Surface Rust:** This was defined as any area where the paint had been removed and the exposed steel surface was red rusted.
- **Perforation:** A perforation was defined as any complete penetration of the sheet metal that left a hole visible to the naked eye.

Determination of Defect Size

The typical plastic grid was not used to avoid touching the vehicle and cause concern to the car owner or security personnel of the housing society. Any imperfection was deemed present on the car body panel if its size was more than one centimetre. Additionally, a group of imperfections with collective size of more than a centimetre were also noted.

Surface rust in the immediate area of a perforation was considered part of the perforation problem and was not counted as two imperfections.

Panels Surveyed

The survey included mainly 4 body panels:

- Bonnet (or hood)
- Boot (or deck lid) and Hatchback
- Rocker (or sill Panels)
- Door panels (including around the door handles)

A schematic diagram of the car panels was provided to each surveyor to mark imperfections on the above parts. A sample corrosion survey sheet is shown in Figure 1.

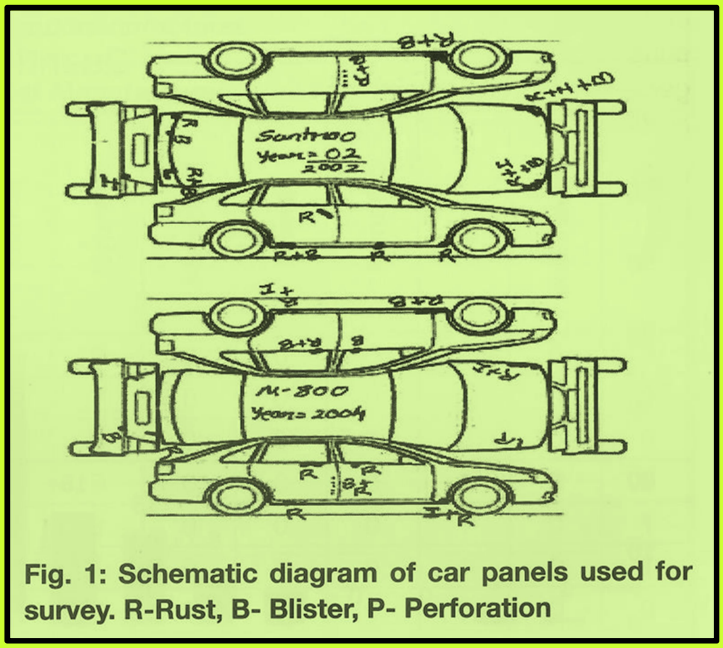


Fig. 1: Schematic diagram of car panels used for survey. R-Rust, B- Blister, P- Perforation

Vehicle Identification

The car model and brand were noted from the back boot or hatchback. The year of manufacture was determined from the last two digits of VIN or Vehicle Identification Number. VIN was visible through the windshield on all vehicles.

Conducting the Survey

Each survey team consisted of two members, one member to inspect the vehicle and a second to mark defects on the schematic map provided. Between 80 and 100 cars were inspected by each team per day. A total of 500 cars were surveyed.

Summary of Results

Table 1 and Fig. 2 summarize the vehicles inspected in the survey in terms of model year, vehicle age and number of vehicles. From the above data, 2008-2013 model year vehicles made up the majority of the 500 vehicles surveyed. Therefore, this survey has most statistical significance for the corrosion of vehicles 5-10 years old.

Table 1: Breakdown of Cars Inspected by Model Year

Model year	Approximate age of the vehicle	Quantity of cars
2000	18	1
2001	17	2
2002	16	0
2003	15	0
2004	14	5
2005	13	8
2006	12	13
2007	11	16
2008	10	38
2009	9	49
2010	8	40
2011	7	51
2012	6	57
2013	5	65
2014	4	65
2015	3	49
2016	2	32
2017	1	9

