MET-INFO

CONTENTS

Published By

The Indian Institute of Metals
Delhi Chapter
Jawahar Dhatu Bhawan
39, Tughlakabad Institutional Area
M. B. Road, New Delhi-110 062

Dr. Mukesh Kumar
Chairman
IIM Delhi Chapter

S C Suri
Editor-in-Chief
IIM DC Newsletter

Tel: 011-29955084, 21820057
E-mail: iim.delhi@gmail.com
Website: www.iim-delhi.com

Inhouse Publication
For Private Circulation only

IIM Delhi Chapter Executive Committee: 2022-23

Dr. Mukesh Kumar
Chairman

Manoranjan Ram
Vice Chairman

Dr. Ramen Datta
Hon. Secretary

R K Narang
Hon. Treasurer

N Vijayan
Hon. Jt. Secretary

MEMBERS

B D Jethra

P N Shali

Anil Gupta

S C Suri

K L Mehrotra

K K Mehrotra

G I S Chauhan

R K Vijayavergia

N K Kakkar

Deepak Jain

K R Krishnakumar

M P Sharma

Prof. Jayant Jain

Dr.Lakshmi Narayan R

EXECUTIVE COMMITTEE MEMBERS : CONTACT DETAILS			
NAME	DESIGNATION	CONTACT NO.	E-MAIL
Dr. Mukesh Kumar	Chairman	9650080849 9584032329	drmukeshkumar@gmail.com
Shri Manoranjan Ram	Vice Chairman	9910014989 9999303008	manoranjanram@yahoo.com m.ram@danieli.com
Dr. Ramen Datta	Secretary	9958084110	dattaramen@gmail.com
Shri Ramesh Kumar Narang	Treasurer	9899298857	rknarang62@gmail.com
Shri N Vijayan	Joint Secretary	9818695690	technothermaindia@gmail.com
Shri B D Jethra	Member	9818326878	jethra@yahoo.com
Shri P N Shali	Member	9810708510 9958385332	pnshali@gmail.com prannathshali425@gmail.com
Shri Anil Gupta	Member	9899414000	indiantrader@gmail.com
Shri S C Suri	Member	9650936736 46584279/26949167	scsuri.iimdc@gmail.com
Shri K L Mehrotra	Member	9810203544	klmehrotra48@gmail.com klm91048@gmail.com
Shri K K Mehrotra	Member	9868112514 9968653355	kishorekmehrotra@gmail.com
Shri G I S Chauhan	Member	9717302437 7048993116	gisc.delhi@gmail.com
Shri R K Vijayavergia	Member	9650155544	rkv.sail@gmail.com
Shri N K Kakkar	Member	9871008505	nirmalkakkar@gmail.com
Shri Deepak Jain	Member	9868640986 8368622619	deepakjain7177@gmail.com
Shri K R Krishnakumar	Member	9818277840	kuduvak059@gmail.com
Shri M P Sharma	Member	9212202084 9818508300	aluminiumconsultant@yahoo.com aflmps@rediffmail.com
Prof. Jayant Jain	Member	9582513867	jayantj@iitd.ac.in
Dr. Lakshmi Narayan R	Member	26591494	rlnarayan@iitd.ac.in

Chapter Activities

New Members

Our Chapter is taking a lot of initiatives to promote the membership of IIM.

In November, three new members were enrolled, two life members and one ordinary member.

IIM Delhi Chapter welcomes the new members:

1. Dr. Nitika Kundan
2. Ms. Shaila Mir
3. Mr. Vivek Kumar Mishra

So far in this year we have roped in 33 members. This is the first time in the history of IIM Delhi Chapter that as many as 33 members were enrolled in a year.

Plant Visit by IIM Delhi Members

A plant visit was arranged by our Chapter to HGI Automotives Ltd, Faridabad, on 26th November 2022.

HGI Automotives manufactures various components of automobiles. The Plant employs about 250 persons. The raw material used by the Plant is Aluminium and Zinc ingots. The ingots are melted in electric furnaces. After melting, the molten material passes through the different processes depending upon the required finished product. The major customers of the Plant are Maruti, LG Home Appliances, Minda and Honda. The Plant also exports automotive components. About 125 different components of automotives are being manufactured by the Plant.

The members were shown the various operations of the Plant by its officials. The officials explained to the members the working of the various units of the Plant. The Plant has its own testing laboratory and a training room.

