# THE INDIAN INSTITUTE OF METALS
## DELHI CHAPTER

IIM Metallurgy Materials Engineering

# "MET-INFO"
## INHOUSE PUBLICATION

**Dr. Mukesh Kumar**-Chairman, Delhi Chapter
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**For Private Circulation only**


## Contents





## Published By

**The Indian Institute of Metals**
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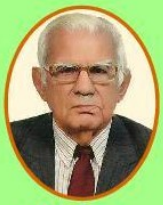

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## STEEL PRODUCTION WITH GREEN HYDROGEN

Spain-based global renewable energy company, *Iberdrola*, and *$H_2$ Green Steel*, a Swedish start-up aimed at producing fossil-free steel, have come together to build a massive, green hydrogen-based steel production plant on the Iberian Peninsula. The locations will have access to cost-effective renewable electricity and the infrastructure required to successfully operate a green hydrogen, green iron and green steel business. Large-scale green hydrogen production will be key to enable the transition of steel industry towards sustainable operations. Iberdrola will deliver renewable energy to the plant, while the DRI production, including any downstream green steel production processes, will be owned and operated by $H_2$ Green Steel. The plant aims to curb carbon emissions by steel production by 95 percent. The production is intended to commence by 2025-26.

### Iberdrola-$H_2$ Green Steel Deal

The partnership between Iberdrola and $H_2$ Green Steel will foster a project with a budget of $2.6 billion to build a facility with an electrolysis capacity of 1 Gigawatt to produce green hydrogen. The green hydrogen produced will then be channelized to a 2-million-tonne direct reduction plant. The companies will explore the opportunity to co-locate a green steel production facility capable of producing 2.5-5Mt/yr of green flat steel. Using green hydrogen for the production of steel will reduce the $CO_2$ emission by 95 percent. Iberdrola will provide wind power-produced electricity, and $H_2$ Green Steel will look over the DRI process.

The 1GW facility to be set up in the Iberian Peninsula is a significant step towards achieving zero emission. Ccurrent electrolyser capacity stands at 0.3GW. The deal between Iberdrola and $H_2$ Green Steel will help reduce the carbon footprint of the steel industry immensely. Global steel industry is responsible for 2.6 giga tonnes of $CO_2$ emission annually and is the largest consumer of coal in the industrial sector. Steel production using green hydrogen will reduce the dependency of the steel industry on coal.

### Green Hydrogen and Green Steel

Hydrogen is slowly gaining traction in the industrial sectors for its usage in various sectors such as mobility, energy, and manufacturing. Three things are crucial for the production of hydrogen – water, electrolyser, and electricity.

If the hydrogen is produced using electricity produced by fossil fuels, it is called grey hydrogen. A better alternative, which halves the carbon emission by fossil fuels, is blue hydrogen, which is produced via steam-methane reforming. High-temperature steam (700°C–1,000°C) is used to produce hydrogen from a methane source, such as natural gas. However, this process isn't emission-free.

The least $CO_2$ emitting hydrogen is produced if the electricity is produced using renewable resources of energy. When electricity produced from green alternatives is used to power the electrolysis of water, the product of the process is called green hydrogen.

Green Hydrogen will be a critical technology in the decarbonization of heavy industrial processes such as the production of steel. Innovative projects like this will help to speed-up the commercialization of larger and more sophisticated electrolyzers, making green hydrogen more competitive. Steel is at the helm of the modern economy. Every manufacturing facility, big or small, uses steel. The production of steel is a significant contributor of $CO_2$ into the atmosphere since, currently, the energy used to treat the iron ore to convert it into steel is derived from fossil fuels that produce carbon in abundance. Green hydrogen is a capable alternative to fossil fuels, and when mixed with natural gas, it makes DRI processes environmentally efficient.

Source : CNBCTV18.com

## FORTUNE 500 INDIA: "STEEL PRICES MAY STAY HIGHER THAN IN LAST 10 YEARS"

*Fortune India spoke to Tata Steel MD and CEO T.V. Narendran after the company announced a 661% jump in net profit in Q2 FY22*

### Are we in a commodity super cycle?

I am not sure what is a super cycle. I have seen steel prices at $180 per tonne 25 years back. Then we got used to $600 a tonne, which looked like a super cycle that time. In the last ten years, we got used to $350. Today, it is $800-$850. But if coking coal is at $400 for China, your starting point is $600. But no other country is adding capacity just because steel prices are high. Also, steel is not an attractive industry for investors. That is why I feel prices will stay higher than we have seen in the last ten years.

### But you would have looked at long-term trends. Where are we right now?

We are obviously at the higher side of what we have seen. But these are not the highest prices I have seen. Steel prices were higher than this leading up to 2008. We look at much lower prices for long-term planning. We take a long-term average. So, going by the long-term average, we are on the higher side. But the question is, what will bring it down if demand is strong?

