

Annual Issue

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Vol. 29 No. 6

June 2023

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■ GSSE 2023 tradeshow to unlock the potential of Stainless Steel at Bombay Exhibition

■ Refractory raw materials - The present sources & way ahead



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Editorial Desk



D. A. Chandekar
Editor

Dear Readers,

I am very happy to present 'Steelworld's annual issue comprising of insightful conversations, techno-commercial articles / features and an elaborate section on statistics. Since last several years, 'Steelworld' has been publishing the 'Annual Issue' and is being received well by the industry. After covid, due to the expansion of digitalization, the magazine reach increased manifold and started reaching the desktops of iron & steel industry executives across the globe. After the covid pandemic was over, the steel industry was about to manifest a V shaped recovery, atleast the experts were predicting that. The demand was growing and the disruptions in the supplychain were being fixed. With the government's emphasis on infrastructure development, 'Steel' was supposed to have a clear ride in coming months. The process had already started but the Ukraine – Russia war extended beyond the expectations of most of the analysts and the global supply chain again got disrupted to some extent. As Ukraine and Russia both were big suppliers of semies to the world, the demand supply balance got disturbed to some extent. Eventually the steel fraternity learnt to live and operate in spite of the

constraints created by the war and today even if the war has not ended, the international steel trade is not much affected by it.

I would say the Indian story is quite positive but not very outstanding. Yes, the consumption is increasing steadily. The infra dev projects are progressing steadily. Auto industry is doing good but not great. The exports are reduced mostly due to economy stagnation in EU and the other developed countries. Still with the prediction of more than 6 % annual growth, India remains the fastest growing large economy on the planet and continues to attract many overseas companies to participate in this growing market.

Since last few years, the efforts to reduce the carbon footprint in the steel production have intensified. Hydrogen is seen as the replacement to carbon but the full scale commercialization is not yet achieved. We do get the nes of sucessfull steelmaking with 100 % hydrogen but still a long way to go before the industry adopts it as a regular practice. Green Steelmaking in real sence is still quite far but we, as an industry, are certainly going in that direction.

Where does India go from here ? Will the growth continue ? Will India enter recession in coming months ? Well, the present situation is so volatile and uncertain, it is quite risky to predict the future. Nobody knows the fate of Ukraine – Russia war, one can not foresee the next move by Chinese govt, the situation in many countries in the Middle East remains fluid. All these geopolitical factors will have a big impact on the global economy and also on iron & steel industry. My guestionation is that India will continue to grow in this year aided by a good monsoon and if the economy grows, the iron & steel industry has to grow, isn't it ?

Write your comments :

<https://steelworldblog.wordpress.com/>

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India's policy reforms will be a key demand driver for zinc

Arun Misra

*CEO & Whole-time Director,
Hindustan Zinc Ltd.*

Hindustan Zinc, the world's second largest integrated producer of Zinc and 6th largest Silver producer since August 1, 2020.



Following this in June 2022, Misra has taken on additional responsibility of managing the operations & growth of Vedanta Zinc International which have their mines and concentrator in South Africa.

Misra was appointed Deputy CEO, HZL on November 20, 2019, and was elevated to CEO & WTD, Hindustan Zinc Limited from August 1st, 2020. In less than 10 months, he was moved to the Corner Office and placed at the helm of the world's second-largest integrated producer of zinc.

Misra is the 1st ever Indian Chairperson of the International Zinc Association. He is also the Vice President of the Indian Institute of Mineral Engineers. Mr. Misra has to his credit several published papers in nationally reputed journals.

Misra was awarded 'CEO of the Year' and Hindustan Zinc the 'Most Innovative Company of the Year' in the

Business Leader of the Year awards. Further, the Company under his able leadership has retained its 1st position in Asia-Pacific for the fourth consecutive year and globally 3rd in S&P Global Corporate Responsibility Assessment in 2022 amongst Mining & Metal companies.

After graduating with a bachelor's degree in Electrical Engineering from IIT, Kharagpur, Mr. Misra took a Diploma in Mining and Beneficiation from the University of New South Wales Sydney, and another Diploma in General Management from CEDEP, France.

D A Chandekar, Editor & CEO of Metalworld Magazine had an exclusive interaction with Mr. Arun Misra, *CEO & Whole-time Director, Hindustan Zinc Ltd., to understand more about the present and future of zinc market in India. He also suggested changes for the policymakers.*

Excerpts :

1. How is the present situation in the global and Indian Zinc markets?

The global economy continues to remain impacted by extraneous factors. Though the previous quarter did begin with optimism on the global economic outlook on account of easing supply chain disruptions and expectations of China's economic recovery supported by positive hope on broad-based recession avoidance, however, the same was short lived. With the potential banking meltdowns and mounting inflation in the US supplemented by China showing few signs of strong economic recovery yet, broader market sentiments continue to remain weak.

Zinc supply and demand forces remain underperforming. There has been a fall in global consumption by 3.3% in 2022 amidst the slowdown of China's economic recovery and possibility of US banking crisis impacting the construction and

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Face to Face

the automotive sector for the first half. Global consumption is forecast to grow by 0.8% in 2023. As for the Indian markets, industries maximized output in the last quarter of FY thus maintaining robust domestic demand.

2. How do you see the future of the zinc market in India?

India is at a momentous point in its journey towards becoming one of the top three economies in the world. Critical sectors such as infrastructure, manufacturing, construction and agriculture will spearhead this growth and commodities, especially zinc, will fuel this reform significantly. India is the world's fourth-largest producer of zinc in 2022. Over the five years to 2022, production from India increased steadily and is expected to rise by a CAGR of 8% between 2022 and 2026.

The application of zinc will increase over time. From the galvanization of steel for flat products; now it is used in long products as well. Now it is used as a key micro-nutrient to maintain the health of soil, and vital mineral for human health used in various multi-vitamin tablets. Zinc can play a critical role here as railway tracks galvanized with zinc last longer and thus will prove to be cost effective in the long run. The key drivers for zinc would be the automotive industry and transmission infrastructure – increase in galvanised cars

& power transmission lines for longevity. It will also become an alternative to battery manufacturing—zinc air batteries. With the growth in infrastructure, and construction activity, zinc is expected to grow at CAGR 7-8% in India between 2022 to 2025.

3. Tell us about Hindustan Zinc and what activities are being carried out there

We are a fully integrated player, focused on driving sustainable future growth as laid out by our parent company, Vedanta's core philosophy of #Transforming For Good. Led by a strong core of experience and expertise, we are focussed on creating value for all our stakeholders.

With self-sufficiency in power with captive thermal power plants, we have ventured into green energy by setting-up wind power plants and also signed the power delivery agreement for 450MW round the clock renewable power. From operating highly mechanized zinc-lead mines and also the world's largest underground zinc mining operation - Rampura Agucha mine, the other operations include Zawar Group of mines, Rajpura Dariba mine, Sindesar Khurd mine and Kayad Mine along with zinc-lead processing facilities which include smelters at Debari, Chanderiya and Dariba and a silver refinery at Pantnagar in Uttarakhand. The core philosophy is based on conducting operations in a Safe, Smart and Sustainable manner wherein



we have deployed of India's first ever Battery Electric Vehicle in underground mining with the aim of decarbonizing Indian mining. Along with this, we have also deployed 21 electric vehicles at the smelting locations, thus further reducing our dependency on fossil fuels. We are certified 2.41 times water positive and are on track to become 5 times water positive by 2025.

Currently, we are creating jobs for more than 22,000 employees, and we have also created numerous opportunities for downstream and ancillary industries. By doing this, we are assisting in the growth and development of the sector and the country as a whole. In addition, we are improving the quality of life in the neighbourhood surrounding our operational units through a variety of CSR initiatives, including training rural youth in sustainable farming methods, empowering rural women through microenterprises, and much more. We are transforming the lives of 1.73 million people through our focussed community development initiatives which has also garnered us the title of Top 15 CSR spenders in the country.

4. What are the initiatives of Hindustan Zinc in the area of digitalization?

Technology & innovation is assisting us in a big way for real-time data-based decision making, reduction of waste, increased productivity, and resource efficiency, while harnessing renewable energy sources for a greener future.

We are currently reimagining the entire value chain, backed

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Face to Face

by automation and analytics, to foster an environment that is conducive to the business growth while making mining operations safer.

The use of drones to measure bulk material volumes and scan stopes in underground mining operations is making exploration for resources safer. Computer-vision based technology helps in detecting quality defects and unsafe working conditions. We are developing the silver rich Sindesar Khurd mine as not just ours but India's most mechanized & digitized mine and make it a model for modern mining. With automated and tele-remote controlled drilling operations, we are achieving maximum efficiency during shift-change (smoke hours) for additional production drilling. This provides flexibility, higher safety standards, visibility, and control from outside the drill cabin. The tele-remote control provides more range and features than other remotes. An operator can work from a comfortable space, such as a control room.

As leaders in sustainable mining, we have become the first mining company in India to introduce battery operated utility vehicles for underground mining thus reducing dependency on fossil fuels and setting an example in the industry.

5. What does the Zinc producing industry expect from the policy makers?

The path to a five trillion-dollar economy is also poised to be a path of transition to a more sustainable future, in which zinc can be a torchbearer. From its usage in steel structures to railway lines and batteries, Zinc is also an



enabler of a circular economy as it can be recycled and can also very easily be returned to nature if used in the agricultural sector. The government investments in zinc and favourable policy reforms will be a key enabler in India's economic success. It becomes imperative to integrate its usage across sectors which will not only help us to build a stronger economy but also be important in India's transition to a modern, sustainable superpower.

Regulating and channelizing the scraps that are imported to India is an urgent action to be undertaken so that it does not deter economic growth. Along with this, there is an

urgency to strengthen the physical examination to prevent the entry of mixed zinc scrap into the country, which can go a long way in boosting the indigenous industry and also propel the vision of Atmanirbhar Bharat.

6. What are the future growth plans of Hindustan Zinc?

Our future growth plans are based on going downstream with the fertilizer plant and alloy plant. As part of the next phase of growth, we are investing Rs. 2,200 crores to set up a fertilizer plant and roaster to expand our zinc footprint and the product portfolio. Along with this, we have also set up Hindustan Zinc Alloys to produce value-added product in the market. This move will make way to produce value-added zinc alloy products and enable us to deliver international quality products in the domestic market.

At the same time, from the sustainability perspective, we are aiming to become carbon neutral by 2050 or sooner and are continually working towards reducing the carbon footprint. With this regard, we have signed power delivery agreement for 450 MW round the clock renewable power. We are also committed to invest USD 1 billion for decarbonization journey including converting all diesel-run mining vehicles to battery operated ones and have set a target to achieve 75% electrification of the mining fleet by 2035 and complete electrification by 2040. ■



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Dr. Mathai has vast experience of more than 28 years in the field of engine and vehicle testing, emission studies and ambient air quality. He has done his doctorate from IIT Delhi.

He has been a part of Auto Fuel Vision & Policy 2025 Committee for drafting the policy. He is a member of various committees of Government & bodies, like BIS and CPCB, etc. where he articulates views of mobility concerns in these forums to facilitate future roadmap.

He has published more than 50 papers in national and international forums. He has 2 patents to his credit. He is a member of NABL, Pune Knowledge Cluster, life member of TSI, Chairman of SAE Western India Section and Secretary of CIMAC India.

Dr. Reji Mathai, Director - ARAI, Pune

D. A. Chandekar, Editor & CEO had an exclusive interaction with Dr. Reji Mathai, Director- ARAI, Pune to understand the research being carried out at ARAI, EV culture & the future of Automobile sector in the country.

Excerpts :

1) Please share the profile of activities & research carried out at Automotive Research Association of India (ARAI).

The Automotive Research Association of India (ARAI), established in 1966, is a leading automotive R&D organisation set up by the automotive industry with the Government of India. ARAI is affiliated to the Ministry of Heavy Industries and is recognized by the Department of Scientific and Industrial Research as a Scientific and Industrial Research Organization

(SIRO). An experienced and well-trained human resource of 720+ is ARAI's main strength. The state-of-the-art Laboratories of ARAI are well equipped with the most advanced facilities in the areas of Emission evaluation, Noise Vibration and Harshness, Structural Dynamics, Engine Development, Environment Research, Computer aided engineering, Vehicle Evaluation, Active and Passive Safety, Material Evaluation, Automotive Electronics and Calibration etc. ARAI also has an Academy.

ARAI offers Testing & Validation, Certification & Homologation, Design & Development, Research & Development, Projects & Consulting, Standardisation & Harmonisation, Education & Training, Testing Solutions services. ARAI also offers Automotive Technologies,

Data Bases, Software tools, Testing Facilities as some of its products.

Research Programme of ARAI include R&D projects in the areas of Simulator, EV Chargers, Hybrid Vehicle development, HCCI Engine, HCNG Engine, New High Specification 3 Cylinder Engine, Bio-Diesel Engine, Dual Fuel Engine, Electronic Fuel Injection System, Integrated Safety System, Material Data Bank, ECU development for GDI, Electric and Hybrid Electric Vehicles, ADAS, Autonomous vehicles, Transmission, Vehicle Dynamics, 3D Road Profile, Advanced Front Lighting System (AFLS) solution etc. Some of the R&D projects of national interest supported by Government of India include E axle Powertrain Kit for 3-wheeler application, Battery Thermal Management System for 2 & 3 wheeler EV application, calibration strategy for BS-VI RDE by virtual



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Face to Face

technique, Smart Structures implementation in automobiles, development of Lightweight Bus with Aluminium Superstructure, Offline & Real-time Simulators for EV / HEV, Power boosting of Small Diesel Engines with Supercharger, Duty Cycle of Public Transport Vehicles, Advanced Low Temperature Combustion System, Lightweight Forging Processes, Road Profile Measurement, Ambient Air Quality Monitoring, Measurement of Nano Particle Emissions, Source Profiling of Vehicular emissions, Material Compatibility evaluation with alternate fuels, and Anthropometrical Data Measurement of Indian Driving Population.

To keep itself at the forefront of technologies, ARAI continuously upgrades its facilities through government and internal funding. Major expansion and upgradation were carried out under National Automotive Testing, R&D and Infrastructural Project (NATRIP) in the areas of Crash, Power Train and Fatigue at ARAI – Homologation and Technology Centre (ARAI – HTC). Also, Centres of Excellence in the areas of Power-Train, Fatigue and Materials have been established at ARAI – HTC. ARAI has also set up Environmental Research Laboratory which undertakes environmental research programmes like Air Quality monitoring for

cities.

ARAI assists the Government of India in formulation of automotive industry standards and harmonisation of regulations. ARAI is also assisting Government of India in establishing vehicle Inspection and Certification centres all across the country. ARAI also lends its capabilities humbly to non-automotive sectors such as



defence, railways, medical etc. to help in their development work.

ARAI is proud to be a part of the Make in India crusade through its services that support, facilitate, and augment Innovate in India, Design in India, Validate in India and Skill India.

2) What research is being carried out to reduce the weight & increase the fuel efficiency of the vehicle?

Importance of light weighting is paramount in Automotive Industry, considering fact that Vehicle mass has inverse relation with Fuel Economy. Reduction in mass gives substantial benefit in improving fuel economy for fossil fuel vehicles and helps in improving range for Electric powered vehicles. Burning fossil fuels for transport application is important factor in causing air pollution in the entire

world. Reduction in the vehicle mass gives substantial benefit in improving fuel economy.

ARAI is working on all three approaches of the light weighting process viz. materials, process development and design. In terms of advanced materials, there are advanced high strength steels, aluminium alloys, magnesium alloys, composites are coming up. ARAI has already geared up for

characterizing and understanding these materials. In terms of process development, we are working on developing forging process for magnesium alloys. These alloys are currently used predominantly in aerospace applications but it is envisaged that sooner they will occupy niche space in automobiles as well. ARAI is also working on process optimizing through simulation of casting, forging and moulding processes.

Marginal improvement in the fuel economy and emissions per kilometre travelled significantly impacts surrounding environment. The quantum of benefit due to light weighting increases where there are several start-and-stop conditions like city buses. In view of this, research has been carried out by ARAI to understand weight reduction parameters for city buses. It was found that the major

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Face to Face



weight of the bus is of its super structure which is made of steel and has a great potential for weight reduction. Lightweight superstructure is developed by ARAI using recyclable material Aluminium. Extrusions and joining technique suitable for Indian road load application is developed and Patent for the same applied along with leading Indian Aluminium material manufacturer. Bus Prototypes developed for 9m Staff bus, 12m Low Entry and 12m SLF model. Superstructure is >30% lighter compared to existing steel superstructure. Fuel consumption trials carried out for typical usage shows fuel economy improvement of 8-10%, which translates into ~3000 litres of fuel saving per year per bus. Bus prototypes conform to the regulatory requirement viz. AIS:052, AIS:153 and UBS-II. Technology of light weighting through aluminium can be directly adapted for EV/HEV buses to compensate for increased weight due to electrification.

ARAI has also worked with leading Indian Aluminium material manufacturer for developing light weighting

goods carriers viz. Bulker for transportation of fly ash and Aluminium trailer of higher laden capacity. Lightweight designs resulted in increasing laden capacity in addition to improved fuel economy during empty trips. ARAI is also engaged in research related to development of lightweight Aluminium Bus Passenger seats, which has immense potential for further reduction of Vehicle mass.

3) Role of emerging materials and manufacturing technologies in shaping auto industry?

Major changes happening in auto industry are related to switching to e-mobility and increasing occupant safety. For e-mobility, IC engine and fuels are replaced by electric motors and energy storage devices (batteries, fuel cells etc.). NVH scenario is drastically changing as major source of noise and vibration i.e. IC engine is replaced by quieter systems like battery and motors. Magnets for motors is another challenge. Power transmission / drive line are changing.

For improving occupant safety, various advanced high strength steels and ultra-high strength steels are

coming up. For light weighting, usage of plastics and composites is increasing. In modern passenger cars, approximately 15- 18% (by weight) plastics/ composites are used. As mentioned earlier, magnesium alloys are promising materials for new age lightweight concepts. So, we can see that all these changes happening are driven through novel materials – be it battery / energy storage materials, magnets, AHSS / UHSS, aluminum and magnesium alloys, plastics and composites.

These materials are also demanding newer manufacturing technologies. Dissimilar material joining, near net shape forging, powder forging, coating and surface processing, molding processes are some of them. Additive manufacturing is considered as very promising technology for near future and many researchers are working on making it suitable for bulk manufacturing at economical level. So, all these emerging trends in energy storage, crashworthy structures, light-weighting and so on are driven by emergence of newer materials and manufacturing technologies.

4) A lot of robotics & artificial intelligence (AI) is being employed in production & running of an automobile. Can you throw more light in this?

Today, Artificial Intelligence based technologies are revolutionising the automotive industry by impacting entire automobile manufacturing process. AI based tools and machines are helping to design

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new automobiles, link supply chains, provide new comfort and safety features and automate factories. All these are helping to provide new experiences to customers. Use of these new technologies are proving to be differentiator factor for OEMs. We can witness the use of these technologies in broader transportation domain as well in form of intelligent transport systems, linkages with insurance services, value added customer services through connected technologies.

At ARAI, we are actively working in developing India-specific solutions using AI based techniques to make automobile safer and smarter. We are collaborating with Indian industry to provide solutions in areas like

1. India-specific data and scenario generation capturing Indian traffic conditions
2. Development of cost-optimised Advanced Driver Assistance Systems (ADAS) like Collision Warning System, Lane Departure Warning and Driver

Monitoring System

3. Improving functional safety as per guidelines of ISO 26262 standard

ARAI is also supporting industry by providing centralised engineering facilities like-

1. Data Centre and AI based software tools
2. Verification and Validation tools and service support from Software-Hardware level to Lab-level to vehicle-level at Test track level

5) EV seems to be the new buzzword in the industry. What research is being carried out at ARAI regarding the EV culture in the country?

ARAI has established a comprehensive infrastructure and facilities for testing, certification and development of the electric and hybrid vehicles under the FAME scheme of Government of India at its Green Mobility- Centre of Excellence.

At ARAI, extensive research is being carried out to support the EV penetration and facilitate building EV ecosystem, which include

- Development of Battery

safety standards such as AIS 156 and AIS 038 Rev 2 which is in line with Global Technical Regulation GTR 20.

- Battery safety lab to develop safe batteries from thermal runaway point of view.
- Developing indigenous technology for DC fast chargers so that Indian companies can manufacture it at affordable price.
- Developing electric retrofitting kits to convert older vehicles to electric power train

6) How do you see the Future of Automobile in the country?

Currently 4 key trends are dominating the Global Automotive industry, namely Connected, Autonomous, Shared and Electric (known as "CASE"). We are witnessing focused R&D, new features, new service models being offered around this "CASE" paradigm.

In India also, we are witnessing similar trends. In Indian context, the challenge will be offering "CASE" at affordable price. Also, we need to develop new technologies for India-specific conditions. Our geographical, cultural and driver behaviour conditions are different and unique. In view of this, solutions and services working at global level may not be directly work as it is for Indian conditions. At ARAI, we are focusing on developing such technology solutions across electric vehicle control systems, Autonomous / ADAS features, connected and cyber security domain to suit Indian conditions. ■

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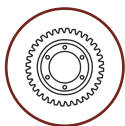
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Challenges and Solutions for Sustainable growth of Indian DRI & Steel Industry

1. iron ore

1.1 Background

India has world's 5th largest iron ore reserves. As per National Mineral Inventory, the total resources of iron ore (hematite & magnetite) as on 01.04.2015 was placed.