The members also had lively interaction with the Head of the Plant.

The Plant visit was very informative.


HGI AUTOMOTIVES (P) LTD

Safe, Affordable & Recyclable Lead Battery is Here to Stay

L. Pugazhenthy
Past President, The Indian Institute of Metals

Over the years, the Lead acid battery, invented by Gaston Plante as early as in 1860, has undergone many technological developments and changes such as improved performance, life cycle, weight reduction, durability, newer materials, testing, high recyclability, cost optimization etc., with the result that the Lead battery today touches our daily lives.

Lead acid batteries were originally used in miner's cap lamps and later made inroads in automobiles, defence, communication, power and railways. With the dawn of the computer era, Lead battery powered UPS became a very common application. During power cuts and outages, inverters backed by Lead acid batteries are a household essential in many parts of India and they are widely used in homes, offices, banks, shops, schools etc.

In the renewable energy sector, both solar and wind, Lead batteries are used for energy storage. India is planning to achieve a target of 500 GW by 2030, with lesser investments in thermal power generation, in order to use more clean energy, thereby reducing carbon emissions. This is India's commitment to the International Protocol on Climate Change (IPCC).

In order to bring down the urban transport pollution load as well as air quality levels, electric vehicles are being promoted in many parts of the world including India. In our country e-mobility is being encouraged with subsidies. For charging the batteries in EVs, if we can use more and more renewable energy that would be the most ideal option.

India will have more electric vehicles such as e-rickshaws, e-scooters, as well as electric buses for public transport and last mile connectivity. And in the long-term future, electric cars also will start plying in metros and cities, though not in large numbers. Unfortunately, for batteries in such applications, India will have to depend on a number of critical metals like Nickel, Cobalt, Lithium etc., (since India does not produce them locally) or import finished batteries from other countries.

However, in the case of Lead batteries, India is blessed with Lead deposits, Primary Lead as well as Secondary/Recycled Lead. India produces around 0.8 to 1.0 million tonnes of Lead, out of locally used Lead batteries. Primary Lead production in India is around 0.25 million tonnes. India has acquired and perfected the expertise in manufacture of Lead batteries, using local materials and inputs, well-developed skills etc. India also exports Lead batteries to many parts of the world. Out of the total Lead consumed in India about 75 to 80% goes for manufacture of Lead batteries. Lead battery is the best example for **Atmanirbharata** and Circular Economy. As a result, Lead acid battery is cheaper and affordable, even for the farmers for using them in tractors as well as in e-rickshaws in metros and cities.

Recovery of Lead from used Lead batteries is an easy, low temperature operation through smelting and refining. In the true spirit of **"Recycle and Reuse"**, Lead batteries are recycled again and again a number of times without any loss in properties. In fact, world-wide, of all the materials, Lead is the most recycled, about 99%, thus resulting in Sustainable Development.

Last but not the least, Lead batteries are being used in a number of applications as highlighted above and there have been no cases of fires or explosions leading to loss of lives. Safety in Lead acid batteries is a well established fact by experience.

In future also, Lead acid batteries will see newer technological developments based on consumer needs and industrial demands. And there are enough indications in the tunnel that Lead acid battery is not only here to stay but also grow in the coming years. Safe and Green Lead should be our ultimate objective for ever.

In order to disseminate the latest on Lead batteries, India Lead Zinc Development Association (ILZDA) will be holding an International Conference at Delhi early December 2022 where world class experts will be making presentations on Energy Storage, E-mobility and Environment Protection.

Zero Emissions Steel Technology (ZESTY)

The Australian Renewable Energy Agency (ARENA) has announced $947,035 in funding to technology company Calix Limited, to evaluate the feasibility of a low emissions method for reducing iron. Proposed demonstration scale Hydrogen Direct Reduced Iron (HDRI) production plant is proposed utilizing Calix's proprietary Zero Emissions Steel Technology (ZESTY). Calix's proposed demonstration plant would be capable of producing 30kt each year of HDRI as a feedstock for steel production. The process builds on Calix's existing Calix Flash Calciner Technology that is used for a variety of industrial processes. The ZESTY Study is due to be completed in late 2023.

Source: Steel Times International, Weekly News, 9.11.22

Steel is the Power Behind Renewable Energy

Global energy transition is underway. Renewable energy, which includes solar, wind, geothermal, hydro and others, is at the center of the transition to a less carbon-intensive society, which also puts steel at the center of the conversation.