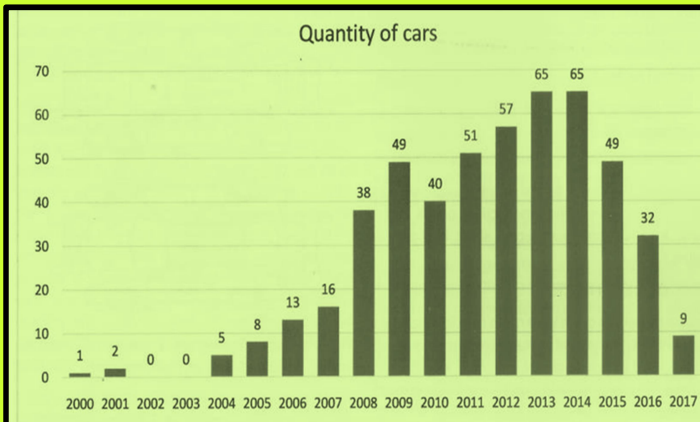


Fig. 2: Graphical representation of the breakdown of the cars inspected by Model Year

Table 2 and Fig. 3 provide further insight into the manufacturers of the vehicles involved in the survey. Maruti, Hydundai and Honda vehicles comprised nearly eighty percent of the survey vehicles and collectively, represent over 80% of the car production in India. A total of 26 vehicles were manufactured by Volkswagen in India and used galvanized steel for the outer body panels.

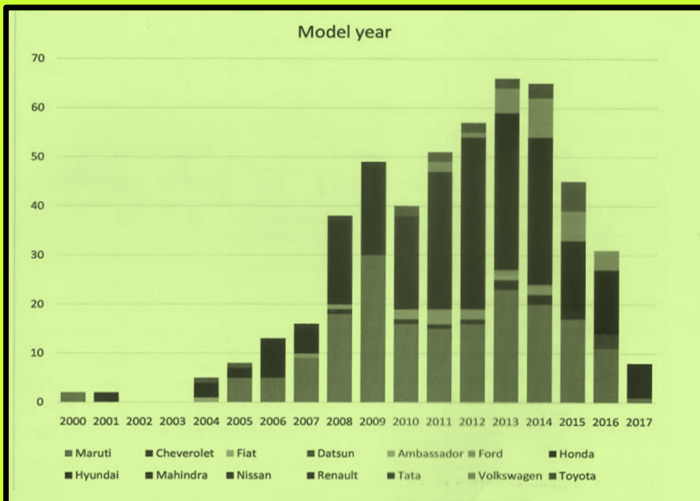


Fig. 3: Graphical representation of the breakdown of the cars inspected by Model Year and Manufacturer

Table 3 below, summarizes the type of corrosion defects found on the various vehicles in the survey (paint blistering, surface red rust, perforation and the total number of imperfections). Figure 4 is a graphical representation of the corrosion defect data from Table 3 into the three imperfection types and the total number of imperfections. Since the 5 to 10 year old vehicles had the most statistical significance,

vehicles outside this range were ignored. As expected, the number of vehicles exhibiting any type of corrosion defect tends to increase with the increasing age of the vehicles. It is also quite evident that the number of paint blistering and surface rust defects were more predominant than perforations. By contrast, it should be noted that the Mumbai car survey showed only a few corrosion perforations and this, along with the higher frequency of surface rust and paint blistering defects noted in Chennai, indicates that the warmer and more humid Chennai coastal area is a more severe environment compared to the less humid Mumbai coastal area.