- Out of the total resources of hematite (i.e., 22.5 BT), only 24% is reserves (proven) and the balance 76% falls under remaining resources (estimation).
- About 65-70% of the iron ore mined are of high grade ($\geq 62\%$ Fe), whereas the reserve is only 36.6%. Preferential or selective mining has led to faster depletion of high-grade iron ores and generation of

overburdens at mine sites.

1.2 Issues

- High grade iron ore reserves is ~ 1985 MT and if continue to be mined at current level, it will get exhausted in next 15 - 20 years.
- If preferential mining continues, we are going to left out with only low/medium grade iron ores and that will require beneficiation of 100% left-over low-grade ores.
- The presence of high gangue minerals (i.e., alumina and silica) in low-grade iron ore restricts its direct use in iron making (Blast Furnace or DRI).
- Beneficiation is required to utilize Low grade iron



Deependra Kashiva
Director General,
Sponge Iron
Manufacturers
Association of India

ores abundantly available in the state of Odisha, Jharkhand, Goa and Karnataka.

These ores are more fragile in nature because it contains good amount of goethite.

1.3 Solutions

- Fast depletion of high-grade iron ore vis-à-vis abundant availability of medium and low grade iron ores have necessitated the use of beneficiation technologies to recover the maximum mineral value and for sustainable growth of Indian DRI and steel industry.
- Blending of low grade with medium grade ore; Beneficiate to improve Fe content, and then use in agglomeration (pelletization)

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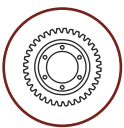
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and sintering).

There is a need to focus on developing advanced beneficiation technology to address low grade iron ore.

2. Coal

2.1. Coking Coal

2.1.1. Issues

It is primarily used in blast furnace. India is importing about 85% of its current requirements.

2.1.2. Solutions

There is a wide fluctuation in the global prices. To reduce dependence on the imported coking coal and to meet the emerging requirements, it is necessary to exploit the domestic coking coal reserves and to beneficiate the available domestic coking coal.

2.2. Non-Coking Coal

2.2.1. Issues

Non coking coal in steel sector is mainly used in coal based DRI process and power generation. To meet the requirement of the sectors, coal is imported mainly from South Africa and Indonesia. Coal from these countries is also imported as indigenous coal has high ash and low fix carbon.

2.2.2. Solution

Though high-grade coal is also available from the CIL sources however its high price and uncertainty in the availability forces the user industries particularly the DRI industry to resort to imports. CIL has to look into these aspects.

3. Direct Reduced Iron

(DRI)

3.1 Background

Indian DRI plants have successfully stabilized the use of BF grade pellets & lumps in the rotary kilns. In India, DRI is primarily used as a substitute of scrap in steel making. DRI doesn't require coking coal, a scarce commodity in India. Gas-based DRI/HBI is clean and environment friendly steel making route (CO2 emission in DRI-EAF route nearly half of BF-BOF route). DRI is preferred iron bearing raw material for secondary steel producers.

3.2 Issues

- Limited availability of



high-grade iron ores and poor quality of iron ore pellets have seriously impacted production and financial performance of Indian DRI producers.

- Coal based DRI plants have serious issues of accretion and other operational problems owing to the use of high

ash non-coking coal.

- Restricted availability of natural gas for gas based DRI route and uncertainty in its prices.
- Gas networking and Pricing mechanism

3.3 Solutions

3.3.1. As stated above, quality of basic inputs like iron ore, pellets and non coking coal needs to be improved.

3.3.2. Serious efforts should be made by MOPNG and GAIL to ensure availability of natural gas at affordable price.

4. Steel Melting Scrap

4.1. Background

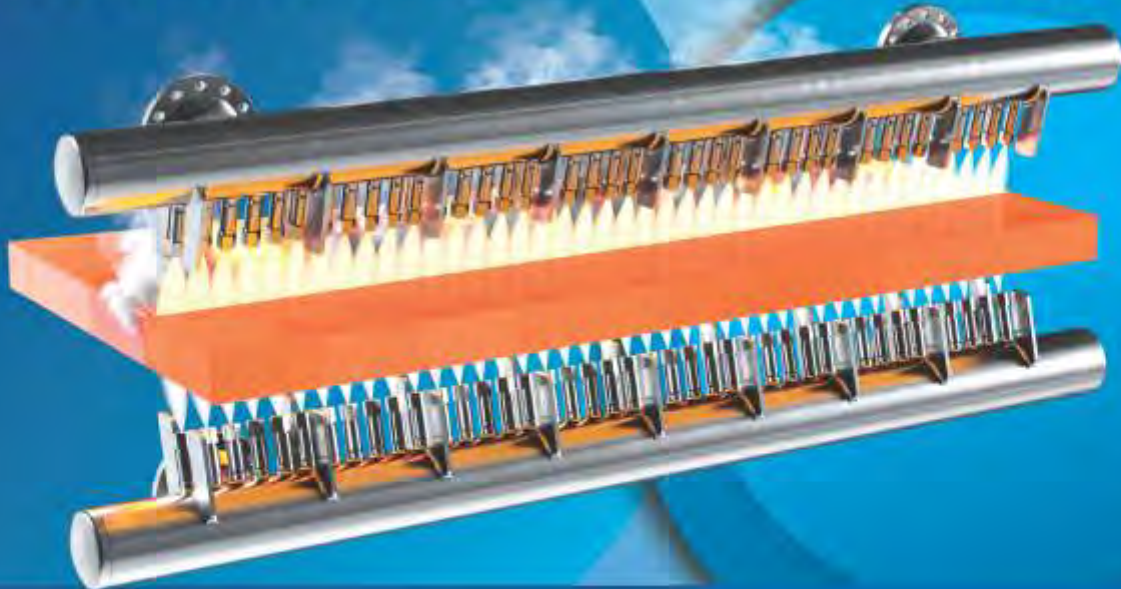
Scrap availability from

indigenous sources is around 22 million tonnes and it is unlikely to increase substantially in near future. Global steel producers are maximising the use of scrap to reduce carbon intensity to meet their target of reduction of CO2 emissions and therefore they are restricting its exports.



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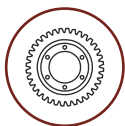
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4.2. Issues

Indian steel producers are also like to maximise the use of scrap. However, they are facing shortage of scrap from internal and external sources. Another important of issue is availability of highquality of scrap.

4.3. Solutions

- Availability from domestic and international sources is limited and likely to persist. Domestic availability can be increased by vehicle scraping and setting up of more scraping yards.
- To improve the quality of scrap, the following procedure may be adopted.
- Installation of the most updated equipment for crushing, shearing, shredding, sorting, Balling, magnetic separation, eddy current separation, and decoating is required.
- To maintain the quality of scrap, proper shorting is the most important step.
- Now several new sensor-based scrap shorting techniques are available which can be implemented in the plants viz.
- Portable optical emission spectrometer
- Laser-induced breakdown spectroscopy.
- Portable XRF
- Automated colour sorting device: it is done based on the computer image analysis wherein each of the metal pieces is

detected. It is done by real-time image analysis and has the ability to sort different metals with slight colour variations like Zn, Cu, brass, and stainless steel.

- Use of Advanced decoating techniques of coated or galvanized steel. The available processes are:
- By thermal method or thermal and abrasion method
- Chemical technique
- Detinning of tin-containing scrap is necessary as tin has a



very detrimental effect on steel properties. ---- Available process is electrolytic or alkaline detinning process.

- Following policy related issues may also be taken:
- Most of the consumers do not know how and where to recycle their old scrap. Awareness programs for effective recycling must be organized so that people can know about the long-term benefit of recycling.
- Appropriate strategies may be developed to

incentivize the scrap collection and processing centers.

- Giving Industry status to the scrap processing centers.
- Application of online marketing to be explored for collection and selling of scrap.

5. Carbon Footprints

5.1. Background

Though carbon intensity in gas based DRI - EAF route is less than half of the conventional BF-BOF route, it is completely higher in the coal-based route. As per the industry sources, carbon intensity in the gas based DRI-

EAF route is about 1.3 tonnes CO₂ / tonnes of crude steel. In the conventional BF-BOF route it is about 2.55 tonnesCO₂ / tonnes of crude steel. In case of coal-based route on an average it is 2.75 tonnes CO₂ / tonnes DRI.

5.2. Issues

In order to reduce carbon intensity and to meet the targeted level of CO₂ emissions, there is a need to reduce carbon intensity in the coal based DRI route as well as conventional BF-BOF route.

5.3. Solutions

- To substitute part of coal by bio gas/ syn gas/ natural gas/green hydrogen in the existing coal based DRI route for which R&D efforts needed.
- To explore the use of biochar as a replacement of

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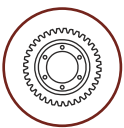
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Industry Update

fossil fuel.

- To explore the possibility of using CCUS in the rotary kilns of coal-based route.
- To encourage existing producers to adopt measures like waste heat recovery plant, pre heating of iron ore/coal,

availability of NG at affordable price will encourage more gas based DRI plants which are also highly desirable for transition to green hydrogen and subsequently to green DRI.

- To set up syn gas based

highly desirable. However, presently there is limitation in the use of green hydrogen in the Blast Furnace route. Major global steel producers are contemplating to switch over to Green Hydrogen + Electric Arc Furnace route.

- To set up a R & D project –



automation, use of energy efficient devices etc. to reduce the carbon intensity in the coal based DRI route.

- To set up more natural gas (NG) based DRI plants. Setting up NG based DRI capacity is also desirable for gradual transition to green hydrogen.
- Infrastructure for transportation of natural gas passing through major public and private sector steel plants, DRI plants and pellets plants in major eastern states is available. Long term

DRI plants.

Though it is highly desirable in view of the vast coal reserves in the country however lack of commercially proven technology and high capex are the stumbling blocks. Merchant syn gas plants based on commercially proven technology should come up either in the DRI clusters or near the iron ore belts with proper infrastructure facilities.

- To set up green hydrogen based DRI plants. Further, to reduce CO2 emissions, use of green hydrogen in BF and DRI making is

National Demonstration Project for exploring the possibility for using the Indian raw materials for producing green DRI / green steel.

- To maximise the use of steel melting scrap in the electric steel making route
- To substitute thermal energy by renewable energy in electric steel making route. ■

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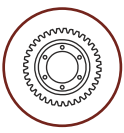
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Synergy for Sustainability

Rajiv Mangal, Vice President, Safety, Health and Sustainability, Tata Steel Sustainability, at its core, embodies the concept of development derived from Brundtland Report about meeting the present needs without compromising the future generations' ability to meet their own needs. It encompasses a multidimensional approach that takes into consideration environmental, social, and economic factors. The world has recognised that to achieve sustainability a paradigm shift is required in how we think, live, and interact with the planet. We need to ensure environmental, social, and financial equity at intragenerational as well as intergenerational level along with an environmentally conscious future for all. In this era marked by mounting environmental challenges and social inequalities, the United Nations (UN) in 2015 launched a guiding framework for global sustainability efforts in the form of 17 Sustainable Development Goals (SDGs).

The 17 sustainable development goals or SDGs include ending extreme poverty and hunger and ensuring universal access to healthcare, clean water and sanitation. Others advance human rights, empowering people through

quality education, gender equality, employment and decent work, reduced inequalities, and innovations in industry and infrastructure so people prosper and feel valued. The wide range environmental goals aim to keep the world within key planetary safety boundaries by changing how the economy works across the globe. They cover climate change, access to affordable and clean energy, sustainable consumption and production, and biodiversity on land and below water. The final two goals focus on values and governance. Together the 17 goals form an integrated package.

One of the key strengths of the SDGs lies in their interconnectedness. The goals recognise that sustainable development cannot be achieved in isolation. Progress in one area often has ripple effects and influences other goals. For instance, addressing Quality Education (Goal 4) will result in achievement of Goal 8 (Decent Work and Economic Growth) and Goal 10 (Reduced Inequalities).

Recognising and harnessing these synergies while implementing our projects and designing our strategies is crucial for maximising the impact of sustainability efforts. Through our business processes and Corporate

Social Responsibility initiatives at Tata Steel we contribute to 15 out of the 17 Goals, prioritised through an intensive and multi-pronged approach considering National/Regional context, current company contribution and opportunity to create greater impact. A total of 68 targets have been prioritised across the 15 Goals.

The Urgency of Climate Action Within the realm of sustainability, climate action (Goal 13) emerges as a pressing priority. Climate change poses an unprecedented threat to our planet and jeopardises progress in achieving the SDGs. The Paris Agreement, a landmark international accord, sets the stage for global climate action. Upholding the Paris Agreement and transitioning to a low-carbon economy are essential steps towards safeguarding the planet and securing a sustainable future.

Tata Steel has set an ambitious target to be net zero emissions by 2045. In its pursuit of decarbonisation, Tata Steel has adopted a two-pronged approach of Carbon Direct Avoidance (e.g., use of hydrogen or steel making using the electric arc furnace route) and Carbon Capture & Usage. Tata Steel's decarbonisation roadmap includes Green Hydrogen – Direct Reduced Iron based steelmaking, use of cleaner fuel (e.g., hydrogen & coal-



Rajiv Mangal
Vice President,
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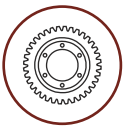
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Industry Update

bed methane) in blast furnaces, carbon capture & usage, increased scrap usage in existing operations and scrap-based steel making.

The Need for Biodiversity Conservation

While we are working on developing low carbon technologies, biodiversity (SDG15) will form our strongest natural defense

About one-third of the greenhouse gas emissions reductions needed in the next decade could be achieved by improving nature's ability to absorb emissions.

Thus for the world to prosper, poverty elimination efforts should be complimented with actions to preserve "natural capital" as people and businesses are dependent on the natural

the Kadma Biodiversity Park, spread across 13.5-acres, where 5,650 trees and 4,650 shrubs have been planted. The Market Opportunities Created Achieving the UN Sustainable Development Goals opens up 60 biggest market "hot spots" worth up to US\$12 trillion of market opportunities in food and agriculture, cities, energy and materials, and health and well-being by 2030. These include Ecosystem Restoration, Waste reduction, Circular Business Models, Energy Efficiency, End-use steel efficiency, Renewables, E-mobility, Cultural Tourism, Carbon Capture and Storage, Modular and Green Buildings.

Moving business to a sustainable growth model will be disruptive, with big risks as well as opportunities at the same time. It will involve experimenting with new "circular" and more agile business models, creating first-in-the-world technologies with research and development and digital platforms that can grow exponentially to shape new social and environmental value chains.

This is an opportunity to strike out in new directions to embrace more sustainable and inclusive economic models which are not only low-carbon and environmentally sustainable, but also turns poverty, inequality, and lack of financial access into new market opportunities for smart, progressive, profit-oriented companies. ■

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against climate change. When human activities produce greenhouse gases, around half of the emissions remain in the atmosphere, while the other half is absorbed by the land and ocean. These ecosystems and the biodiversity they contain are natural carbon sinks, providing so-called nature-based solutions to climate change.

Protecting, managing, and restoring forests, for example, offers roughly two-thirds of the total mitigation potential of all nature-based solutions. Despite massive and ongoing losses, forests still cover more than 30 percent of the planet's land. Conserving and restoring natural spaces, both on land and in the water, is essential for limiting carbon emissions and adapting to an already changing climate.

resources. On the other hand progress towards decarbonisation and the UN SDGs will together redirect the world's economic systems, making normal business activities sustainable, climate resilient, socially fair and environmentally stable.

Tata Steel aims at integrating biodiversity into its business ecosystem by committing to conserve, enhance and restore biodiversity in all of its operations and across the supply chain. We aspire to achieve No Net Loss of Biodiversity. Tata Steel plans to cover 100% sites to assess the impact and dependence of direct operations on biodiversity by 2024. We have planted over 3.2 lakh saplings of native species across all locations. Tata Steel has also set up



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Panel Discussion in 12th Special Steels Convention

Indian Special steel industry poised for a promising future

The Ministry of Steel, Government of India is committed to Net-Zero target by 2070 with the reduction of carbon emissions in steel industry through promotion of energy and resource

long-term goals could shape up the steel industry, Steelworld concluded the 12th Special Steel Convention which was held during 26th May to 1st June in the presence of industry

association with Tata Motors and the current Chairman of ASM International Pune Chapter. The panel also welcomed Alok Vashishth, the Head of Marketing at Kalyani Steel Ltd.

Vashishth's presence was eagerly anticipated, as he shared valuable insights into Kalyani Steel Ltd's recently launched initiatives in green steel making. Furthermore, the panel included Rajkamal Srivastava, a seasoned professional in Special Steel Marketing and currently serving as the President of Jayaswal Neco Ind. Ltd.

Additionally, Dr. Anil Dhawan, the Director General of the Alloy Steel Producers Association of India, and C.H. Sharma, a Steel Plant Consultant, also joined the panel. Their presence further enhanced the panel's expertise, adding insights from the alloy steel industry and steel plant operations, respectively

D.A.Chandekar, Editor & CEO, Steelworld moderated the panel discussion.

What do you have to say about the current status of the Steel industry ?

Udayan Pathak-The industry is currently undergoing significant change and diversification, which brings both challenges and opportunities. Regulatory and



Steelworld Research Team

Compiled by Swati Padave, Editorial Assistant, Steelworld

efficiency as well as renewable energy is being focused by 2030. For the medium term (2030-2047), utilisation of Green Hydrogen and Carbon Capture, Utilisation and Storage are the focus areas. For long term (2047-2070), disruptive alternative technological innovations can help achieve the transition to net-zero. The INR 63.22 billion PLI scheme was announced to expand India's local production capacity of specialty steel products, lower import dependency, and create an export-oriented production base.

To understand more about how the Indian Steel Ministry's mid-term and

experts, leaders discussed the role of future of special steels in India. This panel discussion focused on various crucial aspects that shape the special steel industry, including market trends, technological advancements, and emerging concepts such as microlet steels and green steel making.

The panel was hosted by D.A.Chandekar, Editor & CEO, Steelworld. This panel includes esteemed and accomplished individuals from diverse backgrounds, each bringing their unique expertise to the table.

First and foremost was Udayan Pathak, an influential figure with a long-standing



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Analysis



taxation factors are uncertain, and the industry faces evolving emission standards and potential changes in taxation structures. The debate between electric vehicles (EVs) and alternative options, such as hydrogen engines, is ongoing, with both presenting challenges and opportunities. Safety is another important consideration, with a growing demand for safer vehicles that may result in heavier vehicles and impact fuel efficiency. The feasibility and implementation of autonomous vehicles are also being debated globally. Amidst these changes, the special steel industry has a crucial role to play. Light weighting through high-strength steels like HSS, UHSS, and AHS remains essential, regardless of the transition to electric or hydrogen-powered vehicles. The forward integration of painted steel, in collaboration with the automotive industry, could save time in the manufacturing process. Coatings to mitigate electromagnetic interference from electronic components offer a promising opportunity for steel. The rise of hydrogen as an alternative fuel opens new

avenues for steel in handling, storage, and transportation requirements. The concept of green steel, emphasizing environmentally friendly manufacturing processes, is gaining prominence. However, discussions regarding taxation structures related to integrated green vehicles are in early stages. In conclusion, the special steel industry should prepare for opportunities in lightweighting, forward integration of painted steel, electromagnetic coatings, steel for hydrogen applications, and the production of greener steel. These developments align with the evolving needs of the automotive industry and position the steel industry for future success.

Alok What can you tell me about the present condition of the steel sector?

Alok Vashishth-India's steel industry is currently experiencing significant developments that offer an optimistic outlook. The



localization drive in the automobile sector demands critical components to be developed within the country, positioning India as a major player. Import substitution, pursued by companies like



Kalyani Group, capitalizes on opportunities left by global players and protects domestic interests. Government support and strategic partnerships, such as the collaboration between JSW and JFE for electrical steel production, further contribute to the industry's growth. The steel mills are witnessing increased interest from global OEMs, highlighting India's importance as a market. With factors like localization, import substitution, government support, strategic partnerships, and global OEM engagement, India's steel industry is poised for a promising future.

Rajkamal what do you have to say about the present status of the steel industry?

Rajkamal Srivastava-The steel industry has undergone remarkable transformations,



transitioning from an art to a technology-driven sector. Special steel, commercial steel, and stainless steel have witnessed advancements, particularly in their application for automobiles. However, the



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industry is also grappling with environmental concerns, as it contributes to global CO2 emissions. In India, the carbon footprint of steel production is around 2.6 tons per ton of steel. The government has set visions and goals for the steel industry, aiming to reduce carbon emissions and achieve net-zero emissions by 2070. Special steels play a significant role in various sectors, including automobiles, engineering, railways, defense, and component manufacturing. India aims to become one of the top three automobile producers, with growth potential in domestic consumption and component exports. The electric vehicle (EV) segment presents unique challenges, such as competition from cheaper imported components and future battery replacement costs. The industry is exploring energy efficiency, renewable energy use, and green technologies like hydrogen and carbon capture to achieve sustainability goals. However, the steel industry also faces obstacles, including financial constraints, government processes, logistic costs, land availability, and raw material price volatility. Index-based pricing models, as seen in Europe and America, could offer more flexibility and alignment with market dynamics. The steel industry is actively seeking technological advancements, government

support, and sustainable practices to overcome challenges and achieve long-term goals.