Steel is required by each of these markets. Without steel, none of the renewable energy sources would be possible. Every renewable energy structure – a wind turbine or a solar panel - requires steel. Steel plays an important role especially solar and wind. Each new MW of solar power requires between 35 to 45 tons of steel, and each new MW of wind power requires 120 to 180 tons of steel.

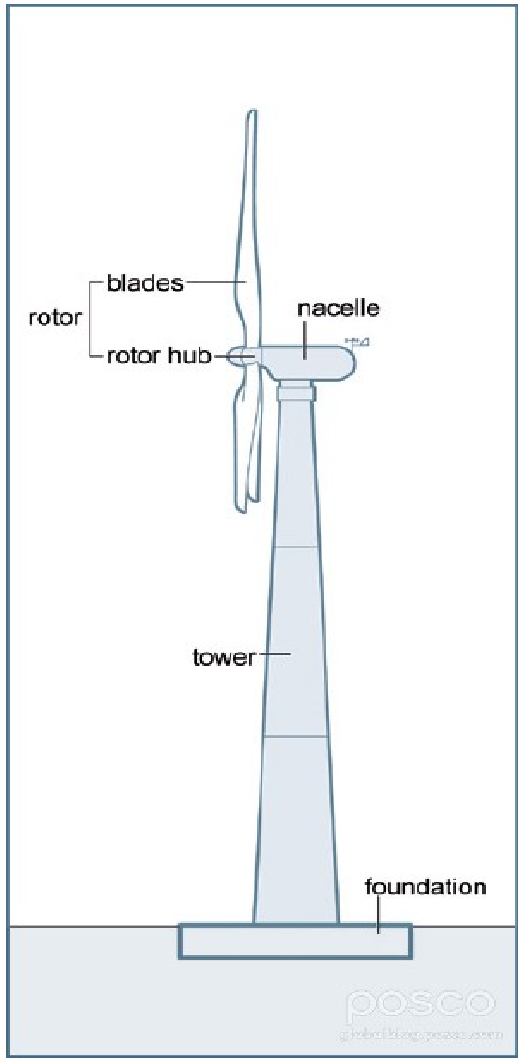
The solar market is divided into two areas. The first are smaller-scale rooftop panels mounted on homes, museums and stadiums. The second is utility-scale projects, which are larger consumers of steel. These plants produce a standard 100 to 300 MW of energy while some in development are approaching 1000 MW. These are basically small power plants, football fields full of solar panels.

Solar power plants use three technologies, all of which use steel in the structure on which the PV modules or mirrors are attached:

- **Solar Photovoltaic (PV)** – panels are mounted on a fixed or moving structure that allows the panel to be optimally oriented to the sun throughout the day; the moving structure is gaining ground on the fixed with tracker technology accounting for half of all PV structures by 2025.

- **Concentrated Solar Power (CSP)** - panels with lenses that focus the sun's ray on a small cell with a much higher energy generation capacity

- **Concentrator Photovoltaics (CPV)** - converts sunlight to electricity by PV cells made of semiconductor materials; usually the material is salt, which becomes liquid and generates steam to create electricity



Steel is also a major contributor to wind energy, which can be grouped into three key markets:

- **Onshore wind farms** - relatively small and produce between 2 and 3 MW of power per turbine. A variety of steels is used for the structural tower itself, the house of the turbine, the turbine blades and electrical steel.

- **Offshore wind farms** - much larger, with recent turbines producing 5 to 8 MW of energy. Offshore wind consumes more steel than onshore and is an area of interest among investors. Offshore has two advantages: the ability to go much higher with no obstructions and the free flow of wind. Offshore requires a combination of steels to support the huge foundations that are anchored to the sea bed. Steel is also found in the structural tower itself and the blades, which are much thicker and longer.

- **New generation wind farms** – these wind farms go the distance, literally! These farms will be built even further from shore, requiring a floating structure. Each turbine will produce 7 to 12 MW of energy.

One turbine has many steel parts. From its all-important foundation down to its screws and studs, every part of a wind turbine-machinery used to produce wind energy-depends on steel. In fact, steel, on average, represents 80 percent of all the materials used to construct a wind turbine. The main components of the machine are the tower, the nacelle and the rotor. While the blades are generally made of other materials, such as carbon fibre or alloys, steel holds the turning blades in place, utilizing a cast iron or forged steel rotor hub.