Table 2: Breakdown of survey in terms of model year and manufacturer

Model year	Indian Car Manufacturer													
	Maruti	Cheverolet	Fiat	Datsun	Ambassador	Ford	Honda	Hyundai	Mahindra	Nissan	Renault	Tata	Volkswagen	Toyota
2000	2	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	1	0	0	0	1	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2004	0	0	0	0	1	0	0	2	0	0	0	1	0	1
2005	5	0	0	0	0	0	0	1	0	0	0	1	0	1
2006	5	0	0	0	0	0	1	7	0	0	0	0	0	0
2007	9	0	0	0	0	1	1	3	1	0	0	1	0	0
2008	18	1	0	0	0	1	3	11	1	0	0	3	0	0
2009	30	0	0	0	0	0	1	8	4	0	0	6	0	0
2010	16	1	0	0	0	2	1	6	2	0	0	10	0	2
2011	15	1	0	0	0	3	4	10	2	0	1	11	2	2
2012	16	1	0	0	0	2	8	11	1	2	2	11	1	2
2013	23	2	1	0	0	1	4	14	1	4	1	8	5	2
2014	20	2	0	0	0	2	13	5	0	1	3	8	8	3
2015	17	2	0	0	0	0	6	6	0	1	1	0	6	6
2016	11	0	0	3	0	0	5	2	0	0	2	4	4	0
2017	1	0	0	0	0	0	0	0	0	0	2	5	0	0

It is quite evident that the major detrimental corrosion issues in Chennai are paint blistering and surface rust. However, a significant number of actual perforations of body panels were noted on cars in Chennai compared to the Mumbai survey of 2015 on the same number of total cars inspected.

Table 3: Survey Summary according to model year, quantity and imperfection type

Model year	Approximate age of the vehicle	Quantity of vehicles surveyed	Type of defects			
			Imperfection	Blistering	Surface rust	Perforation
			No.	No.	No.	No.
2000	18	2	12	3	10	2
2001	17	2	9	4	9	1
2002	16	0	0	0	0	0
2003	15	0	0	0	0	0
2004	14	5	25	1	16	7
2005	13	8	32	3	30	2
2006	12	13	60	9	62	3
2007	11	16	82	12	60	14
2008	10	38	178	18	148	12
2009	9	49	207	21	173	4
2010	8	40	159	6	135	0
2011	7	51	221	18	133	4
2012	6	57	208	7	165	1
2013	5	65	192	4	138	3
2014	4	65	201	1	120	0
2015	3	49	122	1	58	1
2016	2	32	65	0	42	0
2017	1	9	4	0	4	0

It should also be noted that the frequency and severity of the corrosion defects, including perforations, were more severe in Chennai compared to the Mumbai results (40 perforations on 5-11 year old cars in Chennai compared to only 10 in the Mumbai survey). All the perforations were on non-galvanized cars. Of the four major parts inspected, the rocker (sill) panel exhibited the highest damage in terms of paint blistering and surface red rust. This can be attributed to its closeness of these parts to the ground and hence effects of paint chipping from road debris, water ponding, and ocean salt spray.

Summary and Conclusion

The results of the 2018 car corrosion survey conducted on 500 non-galvanized as well as galvanized cars in the warm and humid coastal city of Chennai show that:

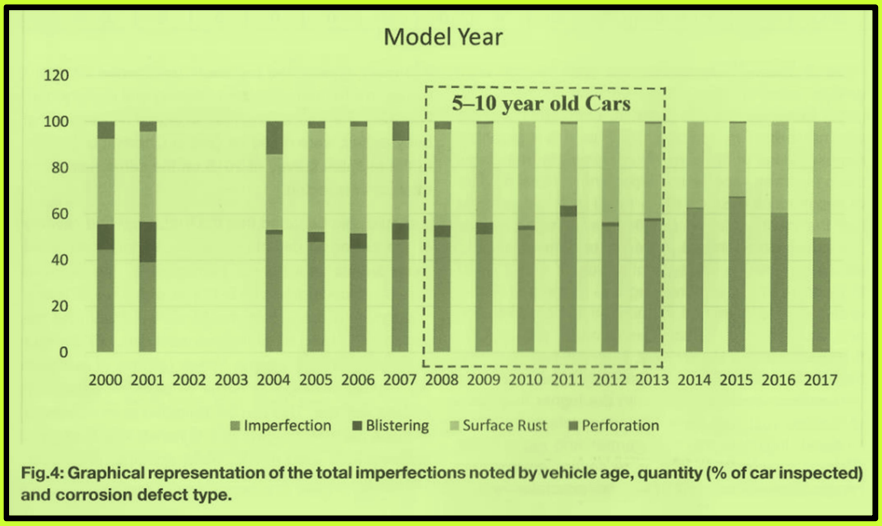


Fig.4: Graphical representation of the total imperfections noted by vehicle age, quantity (% of car inspected) and corrosion defect type.