Sharma, We would appreciate your insights on the current advancements in hydrogen steelmaking, green steelmaking technologies, and the industry's initiatives. Furthermore, we are interested in hearing your perspectives on the future trends in these fields.

C. H Sharma-The steel industry accounts for approximately 8% of greenhouse gas emissions, while the remaining 92% is



attributed to other sectors. To reduce emissions in the steel industry, generating power through renewable sources like solar, wind, or nuclear energy is crucial. However, solar and wind power plants have low efficiency rates. Transitioning to hydrogen-based production is a challenge in India due to the absence of gas-based direct reduced iron (DRI) plants. The current methods of DRI production contribute to pollution. Investing in solar or wind power can help mitigate emissions in steel plants, but the availability of scrap for

electric arc furnaces remains a challenge. The steel industry faces financial constraints, government processes, logistics costs, land availability, and raw material price volatility. In terms of electric vehicles (EVs), hybrid vehicles are gaining popularity, indicating a preference for a combination of electric and petrol power. Achieving net-zero emissions in the steel industry is challenging, but efforts can be made to reduce emissions by 4-5% instead of complete elimination. The steel industry should be considered alongside other sectors, and efforts should focus on larger and more efficient steel plants.

We kindly request Dr. Dhawan to provide his opening remarks for the panel discussion.

Dr. Anil Dhawan-The customer preferences for EVs are shifting, particularly among women and young children in India. There is a study from IIT



Kanpur that claims EVs generate more carbon dioxide compared to hybrids or conventional vehicles. A hybrid model and collaboration between automotive original equipment manufacturers

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(OEMs) and stakeholders are necessary for the future of EVs. It is important to make the right decisions at the right time, as the steel industry involves substantial capital investment and long-term commitments to technology. Import substitution is considered crucial, as the fellow panellist mentioned the strategic importance of the Kalyani Group's focus on import substitution. The challenges faced in terms of non-tariff barriers and the need for collective efforts to overcome them. The importance of the component manufacturing sector, particularly in the two-wheeler industry. The potential shift towards low-quality or import-dominated products and the need to collectively ensure the quality production and supply of components. It is crucial to bring stakeholders together to prevent the import of steel-intensive components and establish India as an auto component hub for domestic production and exports.

Udayan Pathak, after listening to the suppliers' perspective, it's now time for the customer to express their thoughts. Can you please share your opinion.

Udayan Pathak -Stainless steel is commonly used in the B6 vehicle industry, particularly for shields and bus bodies. However, its usage is more prevalent in the unorganized sector rather than among original equipment manufacturers (OEMs). The primary

application of stainless steel is found in mid-segment buses, while higher-end buses prioritize personalized and aesthetically pleasing designs, which may not align with stainless steel's characteristics. Nonetheless, if regulations or other factors promote its use, stainless steel's usage could potentially increase. In the context of electric vehicles (EVs), they are generally preferred for shorter commuting purposes rather than long-distance travel. The choice of vehicle model depends on individual needs and requirements. For example, a petrol version may be preferred for frequent outings and highway drives, while an EV variant could be more suitable for city travel within limited range per charge. Fast EV charging infrastructure on highways allows for quicker charging times, although still longer compared to conventional refueling. Separable batteries are being considered for buses, enabling the replacement of discharged batteries with fresh ones during breaks on long-distance journeys. Implementing separable batteries in cars is more complex due to the location of the battery pack.

Dr. Anil Dhawan- I want to ask Pathak I was particularly excited today about a significant article in the Economics Times. It reported that Tata Motors aims to have every third car sold as either CNG or electric. Additionally, Maruti



Suzuki estimates that one-fourth of its sales will be SUVs in the current fiscal year. Leyland is also planning to invest up to 1.2 thousand crore in switch mobility, which involves transitioning from conventional vehicles to other options. Given these developments, it would be valuable to inform steel producers about the need to excel in their offerings. SIAM, as a prominent organization, represents well-organized and thoughtful auto manufacturers. I wonder if automobile manufacturers have made specific plans regarding the types of vehicles they intend to produce. While auto manufacturing is a dynamic industry influenced by consumer sentiments and investments, it raises the question of whether OEM manufacturers have formulated short-term, medium-term, and long-term plans for different vehicle types. Therefore, it would be interesting to know if there are any production plans by auto manufacturers for the next 10 to 15 years or beyond. It's encouraging that the industry experienced double-digit growth last year, around 10 to 12%, and there is an expectation of continued growth this year. However, alloys and steel producers, being integral parts of the supply chain, are always seeking opportunities. Thus, I have been requesting SIAM and others to explore whether auto manufacturers have devised plans for the coming years, such as the next four to five years, the next 10 to 15



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years, or even looking further ahead to 2030, 2047, or 2070. The auto industry is crucial in terms of the overall industrial sector, and



initiatives like the Production-Linked Incentive (PLI) scheme introduced for the sector are unparalleled, surpassing even electronics and other industries. Consequently, it is reasonable to assume that there are plans in place, and loyal steel producers would greatly benefit from being aligned with those plans.

Udayan Pathak-The manufacturing processes in the automobile industry are primarily driven by government regulations rather than individual manufacturers. The transition from BS4 to BS6 emission standards was a surprise for the automotive industry in India, as the fuel became available earlier than anticipated. While bodies like the Tractor Manufacturers Association can influence government policies, the government's seriousness in implementing regulations related to technical issues is evident. By 2030, new models may not receive permission for non-electric vehicles, and the government may become stricter in introducing new policies. Globally, companies like Mercedes and Toyota

have already declared their commitment to cease investing in internal combustion engine (ICE) power train development. In India, new models with ICE engines may face challenges in receiving permission from agencies like ARAI, while existing models may be allowed to continue for a few more years. However, there is a unique scenario in India where vehicles banned in one region are sold and used in neighboring areas, including villages, where enforcement of fitness, emissions, and other norms may not be stringent. This multi-owner model of vehicle ownership exists in the market due to economic factors. Considering this perspective, electric vehicles (EVs) seem to be a favorable option at present, with significant global research also focused on hydrogen fuel technology. Stakeholders, including customers, regulators, and automakers, play a crucial role in shaping the demand for vehicles and subsequently impacting the Capex plans of the steel industry. The evolving scrappage policy, along with continuous dialogue and interaction between steel producers and automakers, will guide the demand for alloys based on the requirements of dealers and customers.

Alok Vashishth-While the adoption of electric vehicles (EVs) is growing, I agree that there will still be a significant demand for alloy steel until 2030. The environmental

awareness and cost savings associated with EVs are driving their current growth. However, it is important to note that EVs only shift carbon emissions to future years, and the total cost of ownership savings is a major factor attracting consumers. Over the next seven to eight years, EV penetration is projected to be substantial, particularly in two-wheelers, three-wheelers, and buses. However, in heavy commercial vehicles, EV penetration may still be low. Despite the increasing adoption of EVs, the absolute growth of the automobile industry will be substantial, with millions of passenger vehicles still expected by 2030. This indicates a continued demand for alloy steel, as existing capacities will be utilized and additional requirements will arise from regulations and global demand. The weight of steel required per vehicle is significant across different categories, ensuring a continued demand for steel even with a shift to EVs. Technological advancements and potential taxes on individual battery charges may also impact the EV landscape. In conclusion, the demand for alloy steel will persist, requiring additional capacity in the next few years to meet the growing demand in the automotive and non-automotive sectors, including the renewable energy sector.

I would like to make a couple of points that arose from my conversations with some acquaintances in the aluminum industry. They expressed great

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confidence in their ability to secure a significant portion of the automobile sector's business, claiming to have already taken away approximately 10 percent of the steel industry's business in recent years. Furthermore, individuals in the composite industry also seem optimistic about their potential to capture some business from the steel industry. In light of this, Rajkamal how can we safeguard our own business? Specifically, should we be concerned about the threat posed by aluminum and composite materials?

Rajkamal Srivastava- We anticipate significant growth in the demand for components, leading to the establishment of export capacities in India. While the component manufacturing industry is often considered polluting in Europe and America, India is poised to become a hub for critical component production. However, the process of obtaining approvals for capacity additions in India is lengthy, ranging from greenfield approvals to commissioning and OEM approvals. The cost of setting up a one-million-ton plant is approximately 9,000 crore initially, but due to high finance costs and the time it takes to utilize the capacity (around six to eight years), the investment can increase to 17 or 18,000 crore. Nevertheless, many players, including JSW and Kalyani, are expanding their existing capacities through brown

field projects, which are more feasible. Therefore, there is no threat to component exports, and the market is expected to grow further with high predictability. Regarding electric scooters, there are unorganized players in Delhi selling products assembled from components, which are not from reputed companies like Bajaj, Honda, and Hero. These scooters have proper registration, but they are significantly cheaper (around 70,000) compared to organized players (priced at



1 lakh 60,000). Despite this price difference, there is a market for both types of scooters. In the coal industry, there have been anomalies in coal prices, with expectations of prices decreasing or the industry facing a crisis. Financing options need to be considered to address these price fluctuations. Additionally, a formula incorporating volume and index price linkage could help mobilize and manage price increases or decreases effectively.

Dr. Anil Dhawan-The pricing discussions between OEMs (original equipment manufacturers) and suppliers are typically conducted directly, without involvement from industry

associations. It is advisable to contact the OEMs directly to discuss pricing matters. Regarding the Carbon Border Adjustment Mechanism (CBAM) introduced by the European Union, it is a significant development in the form of a carbon border adjustment tax. The current system in the EU includes a quota, and any imports exceeding the quota are subject to a 25% duty. CBAM can be considered a non-tariff barrier that may have cascading effects and contribute to carbon leakage. Carbon leakage refers to a situation where steel producers with higher carbon dioxide emissions, not meeting European standards, could flood the Indian market. This issue was highlighted in a meeting with the Commerce Secretary, emphasizing the need for India to have a similar system in place to avoid this dangerous situation. Additionally, OEMs like Tata Motors will likely start asking suppliers about their CO₂ emissions. From October 1st, states exporting to the EU will be required to report carbon dioxide emissions, even though the actual implementation will start in 2026. Only those meeting the EU's definition of green steel based on these reports will be exempt from additional taxes. This issue is crucial for export competitiveness, and other steel buyers may also demand carbon emission-friendly products. Therefore, it is essential for the industry to undergo carbon and energy audits and work towards reducing carbon emissions,

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both for the domestic and international markets. These are the two key points to consider.

C.H Sharma- The main



point is that for steel producers who are currently operating through the blast furnace route, it is challenging to achieve significant emission reductions without a complete technological shift. They would need to scrap their existing blast furnace operations and switch to alternative technologies, which is dependent on the availability of hydrogen and greener methods of direct reduced iron (DRI) production. Furthermore, besides the steel plants themselves, the inputs they purchase, such as oxygen, electrodes and fluxes, also contribute to pollution. Controlling emissions by 2030 appears to be very difficult, and only marginal reductions of around 10% to 15% may be achievable. European steelmakers are planning to replace some old blast furnaces with DRI and electric-based steelmaking methods. However, achieving zero emissions or capturing CO₂ comes with additional costs, estimated to be around \$100 more per ton of steel produced. Current production costs and OEMs' preferences for lower costs

make it unlikely that these additional costs will be willingly absorbed. It should be noted that although India has committed to being carbon neutral by 2070, drastic reductions in CO₂ emissions are not expected in the near future.

Dr. Anil Dhawan-While it is acknowledged that iron ore-based steel production cannot be completely replaced by scrap, the availability of recyclable scrap does play a role. India currently imports about 10 million tons of scrap. The definition of green steel, which is still unclear, will have significant implications. The concept of scopes 1, 2, and 3 is relevant in this context. Scope 1 refers to raw materials, scope 2 involves energy consumption, and scope 3 covers external factors beyond the factory's control. By effectively controlling and reducing emissions in these scopes, steel production can be considered green. The Indian government is actively involved in addressing these issues and is unlikely to let its capacity go to waste. Steel producers should not be complacent and must adapt to meet the requirements of buyers who may demand CO₂-conscious or green steel, which may come with a premium. It's important to differentiate between zero carbon emissions and a carbon-neutral industry. The cement industry is the largest carbon emitter globally, followed by steel and other sectors. Efforts are being made to

reduce emissions in these industries, and with the collaboration of experts, stakeholders, and the steel industry as a whole, a manageable level of carbon emissions can be achieved.

Udayan Pathak-The point raised is that while OEMs may demand green steel, the government may not impose direct taxation on it. It is true that there are factors outside the control of steel manufacturers, similar to how the automotive industry pays penalties for vehicles that become polluting due to inadequate maintenance by owners. Manufacturers cannot use the excuse that the pollution occurred outside their factory or beyond their control. Therefore, the steel industry needs to establish a robust system to ensure green steel production. OEMs do not charge extra for green features in vehicles because customers are generally unwilling to pay more. Similarly, the steel industry must transition to green steel by scaling up operations, increasing efficiency, and finding ways to offset the associated costs. This approach can create a win-win situation for both customers and manufacturers.

D A Chandekar : We will now conclude with final comments from each panelist.

Alok Vashishth- I am extremely optimistic about the steel industry's future and have repeatedly emphasized its potential. The key challenge lies in adding capacity while ensuring the necessary capabilities and receiving continued support from the government. While the

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government has provided significant support, there is a need for a clearer policy framework and assistance to drive the demand for green steel. This can be achieved through measures such as taxation or incentives, government projects prioritizing green steel, integration of retail demand into the national demand, and financial support through reduced loan interest rates or other means. Over time, as we develop a green mindset and focus on both the demand and marketability of green alloys, the steel industry has the potential for a promising future.

Rajkamal Srivastava- Regarding the demand for steel, I am highly optimistic, not only for special steels but also for the overall steel industry in India. However, when it comes to green steel, there is a notable difference between Europe and America, where 45 to 55 percent of production is through the scrap route, and India, where blast furnace production has been dominant over the past 25-30 years due to abundant natural resources. As we strive towards the vision of reaching 500 million tons of steel production, with a significant portion through electric arc furnace or environmentally friendly methods, we must consider the utilization of our untapped natural resources. Currently, the cost of melting steel through electric arc furnaces is higher by around 20,000 rupees per ton. We need to address the cost economics and find solutions to offset the

potential charges or penalties imposed globally for not adhering to green steel standards. It is crucial to establish policies that favor the industry, align with government objectives, and support the environment in our pursuit of green steel.

C.H. Sharma- I share the



optimistic view regarding the demand for alloy steel, and I don't foresee any issues with increased capacity, as echoed by other panelists. I would like to emphasize two additional points. Firstly, in order to transition to green steel, the industry will require substantial investments. It would be beneficial for the government to provide subsidies or offer better loan terms to incentivize technological changes in the industry. This support should be considered for the future, around 10-15 years from now. Secondly, there is a significant need to enhance the quality of our steel. Although we have made progress over the past 50 years, there is still room for improvement to match the quality standards set by Japanese steel. It is essential to work concurrently on improving the quality culture within the industry to ensure we are more competitive in terms of quality. Quality improvements do not necessarily require high costs, but rather a commitment to a culture of excellence. These two aspects are crucial as we strive for a green steel future,

considering the well-being of future generations and the importance of providing them with clean air to breathe.

Dr. Anil Dhawan- In conclusion, I want to highlight a few key points. Firstly, there's no need to be overly concerned about the electric furnace (EF) route as economies of scale favor the blast furnace (BF) route. The current capacity for alloy production is divided almost equally between EF and BF routes, each with its own advantages and meeting quality requirements. Secondly, import substitution should be pursued as a strategy, particularly in niche markets. Thirdly, the demand for alloy steel extends beyond the automotive segment, with opportunities in defense, aerospace, and construction, especially for anti-corrosive applications. Collaboration and close relationships with OEMs and stakeholders are essential for innovation, demand creation, and meeting industry standards. With a strong focus on R&D and demand generation, the steel industry is well-equipped to overcome any future challenges.

Udayan Pathak- I believe that the steel industry should not solely focus on conventional steelmaking. Instead, there should be a greater emphasis on forward integration, finding opportunities to add value to the steel products and create a more efficient supply chain. This can help optimize costs and ultimately benefit both the industry and customers. Additionally, improvements in backward integration, such as exploring the usage of hydrogen as an alternative energy source, can also contribute to the overall efficiency and sustainability of the steel production process. ■

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- India's Steel Sector Booming Amid Global Shift from West to East
- Collaborative Government-Industry Efforts Propel Growth and Job Creation
- National Infrastructure Projects to Complement Steel Industry Expansion
- Green Steel and Decarbonisation Initiatives Take Center Stage
- Embracing Technology and Innovation to Fast-track Steel Sector

India's steel industry is poised to lead global growth as the nation emerges as an epicentre for the sector's evolution, according to the Hon'ble Minister of Civil Aviation and Steel, Government of India, Sh. Jyotiraditya M. Scindia.

Addressing the Ministry of Steel, Ministry of Commerce, Government of India and FICCI's exhibition and conference - India Steel 2023, the minister highlighted the country's rapid ascent in steel production, with a growth of 6% CAGR over the last decade and a predicted 11-12% increase in consumption levels in the coming years.

"We have already emerged as the second largest steel producer in the world, and our per capita steel consumption has gone up from 57kg to 78kg during the last nine years. This proves our mandate to become a powerhouse of manufacturing and increase the share of Steel in GDP from 2 to 5%," said Scindia.

The minister pointed to four key factors contributing to the sector's growth: collaborative efforts between the government and industry, the strengthening of national infrastructure, a focus on green steel production, and the adoption of new technologies. Minister Scindia revealed that the government recently signed 57 MoUs with 27 companies under the Production Linked Incentive (PLI) Scheme for speciality steel. This is expected to generate an investment of about Rs. 30,000 Crores, create an additional capacity of 25 Million Tonnes of speciality steel within the next five years, and provide over 60,000 job opportunities. Scindia also highlighted the government's commitment to producing green steel and



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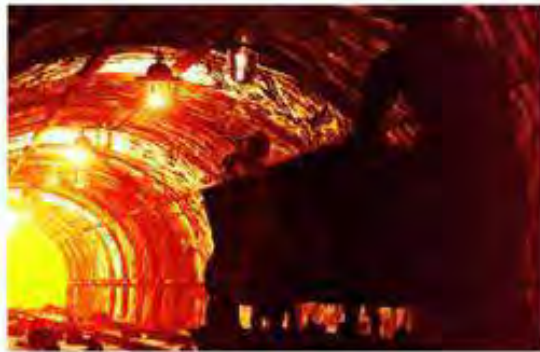
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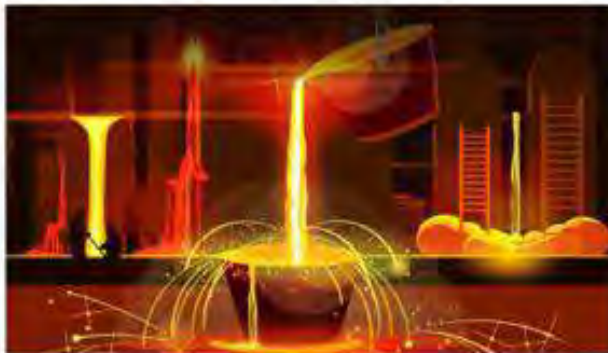


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reducing the sector's carbon footprint. "We are taking appropriate steps to make the steel sector more green and sustainable," he said, stressing the need for recycling and promoting the circular economy within the industry.

Finally, the minister

Tackling Low-Grade Iron Ore and Consumption Disparity Union Minister of State for Steel and Rural Development, Shri Fagga Singh Kulaste, highlighted three critical topics for discussion during the conference, the first being the utilisation of low-grade iron ore. Kulaste urged

the secondary steel sector to adopt technology to enhance competitiveness and create more job opportunities.

Challenges Facing the Indian Steel Industry

In his opening address, Mr Subhrakant Panda, President, FICCI, emphasised the importance of the steel



industry in facilitating India's growth story. "Steel is the building block of new India and indeed a vital component in the nation's economic development," he stated. However, the Indian steel industry faces several challenges that need to be addressed to achieve its ambitious growth targets, such as decarbonisation and the dependence on the import of coking coal. He added that decarbonisation is a crucial objective for the steel industry, with the government and private

underscored the importance of embracing technology and innovation to fast-track the steel sector. Scindia mentioned the formation of two Advisory Committees, one for Integrated Steel Producers and another for Secondary Steel Producers, to ensure the active participation of stakeholders in decision-making.

"I strongly believe that as the next era of growth belongs to India, within India, the next era of growth belongs to the steel industry," said Scindia, urging stakeholders to come together to drive the sector's success and achieve the nation's ambitious goals.

industry professionals to process and utilise low-grade iron ore within the country for steel production, saying, "It will result in creating employment opportunities, capital investment, and boosting the economy." Addressing the significant consumption gap between urban and rural areas, Kulaste pointed out that steel consumption in rural areas is only one-third of the national average. He emphasised the importance of bridging this gap by understanding rural needs, informing and training rural populations about steel products, and implementing similar programmes. Lastly, Minister Kulaste encouraged

sector working together to develop a roadmap for the sector to transition to low carbon emissions.