### Will Indian manufacturers have pricing power?

India has a huge advantage with indigenous iron ore reserves. A lot of our pricing power also

comes from our supplies as we don't control coal prices, which are higher today. India is well-positioned as we believe that consumption of steel will grow strongly.

### What are the reasons behind rise in Tata Steel profitability?

Investment in digital infrastructure in the last three-four years helped us. We also pivoted from domestic markets to export markets. From typically 10-15% of the production, exports went up to 40-50% during the time India was shut. This provided agility. Has doubling of steel prices helped? Prices have gone up and have played a very important role in numbers that you see. But we are always focused on cost and how to remain stronger in a down cycle.

### Is this the best ever margin?

The EBIDTA margin of the India business in the last 20 years has ranged between 20% and 40-45%. We are now in the 40-45% range for the India business. The Netherlands business is in the 16-18% range and the UK in the 5-7% range.

### How did you bring down cost?

Through efficiency metrics. But over the last four-five years, Tata Steel has brought down coal usage by 100 kgs per tonne of steel, having an impact of roughly ₹1,000 crore a year.

Source: www.fortuneindia.com

## HIGHER COST, SOFT PRICES MAY HURT PROFITABILITY OF STEEL COMPANIES

Steel companies are expected to see a decline in earnings from the current quarter (Q3 FY22) with higher input costs, especially of coking coal, Icra said recently. Domestic steel prices that have started to soften from the second quarter highs may also hurt the industry's profitability going ahead. Even with cost pressures, the industry's absolute profitability metrics are expected to remain at healthy levels in the next 12 months, leading the ratings agency to maintain a positive outlook for the sector. Despite a sequential moderation in steel spreads due to cost pressures, the domestic steel industry recorded another all-time high quarterly profit in Q2, largely supported by higher deliveries following the recovery in economic activity post the second wave.

According to Icra, input cost pressures for domestic mills could moderate somewhat towards the latter part of Q4 FY22, as seaborne coking coal prices have declined by 20% since the highs of mid-November 2021, the benefit of which would slowly get reflected in mill margins

after a lag of two-three months. “Our calculations suggest that consumption cost of coking coal is expected to increase by around 65-70 per cent sequentially in the third quarter. Though price of iron ore has been coming down, it will not be able to entirely compensate for the steep rise in coking coal costs. On the realisation front, taking a cue from the correction in Chinese export offers, domestic steel prices have witnessed corrections in the last fortnight. We therefore believe that the gross spreads for a primary steel producer, who is dependent on market purchase of raw material, would be sequentially lower by around 10% in the current quarter, and the industry’s third quarter earnings would be lower than the high-watermark achieved in Q2 FY2022," Jayanta Roy, senior vice-president & group head, corporate sector ratings, Icra, said.

While China led the first leg of the recovery in global steel markets till the early part of CY2021, going forward, the sustenance of the upcycle in the second leg would hinge on the healthy demand momentum continuing outside of China. The World Steel Association’s latest short-range outlook forecasts a strong steel demand recovery in ex-China steel markets of India, Japan, South Korea, US, Europe, and the CIS countries in CY2021 and CY2022, benefitting from higher vaccination rates and government fiscal stimulus measures. The post-monsoon demand recovery in India has been showing positive signs, with the monthly finished steel consumption in October 2021 reaching a seven-month high of 8.8 million tonne (mt) and representing a sequential uptick of around 7% over the previous month.

However, if the rapid spread of the Omicron variant leads to an un-anticipated disruption in economic activity in the key steel-producing hubs as mentioned above, the industry could see an accelerated process of mean-reversion of spreads in FY2023, much sooner than what is anticipated today, the report said. This remains a key risk that could well determine the durability of the current upcycle, it added. Following the metals meltdown of FY2016, and a prolonged downturn that persisted for several years, both lenders and steel mills became cautious on new investment projects. Between FY2017 and FY2021, the average annual capex for listed steel companies was less than half (42%) of the average annual capex seen during the previous five-year period spanning from FY2012 – FY2016. However, after a gap of eight years, with the industry’s capacity utilisation poised to touch 80% in FY23 again, new investment activity has seen a rebound as lenders redraw their negative list for sectors following the earnings surge of steel companies.

“Unlike the last several years, where only the top 4-5 players were doing bulk of the new investments, this time around, we are seeing that even smaller steel players are considering investment in new projects as banks are willing to make fresh lending. Our estimates suggest that in FY22, the capex spend for listed steel companies is expected to increase by around 70% year-on-year, albeit on a lower base," Roy said. “This uptrend in new investment activity would continue in FY2023 as well, when the industry is expected to report a 10-15% annual growth in its capex spend. However, if one puts the current capex cycle in perspective, the annual capex spend will still be much lower than the decadal peak achieved

in FY2014," he added.