At the top of the tower are the rotor and the nacelle. Because a nacelle can weigh as much as 300 tonnes, steel's strength makes it the perfect material for the nacelle's frame, housing and machinery. The nacelle contains some of the highest-value steel, including electrical steel, a specialty metal tailored to fabricate the specific magnetic properties that make wind energy feasible.

Behind the blades, a low-speed shaft transfers the rotational force of the rotor to the gearbox. Here, the gears are operated using precision tools and hardened steel components, and increase the low rotational speed of the rotor shaft to the high speed required to power the generator. Next, the mechanical energy captured by the blades is converted into electric energy, which is then directed to the transformer and converted to the higher voltage needed by the electricity grid.

Most of the steel in a wind turbine is utilized in the tower. There are a variety of towers, including steel-concrete hybrid towers, steel truss towers and steel lattice towers, but about 90 percent of all wind turbine towers are tubular steel towers. To construct one of these, fan-shaped plate segments are cut from rectangular parent steel plates and are then roll-formed and welded into cone sections. The tower and the foundation, which connects the turbine to the ground or seabed, have to be tailored to carry these heavier blades and the bigger rotor that they necessitate.

Carbon Capture Begins at NTPC's Power Plant in India

Carbon capture is underway at NTPC's 500 MW coal-fired power plant (Unit-13) at Vindhyachal Super Thermal Power Station, in Madhya Pradesh. Using CDRMax™ technology of Carbon Clean, the plant is designed to capture 20 tonnes of carbon dioxide per day, which will later be combined with hydrogen to produce 10 tonnes per day of methanol through a catalytic hydrogenation process.

NTPC Energy Technology Research Alliance (NETRA) has selected Carbon Clean and Green Power International Pvt. Ltd. to set up the carbon capture plant at NTPC

Vindhyachal. This plant is designed to capture 20 tonnes of carbon dioxide (CO_2) per day, which will use a modified tertiary amine to capture CO_2, from the flue gas of the power plant. The CO_2 will eventually be combined with hydrogen to produce 10 tonnes per day of methanol through a catalytic hydrogenation process.

The capture of CO_2 from the flue gas of coal-fired power plants, and its conversion to methanol, is a priority area for NTPC and is expected to create potential new business opportunities and revenue streams for the company.

Carbon Clean's CDRMax™ carbon capture technology can be used with point source gases that contain CO_2 concentrations between 3% and 25% by volume and produces CO_2 with purities greater than 99%, which can then be sold, re-used, or sequestered. The CDRMax™ process uses the company's proprietary solvent, process equipment design, and advanced heat integration to significantly reduce both capital and operating costs.

Source: Carbon Clean, Press Release, September 29, 2022

UK Steel industry Sets Out Vision for Net Zero Transition

To create a Net-Zero steel sector in the UK and meet Government targets, a new report from UK Steel calls for a renewed focus on establishing a positive policy environment for steelmaking.

- Government has targeted a 95% emission reduction from steelmaking by 2050, while the Climate Change Committee has recommended that emissions from ore-based steelmaking be near zero by 2035.
- New Net Zero steel production will increase electricity use, but industrial electricity prices are a key barrier, as UK steelmakers currently pay almost 60% more than their European counterparts.
- UK demand for steel is expected to grow by 2030, presenting an opportunity to re-industrialise and create green jobs.
- Any route to Net Zero steelmaking must include creating a market for Net Zero steel, ensuring that imported, high-emission steel does not undermine domestic investment.
- Globally, no steel sector has yet decarbonised – the UK can secure a tremendous first-mover advantage.

Delivering Net Zero in this strategic sector is a generational challenge which will need far-sighted support from Government and a positive policy environment to achieve. No steel sector or steel company in the world has yet successfully decarbonised.

There is not one single technology to decarbonise, but a range, including electrified steelmaking, carbon capture and storage and hydrogen. In the future, hydrogen-based steelmaking may also become more attractive.

The challenges for the steel sector, therefore, are existing high industrial electricity prices. If a steel company is to invest in the costly transition to Net Zero steelmaking, policy environment must encourage it. Additionally, while Net Zero steel is a hugely exciting opportunity and has been welcomed across the board, currently, there does not exist a market for it. Government must work to establish a market for Net Zero steel, supporting the emerging products and ensuring that steelmakers can compete in the short as well as the long term. To bring down emissions, country can simply import steel. But such a choice would be devastating to steelmaking communities and will do nothing to bring down global carbon emissions. One cannot offshore its emissions and hope that others will do the decarbonisation.