Furthermore, he noted, "Supportive policies and a conducive regulatory environment will enable the steel industry to overcome challenges and leverage the opportunities arising out of the significant growth trajectory that India is embarking upon." **Steel Consumption Records Humongous Growth** Sh. Nagendra Nath Sinha, Secretary, Ministry of Steel, emphasised that the steel industry has experienced a growth rate of 12.7 per cent in the past year alone, with steel

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consumption rising from 105 million tons in 2021-22 to 119 million tons in 2022-23. Further, while alluding to the domestic benefits of a thriving steel industry, Secretary Sinha emphasised the potential for international cooperation. He pointed out that India's steel sector could play a crucial role in addressing other countries' development and infrastructure needs while

Steel 2023 conference showcased the importance of the steel sector, with more than 10,000 footfalls and around 80 speakers attending the event. Sessions focused on policy frameworks, technology solutions, and circular economy practices aimed at achieving the government's ambitious targets for 2030 and 2047. During the session



working towards a more integrated global economy. Ms Soma Mondal, Chair, FICCI Steel Committee and Chairman, Steel Authority of India, Shri Hemant Sharma, Principal Secretary, Industries Department, Government of Odisha, and Ms Ruchika Chaudhry Govil, Additional Secretary, Ministry of Steel, Government of India, among others, also spoke on occasion. Focus on Innovation and Research to Produce New Age Steel: Ruchika Chaudhry Govil, Additional Secretary, Ministry of Steel India Steel 2023 Conference Records Over 10,000 footfalls. Mumbai, April 20, 2023 – The second day of the India

"Technology Solutions for Enhancing Productivity and Efficiency", Ms Ruchika Chaudhry Govil, Additional Secretary, Ministry of Steel, urged the industry to focus on innovation and research to produce New Age steel. She said, "The challenge is to grow responsibly." The world is focused on the India Steel growth story and views with a critical eye on how India will achieve growth with decarbonization, she said. Earlier during the inaugural programme, Shri Subhrakant Panda, President, FICCI, called for urgent steps to increase capacities of existing mines and operationalize new ones for coking coal production. Setting the context for 'Conducive Policy

Framework & key enablers for Indian Steel', Shri Abhijeet Narendra, Joint Secretary, Ministry of Steel, emphasized the need to prioritize research and development, create indigenous technology, and promote energy-efficient methods for steel production. He said, "It is crucial to march towards zero emission regime through sustainable solutions; decarbonization would be the key driver to take the sector forward."

During the valedictory session, Shri Sanjay Roy, Joint Secretary, Ministry of Steel, stressed the importance of meeting global goals and considering the future generations while promoting greener growth. "We have to grow greener to give better climate to our future generations," he said. He underlined the National Steel Policy, incentives through PLI schemes, focus on increasing efficiency of plants through process changes and new technologies.

In addition, two roundtables, - "Round table interactions of Secondary Steel Sector", and on 'Circular Economy and By-product Utilization in Steel Industry' saw industry leaders discussing the crucial aspects to help the industry achieve the targets set by the Government for 2030 and 2047. The industry requested government support and action from the Ministry of Steel to achieve the set targets and reduce dependence on other countries for raw materials and technology. Presentations on the day showcased the technologies used by various steel companies to improve production and enhance



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H10 / AISI H10 / DIN 2345
H12 / AISI H12 / DIN 2616

COLD WORK STEEL (IND/USA/EUR)

H13CR-D2/AISI D2/DIN 2379 A2/AISI A2/DIN 2363
H11CR-D1/AISI D1/DIN 2080 O1/AISI O1/DIN 2540
D5/Co12NiV/DIN 2604

PLASTIC MOULD STEEL (IND/USA/EUR)

P20 - N1/AISI P20 - N1/DIN 2378
P20/AISI P20/DIN 2311

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EN31/AISI 52100/100Cr6
20MnCr5
SAE8620

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Refractory raw materials - The present sources & way ahead

Introduction: India celebrated its 75th anniversary of independence in 2022 and these kinds of milestones give us an opportunity to celebrate the achievement of the past and also an opportunity to envisage the vision of the country. The government of India has set a goal for our country to become a DEVELOPED ECONOMY by 2047.

Recent accelerated pace of economic reforms of the last few years in the domains of fiscal, digital,

physical infrastructure and social inclusion has positioned India for higher and sustainable growth. India is an opportunity for adopting technology at the global scale. From one side spurt of new edge companies across technology and other sectors on the back of rapid digitalisation and strong capital ability and on the other side the growth of industries like steel, cement, fertilizer will deliver the growth of the Indian economy. To summarise



Dr A K
Chattopadhyay
Refractory
Consultant, Director
& Technical Advisor,
SKG Refractories Ltd

some figures of Amrit kal and beyond we narrate few projections:

1. India's GDP will be 26 trillion dollars in market exchange rates.
2. India's per capita income would exceed \$15000 that will put us among the ranks of developed economy.
3. India will be the fastest growing large economy in the medium term.

Where India reaches by 2047 will certainly depends on current strengths and

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View Point

momentum, future strategy, it's execution. We strongly believe that India's current strengths such as high services export, a growing digital ecosystem, availability of large working edge population, track record in creating renewable energy capacity, low private debt to GDP ratio and few of the reforms agenda such as growing entrepreneurship and start-ups, making Indian manufacturing globally competitive, funding and facilitating infrastructure development will play the critical role in sustaining growth in the next few decades.

Government of India has embarked on a growth of steel in per capita consumption of 158kg by 2030 (present level of 72kg) with a total finished steel production of 230 million tons and total crude steel capacity of 300 million tons.

Expansion of steel capacity will be constrained apart from other factors from the availability of good quality refractory. Good quality of Refractory requires good quality raw material and today it is well known that India's refractory industry is highly dependent on imported raw materials. The key refractory raw materials are:

1. Medium to high alumina raw material: Starts from 40% alumina fire clay material to 60% alumina (sillimanite and mullite), 80-90% alumina bauxite,

94-95% BFA and 99.5% WFA & WTA. Raw materials commonly used for making high alumina and alumina silicate refractory

2. Raw materials used for making insulating materials:
3. Fine Powders and binders: That mix with the aggregates to control different properties and



also some speciality synthetic materials.

4. Basic Materials: Magnesite, chromite, dolomite,
 - a. Magnesite: Magnesite is used for the major areas of steel melting such as lining of ladles, EAF and converter.
 - b. Chromite: chromite used for slag corrosion

resistance and bulk of chromite is used by the alloy industry e.g., Ferro chrome, Charge chrome and approximately 4-5% of total production goes to refractory and steel industry.

- c. Dolomite: It's an excellent basic refractory material and used mainly for secondary refining of steel particularly in the AOD process for manufacturing of stainless steel.

Present situation in India:

1. India is heavily dependent on imports to meet its requirements of bauxite as Indian bauxite contains as impurities iron, lime, titania etc
2. Magnesite is used in refractory industry as dead burnt magnesite and fused magnesite. The biggest deposit of magnesite from Salem in India is having high silica and low in lime and iron content and not suitable for making high quality bricks for steel plant application. No fusion facility is available in India.

Raw materials - present import sources:

Way ahead

To safeguard the interest of Indian Refractories we propose from the industry two suggestions: 1) We should step up our R &D activity through our Central Research Institutes immediately to upgrade our existing bauxite & magnesite. In case of bauxite there are reports available for

AUSTENITIC & SUPER AUSTENITIC STAINLESS STEEL :

DUPLEX AND SUPER DUPLEX STAINLESS STEEL :

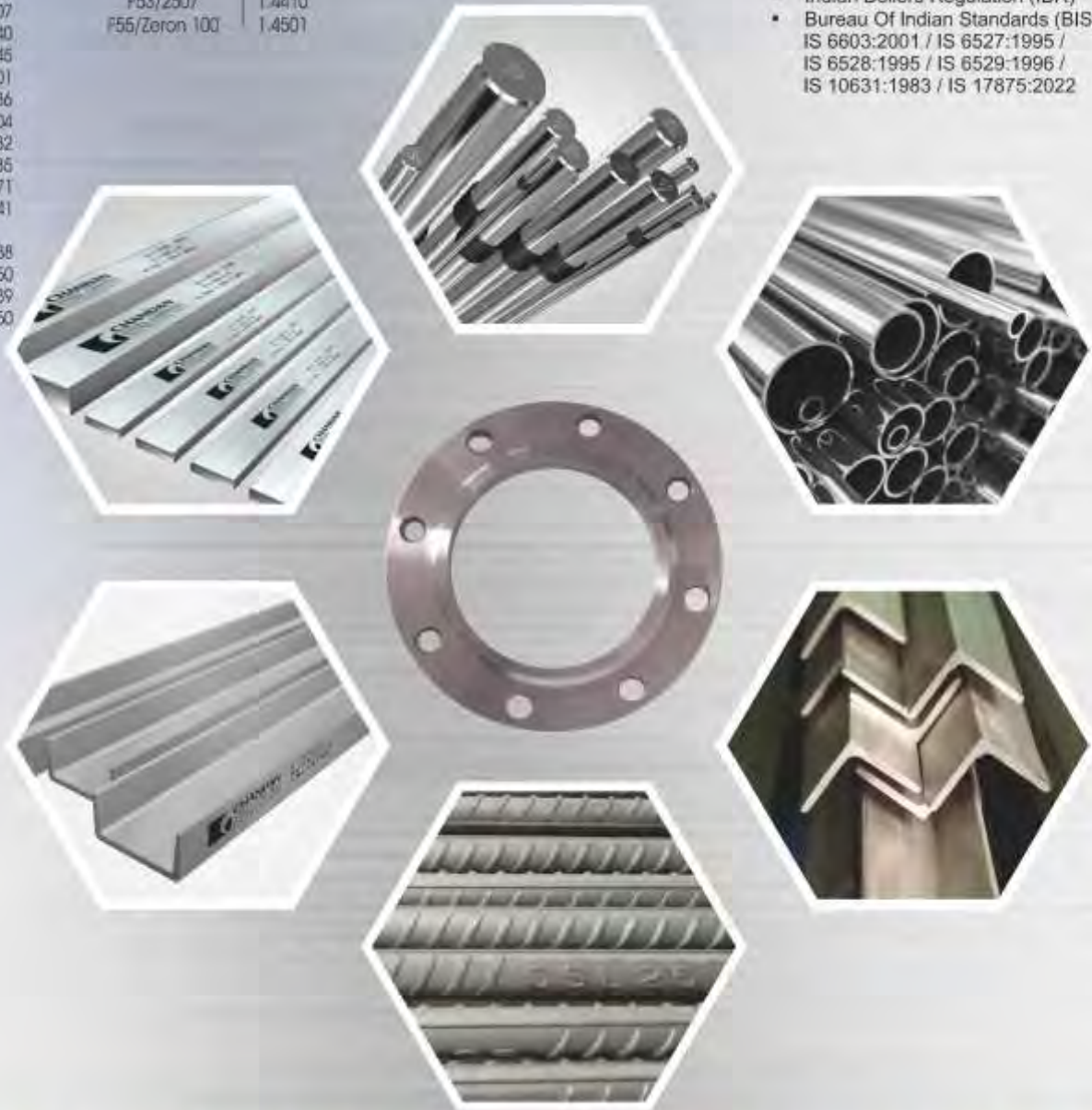
MARTENSITIC STAINLESS STEEL :

AISI/ASTM/ASME	EN
303	1.4305
304	1.4301
304L	1.4306
	1.4307
310	1.4840
310S	1.4845
316	1.4401
	1.4436
316L	1.4404
	1.4432
	1.4435
316Ti	1.4571
321	1.4541
317	-
317L	1.4438
347	1.4550
904L	1.4539
347	1.4550

AISI/ASTM/ASME	EN
F51	1.4362
F60/2205	1.4462
F61/2507 Cu	1.4507
F53/2507	1.4410
F55/Zeron 100	1.4501

AISI/ASTM/ASME	EN
F62/410	1.4006
420	1.4021
416	1.4005
431	1.4057

- QMS ISO 9001:2015
- PED 2014/68/EU
- AD 2000-Merkblatt WO/W2/W10
- CPR Regulation (EU) No.: 305/2011
- REACH Compliance
- RoHS Compliance
- ABS (American Bureau Of Shipping)
- Det Norske Veritas (DNV GL)
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bioleaching of bauxite by some bacteria and thereby complete removal of calcium and about 45% of the iron removal are possible.

CSIR Bhubneswar has extensive work through microwave heating & subsequent magnetic separation & 80% of the recovery of bauxite is possible through the method from the crude bauxite containing 5-6% of Fe₂O₃.

Several other researchers used methods of reaction of sintering bauxite with industrial silica sol, fly ash, precipitated silica, clay, with or without some additives. A consolidated approach for beneficiation of the Indian Bauxite is the call of the day. In case of magnesite which contains impurities mainly

silica, Iron oxide & lime, which restricts its high temp applications and here also lot of research work on Salem magnesite & Almora magnesite have been done and detailed microstructural studies for improvement of densification behaviour., mechanical properties need to be taken

up on a war foot basis. 2) While there is a need for technological upgradation, parallely the industry suggests to the Ministry of Steel to consider formulating a National Refractory Policy which will outline the demand and supply side expectations and frame work for operation of refractory industry in India. The policy aligns with the expectation of major users like steel and cement and also shall ensure

a positive business sentiment.

The industry also suggests the Ministry of Steel to consider incentivising import of raw material specially for those raw materials which are geographically not found in India. Duty should be made nil as any implications of import duty makes the domestic manufactures less viable and do not provide a level playing field specially when compared to Chinese imports of finished refractories.

Lastly to improve manufacturing sector and to make it globally competitive Govt of India has introduced for the steel sector a "PLI" (Productivity Linked Incentive) scheme.

This scheme takes care of three things 1) Building Capacity 2) Substituting imports, boosting exports 3) creating jobs A successful implementation of PLI scheme will ensure improvement of industrial

infrastructure & economics of scale, benefitting manufacturers of all sizes. The PLI frame work envisage definitive step towards India becoming a manufacturing hub.

We from refractory fraternity ardently request Govt to consider introduction of PLI scheme to refractory industry since refractory is an integral part of steel manufacturing and not a single ton of steel can be produced without

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Good Practices followed in marketing and sales of a Design /Engineering and technology firm

This article is based on principles followed by marketing team of ACRE, Dalian China and as enunciated by Mr Shi Zhengyan, the MD of ACRE India. But it can also be seen as a good practice by all some of the major Engineering companies. This article is written primarily for the benefit of relatively smaller buyers and sellers of Engineering or design packages, and is applicable even the consultancy service providers. It will help them to get to market success along with their recipe for the manufacturing or service success.

A little about ACRE and it's business ACRE Coking&Refractory Engineering Consulting Corporation was founded in 1953. For the past 70 years, based on the rich engineering experiences over commissioned 2000 coke oven batteries, they have optimized the structure, process and materials of coke oven and coke dry quenching (CDQ) technology. Incorporated the upcoming analog simulation technology and the developments of new materials. They have achieved significant improvements in aspects of larger capacity, life

extension and environmental protection and as a result of reached a status of an international leading engineering corporation.. There are two major parts for ACRE market and marketing efforts .

Part Two: Detailed Rules & Regulations for ACRE marketing. Part One : Guideline for ACRE Marketing (six groups) Group One To understand the need of nation and market, To meet the requirement from customer and To create&update customer's file

This is the most significant factor to the marketing, It is a precondition for getting contracts after contracts .As sales manager the first step is to study the customer's national policy and market trends, and then to invest his limited energy to the good market, excellent customer and superior project and o create a marketing file.....: Sheep will play happily where there is grassland.

The second step is to do market study and make a judgement on the basis of what is "possible and reasonable". Search the market and contact thecustomer through multiple channels based on the established information platform. Track the acquired

information, record it to the marketing system and update it dynamically. Do value-added service for the commissioned projects domestic and abroad by way of site visit and remote service.



D P Deshpande



Shi Zhengyan

Directors of ACRE India.

Group Two To make a plan & strategy before action The purpose to start preliminary study, to do dynamic tracking and to make a plan for first marketing scheme (5W+2H) and second marketing scheme (for senior visit) is only for paving ways to getting new contracts.....Food and fodder should go ahead of troops and horses. he emphasis of plan&strategy is to prepare before action and consequently it is expected that customer would think of ACRE as a company standing out amongst the other competing companies. !

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Group Three To appoint the responsible & capable person To fulfill potential of each marketing effort in setting and achieving the target, it is necessary to identify and appoint responsible and capable person to do the job.

Marketing manager shall bid with calculated & precise price for his target as per ACRE detailed rules and regulations of bidding for GCP..... Everyone has the ear to the music.

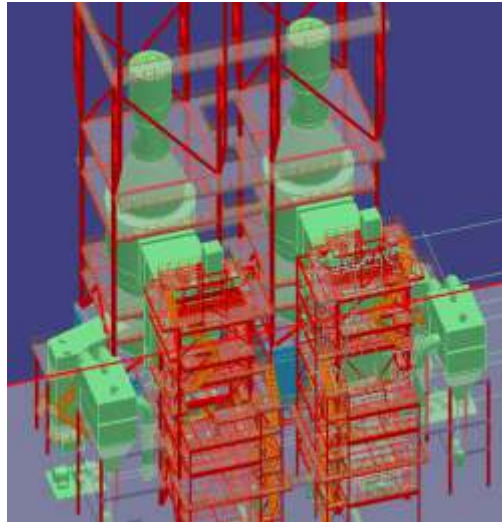
Every marketing manager should exert all his energy to obtain order and fulfill his obligation within his domain.

Group Four To optimize the design work Design is the core competence and the main product of ACRE.

For domestic projects:



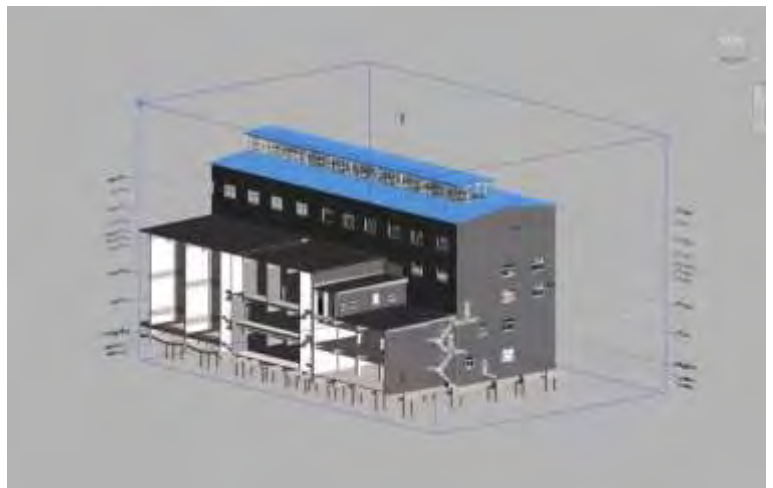
customer requirement including 3D design and BIM application. Division of responsibility, reward and punishment system have been clearly defined in ACRE marketing system.



strengths of ACRE is design work. Only through devising strategies on design work, will ACRE get contracts and the recognition of customers

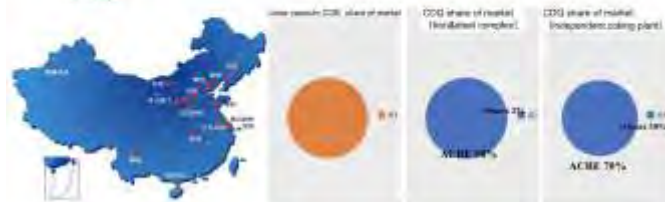
Group Five To coordinate different units and To improve the working efficiency

Matching work and cooperation between different units inside&outside ACRE has much more significance in order to win in marketing battle. To coordinate with Purchasing D./Financial D./Legal D./Project M.D/Science & technology M.D/Design D. and take aim at the object and shoot the arrow at the target. Effective



Large capacity COB and CDQ share of market in China

Except Xizhang, Hainan, Hongkong, Macao and Taiwan, the other provinces in China witnessed the excellent reference plants of ACRE.



For overseas projects:

Update ACRE regulations for optimizing design work and apply ACRE detailed rules and regulations of bidding for GCP. To also optimize the design work as per

To strengthen the bidding document by comparison on with the others and update the standard formulate for bidding document. The great

communication and timely information sharing are very important in a big company to evade the involution.

Group Six To collect, analyze and apply feedback from customer To enhance the quality of future work

Every animal has a way to stay alive, so does ACRE. Listening to feedback from customer is a route to survival for ACRE ACRE shall listen to the voice of customer from feedback after design, evaluation after finishing the project, obtain



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View Point

feedback from site supervision and so on to recognize any shortcomings in quality, energy consumption, environment protection and low price-performance ratio so as to improve them by proper measures. For the lost bidding, to analyze from the point of technology, commercial, plan, and negotiation as a result to find reasons and make modification for future projects.

Part Two: Detailed Rules and Regulations for ACRE marketing

Item No.

One To focus on the principle and to optimize & strengthen the marketing object Focus on principle

ACRE insists on providing the best coking technology such as large capacity coke oven batteries with high quality, high effectiveness, low energy and low consumption, especially on the environmental protection for the high-end customers. Do not deviate from the main course of COB and do remember COB is the basic Rules of Living for ACRE.