1. There is good correlation between the number of corrosion defects in the car body and the age of the vehicles. A significant number of non-galvanized cars between five and ten years old had paint blistering, surface rust, and perforation corrosion defects.
2. The corrosion defects noted on different parts of the non-galvanized automobiles showed that the body parts closer to the road surface were most prone to imperfections such as paint blistering, surface rust and perforations.
3. Compared to a similar survey conducted by the same inspection team from IIT Bombay in 2015 in the Mumbai coastal area, the Chennai results were significantly worse in terms of earlier onset of visible corrosion as well as significantly more perforations on non-galvanized cars. No perforations were noted on any of the galvanized cars.
4. Based on the experience gained in the Chennai & Mumbai surveys, we can expect that converting car bodies from the current non-galvanized steel to galvanized steel will prevent the early onset of corrosion and prolong the life, appearance, safety and resale value of Indian made cars.

Source: Steel Tech

TATA STEEL CHARTS RS 60,000-CR CAPEX

To ramp up capacity of Kalinganagar plant to eight million tonnes, secure iron ore capacity of 50 million tonnes per annum, Tata Steel unveiled plans to invest ₹50,000-60,000 crore over the next five years. This will be used to enhance the capacity of different units including ramping up its Kalinganagar plant to eight million tonnes, securing iron ore capacity of 50 million tonnes per annum, and enhancing the cold rolling capacity to 6.5 mtpa from 4.3 mtpa.

To beat the cyclical nature of the business, T V Narendran, Managing Director, said Tata Steel will focus on new and allied businesses such as production of low-carbon steel,

composite material, graphene, medical materials, services and solutions. Each of these has the potential to become a ₹1,000-crore business over a period. Most importantly, in most of these businesses, the company will not be competing on steel but on other materials altogether, Narendran said at an investors' call.

The company targets doubling its capacity to 40 million tonne by 2030 largely through organic growth, he said. With the focus on ESG (environment, social and corporate governance) rating, the company plans to make 5 million tonnes of steel through the recycling route. It has already set up a recycling plant of 0.5 mtpa at Rohtak in Haryana. The company can set up a steel plant on 50-100 acres closer to the recycling unit using the electric arc furnace route instead of the conventional steel plant that requires 3,000 acres, he said

Tata Steel also plans to increase capacity of ductile iron pipes and tinplate to 1 mtpa each from 0.2 mtpa and 0.4 mtpa respectively. Tubes and wire production capacity will be increased to 2 mtpa and one mtpa from 1.3 mtpa and 0.45 mtpa respectively. On average, the company plans to spend ₹10,000-₹12,000 crore per annum, excluding acquisitions. The company has invested ₹80,000 crore over the last years. The company plans to reduce its debt by $1 billion every year. It has bought down its net debt to ₹75,390 crore as of March-end from ₹1.04 lakh crore.

Source: Hindu Business Line

A SCIENCE-FICTION ROUTE TO GREEN STEEL

Foreword

Albert Einstein once said – "Imagination is more important than knowledge". This has never been so relevant as it is now. With technology changing faster than the society can digest, with processed information and scholarly views literally available at fingerprints, this is a different world. A world where power of imagination is out performing knowledge as organisational or individual asset.

This is not a technical article in the conventional sense but an extrapolation of technical ideas into future. The objective is to stimulate imagination among students, young professionals and may be captains of industry.