Source: U K Steel Net Zero Steel-A vision for the Future of UK Steel Production-July 2022

Industry Urges Government to Establish 'India Rare Earths Mission'

Policy must back private sector mining in critical sector in which India produces only 1% of global output despite having 6% of world's reserves; CII suggests splitting state-run Indian Rare Earths Ltd. and tasking new entity with overseeing the mining, production of non-Thorium minerals

To counter India's reliance on China for imports of critical rare earth minerals, industry has urged the government to encourage private sector mining in the sector and diversify sources of supply for these strategic raw materials.

"Set up an 'India Rare Earths Mission', manned by professionals, like the India Semiconductor Mission and make their exploration a critical component of the Deep Ocean Mission plan of the government, the Confederation of Indian Industry (CII) has submitted, suggesting steps to encourage private players to mine such minerals.

Though India has 6% of the world's rare earth reserves, it only produces 1% of global output, and meets most of its requirements of such minerals from China, the industry grouping pointed out in a memorandum of suggestions for the Union Budget recently submitted to the Finance Ministry.

In 2018-19, for instance, 92% of rare earth metal imports by value and 97% by quantity were sourced from China. "Clearly there is a need to build domestic capability and broad-base supply sources for such an important and strategic raw material," the CII said, making a pitch for harnessing the potential of the country's own rare earth reserves.

Suggesting that such minerals should not be held captive to India's civil nuclear programme, the industry body has recommended that the public sector firm Indian Rare Earths Limited (IREL), administered by the Department of Atomic Energy, should be split into two entities. While IREL primarily focuses on Thorium mining, CII has suggested that the second entity could pursue other minerals.

The industry group has also mooted making rare earth minerals a part of the 'Make In India' campaign, citing China's 'Made in China 2025' initiative that focuses on new materials, including permanent magnets that are made using rare earth minerals. China offers state support for the industry.

Source: The Hindu, November 27, 2022

Electrokinetic Mining Techniques to Extract REEs

Mining rare earth has long been considered a dirty business, as it can lead to water and soil pollution. A new technology developed by Chinese scientists may offer a greener alternative for the industry.

Rare earth elements (REEs), especially heavy REEs, are an essential part of many high-tech devices, from the iPhone to the Tesla electric engine to LED lights. More than 90 percent of the global heavy REE demand is sourced from ion-adsorption deposits, which form within weathering crusts. Conventional mining applies excessive usage of chemical agents to recover REEs from these deposits, not only exhibiting low efficiency but also polluting the environment.

Researchers from the Chinese Academy of Sciences' Guangzhou Institute of Geochemistry proposed a new approach that employs **electrokinetic mining techniques** to extract REEs from weathering crusts. In this approach, researchers generated an electric field by putting electrodes on the top and bottom of a volume of soil. Electrokinetic effects can accelerate the migration of REEs, reducing the need for harmful chemical agents. To evaluate the feasibility of the new method, they carried out several experiments of different scales. Results suggested that the new method outperformed traditional mining techniques. For instance, the scaled-up experiments achieved a recovery efficiency of 96 percent within 67 hours by using electrokinetics, while that using the conventional technique was only 62 percent at 130 hours. The difference between the impact of the old and the new approach was even more significant in an on-site field test: using electrokinetics can help achieve a recovery efficiency higher than 90 percent, an 80 percent decrease in polluting agent usage and a 70 percent reduction in metallic impurities.

The study confirmed that the electrokinetic technology enabled green, efficient and selective recovery of REEs. Researchers also noted that the new method has great potential for use in the mining of other critical metals under conditions in which the metals exist in ionic states.

Rare earths are important strategic resources and key elements in the development of new technology and green applications. China leads the world's rare-earth sector in terms of production and refining technologies. China exported 33,539 tons of rare-earth minerals in the first eight months of 2022.

From the perspective of rare earth reserves, the global rare earth reserves were at 120 million tons in 2021. The top five countries in terms of reserves are China, Vietnam, Brazil, Russia and India, accounting for 95.8 percent of the total reserves.

Source: Xinhua-Global Times Published: Nov 10, 2022