Focus on marketing target ACRE shall concentrate upon a good market, responsible customers and superior project under the full comprehension of national policies and requirement from customers and market. The customers like Baowu Group, Ansteel Group and TSL are the customers who possess good reputation, make payment without delay and execute projects rapidly so that there is relatively stable outcome from them, ACRE shall appoint the marketing team with rich experience to serve such customers.

Item No. Two To innovate technology & marketing mode Innovations in technology ACRE has the leading the coking technology in the world ant it constantly endeavors to upgrade and innovate. At present, her technologies are in the leading position such as 6.78m, 7.65m, CDQ with 260t/h, CPS+NG,HPF desulfurization, acid making, Zero liquid discharge of waste water treatment, De-SOx&NOx, and charging & pushing&CDQ dusting.

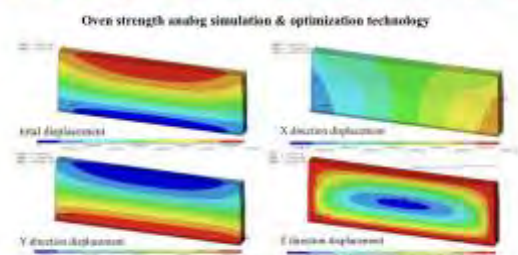
By observation of the technical progress in coking

market and requirement from customer and by transforming scientific&technical achievement into design work, the R&D team in ACRE continuously upgrades and innovates the technologies every year. Technology innovation is the greatest achievement and reward for the progress of ACRE. ACRE shall cease to exist without innovation and ACRE will fall behind without upgrade because the competitors are also making a fast progress. This is evident if we look at the technology ten years ago.....One's failure is not because what he did is wrong but because he doesn't know what his competitor has done is right. The vision of ACRE is to integrate its work in the top charging battery, stamp charging battery, CDQ, BPP, civil construction, environmental protection etc ...into an international company and make great contribution to the development of iron and steel industry around the world.

ACRE Serialized Solutions for Large-capacity coke oven to meet the demand of all categories of Coke and Capacity



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View Point

novation for Customized Design&Service Each customer requires his own domain. Especially the requests from overseas customers are quite different from that of domestic. ACRE shall make full use of the experience&feedback from the executed projects and make good plan and provide a customized service.

Innovation for marketing mode Under the latest change of marketing, ACRE shall adopt the PT(project technology)+... on the basis of current marketing mode of E+P+C,such as PT + 3rd party technology PT + PM / PT + POM (production + operation + maintenance) PT + Finance PT + IT

These new marketing mode not only absorb the essence of 3rd party augments/developments, strengthen the whole control for the projects after commissioning but also finance the customer who don't have enough fund for his project. By adopting these modes could ACRE create a customization and sign the contracts eventually. IT is the developing strategy both for ACRE and the customers. ACRE shall apply the analog simulation and BIM, fulfill the digital delivery of design work, enhance the experience from customer on technical service and improve the added value of ACRE technical service.

Item No. Three To integrate marketing by ACRE staff Integrating marketing by ACRE staff is an important strategy to promote marketing within ACRE The

purpose of doing this is to realize the full potential and arouse the enthusiasm of each staff to make a better economic benefit.

Advocate each staff to enjoy his passionate job and create such environment in which everyone will cooperate with others well, struggle ahead and strive as hard as he can to broaden the market The essence of integrating



marketing by ACRE staff is service, creating good impression and spreading the influence of ACRE brand. To create the max Customer Deliver Value and the max Customer Satisfaction so as to achieve the market competitiveness. From Jan. to Feb.2022, ACRE specialists presented the latest coking technology to TSL in three separate internet meetings and received the full approval and great encouragement. In March 30, ACRE signed the contract of supplying COB equipment for Battery 6 in Jamshedpur. This is the reward from the technical training for the plant-wide coking field.

Item No. Four To compare the bidding document with

other company To analyze the failure of bidding results Know your enemy, know yourself and in every battle you will be victorious.

To be the top class company in the world, ACRE shall know herself and know her competitor simultaneously. ACRE shall compare the bidding document with the competitors both domestic and abroad, including the advanced coking technology in Japan, Germany and other countries. By comparing bidding document, ACRE tries her best to provide the technology, reference and service which are owned by ACRE exclusively and better than the other competitor.

Also To analyze the reasons thoroughly for losing the contract, including technology, commercial, strategy, technique for negotiation and so on.If ACRE price is higher than the signed contract price of the other competitor, ACRE analyzed the higher cost for procurement and construction when bidding specially and adopt the ACRE Detailed rules and regulations of bidding for GCP to reduce the extra cost in bidding.

Failure is the mother of success. And there is a need to embrace the reality, deal with it . Big company must master this principle and make further progress to get a better result in future.

Item No. Five To make mistake collector Teach and reinforce the merits of learning from mistakes. Mistakes might happen from anywhere like design, procurement and construction. ACRE has established such an environment in which engineers could draw lessons



View Point

from mistakes, modify them and improve the future projects.

Each month/quarter, the mistake collectors would be edited into a Bible by ACRE after sorting from design optimization, operation evaluation from management department, risk evaluation from legal division and feedback of losing contract from marketing department. And finally these Bibles are the asset of ACRE by the end of each year and it helps ACRE engineers to the right direction like a navigation light !

Item No. Six To provide excellent service for customer

ACRE shall provide excellent plantwide service for customer from preliminary study to commissioning. It believes in serving customers well and satisfying them. ACRE is a national team specialized in coking field. Design work is the lifeline of ACRE. ACRE has developed a complete series of scientific management on design work and has compiled the detailed regulations on production organization and management. ACRE productions have been recognized by customers with the aid of complete knowledge-managing function ACRE engineers could meet the customer request quickly, especially for the difficult or even unreasonable demand from overseas clients. ACRE has been playing an important role in the world stage under the principles of distinguished technology,

fast reaction without delay and remarkable performance.

ACRE strengthened the remote service on internet for overseas projects because Chinese specialists could not go abroad for the sake of COVID-19. For example, an Indian project JSPL, our engineers overcame the difficulties and fulfilled the commissioning task of CDQ and ACRE gained rich experience from it.

Item No. Seven To communicate with customer frequently To manage the customer precisely and To strengthen the influence of ACRE brand

ACRE has complied the full set of names of the customers both domestic and abroad, which will be followed by senior, chief and relative manager within his hierarchy. Keep in touch with customer frequently, understand the request from customer and increase the visiting times Seniors of ACRE shall pay visits to the important customers to strengthen the communication on the principle of mutual connectivity and trust. To intensify the strategy cooperation and technical exchange and broaden the ACRE brand influence. Since the foundation in 1953, ACRE has been adhering to the principles of honesty, satisfaction to customer, distinguished design, precise organization, keeping improvement and excellent projects. To serve the society is the concept on which ACRE brand has been striking the root in the coking field for more than 70 years

and has contributed more than 2000 COBs for the world.

You can find how ACRE does her brand ad. in the following ways: Update the content for ACRE brand ad. Attend the exhibitions domestic and abroad Share the brand promotion in high quality Select and join the associations domestic and abroad Make plan and attend the academic conference and publish brilliant articles Update the propaganda on internet duly To seek opportunity and establish ACRE Official Number, Twitter and Facebook for overseas market

By the combination of the above brand promotion, ACRE is sure to boost and revitalize in the coking field and the world could understand ACRE further.



Conclusion It is well known that ACRE is a 70 year old brand and possesses a full set of perfect management system. Of course all ACRE rules and regulations have been made based on the laws and provisions from China, Minmetal and MCC group such as 7 don'ts, 6 can'ts and 3 disciplines & 8 reminders. To establish a fully integrated organization, to form a strong marketing team, to set up perfect assessment mechanisms and to improve the marketing performance in consequence as a consequence to make contribution to the coking field.



Raw materials security to enhance the growth of steel industry in India

Steel and its associated mining and metallurgy sectors have been at the forefront of industrialization in India over the last two decades. Being a raw material and intermediary product, Steel production and consumption are frequently seen as measures of the growth of the Indian economy. Therefore, the steel sector has always been at the forefront of industrial progress and it is the foundation of the Indian economy. The steel industry is associated with the metallurgical and mineral sectors which include the backward integration in the mining and mineral segments, and forward integration in infrastructure and automotive sectors. The entire mining and metallurgical sectors have seen a cumulative foreign direct investment (FDI) of US\$17.22 billion between April 2022 and December 2022 which embarked the growth across the economy.

Iron ore reserves
According to the India Bureau of Mines (IBM), India is bestowed with a large resource of iron ore deposits which occurs in different geological formations. Hematite and magnetite are

the most prominent of the iron ores in India. The United Nations Framework Classification (UNFC) estimates India's total iron ore reserves at 28.52 billion tonnes as of April 1, 2010. Of the estimated 17.88 billion tonnes of hematite available, 8.09 billion tonnes are under the reserved category and 9.79 billion tonnes under the remaining resource segment. Whereas, total resources of magnetite are estimated at 10.64 billion tonnes of which reserves are merely 0.02 billion tonnes while 10.62 billion tonnes are under remaining resources.

Around 96% of hematite resources are confined in Orissa, Jharkhand, Chhattisgarh, Karnataka and Goa. The remaining resources are spread in Maharashtra, Madhya Pradesh, Uttar Pradesh, Rajasthan, Assam etc. Existing reserves of hematite merely account for around 28% of the total iron ore resources of the country (28.52 billion tonnes). In India, around 70% of the hematite reserves and 50% of the total remaining resources (total resources 60%) are located in Orissa and Jharkhand only while Chhattisgarh and Karnataka account for around 11% each of the hematite reserves and

around 40% of total remaining resources. The hematite reserves of 8093 million tonnes comprise 73.9% (5982 million tonnes) of measured reserve and the remaining is under the probable reserve category.

London-based research firm GlobalData revealed that there are more than 917 iron ore mines in operation globally, of which 127 mines are in India. The following five largest iron ore mines by production in India. Bailadila Iron Ore Mines (Bacheli Complex) is a surface mine located in Chhattisgarh. It is owned by NMDC and produced an estimated 12.52 million tonnes of iron ore in 2022. The mine will have operated until 2051. Kirandul Complex under Bailadila Iron Ore Mines is another large iron ore mine owned by NMDC. The surface mine produced an estimated 12.37 million tonnes of iron ore in 2022. This mine will operate until 2039.

Located in Odisha, the Balda Block Iron Mine is owned by Serajuddin & Co and produced an estimated 9.36 million tonnes of iron ore in 2022. The mine will operate until 2033. The Joda East Mine, owned by Tata Steel, is a surface mine located in Odisha. The mine produced an estimated 9.27 million tonnes of iron ore in 2022. Jajang Rungta Mine is owned by JSW



Dilip Kumar Jha
Business Journalist



Company-wise iron ore production in FY 2022-23			
Company	Actual volume (million tonnes)		Growth over last year (%)
NMDC	41.2		2
SAIL	34.0		-
Tata Steel	33.0		6
OMC	29.7		10
JSW	28		10
Rungta sons	13.4		18
AM/NS India	9.0		15
JSPL	8.5		107
Vedanta	5.3		2
ESL Steel	4.4		2.33
Other	48.9		9

Source: Company websites

India's increasing iron ore production			
Financial year (April-March)	Actual volume (million tonnes)		Growth over last year (%)
2018-19	206		-
2019-20	246		19
2020-21	205		17
2021-22	253		24
2022-23	255		1
2023-24(f)	275-285		11

Source: Ministry of Steel, Government of India; f=forecast

India's import of coal and coking coal (million tonnes)			
Financial year (April-March)	Coking coal	Non-coking coal	Total coal
2012-13	35.56	110.23	145.79
2013-14	36.87	129.99	166.86
2014-15	43.72	168.39	212.10
2015-16	44.56	159.39	203.95
2016-17	41.64	149.37	191.01
2017-18	47.00	161.25	208.25
2018-19	51.84	183.51	235.35
2019-20	51.83	196.70	248.54
2020-21	51.19	164.05	215.25
2021-22	57.16	151.77	208.93
2022-23	54.46	162.46	216.92

Source: Director General of Commercial Intelligence and Statics (DGCI&S)

India's steel scenario (million tonnes)			
Financial year	Crude production	Finished production	Consumption
2018-19	110.92	101.29	98.71
2019-20	109.14	102.62	100.17
2020-21	103.54	96.20	94.89
2021-22	120.29	113.60	105.75
2022-23	125.32	121.29	119.17

Source: Ministry of Steel



View Point

Steel, the Jajang Rungta Mine. This is the surface mine located in Odisha. It produced an estimated 8.93 million tonnes of iron ore in 2022. The mine is set to exhaust iron ore reserves shortly.

Rising production

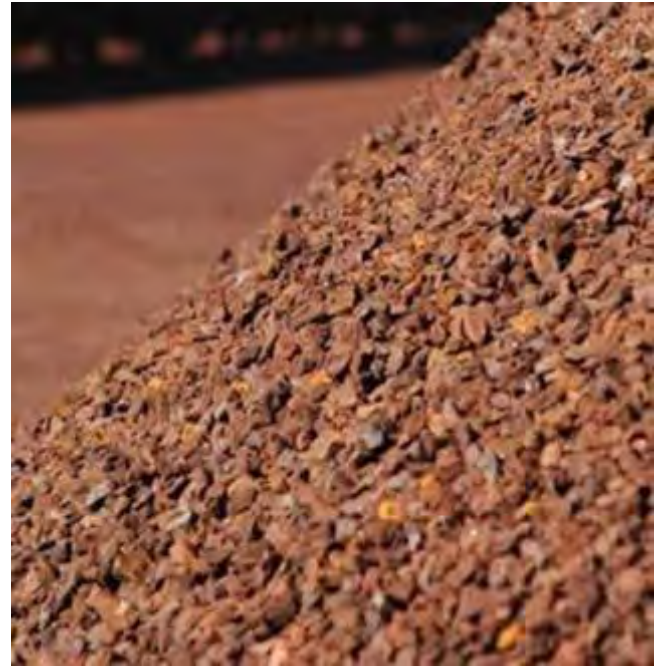
India's iron ore production is likely to rise by 10% to 275-285 million tonnes in the financial year 2023-2024. The total volume of iron ore production in India in the 2022-2023 fiscal year was 255 million tonnes. One of the factors to increase the production of iron ore in the country will be the efforts of large mining companies. Thus, the contribution of public sector undertaking (PSU), NMDC and OMC Ltd to the total production volumes in the current financial year is likely to be 30%. NMDC forecasts production at 49 million tonnes in the 2023-2024 financial year, compared with 41 million tonnes in the previous financial year. By the 2029-2030 financial year, the miner aims to increase production to approximately 100 million tons. The company intends to obtain the support of relevant ministries and the government to speed up the acquisition of relevant environmental permits (EC) and infrastructure expansion.

Lloyds Metals&Energy is also expected to increase iron ore production in the current financial year. In 2023, the company received environmental approval to

expand its mine in the state of Maharashtra, and with the infrastructure in place, began mining to increase capacity. Iron ore production in the state of Odisha, which is the largest producer of this raw material, is expected to reach 155-160 million tonnes in the 2023-2024 financial year, compared to 140 million tonnes in the previous financial year.

OMC, based in Odisha, plans to increase iron ore production to 34 million tonnes during the period, compared to 29.7 million tonnes in the 2022-2023 financial year. By the 2026-2027 financial year, the miner aims to increase sales to 76.9 million tonnes, in particular by increasing production at Gual from the current 6 million tonnes to 30 million tonnes. The three other powerful players in the state's mining industry are Tata Steel, JSW Steel and Steel Authority of India (SAIL) – together they can extract 60-65 million tons of ore. The state of Karnataka in the current fiscal year can increase iron ore production to 40-45 million tons from 38 million tons in the 2022-2023 financial year. The country's Supreme Court lifted export restrictions and eased sales regulations, so the region can count on higher profits. Many market players are opting for a hybrid model of auctions and direct sales, and Karnataka has also started exporting iron ore. Coal and coking coal

As per the National Inventory for Indian coal and lignite resources, India has a total reserve of these minerals of 361 billion tonnes, a significant increase from 352 billion tonnes and 344 billion tonnes projected in 2021 and 2020 respectively. India is the



second largest producer and consumer of coal after China, mining 777.31 million tonnes in the financial year 2021-22. Around 30% of coal is imported due to demand-supply mismatch and poor quality with high ash content.

During the last nine years, India's overall coal production has gone up by 47% to 893.08 million tonnes. India's overall coal supply has touched 877.74 million tonnes, recording a 45.37% growth. The major leap in coal production of 893.08 million tonnes in the financial year 2023 is the highest in the history of the country. At the same time, as per the recently finalised Action Plan for 2023-24 by the Ministry of Coal, the



View Point

coal production target for the financial year 2023-24 stands at 1012 million tonnes by enhancing overall production, efficiency, sustainability and adopting new technologies. During the financial year 2022-23, the Ministry signed agreements for a total of 23 coal mines having cumulative peak rated

coal mines. The mission has been launched to enhance the production of coking coal production from 52 million tonnes in the financial year 2022 to 140 million tonnes in the financial year 2029-30.

Coking coal is mainly used in the manufacturing of steel through the blast furnace route. Domestic coking coal is high as coal

steel sector. India has taken significant steps towards becoming self-reliant in manufacturing activities, including the steel industry. In the last decade, steel production in India has steadily grown by 6%. Global steel experts led by the world steel association have predicted that India is going to be the epicentre of growth of global steel growth, stated the Union Minister. India's finished steel production has increased by over 6%, whereas global steel production declined by 4.2% in the calendar year 2022. India has already emerged as the second largest steel producer in the world and the country's per capita steel production has gone up from 57 kilos to 78 kilos total during the last 9 years 70 years to 78 kilos during the last 9 years.

This proves the country's mandate to become a powerhouse of manufacturing. This growth is having manifold results like collaborative efforts of the industry and government wherein, the government plays the role of a facilitator and the industry drives this engine of growth. The Steel Ministry has recently signed 57 MoUs with 27 companies for speciality steel under the PLI scheme. The PLI scheme, which is expected to generate an investment of about Rs 30,000 crores and create additional capacity of about 25 million tonnes of speciality steel in the next five years, will act as a multiplier and create 60,000+ jobs in the Amrit Kaal and contribute towards achieving the goal of becoming the third largest economy of the world by the year 2030-31. ■

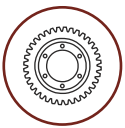


capacity (PRC) of 33.224 million tonnes per annum. Considering the good response received for the 6th round of commercial auctions, it is expected that 25 coal mines will be allocated during the financial year 2023-24 for commercial mining.

Mission Coking Coal' has been launched by the Government in August 2021, to come up with a roadmap that would suggest ways to augment the production and utilization of domestic coking coal in India by 2030. Mission Coking Coal document has made recommendations majorly relating to new exploration, enhancing production, expanding washing capacity, and auction of new coking

(mostly between 18-49%) and is not suitable for direct use in the blast furnace. Therefore, coking coal is washed to reduce the ash percentage and Indian prime and medium coking coal (of less than 18% ash) is blended with imported coking coal (less than 9% ash) before utilization in the furnace. The government of India has chalked out a mega to enhance the country's coking coal capacity from 23 million tonnes in the financial year 2021-22 to 61 million tonnes in the next few years.

Shifting from west to east Looking at the structural shift from west to east, India has now emerged as an epicentre for the evolution and growth of the



GSSE 2023 tradeshow to unlock the potential of Stainless Steel at Bombay Exhibition

2nd Edition

GSSE
GLOBAL STAINLESS STEEL EXPO 2023
14 15 16 SEPTEMBER
BOMBAY EXHIBITION CENTRE MUMBAI

POWERED BY



After a remarkably impressive debut last year, India's reputed tradeshow organizers, Virgo Communications & Exhibitions, are once again, organizing their much-lauded second edition of GSSE: Global Stainless Steel Expo 2023 from 14 to 16 September at Bombay Exhibition Centre, Mumbai. It's a 'must-attend' tradeshow for all those who are connected with the stainless steel industry and processes related thereof. GSSE is an apt platform that attracts the participation of

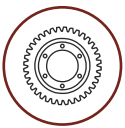
India's leading stainless steel producers who come together to showcase sustainable business solutions to end-user industries. The event will further augment the usage of the metal mainly in India which is the second-largest consumer of stainless steel consumer in the world. The platform presents an exclusive opportunity for manufacturers & suppliers of stainless steel products to meet with potential customers representing 200+ product applications from India and across the



Vijay Sharma
Director - Jindal Stainless

globe. It has fast developed as the largest dedicated stainless steel industry stakeholder platform that helps end-user industries to source and network!

Explaining the importance of the event, Vijay Sharma, Director, of Jindal Stainless, said, "As the exclusive Title Partner for GSSE, we are looking forward to yet again interacting with fellow stakeholders in the stainless steel ecosystem, including suppliers, users, traders, associations, regulators, and fabricators. Together with these partners, we intend to leverage this event to discuss issues pertinent to the growth of India's stainless steel industry, and solutions needed to raise the bar for the whole country."



Industry Update

becoming a preferred material in a lot of industries that have replaced conventional materials. The varied properties of this material make it such a versatile material that sees diverse applications across varied segments. However, it is the construction and infrastructure industry that remains the biggest

buildings.