A Brief Background

The change process started about forty or fifty years ago at a gentle pace but now in 2065 the engineering education would look nearly unrecognizable to old timers. There is one common Engineering course called BEM meaning Basic Engineering and Mathematics. Having completed this three-year curriculum, students get a choice to visit industries they wish to get a feel of. Then they have options for hundreds of specialisations such as

"Humanoid Engineering", "Non-invasive Diagnosis and Cure Implement Engineering", "Weather Intervention Engineering", "Ocean Floor Engineering" and so many. The age-old Civil Engineering however still exists but with a suffix ET, meaning Extra-Terrestrial. They are into designing and making Space-Stations or Lunar Buildings. Earlier students had to get certificate from a particular Institute but now-a-days they are free to take courses from whichever Global Institute they want. In spite of so much transformation, the Anthropologists sound quite stubborn. They still say that after the Old stone age, New-stone age and Bronze Age, the Iron Age still continues. Advent of Iron Age was around 1500 BCE and if at all the name may be modified to Steel Age. The Anthropologists use the "Technology Minus" model as a proof. This a highly complex gigantic computer model which can simulate the absence of any particular technology or industry. The output is a number signifying the drop in Quality of Life of Humanity as a result. The sharpest drop is seen if Steel Technology suddenly ceases to exist. The effect is many times severe than digital imaging or communication technologies.

Maybe driven by this curiosity a group of students opted to visit Steel Industry or maybe they know this is one industry that has responded to the Climate Change challenge very aptly. So much so that steel today is greener than most materials. The tour was from Ore Mines to the Steel Plant. Their day started as they alighted from a vertical landing-take-off aircraft on a flat hill top.

The Ore Mining and Preparation Complex

The place appeared hilly in the midst of a dense forest area. Except for a few geometrical shaped structures no factory like construction could be seen. The place looked more like a National Park than a typical Industrial Complex. The tour coordinator welcomed the group and the visit started. They heard a feeble thud and the coordinator said that blasting was going on in the North Eastern bench –"you can see the cracks and fissures on the rock face. However we are having a problem with our blasting method, owing to too much noise." The group looked surprised. There was hardly any explosion like sound. He explained – "Noise is in the subsonic range, we humans cannot hear it but the elephants can. There are evidences that elephant herds get scared and they might even change their migration corridor. The Apex Court has given us two years' time to rectify – we are working with two Universities on subsonic shielding technology."

The ore mass, mostly in the form of huge boulders were being dug out and brought to the EMWT. They could see a large, maybe 3 m wide tunnel like equipment. EMWT meant Emolliating Micro Wave Tunnel. In the past centuries the manual rock breaking industry, in fact, used a similar principle. They used to lit fire around large hard rocks overnight. Then they put water on them to induce thermal cracks which made their job easier. In EMWT, thermal stress got generated in the rock body by beaming high energy microwave resulting in internal cracks.

The power consumption must be very high – someone commented. –"No, it is not. They use short pulses and not continuous power." Said the coordinator. The technology seemed excellent as they saw large rocks breaking almost silently like fragile biscuits in the Jaw Crushers.

The second tunnel after Jaw Crusher was LAMWT – Liberation Aiding MicroWave Tunnel, a precisely controlled Microwave equipment. The power and pulses were controlled to generate cracks at the interface of mineral body and gangue materials. –"Liberation characteristics are much better with this. However being of natural origin, the ore bodies are very inhomogeneous and change from a rock to the other. There is a "Dielectric Laboratory" on that hill top which studies the samples and advises the microwave recipe with regard to pulse and power. Frequency is usually not touched – anyway not so much scope either because frequency bands have to be within the Government Regulated Width." Explained the coordinator.

They had a short visit to the Lab on hill top. It looked very sophisticated – equipment were mostly for electrical measurements unlike old mineral assessment facilities. The output from LAMWT were fed to a crusher to reduce the size to less than 2mm and then conveyed into FBMT – Fluidised Bed Magnetisation Tower. It used flue gas from a captive natural gas fired power station for fluidisation. The coordinator explained - "Hematite to magnetite transformation can take place at very low concentrations of reducing gas like carbon monoxide or hydrogen. A temperature of 250 or 300C is good enough. Being magnetic a LIMS, Low Intensity Magnetic Separator which is an age-old process, nicely separates out gangue from mineral(3,4,5,6)". The whole process was dry but there was no dust emission seen because of the 'Electro seeding Technology' meaning injection of electrically charged particles which attracted gangue particles and developed 2 or 3 mm agglomerates with a typical half-life of one hour. A spray of polymer solution stabilised the agglomerates. They saw sand like particles on a conveyor.