Given the strong earnings growth and capex curtailments following the pandemic-related uncertainty, steelmakers started to aggressively deleverage since the second quarter of FY2021. This trend is reflected by the industry's consolidated bank borrowings declining by 26% in a short span of eighteen months (March 2020 to September 2021), the report said. The industry's consolidated borrowings today are at their lowest levels since March 2012. To put things in perspective, the domestic steel sector's consolidated borrowing per metric tonne of installed capacity stood at $176/MT in September 2021, shrinking by almost half from $ 350/MT prevailing in November 2008, when the last steel supercycle ended following the global financial crisis. This indicates that domestic steel companies are now significantly less leveraged than in FY2009. Given two back-to-back years of strong performance, the credit metrics of the domestic steel industry are expected to witness a significant improvement now.

Source: www.livemint.com

## UNION STEEL MINISTER REVIEWS CPSES' CAPEX PROGRESS FOR 2021-2022

The Union Steel Minister, Ram Chandra Prasad Singh reviewed recently the progress of the capital expenditure (Capex) target of Rs 13,300 crore for the year 2021-22 announced by state-owned steel and iron ore companies. "The Union Minister emphasized the utmost importance of timely completion of project works. He advised setting daily targets and close monitoring for time-bound project implementation," Press Information Bureau said in a statement. Steel Minister of State, Faggan Singh Kulaste and the CMDs of Steel central public sector enterprises (CPSEs) from SAIL, NMDC, RINL, KIOCL MOIL and MECON and senior officers of the Ministry of Steel attended the meeting. This achievement of targets shall motivate the workforce, enhance India's steel production and spur higher growth, the statement said. The minister directed CMDs to redouble efforts to ensure that there are no slippages in milestones for achieving the project targets for the year 2021-22.

"The Steel Minister reviewed the capital expenditure done till November in FY 2021-22, by PSUs. Minister Singh advised the CMDs to plan for the remaining period of the financial year on a daily basis to meet the shortfall in target achievement," the statement said.

## COMMERCE MINISTER APPEALS TO STEELMAKERS TO ADDRESS ISSUES OF MSMEs AND EXPORTERS

In yet another meeting held a few days back, the Minister for Commerce & Industry, Piyush Goyal appealed to steel makers to explore the possibilities of offering relief to small industries and exporters. The meeting was convened to address the issues raised by small industries and exporters about steel input prices. Speaking on the occasion, Goyal said that

special care of MSMEs needs to be taken for an easier and cost-effective supply of Steel. He asked the Steel Industry stakeholders to assess the manufacturing costs and explore the possibilities of offering relief to small industries using steel as input for the manufacturing of components and other engineering products.

"Steel Industry stakeholders showed intent to support Small and Medium enterprises and exporters. They assured the Small Enterprises and Exporters about finding affordable solutions to address their challenges especially in the wake of the pandemic," the PIB said in a statement. The meeting was attended by the Union Minister of Steel, Ram Chandra Prasad Singh, Minister of MSME, Narayan Tatu Rane. From the steel industry, senior executives from Tata Steel, JSW Steel, SAIL and RINL attended the meeting. Federation of Indian Exporters Organization (FIEO) Ajay Shai, Mohit Jauhari of Auto Components Manufacturers Association (ACMA) and Chairman, EEPC, Mahesh Desai and Secretary-General of All India Cycle Manufacturers Association, Dr K.B Thakur also attended the meeting.

Source: The Economic Times

## AM/NS TO INVEST OVER RS 1 TRN IN A 24 MN TONNE STEEL PLANT IN ODISHA

A High-Level Clearance Authority of the Odisha government approved a proposal recently from ArcelorMittal Nippon Steel (AM/NS) to set up a 24 million tonne (mt) integrated steel plant at an investment of more than Rs 1 trillion. In a statement, IPICOL (Industrial Promotion & Investment Corporation of Odisha), the single-point of contact for all industrial investments in the state, said that under the chairmanship of Chief Minister Naveen Patnaik, the 27th meeting of the High-Level Clearance Authority has approved Arcelor Mittal Nippon Steel's (AM/NS's) proposal to set up a 24 mtpa integrated steel plant at Mahakalpara block of Kendrapara district against an investment of Rs 1.02 trillion. The company had earlier this year signed an MoU for setting up a 12-mt steel plant in Kendrapara, for an investment of Rs 50,000 crore.

However, the state government officials said after studying the land it was found to be suitable for 24 mt and an application was made. IPICOL said the approved project is the largest project in the manufacturing sector in the country. According to the state's nodal agency for investment, AM/NS will produce 24 mt of various grades of steel with its latest green steel making technology. It will also produce high value-added steel downstream products.