Load Bearing Construction
The strength of the material, ease of availability and the fact that it can be reused make it one of the preferred materials for the construction of load-bearing structures. Steel trusses, columns and other components that bring stability and add strength to



consumer of the material globally. While stainless steel has always been a crucial part of the construction industry, it is now more than ever that the diversity of its usage comes to light. It is interesting to note that the construction industry uses about 12% of cold rolled stainless steel and 5% of hot rolled stainless steel. Some of the uses of stainless steel in the construction industry.

Facades

Stainless steel is often used in the treatment and design of the external facade of buildings. Right from using stainless steel jaalis or laser cut motifs, stainless steel fittings, railings, grills etc. are commonly seen in the facade design of many

a structure are widely made in this versatile material.

Temporary and Large Scale Structures

It is extremely fascinating to see that stainless steel can be used for both temporary structures and structures that demand extreme strength and stability. From industrial plants, and metro stations to temporary sheds and setups, stainless steel is a preferred material. The construction is much faster and the fact that it can be completely recycled once dismantled makes it a go-to material for such types of construction. It is easy to clean and offers an austere and clean ambience further enhancing its appeal.

Supporting Components and Fittings

From fasteners for glass panels to door knobs, there are hundreds of fittings and supporting components that are made out of stainless steel. Since the material is easy to clean, free of corrosion and rusting, sturdy and needs no coating or painting, it is used extensively both for internal & external fittings. Bathroom fittings, latches, railings, handles, kitchen baskets, organisers and many more products are made in stainless steel owing to the aforementioned factors.

Bridges and Other Utilities

Bridges are required to be strong and long-lasting. They have to endure the anticipated load and stand the test of time and natural calamities, extreme weather conditions etc.

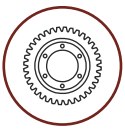
Keeping these factors in mind, stainless steel becomes a preferred choice of material.

From stainless steel cables

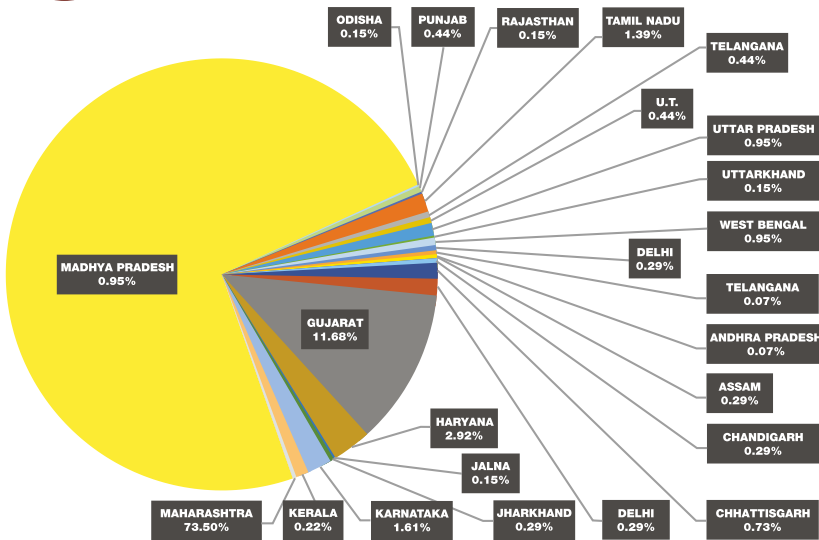
WHY SWITCH TO STAINLESS STEEL?

ATTRACTIVE APPEARANCE (AESTHETIC)	VERY DURABLE
CORROSION RESISTANT	LOW-MAINTENANCE (LONG LASTING)
HYGIENIC	HIGH TENSILE STRENGTH
AVAILABLE IN DIFFERENT SURFACE FINISHES - MATTE, BRUSHED, MIRROR	EASE OF FABRICATION (WELDABLE)
AVAILABLE IN VARIOUS COLOURS	TEMPERATURE RESISTANT (HIGH & LOW)
ENVIRONMENTAL FRIENDLY (RE-CYCLABLE)	

and wires to bars and rods, the use of this material is extensive. When stainless steel reinforcement bars are used, the estimated service life of the deck of a reinforced concrete bridge is up to 75-100 years. Apart from bridges, stainless steel is used in the construction of flyovers, elevated roads, metro lines etc. The clean and sterile finish that it offers, ease of maintenance, lack of any toxic coating and resistance to corrosion and discolouration are some of the key factors that have



Industry Update



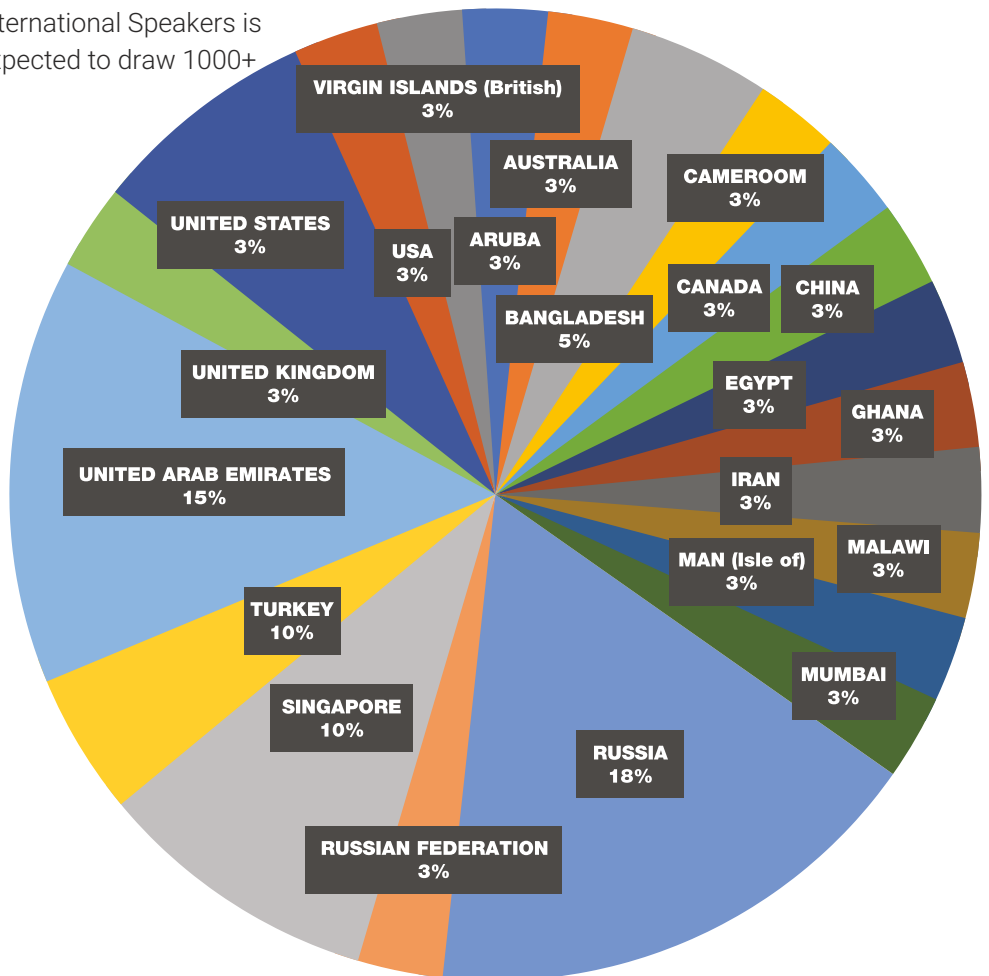
use of stainless steel in the construction industry. It can be used for kitchen slabs, industrial kitchens, hospitals, partitions and more. When not needed, it can be easily dismantled and recycled without any wastage or loss of material or funds. As the use of stainless steel continues to show steady growth, this is the time for manufacturers and dealers of the material to showcase their offerings to potential clients. GSSE 2023 offers the ideal platform for industries and manufacturers of varied types of stainless steel products and raw materials to come together under one roof to strike promising business alliances.

- GSSE 2023: Highlights
- o B2B Exhibition
 - o 150+ Exhibitors
 - o Overseas Participation
 - o 10000+ trade visitors
 - o 100000 sq. ft. area
 - o Buyer Seller Meet
 - o CEO Round Table
 - o Industry and Technical Conference
 - o 12+ Knowledge Sessions

o 50+ Industry Speakers

GSSE 2022: Visitor Footfalls

Apart from the expo, a concurrent 3-day conference featuring 12 power-packed Knowledge sessions with 50+ Renowned National & International Speakers is expected to draw 1000+



attendees from 500+ organizations.

If you want to explore and learn about the advantages of stainless steel for your business, then GSSE 2023 is a must-visit for you to witness the latest advances and updates in the stainless steel industry. Visitor Registrations is Open for GSSE 2023. For more information, visit www.gssexpo.com or scan the QR code for simple online visitor registration.



Tata Steel and UK to jointly support innovative projects on Green Hydrogen and Decarbonisation

As part of its ongoing efforts to decarbonise the steel sector, Tata Steel announces 'Tata Steel - Sprint to Zero' 2023 Challenge, an initiative to fund innovative research and development projects in low carbon hydrogen that offers tech-led or tech-enabled solutions to address green hydrogen technologies for the industrial sector's sustainable future. The announcement, part of the UK-India Hydrogen Partnerships, was jointly made by George Freeman, Science Minister of UK, and Dr. Debashish Bhattacharjee, Vice President (Technology and

R&D), Tata Steel, at IISc Bangalore on July 7, 2023.

The UK-India Hydrogen Partnerships builds on the UK-India Hydrogen Hub announced by the UK and Indian Prime Ministers in 2022. It will feature a range of private industry sponsored pilots to tackle 5 Grand Challenges – storage, transport, safety, production, and cost – faced by both countries.

Tata Steel is the first sponsor of the UK-India Hydrogen Partnerships sprint series, awarding £80,000 (~Rs 83 lakh) funding to two innovative projects in low carbon hydrogen. As part of the Challenge, the Company will

also offer experiential engagement to selected entities including a priority access to its integrated steel plants. The proposals bidding for the grant are expected to address two challenges: a) development and deployment of hydrogen technologies for greening the industrial sector and b) solutions for hydrogen storage/purification.

Minister of State at the UK Department for Science, Innovation and Technology, George Freeman, said: "Across the world, steel is the construction backbone of so much of the global economy. Steelmaking is highly energy and carbon intensive, and cleaning up the steel industry is a key pillar of reducing



Technology

global warming. Pairing up the UK's expertise in low carbon manufacturing technology with the Indian steel industry, by working with progressive manufacturers like Tata Steel, we can unlock the innovations that will deliver the steel sector an environmentally sustainable future. For us all."

Dr. Debashish Bhattacharjee, Vice President, Technology and R&D, Tata Steel, said: "The

committed to finding a solution to these challenges and have created a platform like 'Tata Steel – Sprint to Zero 2023' to ensure the best minds from academia and industry join hands in this effort. We are delighted to launch the Sprint initiative in partnership with the UK Government and look forward to a unique collation of UK and Indian innovation policymakers, R&D companies, start-ups, hubs and places, investors,

with a strong academic, research and development background. The last date for submission of proposals is August 31, 2023, and winners will be announced by October 2023. The projects will commence from November 2023 and will last for 9-12 months.

'Tata Steel - Sprint to Zero' 2023 Challenge – Website: www.b2match.com/e/tata-steel-sprint-to-zero

Earlier this year, Tata Steel had executed the trial injection

of hydrogen gas using 40% of the injection systems in 'E' Blast Furnace at its Jamshedpur Works. This was the first time in the world that such a large quantity of hydrogen gas was continuously injected in a blast furnace.

- Tata Steel group is among the top global steel companies with an annual crude

steel capacity of 35 million tonnes per annum.

- It is one of the world's most geographically diversified steel producers, with operations and commercial presence across the world.
- The group recorded a consolidated turnover of ~US\$30.3 billion in the financial year ending



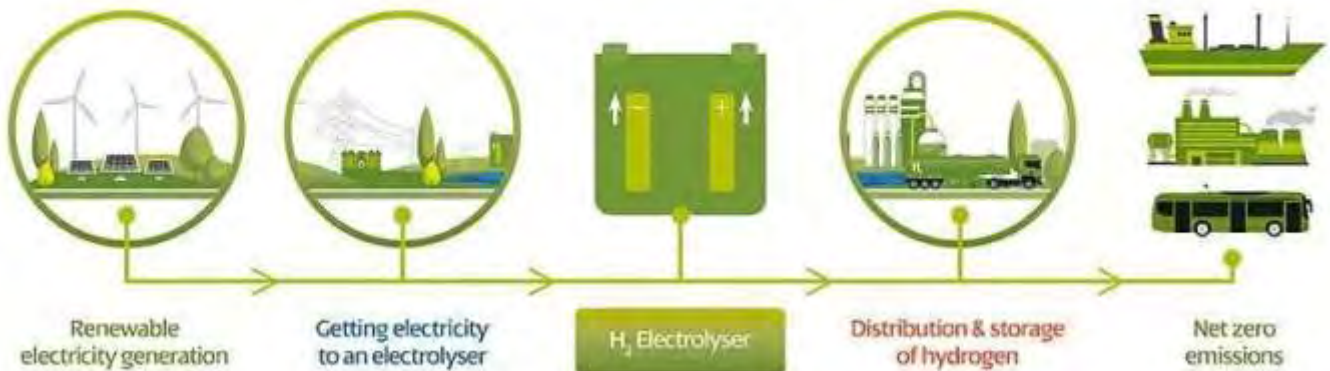
priority of the steel sector today is to decarbonise and do it in a way that are both technologically and economically sustainable. While the current levels of carbon footprint from the steel sector is unsustainable, the available version of clean hydrogen faces numerous challenges like high operational cost and energy loss. We are

research groups and Catapults."

The funding call is open for solutions from academia, start-ups and industries across India and the UK. The projects must be co-led by an Indian or a UK organisation with a maximum of three partners per project, where at least one organisation must be either from the UK or India,



What is green hydrogen



March 31, 2023.

- A Great Place to Work-Certified™ organisation, Tata Steel Limited, together with its subsidiaries, associates, and joint ventures, is spread across five continents with an employee base of over 77,000.
- Tata Steel has announced its major sustainability objectives including Net Zero Carbon by 2045, Net Zero Water consumption by 2030, improving Ambient Air Quality and No Net loss in Biodiversity by 2030.
- The Company has been on a multi-year digital-enabled business transformation journey intending to be the leader in 'Digital Steel making by 2025'. The Company has received the World Economic Forum's Global Lighthouse recognition for its Jamshedpur, Kalinganagar and IJmuiden Plants.
- Tata Steel aspires to

have 25% diverse workforce by 2025. The Company has been recognised with the World Economic Forum's Global Diversity Equity & Inclusion Lighthouse 2023.

- The Company has been a part of the DJSI Emerging Markets Index since 2012 and has been consistently ranked amongst top 10 steel companies in the DJSI Corporate Sustainability Assessment since 2016.
- Tata Steel's Jamshedpur Plant is India's first site to receive ResponsibleSteel™ Certification.
- Received Prime Minister's Trophy for the best performing integrated steel plant for 2016-17, 2023 Steel Sustainability Champion recognition from worldsteel for six years in a row, 2022 'Supplier Engagement Leader' recognition by CDP, Top

performer in Iron and Steel sector in Dun & Bradstreet's India's top 500 companies 2022, Ranked as the 2023 most valuable Mining and Metals brand in India by Brand Finance, and 'Most Ethical Company' award 2021 from Ethisphere Institute.

- Received 2022 ERM Global Award of Distinction, 'Masters of



Risk' - Metals & Mining Sector recognition at The India Risk Management Awards for the seventh consecutive year, and Award for Excellence in Financial Reporting FY20 from ICAI, among several others.



News Update

ArcelorMittal and John Cockerill announce plans to develop world's first industrial scale low temperature, iron electrolysis plant



ArcelorMittal and John Cockerill announce plans to develop world's first industrial scale low temperature, iron electrolysis plant Volteron™ plant targeted to start-up in 2027 June 14 2023, 12:00 CET ArcelorMittal, the world's leading steel company, and John Cockerill, a group leading the development of steel processing facilities and electrolyzers, today announce plans to construct the world's first industrial-scale low temperature, iron electrolysis plant. The Volteron™ plant, which in a first phase will produce between 40,000 and 80,000 tonnes a year of iron plates, is targeted to start production in 2027. Once the technology has been proven at this scale, the intention is to increase the plant's annual capacity to between 300,000 and 1 million tonnes. ArcelorMittal and John Cockerill have been working together on an innovative electrochemical process to transform iron oxide into iron plates for the last few years. The successfully completed project, formerly known as SIDERWIN, has to date been publicly funded through the EU's Horizon 2020 programme. In addition to ArcelorMittal and John Cockerill, project partners have included EDF, Tecnalía, Quantis, University of Aveiro, National Technical University of Athens, Norwegian University of Science and Technology, Dynergie, Recoy, CFD Numerics and Mytilineos.

This next phase of the project will be carried forward as an exclusive partnership between ArcelorMittal and John Cockerill. Volteron™ is a carbon free, cold direct electrolysis process that extracts iron from iron ore using electricity. On a pilot scale plant, the process has proved to be highly efficient using standard iron ore. The iron plates created during the electrolysis process are then processed into steel in an electric arc furnace. Commenting, Brad Davey, EVP and head of corporate business optimisation, ArcelorMittal, said: "This is a tremendously exciting development and opportunity for our company.

We have been working on direct electrolysis technology for some time given the potential it holds to decarbonise steelmaking. Having now proven our energy efficient, low temperature process at a pilot level, the natural next step for us is to progress to an industrial plant. We intend to achieve this target within four years and be the first in the world to produce steel at scale via low temperature electrolysis. "It is a significant moment for ArcelorMittal,

and for the global steel industry. Direct electrolysis is a disruptive, breakthrough technology. Although the technology needs to mature, it could revolutionise how steel is made, removing carbon entirely from steelmaking. We intend to be pioneers in that process." Press release Page 2 of 3 Sébastien Roussel, President of John Cockerill Industry, added: "As a bicentennial technology leader in steelmaking engineering and current world leader for electrolysis dedicated to hydrogen production, we are extremely proud to develop together with ArcelorMittal a technology that can be a significant contribution to tackling global warming. We are convinced that Volteron™ is the most energy efficient process to produce steel without emitting CO2 and that it will soon become a real game changer for the steelmaking industry." Direct electrolysis is one of three decarbonisation technology pathways ArcelorMittal is working on to make net zero steelmaking a reality. The other two are Smart Carbon and Innovative-DRI. The Smart Carbon pathway involves modifying the blast furnace steelmaking route and harnessing clean energy sources including bioenergy and carbon capture and storage, while the Innovative-DRI route involves using hydrogen as a replacement for fossil fuels to make direct reduced iron, a metallic feedstock for steelmaking in an electric arc furnace. To learn more about ArcelorMittal's climate action targets, ambitions and projects .

ArcelorMittal Nippon Steel India and Festo India to collaborate on higher and vocational education

AM/NS India and Festo India announced the signing of a MoU at the Festo Corporate Center in Stuttgart, Germany. The partnership will focus on development of New Age Makers Institute of Technology (NAMTECH), an



ArcelorMittal Nippon Steel India education initiative aimed at delivering an integrated model of high-quality engineering and technical education, with special emphasis on manufacturing and sustainability. NAMTECH will start operating an interim campus in the Research Park at IIT Gandhinagar, Gujarat, from August



2023.

NAMTECH and Festo India will work in tandem on the design and delivery of technical labs at the campus in Gandhinagar. They will also design and deliver short- and long-term academic programs, starting with a Professional Master's Program in Smart Manufacturing, Professional Technologist Program in Industrial Automation and Trainings, matching international standards. These will enable students to participate in prestigious global competitions like the WorldSkills Competitions, showcasing their abilities on a worldwide stage.

The partnership will also work to launch programs in the areas of academic and capability development to ensure the delivery of student services, such as providing industry experts as faculty members, organising industry visits, and creating internship and employment opportunities for students in India and abroad. Festo and NAMTECH will actively promote and highlight the significance of Industrial Automation to various industries and stakeholders.

Historic day for Visakhapatnam- Atul Bhatt, CMD, RINL inaugurates the prestigious 'Center for Entrepreneurship on Industry 4.0'

At a glittering program held at RINL, Sri Atul Bhatt, CMD, RINL and chief mentor, 'Kalpataru', inaugurated the most prestigious project 'Center for Entrepreneurship on Industry 4.0' namely 'Kalpataru' in Ukkunagaram township of Visakhapatnam Steel Plant to incubate and nurture the Startups on Industry 4.0.

Speaking on the occasion, Atul Bhatt, CMD, RINL said that it is a momentous day not only for RINL but also for the City of Visakhapatnam. "This Centre would be instrumental in fulfilling the vision of Atmanirbhar scheme of Gov. of India. This center offers the best of ecosystem to 'Start Ups' as problems statements is provided by



customers, risk is covered by CoE, back up support in terms of Infrastructure is from STPI, Academic help from AU & IIM- V, and technology support from reputed Organizations.", Sri Atul Bhatt said.

Hoping to see 'Unicorn' coming out of this Centre as Huge opportunity is lying ahead, Atul Bhatt said that In the next coming decade India will be augmenting steel capacity by another 150 MT through Green field projects with massive investment and If the Startup can provide effective solution to problem of steel industry then return on investment(ROI) will be huge.