Anticipating the obvious question the coordinator explained – "These are used as sand with or without cement. Our Landscape Engineer uses such materials for doing up the barren mine faces." The team felt that the landscape engineer was doing a good job, the place never looked like having rock blasting and mineral processing activities.

Transportation of Ore

The last rail or truck transport took place some twenty years back. They were told that every gramme of ore was transported through Maglev Pipeline. Principle-wise these pipelines were same as the Maglev trains that first came up some fifty years ago in Japan and China. Ore particles, being magnetite, are easily amenable to magnetic levitation. The pipeline was designed to convey levitated particles, the propulsion was also electromagnetic. The group wondered the power consumption would be enormous for this 300 km line. However, it was not so. The line was mostly self-powered by intermittent solar

panels, the residual demand being supplemented from the grid. The excitation was sequenced both on the length and time dimensions. When excitation was on say in the segment, it was off till n+3 segments. On any particular segment the excitation was pulsed. The amplitude and pattern were adjusted according to the reology of the material, such as the gravity-settling characteristics. Someone was curious to know the capital cost involved because of the electrical winding running over hundreds of kilometres. The coordinator said – "The Hot Rolling Mills make ICSC (meaning Insulated Copper Strip Cladded) plates or coils. As the coils or plates are welded into pipes spirally or lengthwise, the copper strips provide necessary winding for electromagnetics. With levitated transport picking up everywhere, this kind of copper printed steel products are in high demand."

The control room for the pipeline had visual monitors and controls for every segment of the line. Mean time between breakdowns or disruptions appeared to be quite impressive.

The Steel Plant

The group was interested upto the stage of liquid metal production because traditionally most the energy consumption and emissions were from these units. Having flown to the Steel Plant 300 Km from the ore mines they resumed the study-tour. The coordinator said that the skyline of the Plants changed unrecognisably over the last decade. Pellet Plants, Direct Reduced Iron (DRI) Units had all gone. The look of Blast Furnace was quite different and some new units like Fluid-Bed MTI Reactor came up.

The Fluid-Bed MTI Unit looked a very 'peaceful' kind of equipment because being one of the primary facilities for ironmaking, there were no radiating heat nor sound nor dust floating around. It was a tower with inlets and outlets on the upper half. As they were looking at the battery of four Reactors in operation, the process engineer arrived to help the group understand the technology.

"Magnetite", he showed the equilibrium diagram superimposed with the H2-H2O line, "can be theoretically reduced straight to iron at low or even at ambient temperatures. This had been known for ages but the difficulty is twofold. At low temperatures, the time needed for hydrogen to diffuse into and the resultant water molecule to migrate out from a magnetite piece is exceptionally long. This can be countered by using small sized particles. The second difficulty is maintaining very high pH2/(pH2O+pH2) ratio for the reaction to proceed. This is managed by using higher reactor pressure that helps condensing out H2O from gas phase. Also, a series of dehumidifier candles are used which absorb any residual H2O in the gas phase. The surface to gas phase mass transfer is very favourable with fluidised particles. A residence time of 7.5 minutes is enough to reduce magnetite particles to iron. The reactor temperature is 250 C only.

"Hydrogen comes for a series of Electrolysers. Unreacted hydrogen is converted into power in a battery of Fuel Cells making the energy balance and economics workable."

In the control room they could see the interior of the reactor through camera captured live images. Some in the group had the impression that iron ore reduction had to be necessarily a high temperature process. The process engineer added - "So many advantages of low temperature reduction –heat losses are low, reactor construction and linings are simple, sensors and closed loop controls are less expensive yet precise.

"The reduced iron particles are conveyed into nitrogen sealed bins. Induction heaters heat up the particles very rapidly as they are fed to a Roller Briquetting Machine. You can see the briquettes there, each about 10 kg. This process is same as the old Hot Briquetted Iron Technology for DRI Modules. However, from DRI modules the briquetting mix used to be at around 600^{o}C hence no flash heating was necessary.