SAIL clocks best ever Q1 in production and sales



Steel Authority of India Limited (SAIL) has achieved record-breaking performance in the first quarter of the financial year 2023-24 (Q1 FY24) in terms of production and sales. The production of hot metal, crude steel, and saleable steel of

5.037 million tonnes (MT), 4.667 MT, and 4.405 MT, respectively, marked the best ever first quarter results. These figures represent a remarkable growth of 7%, 8%, and 8% respectively in comparison to the previous best. Moreover, the company attained its highest-ever sales performance in the first quarter by achieving a sales volume of 3.9 MT. This is a growth of around 24% over CPLY.

The company is focused on maximizing capacity utilization and meeting the customer demands.

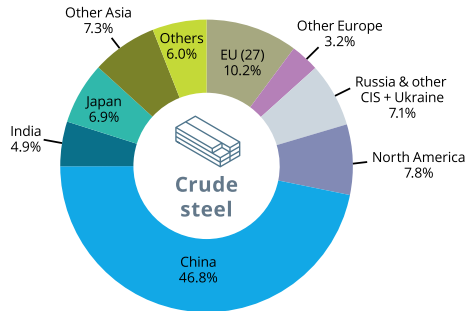




Steel production and use: geographical distribution, 2012

Crude steel production

World total: 1C563 million tonnes

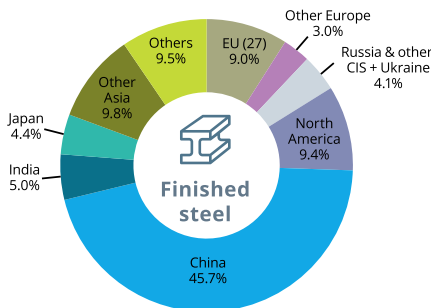


Others comprise:

Africa	1.0%	South America	3.0%
Middle East	1.6%	Australia and New Zealand	0.4%

Apparent steel use (Finished steel products)

World total: 1C445 million tonnes



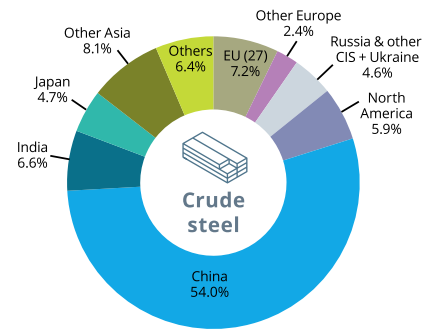
Others comprise:

Africa	2.3%	South America	3.2%
Middle East	3.5%	Australia and New Zealand	0.5%

Steel production and use: geographical distribution, 2022

Crude steel production

World total: 1C885 million tonnes

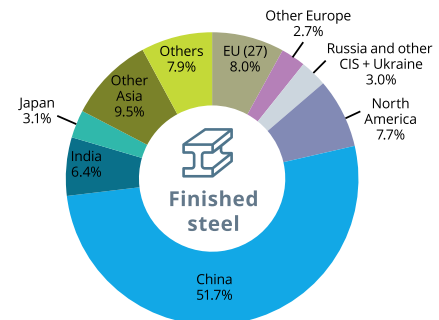


Others comprise:

Africa	1.1%	South America	2.3%
Middle East	2.7%	Australia and New Zealand	0.3%

Apparent steel use (Finished steel products)

World total: 1C781 million tonnes



Others comprise:

Africa	2.3%	South America	2.3%
Middle East	2.9%	Australia and New Zealand	0.4%



Apparent steel use 2018 to 2022

million tonnes, finished steel products

	2018	2019	2020	2021	2022
Austria	4.2	4.0	3.6	4.5	4.3
Belgium-Luxembourg	4.5	3.4	3.0	4.8	3.5
Czechia	7.2	6.7	6.2	7.8	6.6
France	14.9	14.6	12.2	13.8	10.1
Germany	39.6	35.1	31.3	35.5	31.6
Italy	25.3	25.0	20.4	26.6	24.9
Netherlands	4.5	4.6	4.1	4.7	5.2
Poland	14.9	13.6	12.9	15.3	13.3
Romania	4.6	4.5	4.1	4.3	3.8
Spain	13.8	13.2	11.6	13.0	12.4
Sweden	4.1	3.8	3.1	3.8	3.5
Other EU (27)	19.2	19.1	18.0	19.9	19.6
European Union (27)	156.8	147.7	130.7	154.0	138.8
Türkiye	30.7	26.1	29.5	33.4	30.7
United Kingdom	10.8	10.3	9.0	10.8	9.2
Others	6.8	6.8	6.5	6.8	5.1
Other Europe	48.3	43.2	44.9	51.0	45.0
Russia	41.3	43.5	42.3	43.9	41.7
Ukraine	4.7	4.7	4.6	4.8	2.2
Other CIS	9.5	10.1	10.7	10.0	7.1
Russia & other CIS + Ukraine	55.5	58.3	57.6	58.7	51.0
Canada	15.1	13.0	13.7	14.5	13.5
Mexico	25.3	24.4	21.9	25.6	24.8
United States	99.8	97.6	80.0	97.0	94.5
Other North America	4.3	4.5	3.6	4.8	4.1
North America	144.4	139.5	119.2	141.8	137.0
Argentina	4.8	3.9	3.6	5.0	5.1
Brazil	21.2	21.0	21.4	26.3	23.5
Venezuela	0.2	0.1	0.1	0.1	0.1
Other South America	12.3	12.5	10.3	14.4	12.5
South America	38.5	37.5	35.4	45.8	41.2
Egypt	11.1	10.4	9.7	10.2	11.1
South Africa	5.1	4.8	3.8	5.0	4.4
Other Africa	22.3	25.9	23.2	24.0	24.5
Africa	38.4	41.0	36.7	39.2	40.0
Iran	19.6	18.5	17.2	18.2	19.1
Other Middle East	32.6	32.0	30.6	31.8	32.2
Middle East	52.1	50.5	47.8	50.0	51.3
China	836.1	911.9	1 008.2	953.9	920.9
India	96.7	102.6	89.3	106.2	114.9
Japan	65.4	63.2	52.6	57.4	55.0
South Korea	53.7	53.2	49.2	56.0	51.2
Taiwan, China	17.8	17.6	18.8	21.1	17.4
Other Asia	103.8	106.2	93.9	99.1	97.2
Asia	1 173.5	1 254.8	1 312.1	1 293.8	1 256.6
Oceania	6.6	6.6	6.1	7.3	7.3
World	1 714.2	1 779.0	1 790.4	1 841.7	1 768.2

Apparent steel use per capita 2018 to 2022

kilograms, finished steel products

	2018	2019	2020	2021	2022
Austria	473.4	448.2	409.6	504.0	476.3
Belgium-Luxembourg	373.3	281.3	243.8	392.8	283.3
Czechia	685.9	637.1	586.6	743.0	631.1
France	231.0	226.1	189.4	213.7	156.2
Germany	478.3	422.6	376.1	425.7	379.0
Italy	422.9	418.3	343.1	449.3	421.9
Netherlands	262.5	265.8	237.6	269.9	295.8
Poland	386.7	354.2	336.0	398.3	332.5
Romania	233.2	232.5	212.2	220.2	194.8
Spain	295.7	280.9	245.8	274.4	261.6
Sweden	399.8	370.1	302.2	361.1	335.5
Other EU (27)	261.2	259.5	245.0	272.7	267.1
European Union (27)	353.0	331.8	293.5	346.1	310.3
Türkiye	370.2	312.4	350.4	393.7	359.8
United Kingdom	162.9	153.5	133.7	160.8	136.3
Others	207.6	209.0	198.2	209.6	157.6
Other Europe	265.3	235.9	244.3	276.4	242.9
Russia	283.7	298.6	290.6	302.7	288.3
Ukraine	105.1	105.3	104.8	109.4	54.7
Other CIS	93.1	98.0	102.1	94.8	66.1
Russia & other CIS + Ukraine	190.0	198.8	195.9	199.6	175.0
Canada	408.2	345.8	361.4	379.2	351.6
Mexico	204.0	195.3	173.6	201.7	194.8
United States	300.4	291.9	238.2	288.0	279.4
Other North America	45.9	47.7	37.9	50.0	43.2
North America	246.5	236.1	200.5	237.5	228.2
Argentina	108.7	87.6	79.8	111.2	112.0
Brazil	100.9	99.0	100.6	122.9	109.0
Venezuela	5.7	4.5	3.2	3.6	3.7
Other South America	87.6	87.5	70.8	98.1	84.9
South America	90.6	87.6	82.0	105.6	94.4
Egypt	106.7	98.0	90.2	93.4	100.3
South Africa	88.4	81.8	63.8	84.2	73.1
Other Africa	19.7	22.3	19.5	19.6	19.6
Africa	29.7	31.0	27.0	28.2	28.1
Iran	228.4	213.6	197.1	207.4	215.4
Other Middle East	183.2	176.4	165.7	170.2	169.2
Middle East	197.9	188.4	175.8	182.1	183.9
China	590.0	641.3	707.6	669.0	645.8
India	70.7	74.2	64.0	75.5	81.1
Japan	518.1	502.5	420.3	460.7	443.6
South Korea	1 039.3	1 027.5	948.9	1 081.2	988.0
Taiwan, China	749.7	740.8	788.9	886.1	728.2
Other Asia	89.0	90.0	78.7	82.1	79.6
Asia	282.5	299.8	311.2	305.1	294.7
Oceania	155.2	152.5	139.8	163.4	162.2
World	223.2	229.2	228.4	233.0	221.8



Pig iron 2021 and 2022

million tonnes

	Production 2021	Production 2022	- Exports 2022	+ Imports 2022	Apparent = Consumption 2022
Austria	6.1	5.8	0.0	0.0	5.8
Belgium-Luxembourg	4.2	4.3 ^(e)	0.1	0.1	4.3
Czechia	3.9	3.4	0.0	0.1	3.4
Finland	2.5	1.9	0.0	0.0	1.9
France	9.5	8.2	0.1	0.1	8.2
Germany	25.7	23.7	0.2	0.4	24.0
Hungary	0.6	0.5	0.0	0.0	0.5
Italy	3.9	3.5	0.0	1.4	4.9
Netherlands	5.9	5.5	0.5	0.7	5.7
Poland	3.6	3.1	0.1	0.2	3.2
Romania	2.1	1.5	0.0	0.0	1.5
Spain	4.0	3.4	0.0	0.3	3.7
Sweden	3.0	2.8	0.0	0.0	2.9
Other EU (27)	4.0	3.2	0.0	0.1	3.2
European Union (27)	79.0	70.7	1.0	3.5	73.1
Türkiye	10.4	9.1	0.0	1.6	10.7
United Kingdom	5.8	4.8	0.0	0.0	4.8
Others	2.3	1.9 ^(e)	0.0	0.0	1.9
Other Europe	18.6	15.8	0.1	1.7	17.4
Kazakhstan	3.3	2.9 ^(e)	0.1	0.0	2.9
Russia	53.8	51.6 ^(e)	3.7	0.0	47.9
Ukraine	21.2	6.4	1.3	0.0	5.1
Other CIS	0.0	0.0 ^(e)	0.0	0.0	0.0
Russia & other CIS + Ukraine	78.3	60.9	5.0	0.0	55.9
Canada	6.2	5.7 ^(e)	0.2	0.0	5.6
Mexico	2.7	2.5	0.0	0.2	2.6
United States	22.2	21.0 ^(e)	0.0	4.6	25.6
Other North America	0.0	0.0 ^(e)	0.0	0.0	0.0
North America	31.1	29.2	0.2	4.8	33.7
Argentina	2.1	2.1	0.0	0.0	2.1
Brazil	28.5	26.8	3.7	0.0	23.1
Chile	0.7	0.6	0.0	0.0	0.6
Other South America	0.3	0.3 ^(e)	0.0	0.2	0.5
South America	31.6	29.7	3.7	0.2	26.2
South Africa	2.9	2.4	0.6	0.0	1.8
Other Africa	0.0	0.0 ^(e)	0.0	0.0	0.0
Africa	3.2	2.7	0.7	0.0	2.1
Iran	2.7	2.5 ^(e)	0.1	0.0	2.4
Other Middle East	0.0	0.0 ^(e)	0.0	0.0	0.0
Middle East	2.7	2.5	0.4	0.3	2.4
China	868.6	863.8	0.2	1.1	864.7
India	77.6	79.9	0.6	0.1	79.4
Japan	70.3	64.1	0.1	0.1	64.2
South Korea	46.4	42.2	0.1	0.2	42.3
Taiwan, China	15.2	13.4	0.0	0.3	13.7
Other Asia	24.1	22.1 ^(e)	0.3	0.4	22.2
Asia	1 102.3	1 085.6	1.2	2.1	1 086.4
Australia	3.8	3.7	0.0	0.0	3.7
New Zealand	0.7	0.6	0.0	0.0	0.6
Other Oceania	0.0	0.0 ^(e)	0.1	0.0	- 0.1
Oceania	4.4	4.3	0.1	0.0	4.2
World	1 351.3	1 301.3	12.4	12.5	1 301.4

^(e) = estimate

Direct reduced iron production 2018 to 2022

million tonnes

	2018	2019	2020	2021	2022
Germany	0.6	0.5	0.5	0.5	0.5 ^(e)
Sweden	0.1	0.1	0.1	0.1 ^(e)	0.1 ^(e)
European Union (27)	0.7	0.6	0.6	0.6	0.6
Russia	7.9	8.0	7.8	7.8	7.7
Canada	1.7	1.4	1.2	1.6	1.5
Mexico	6.0	6.0	5.2	5.8	5.8
Trinidad and Tobago	1.5	1.7	1.3	1.6	1.6 ^(e)
United States	3.4	3.2	3.4	5.0	5.0 ^(e)
North America	12.5	12.4	11.0	14.1	14.0
Argentina	1.6	1.1	0.5	1.4	1.4
Venezuela	1.0	1.0	0.9	0.8	0.3
South America	2.6	2.1	1.4	2.2	1.7
Algeria	0.1	1.5	2.2	3.1	3.1 ^(e)
Egypt	5.8	4.4	4.8	5.4	6.0
Kenya ^(e)			0.1	0.1 ^(e)	0.1 ^(e)
Libya	0.6	0.9	0.8	0.9	1.1
South Africa ^(e)	0.8	0.7	0.2	0.2	0.2
Zambia ^(e)	0.1	0.1	0.1	0.1 ^(e)	0.1 ^(e)
Africa	7.4	7.6	8.2	9.7	10.6
Bahrain	1.6	1.5	1.4	1.5	1.5 ^(e)
Iran	25.7	28.5	30.8	31.6	32.9
Oman	1.5	1.8	1.7	1.7	1.7 ^(e)
Qatar	2.5	2.4	0.8	0.8	1.6
Saudi Arabia	6.0	5.8	5.2	6.1	6.7
United Arab Emirates	3.8	3.7	3.0	3.7	3.4
Middle East	41.2	43.6	42.8	45.4	47.8
India	34.2	36.8	33.6	39.0	42.3
Indonesia	0.2	0.1	0.0	0.1 ^(e)	0.1 ^(e)
Malaysia	0.7	0.6	0.7	0.4 ^(e)	0.4 ^(e)
Asia	35.2	37.5	34.4	39.5	42.7
World	107.5	111.8	106.3	119.3	125.1

^(e) = estimate



Iron ore 2021

million tonnes, actual weight

	Production	- Exports	+ Imports	= Apparent consumption
Austria	3.0	0.0	4.5	7.5
Belgium-Luxembourg	0.0	0.0	5.8	5.8
Czechia	0.0	0.0	6.0	6.0
France	0.0	0.1	13.9	13.8
Germany	0.3	1.4	40.2	39.0
Italy	0.0	0.0	5.9	5.9
Netherlands	0.0	19.2	27.4	8.2
Poland	0.0	0.0	5.7	5.7
Romania	0.0	0.0	3.0	3.0
Slovakia	0.0	0.1	6.2	6.1
Spain	0.0	0.1	5.7	5.5
Sweden	28.9	24.0	0.0	4.9
Other EU (27)	0.0	0.2	4.7	4.6
European Union (27)	32.2	45.1	129.0	116.0
Bosnia-Herzegovina	1.6	0.0	0.0	1.6
Norway	1.7	1.7	0.0	0.1
Türkiye	8.3	3.5	11.3	16.0
United Kingdom	0.0	0.0	8.1	8.1
Others	0.0	0.3	1.7	1.4
Other Europe	11.6	5.5	21.2	27.2
Russia & Other CIS + Ukraine	229.3	75.5	9.6	163.5
Canada	57.5	53.8	8.3	12.0
Mexico	29.7	2.8	2.6	29.5
United States	48.7	14.5	5.4	39.6
Other North America	0.0	0.5	1.9	1.3
North America	135.9	71.7	18.2	82.4
Brazil	399.3	359.1	0.3	40.5
Chile	16.3	16.4	0.0	- 0.1
Peru	10.7	8.9	0.0	1.8
Venezuela	3.5	2.3	0.0	1.2
Other South America	0.7	0.0	5.9	6.6
South America	430.5	386.6	6.2	50.0
Liberia	4.2	3.6	0.0	0.6
Mauritania	12.6	13.2	0.0	- 0.6
South Africa	73.1	67.9	0.0	5.2
Other Africa	11.3	3.4	12.9	20.7
Africa	101.2	88.2	12.9	25.9
Middle East	55.7	13.7	30.2	72.2
China ⁽¹⁾	266.0	23.3	1 125.6	1 368.3
India	249.3	35.8	5.5	219.0
Japan	0.0	0.0	113.1	113.1
South Korea	0.2	0.3	74.2	74.1
Other Asia	39.2	35.7	95.1	98.6
Asia	554.7	95.1	1 413.5	1 873.1
Australia	922.2	876.6	0.9	46.5
New Zealand and Other Oceania	3.7	0.1	0.0	3.6
Oceania	925.9	876.7	0.9	50.1
World	2 476.9	1 658.1	1 641.7	2 460.4

⁽¹⁾ Production adjusted so that Fe content is similar to world average.

Source: RMG Consulting

World trade in iron ore by area 2022

million tonnes

Exporting region	Destination								Total Imports	of which: extra-regional imports
	European Union (27)	Other Europe	Russia & Other CIS + Ukraine	North America	South America	Africa and Middle East	Asia	Oceania		
European Union (27)	31.2	2.6	21.5	22.4	20.5	19.5	1.8	0.3	119.9	88.6
Other Europe	3.5	0.4	1.8	1.6	6.3	2.7	1.2	0.5	17.9	17.6
Russia & Other CIS + Ukraine	0.0	0.0	0.0	-	-	0.0	0.0	-	0.0	0.0
North America	1.1	0.1	-	10.0	5.9	0.0	1.6	0.0	18.7	8.8
South America	0.0	0.0	-	0.4	6.9	-	0.1	0.0	7.4	0.5
Africa and Middle East	5.6	0.5	0.4	3.1	28.4	11.2	0.3	-	49.5	38.4
China	1.8	1.0	19.3	17.1	258.2	56.1	22.2	732.1	1 107.8	1 085.6
Japan	0.0	-	0.5	7.2	30.2	3.5	0.0	62.9	104.2	104.2
Other Asia	1.1	0.1	0.3	6.2	11.6	3.1	45.7	92.2	160.4	114.7
Oceania	0.0	0.0	-	-	0.0	1.0	0.0	0.0	1.0	1.0
Total exports	44.3	4.6	43.9	67.8	368.1	97.1	72.9	888.0	1 586.8	1 459.3
of which: extra-regional exports*	13.1	4.3	43.8	57.9	361.2	85.9	5.1	888.0	1 459.3	
Net exports (exports-imports)	- 75.5	- 13.3	43.8	49.1	360.7	47.6	- 1 299.5	887.0		

* Excluding intra-regional trade marked



Trade in ferrous scrap 2021 and 2022

million tonnes

	Exports		Imports	
	2021	2022	2021	2022
Austria	1.2	1.2	1.2	1.1
Belgium	4.1	3.9	4.0	4.5
Bulgaria	0.6	0.5	0.1	0.2
Czechia	2.2	2.2	0.5	0.5
Finland	0.7	0.6	0.0	0.2
France	6.3	6.3	1.4	1.4
Germany	6.5	7.2	4.3	4.2
Greece	0.1	0.2	0.9	0.9
Italy	0.5	0.8	6.1	5.2
Netherlands	6.5	6.7	3.1	3.8
Poland	2.4	2.2	0.6	0.8
Slovakia	0.8	0.9	0.4	0.2
Spain	0.6	0.9	3.7	3.0
Sweden	1.3	1.4	0.1	0.2
Other EU	9.0	8.3	5.7	5.6
European Union (27)	42.9	43.5	32.1	31.8
Türkiye	0.1	0.2	24.3	21.1
United Kingdom	8.1	8.2	0.4	0.2
Others	1.8	1.8	1.1	1.0
Other Europe	10.0	10.2	25.8	22.3
Kazakhstan	0.1	0.1	0.0	0.0
Russia	4.0	1.0	0.9	0.0
Ukraine	0.6	0.1	0.0	0.0
Other CIS	0.3	0.2	1.5	0.1
Russia & Other CIS + Ukraine	5.0	1.4	2.4	0.1
Canada	4.4	4.7	0.7	1.1
Mexico	0.6	0.8	2.8	2.9
United States	15.9	17.5	4.9	4.7
Other North America	0.8	1.0	0.0	0.0
North America	21.7	24.0	8.3	8.8
Brazil	0.5	0.4	0.2	0.0
Other South America	1.8	1.9	0.3	0.2
South America	2.3	2.2	0.6	0.3
South Africa	0.2	0.5	0.1	0.1
Other Africa	1.3	1.3	1.8	0.9
Africa	1.5	1.8	1.9	0.9
Middle East	3.7	3.6	0.8	0.6
China	0.0	0.0	0.5	0.6
Japan	7.0	6.3	0.0	0.1
South Korea	0.2	0.3	4.5	4.7
Taiwan, China	0.1	0.1	2.9	2.9
Other Asia	1.9	2.8	20.0	22.8
Asia	9.2	9.5	28.0	31.0
Oceania	2.2	2.4	0.1	0.2
World	98.5	98.6	100.0	96.0

World trade in ferrous scrap by area 2022

million tonnes

Exporting region	Destination										Total imports	of which: extra-regional imports
	European Union (27)	Other Europe	Russia & Other CIS + Ukraine	North America	South America	Africa and Middle East	China	Japan	Other Asia	Oceania		
European Union (27)	26.9	3.4	0.1	0.6	0.1	0.2	0.0	0.0	0.0	0.0	31.3	4.5
Other Europe	12.4	2.4	0.7	4.0	1.0	1.2	-	0.0	0.2	0.0	21.9	19.5
Russia & Other CIS + Ukraine	0.1	0.0	0.2	0.0	-	-	-	-	0.0	0.0	0.2	0.1
North America	0.4	0.1	0.0	8.6	0.0	0.0	-	0.0	0.3	0.0	9.4	0.8
South America	0.1	0.0	0.0	0.8	0.2	0.0	-	0.0	0.0	0.0	1.1	0.9
Africa	0.4	0.7	0.0	0.3	0.0	0.1	0.0	-	0.0	0.0	1.6	1.5
Middle East	0.1	0.2	0.0	0.2	0.0	0.2	-	0.0	0.0	0.0	0.7	0.5
China	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.4	0.1	0.0	0.6	0.6
Japan	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.1	0.0	0.1	0.1
Other Asia	3.1	3.3	0.4	9.4	0.9	3.7	0.0	5.9	2.4	2.3	31.4	28.9
Oceania	0.0	0.1	-	0.0	0.0	0.0	-	-	0.0	0.1	0.2	0.1
Total exports	43.5	10.2	1.4	24.0	2.3	5.4	0.0	6.3	3.1	2.4	98.5	57.5
of which: extra-regional exports*	16.6	7.8	1.2	15.3	2.0	5.1	0.0	6.3	0.6	2.3	57.5	
Net exports (exports-imports)	12.2	-11.7	1.1	14.6	1.1	3.1	-0.6	6.2	-28.3	2.2		

* Excluding intra-regional trade marked



Trade in ferrous scrap 2021 and 2022

million tonnes

	Exports		Imports	
	2021	2022	2021	2022
Austria	1.2	1.2	1.2	1.1
Belgium	4.1	3.9	4.0	4.5
Bulgaria	0.6	0.5	0.1	0.2
Czechia	2.2	2.2	0.5	0.5
Finland	0.7	0.6	0.0	0.2
France	6.3	6.3	1.4	1.4
Germany	6.5	7.2	4.3	4.2
Greece	0.1	0.2	0.9	0.9
Italy	0.5	0.8	6.1	5.2
Netherlands	6.5	6.7	3.1	3.8
Poland	2.4	2.2	0.6	0.8
Slovakia	0.8	0.9	0.4	0.2
Spain	0.6	0.9	3.7	3.0
Sweden	1.3	1.4	0.1	0.2
Other EU	9.0	8.3	5.7	5.6
European Union (27)	42.9	43.5	32.1	31.8
Türkiye	0.1	0.2	24.3	21.1
United Kingdom	8.1	8.2	0.4	0.2
Others	1.8	1.8	1.1	1.0
Other Europe	10.0	10.2	25.8	22.3
Kazakhstan	0.1	0.1	0.0	0.0
Russia	4.0	1.0	0.9	0.0
Ukraine	0.6	0.1	0.0	0.0
Other CIS	0.3	0.2	1.5	0.1
Russia & Other CIS + Ukraine	5.0	1.4	2.4	0.1
Canada	4.4	4.7	0.7	1.1
Mexico	0.6	0.8	2.8	2.9
United States	15.9	17.5	4.9	4.7
Other North America	0.8	1.0	0.0	0.0
North America	21.7	24.0	8.3	8.8
Brazil	0.5	0.4	0.2	0.0
Other South America	1.8	1.9	0.3	0.2
South America	2.3	2.2	0.6	0.3
South Africa	0.2	0.5	0.1	0.1
Other Africa	1.3	1.3	1.8	0.9
Africa	1.5	1.8	1.9	0.9
Middle East	3.7	3.6	0.8	0.6
China	0.0	0.0	0.5	0.6
Japan	7.0	6.3	0.0	0.1
South Korea	0.2	0.3	4.5	4.7
Taiwan, China	0.1	0.1	2.9	2.9
Other Asia	1.9	2.8	20.0	22.8
Asia	9.2	9.5	28.0	31.0
Oceania	2.2	2.4	0.1	0.2
World	98.5	98.6	100.0	96.0

World trade in ferrous scrap by area 2022

million tonnes

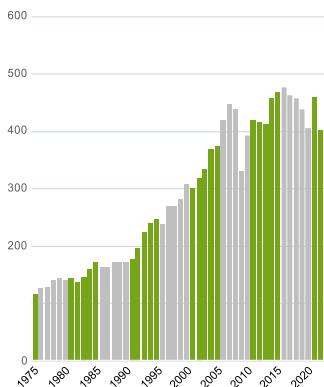
Exporting region	Destination										Total imports	of which: extra-regional imports
	European Union (27)	Other Europe	Russia & Other CIS + Ukraine	North America	South America	Africa and Middle East	China	Japan	Other Asia	Oceania		
European Union (27)	26.9	3.4	0.1	0.6	0.1	0.2	0.0	0.0	0.0	0.0	31.3	4.5
Other Europe	12.4	2.4	0.7	4.0	1.0	1.2	-	0.0	0.2	0.0	21.9	19.5
Russia & Other CIS + Ukraine	0.1	0.0	0.2	0.0	-	-	-	-	0.0	0.0	0.2	0.1
North America	0.4	0.1	0.0	8.6	0.0	0.0	-	0.0	0.3	0.0	9.4	0.8
South America	0.1	0.0	0.0	0.8	0.2	0.0	-	0.0	0.0	0.0	1.1	0.9
Africa	0.4	0.7	0.0	0.3	0.0	0.1	0.0	-	0.0	0.0	1.6	1.5
Middle East	0.1	0.2	0.0	0.2	0.0	0.2	-	0.0	0.0	0.0	0.7	0.5
China	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.4	0.1	0.0	0.6	0.6
Japan	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.1	0.0	0.1	0.1
Other Asia	3.1	3.3	0.4	9.4	0.9	3.7	0.0	5.9	2.4	2.3	31.4	28.9
Oceania	0.0	0.1	-	0.0	0.0	0.0	-	-	0.0	0.1	0.2	0.1
Total exports	43.5	10.2	1.4	24.0	2.3	5.4	0.0	6.3	3.1	2.4	98.5	57.5
of which: extra-regional exports*	16.6	7.8	1.2	15.3	2.0	5.1	0.0	6.3	0.6	2.3	57.5	
Net exports (exports-imports)	12.2	-11.7	1.1	14.6	1.1	3.1	-0.6	6.2	-28.3	2.2		

* Excluding intra-regional trade marked



World steel trade in products 1975 to 2022

million tonnes



Exports are of finished and semi-finished steel products. Production of finished steel, where not available from national sources, is calculated from crude steel production, taking into account the continuous casting ratio.

Year	Exports	Production	Exports share %
1975	114.7	506.9	22.6
1980	140.6	578.7	24.3
1985	171.0	599.0	28.5
1990	171.0	654.0	26.2
1991	177.1	660.0	26.8
1992	196.1	658.0	29.8
1993	222.5	664.9	33.5
1994	238.6	656.2	36.4
1995	246.6	685.6	36.0
1996	236.4	687.1	34.4
1997	267.9	730.1	36.7
1998	268.7	713.4	37.7
1999	280.8	725.8	38.7
2000	307.5	783.6	39.2
2001	300.5	785.9	38.2
2002	318.0	837.1	38.0
2003	333.6	899.1	37.1
2004	368.3	985.6	37.4
2005	373.3	1 065.5	35.0
2006	418.5	1 161.3	36.0
2007	446.8	1 255.4	35.6
2008	438.5	1 250.4	35.1
2009	330.1	1 155.9	28.6
2010	392.7	1 337.6	29.4
2011	418.7	1 435.4	29.2
2012	416.0	1 458.9	28.5
2013	412.6	1 543.1	26.7
2014	457.4	1 563.4	29.3
2015	467.4	1 515.5	30.8
2016	476.8	1 523.0	31.3
2017	462.9	1 620.2	28.6
2018	457.2	1 703.6	26.8
2019	438.8	1 748.6	25.1
2020	405.6	1 754.7	23.1
2021	459.1	1 827.6	25.1
2022	401.7	1 756.3	22.2

World steel exports by product 2018 to 2022

million tonnes

	2018	2019	2020	2021	2022
Ingots and semi-finished material	61.7	56.1	55.7	61.1	44.6
Railway track material	2.6	4.9	2.6	2.8	2.6
Angles, shapes and sections	22.7	21.5	19.6	20.3	19.0
Concrete reinforcing bars	18.7	19.1	19.2	22.0	15.4
Bars and rods, hot-rolled	18.7	15.2	12.8	15.3	12.7
Wire rod	27.4	26.8	25.2	29.0	25.5
Drawn wire	9.0	8.8	8.7	9.6	8.6
Other bars and rods	6.4	5.6	4.5	6.1	7.4
Hot-rolled strip	3.8	3.2	2.8	3.4	3.0
Cold-rolled strip	4.5	4.0	3.7	4.8	4.1
Hot-rolled sheets and coils	78.9	78.4	74.6	79.3	68.0
Plates	33.3	32.8	29.4	30.9	32.2
Cold-rolled sheets and coils	35.7	32.5	19.0	36.7	30.8
Electrical sheet and strip	4.6	4.1	3.9	5.1	5.2
Tinmill products	6.8	6.9	7.0	6.8	6.9
Galvanised sheet	44.7	43.0	37.0	45.3	38.4
Other coated sheet	17.9	18.2	18.1	20.2	16.5
Steel tubes and fittings	41.2	40.9	32.3	34.3	34.2
Wheels (forged and rolled) and axles	0.9	0.8	0.7	0.9	0.8
Castings	1.3	1.3	1.1	1.4	1.5
Forgings	1.1	1.0	0.9	1.0	1.1
Total	441.9	425.2	378.8	436.3	378.4

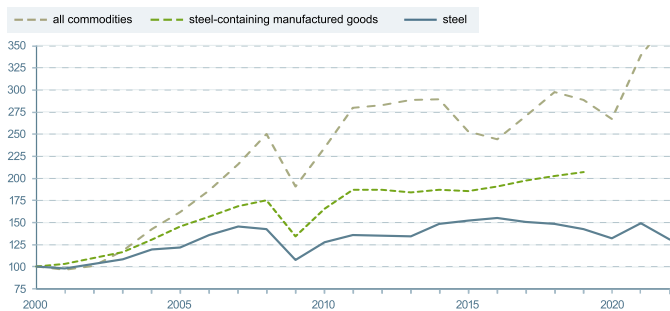
Exports data is reported by country and therefore includes for example intra-EU trade, trade between USMCA countries, etc.

The figures are based on a broad definition of the steel industry and its products, including ingots, semi-finished products, hot-rolled and cold-finished products, tubes, wire, and unworked castings and forgings.

The above table comprises the exports of 62 countries, which represents approximately 94.8 per cent of total world trade in 2022.

World volume of trade 2000 to 2022

Quantum indices 2000 = 100





World trade in steel by area 2022

million tonnes

Exporting region \ Destination	European Union (27)	Other Europe	Russia & Other CIS + Ukraine	North America	South America	Africa and Middle East	China	Japan	Other Asia	Oceania	Total imports	of which: extra-regional imports
European Union (27)	100.0	10.3	8.8	0.1	1.2	1.9	4.3	1.7	13.3	0.2	141.9	41.9
Other Europe	10.2	2.7	6.3	0.0	0.3	0.8	2.8	0.5	5.1	0.1	28.7	26.0
Russia & Other CIS + Ukraine	0.5	0.5	1.9	0.0	0.0	0.0	1.3	0.0	0.2	0.0	4.5	2.6
North America	6.0	2.6	0.9	17.1	7.9	1.5	4.4	2.9	10.9	0.4	54.6	37.6
South America	1.0	0.8	0.3	0.1	3.0	0.1	5.4	0.9	1.9	0.0	13.4	10.4
Africa	1.8	3.1	0.6	0.0	0.1	1.5	8.1	0.9	1.9	0.0	18.0	16.5
Middle East	0.9	4.3	0.4	0.1	0.1	2.9	7.1	0.8	2.4	0.1	19.1	16.2
China	0.8	0.0	2.6	0.0	0.1	1.6	-	3.8	8.0	0.0	17.1	17.1
Japan	0.0	0.0	0.0	0.0	0.0	0.0	1.0	-	4.3	0.0	5.3	5.3
Other Asia	1.3	0.6	3.4	4.1	0.2	5.0	32.8	20.1	28.9	0.3	96.6	67.8
Oceania	0.2	0.2	0.0	0.0	0.0	0.1	0.9	0.1	1.3	0.2	2.9	2.7
Total Exports	122.9	25.0	25.1	21.6	12.9	15.3	68.1	31.7	78.1	1.3	402.1	244.0
of which: extra-regional exports*	22.9	22.4	23.2	4.5	9.9	10.9	68.1	31.7	49.2	1.2	244.0	
Net exports (exports - imports)	-19.0	-3.6	20.6	-33.0	-0.5	-21.8	11.1	26.4	-18.5	-1.6		

* Excluding intra-regional trade marked

Major importers and exporters of steel 2022

million tonnes

Rank	Total exports	Mt
1	China	68.1
2	Japan	31.7
3	European Union (27) ¹	26.0
4	South Korea	25.5
5	Germany ²	22.3
6	Türkiye	18.0
7	Russia	17.9
8	Italy ²	16.0
9	Belgium ²	14.7
10	Brazil	12.1
11	India	12.1
12	France ²	11.5
13	Taiwan, China	9.9
14	Netherlands ²	9.4
15	Indonesia	9.2
16	Spain ²	8.4
17	United States	8.3
18	Viet Nam	7.4
19	Malaysia	7.1
20	Austria ²	6.8

Rank	Total imports	Mt
1	European Union (27) ¹	48.1
2	United States	28.9
3	Germany ²	21.0
4	Italy ²	20.2
5	Türkiye	17.4
6	China	17.1
7	South Korea	13.7
8	Thailand	13.4
9	Belgium ²	12.5
10	Poland ²	12.0
11	France ²	12.0
12	Viet Nam	11.5
13	Indonesia	11.2
14	Mexico	10.9
15	Netherlands ²	10.3
16	Spain ²	9.8
17	Canada	9.4
18	Philippines	7.6
19	Taiwan, China	7.1
20	Czechia ²	7.0

Rank	Net exports (exports - imports)	Mt
1	China	51.1
2	Japan	26.4
3	Russia	16.6
4	South Korea	11.8
5	Brazil	8.8
6	Oman	5.4
7	India	5.2
8	Ukraine	4.1
9	Taiwan, China	2.8
10	Austria ²	2.6
11	Belgium ²	2.2
12	Luxembourg ²	1.6
13	Malaysia	1.4
14	Kazakhstan	1.3
15	Germany ²	1.3

Rank	Net imports (imports - exports)	Mt
1	European Union (27) ¹	22.0
2	United States	20.6
3	Thailand	11.6
4	Philippines	7.5
5	Poland ²	6.8
6	Mexico	4.3
7	Italy ²	4.2
8	Viet Nam	4.1
9	Saudi Arabia	3.8
10	Canada	2.8
11	Israel	2.7
12	Pakistan	2.6
13	Czechia ²	2.5
14	Colombia	2.5
15	Bangladesh	2.4

⁽¹⁾ Excluding intra-regional trade

⁽²⁾ Data for individual European Union (27) countries include intra-European trade



Indirect trade in steel 2000 to 2019

million tonnes, finished steel equivalent



Year	Indirect exports, Mt
2000	172.1
2001	178.1
2002	187.8
2003	199.1
2004	224.0
2005	249.2
2006	269.5
2007	292.4
2008	303.6
2009	231.4
2010	285.4
2011	323.8
2012	324.1
2013	319.1
2014	324.5
2015	322.4
2016	329.8
2017	341.5
2018	354.6
2019	358.9

An explanation of the methodology of indirect trade in steel can be found in the report 'Indirect Trade in Steel (March 2015)' at worldsteel.org/publications/steel-reports. Last updated in May 2021.

Major indirect importers and exporters of steel, 2019

million tonnes, finished steel equivalent

Rank	Indirect exports	Mt
1	China	95.8
2	Germany*	32.9
3	Japan	21.7
4	United States	20.9
5	South Korea	17.9
6	Mexico	17.2
7	Italy*	13.3
8	Poland*	9.9
9	Spain*	9.5
10	Türkiye	8.6

Rank	Indirect imports	Mt
1	United States	49.0
2	Germany*	25.7
3	France*	13.8
4	United Kingdom	11.9
5	Canada	11.6
6	China	9.4
7	Belgium-Luxembourg*	8.8
8	Russia	8.8
9	Spain*	8.5
10	Italy*	8.5

Rank	Net indirect exports (exports - imports)	Mt
1	China	86.4
2	Japan	13.9
3	South Korea	12.7
4	Mexico	9.1
5	Germany*	7.2

Rank	Net indirect imports (imports - exports)	Mt
1	United States	28.1
2	Russia	6.3
3	United Kingdom	6.0
4	Canada	5.2
5	France*	5.1

*Data for individual European Union (27) countries include intra-European trade

True steel use 2015 to 2019

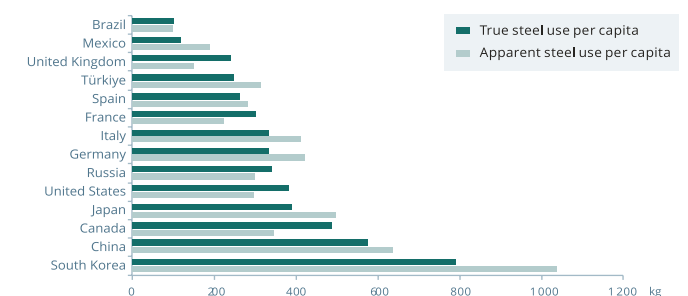
million tonnes, finished steel equivalent

	2015	2016	2017	2018	2019
France	17.1	18.4	19.0	19.1	19.7
Germany	28.8	31.0	30.3	28.4	27.9
Italy	18.8	18.5	19.5	20.2	20.2
Spain	10.8	10.3	11.0	11.6	12.3
European Union (27)	126.8	132.3	136.8	143.8	139.7
Türkiye	32.5	32.1	33.5	26.7	20.7
United Kingdom	16.5	17.1	16.9	16.8	16.2
Other Europe	56.7	57.0	58.3	51.7	45.0
Russia	43.8	43.5	46.9	47.1	49.8
Russia & Other CIS + Ukraine	52.0	52.7	57.7	58.4	62.0
Canada	18.6	18.6	19.1	19.3	18.2
Mexico	20.2	20.1	22.7	21.1	15.2
United States	118.9	115.4	122.2	127.1	125.7
USMCA	157.8	154.1	164.0	167.5	159.2
Brazil	22.6	19.2	19.4	21.2	21.3
Central & South America	47.0	39.9	41.9	42.5	41.5
Africa and Middle East	89.4	84.5	82.3	79.9	81.8
China	611.7	620.5	706.2	761.5	825.5
Japan	48.3	46.9	50.3	51.5	49.4
South Korea	39.7	41.6	41.7	41.3	40.5
Asia and Oceania	880.3	904.1	996.5	1 066.4	1 130.1
Total¹	1 410.0	1 424.7	1 537.6	1 610.3	1 659.2

(1) The total comprises 74 countries.

Apparent and true steel use per capita 2019

kilograms, finished steel equivalent





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Piranha

Piranha

- Capacity is 6-60 tons / hour according to models.

Shark

- Capacity is 8-30 tons / hour in cutting and 10-35 tons / hour in baling.



Shark

Features

- Presses heavy and light scrap before cutting and increases its density.
- Then it performs cutting process in desired lengths automatically and continuously.
- Short stroke program (line up to scrap thickness) available for shorter cycle time
- Remote modem diagnosis and repair system for fast service
- Special oil filtration system for smooth operation
- Automatic lubrication



Engineering & Technologies

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