A little away from the Fluid-Bed Reactors, there stood a Blast Furnace - it looked a bit different from what it used to be fifty-sixty years ago. The group was told that this furnace used hydrogen enriched natural gas and recycled plastic granules at very high rates. Some 150-200 kg coke was used but compared to conventional coke this was lighter and stronger, thus providing necessary gas passages in the Blast Furnace. They used pelletised high volatile coal in the coking blend so that the coke had low bulk density.

There was an open area of some 150 x 250 meters where a large diameter down comer from the Blast Furnace was seen to be terminating. The Blast Furnace engineer explained -"This a technology being developed by the Research and Technology Development (R&TD). They have an underground bed of olivine sand through which BF gas is passed. They are trying to make olivine sand absorb CO2. Interestingly, one of the products of the reaction is water which seeps into the water table. They have reclaiming facility for used sand to be sent for normal constructural usage"

A battery of ultra-high power Electric Arc Furnaces (EAF) were fed with Hot Metal, Scrap and Iron Briquettes. The Steel Shop looked clean and dust free. – "Not much change in EAF over the decades expect for the scrap preheating conveyor which uses waste gas. Our furnaces are equipped with bottom stirring elements and facilities for injecting calcium-ferrites when deep dephosphorisation is needed." Said the person in-charge.

Discussion Session

The group had a discussion with the Steel Plant Staff, representing Process Technology, Energy Management, R&TD, Cost Analysts and General Management.

Why Blast Furnace? Someone asked.

"It is a proven practice for maybe 70/80 years to charge Hot Metal in EAFs. It helps smoother power in-take, better molten bath condition, faster melting, better nitrogen control

etc. Though EAFs can be run with either scrap or briquettes or both, Hot Metal as the third partner helps a lot. Therefore Blast Furnace."

"How is the economics with scrap, after all you need to buy it?"

"The scrap availability in the country has steadily gone up over the years. In earlier days India was a developing country with less scrap getting recycled. Now the situation is different. Scrap melted steel is by far the greenest steel you can make. The government is giving incentives to scrap usage."

"Fossil fuels are cheapest source of energy and carbon anyway. Is steel produced with so much hydrogen really cost effective?"

"At one point of time electrolysed hydrogen used to be expensive. However, with introduction of high conductivity synthetic electrolytes and cells designed with superconductivity components, the efficiency has gone up considerably. Cheaper Solar Power and high efficacy Fuel Cells also helps the cause. The combination works"

And the final words came from the Managing Director of the Plant who joined the session towards the end; "My dear young friends, even if the cost is higher it is worth incurring that extra bit to protect the planet. We like you to believe in this principle because you are the future warriors to take the efforts forward!"

Source: Steel Tech

INDIA IMPOSES CVD ON IMPORTS OF ALUMINIUM WIRE ROD FROM MALAYSIA

India's Director General of Trade Remedies announced that based on the duly substantiated application with prima facie evidence filed by the Applicants, it has initiated an anti-subsidy investigation on import of Aluminium Wire & Wire Rods above 7 mm diameter originating in or exported from Malaysia. DGTR has recommends imposition of countervailing duty equal to the lesser of margin of subsidy and the margin of injury, so as to remove the injury to the Domestic Industry. The Authority recommends imposition of definitive countervailing duty on all imports of goods given herewith: Press Metal Bintulu Sdn Bhd - 6.8669%; Press Metal Aluminium Rods Sdn Bhd - 6.8669%; and Other - 16.4874%.Vedanta Limited and Bharat Aluminium Company Limited had jointly filed an application for initiation of anti-subsidy investigation concerning imports of Aluminium Wire & Wire Rods above 7 mm diameter originating in or exported from Malaysia. The product under consideration in the present investigation was defined in the notice of initiation as "Aluminium "Wire Rods above7 mm dia". The scope of the product under consideration includes both alloyed and non-alloyed wire- wire rods. The major raw material used for manufacturing the product under consideration is alumina. The product under consideration is produced and obtained by casting primary aluminium hot metal obtained

from smelting of alumina. Wire/ Wire rods can also be produced by melting of scrap. Wire rod produced through scrap is beyond the scope of the product under consideration. The product under consideration is primarily used in electrical industry, steel industry and others. The product is classified under the Chapter76 of the Customs Tariff Act,1975 (51 of 1975) under customs heading 76011040, 76012040,76041010, 76042920, 76051100 and 76052100.

Source: MMR

GLOBAL NICKEL DEMAND FOR BATTERY USE TO RISE 18% IN 2021: SUMITOMO METAL

Global demand for nickel used in batteries is expected to rise 18 percent this year from 2020, backed by strong sales of electric vehicles (EVs) in China, Sumitomo Metal Mining, Japan's biggest nickel smelter, said.

Sumitomo Metal, which supplies cathode materials for Panasonic lithium ion batteries that are used in Tesla EVs, said the demand for nickel used in rechargeable batteries will increase to 228,000 tonne in 2021 from 193,000 tonne in 2020. Nickel is mainly used in stainless steelmaking but is also a vital ingredient for the lithium-ion batteries used to power EVs, where demand is set to accelerate over coming years. "Sales of EVs are growing very fast, especially in China, despite the COVID-19 pandemic," Yusuke Niwa, general manager of Sumitomo Metal's nickel sales and raw materials department, told reporters.

"The recent drawdown in LME's nickel stocks is seen to reflect rising demand for the metal used in batteries," he said, pointing to a drop by more than 30,000 tonne over the past two months. The company also predicted that a global nickel market surplus will narrow to 58,000 tonne this year from 132,000 tonne in 2020 as robust demand from the stainless steel sector will offset higher output of nickel pig iron (NPI) in Indonesia.

Global demand for nickel is seen increasing by 9.2 percent in 2021 to 2.58 million tonne, while supply is expected to climb by 5.8 percent to 2.638 million tonne. During the first four months of the year, the global nickel market saw a deficit of 34,900 tonne, the International Nickel Study Group said. "But we expect a surplus later this year as more projects for NPI production in Indonesia will start up," Niwa said. Japan's demand for nickel is projected to rise 15.7 percent to 167,400 tonne, while supply is forecast to fall 2.4 percent to 165,800 tonne.

Source: www.cnbctv18.com

STATE-RUN CIL EXPORTS COAL FOR FIRST TIME

State-run Coal India Ltd exported coal for the first time to Bangladesh, nearly a month after tweaking its e-auction coal sale policy lifting the restriction on export of coal. The coal below 2200 gross calorific value coal purchased under spot e-auction from Dahibari siding

of Bharat Coking Coal Limited (BCCL), the Jharkhand-based coal producing subsidiary of CIL has been shipped to Rampal Power Station, Khulna in Bangladesh. The plant falls under the Maitree Super Thermal Power Project - a joint venture between NTPC Ltd and Bangladesh Power Development Board, a company executive said.The Bangladesh bound coal left the Indian shore from Syama Prasad Mookerjee Port, Kolkata, the sea route which links India and Bangladesh.

The Maharatna coal miner on June 8 amended its e-auction sale policy allowing across the borders sale of coal bought under spot e-auction and special spot e-auction by domestic coal purchasers including traders. Both types of auctions are meant for all categories of Indian coal buyers and traders. Special spot e-auction though offers extended time for lifting coal. “Though small in quantity, what is encouraging is that a beginning has been made. We look forward for more exports that would help in improved coal sales under the two categories of the auction platform,” said the senior executive of the company. For April-June’21 quarter CIL has allocated 6.7 million tonnes (MTs) of coal under spot e-auction which is nearly one-fourth of the entire booked quantity of 27.3 MTs, fetching the company 30% add-on over the notified price. For the comparable period last year, the add-on was 16% under spot e-auction.

Source: Economic Times