Besides, the facility will also produce 18.75 mt of cement annually, making it one of the largest cement manufacturing plants in the country. The project will generate direct employment opportunities to 16,000 people and create significant indirect employment opportunities through ancillary and downstream industries and services. Along with the steel complex, the company will also develop a downstream industry park to promote the MSMEs

and help import substitution.

According to IPICOL, a large number of ancillary manufacturing companies are expected to put up their units in this region to support the huge steel making facility. “The infrastructure to be developed for the Kendrapara projects facility will give a boost to the logistics and overall development of the region. This modern, green and environment friendly steel making facility will put Kendrapara and Odisha on the world steel map,” the IPICOL statement said.

A number of international equipment manufacturers will be stakeholders in this project and catalyse more employment opportunities to the state, the statement further said. The project will get completed in seven years in phases, IPICOL said. With this investment, Odisha’s total investments garnered in the past 12 months stand at Rs 2.7 trillion, generating employment opportunities for over 77,000 people.

Source: Business Standard

## ODISHA'S NEW STEEL PLANT: BIG, GREEN

It is welcome that ArcelorMittal, the world's largest steel producer, is to set up a mega steel plant in coastal Odisha, in a joint venture with Nippon Steel, the second-largest steel maker. The 24 million-tonne (MT) project would entail an investment of over ₹1.02 lakh crore. This would be an example of a state, and the country, leveraging its resource endowments to industrialise and step up economic growth.

The ArcelorMittal Nippon Steel (AM/NS) plant would reportedly incorporate cutting-edge green steel-making technology, to produce various grades of steel, and foray into downstream products to shore up value addition. The policy of eschewing captive mining, and attendant opacity, seems to be paying rich dividends. Global majors are, indeed, setting up big-ticket projects, helping India integrate with global value chains. Back in 2005, South Korean steel specialist Posco had proposed a 12 MT integrated steel plant in Odisha, but the project got bogged down over land acquisition, access to captive ore and other stumbling blocks. It is another matter that at least three other large steel producers, with a combined capacity of over 12 MT then, did go on to put up plants; Odisha's steel capacity, now 33 MT per annum, and projected to be 100 MT in 2030, would make it a major metal and industrial hub globally.

Note that modern steel-making is hugely knowledge-intensive; many of the high-grade steels in use today were quite unheard of just a decade or two ago. Steel producers work with downstream users to make high-specification, branded products. AM/NS surely needs to step up innovative use of hydrogen in steel-making so as to purposefully stem carbon emissions, even as we educate, train and upskill the right talent for the task at hand.

Source: The Economic Times

## DOMESTIC STEEL PRICES DOWN AS IRON ORE, COKING COAL PRICES FALL

The domestic benchmark hot-rolled coil (HRC) steel price has come down to around Rs 67,000 a tonne from an all-time high level of Rs 69,000-70,000 at the end of October on the back of reducing iron ore and coking coal prices. Steelmakers such as JSW Steel and Arcelor Mittal Nippon Steel India (AM/NS), though, said the price fall since the beginning of December could be temporary as Indian steel prices are still at a discount to international prices. "Since Indian steel prices have not gone up in line with international prices, we expect a stable range-bound prices going ahead," said Jayant Acharya, director, commercial & marketing, at JSW Steel.

Iron ore prices have come down by over 60% in the international markets, while state-owned NMDC had recently cut iron ore prices by between Rs 200 and Rs 870 a tonne for December deliveries, data from steel research and analysis firm SteelMint showed. Coking coal prices, too, have come down from their October peak due to factors including China's decision to lift restriction on coal mining amid a power crisis, restricted buying from many Asian countries and improved supply from mines across the world. But the prices still remain much higher than, say, a year ago. Coking coal price (CNF India, Australia premium HCC) was $318 per tonne in mid-November, down 20% month on month (mom) but 212% higher year on year (yoy), as per a recent report by rating agency India Ratings and Research (Ind-Ra).

Acharya said most of the industry had not hiked steel prices when coking coal prices were increasing and hence further price reduction is unlikely. "The high-cost coking coal which peaked at $ 408 per tonne fob in October is likely to be in transit for consumption by us in December and partly in January 2022," he said. "We haven't been able to pass on the increased cost impact." AM/NS chief marketing officer Ranjan Dhar said one reason for the recent fall in prices was reduced buying from trader's market. "The effect of coking coal price reduction or iron ore price reduction will not impact the Indian company's cost structure immediately," he said. "If input RM (raw material) prices continue to fall, it might reflect during H1 (first half) of next financial year which is some time away."

Dhar said the current steel price are stable as Indian steel demand is good and improving month on month. "I, therefore, don't see any structural reason for a price correction. On the contrary, the steel stocks levels are low across channels," he said. "We are, however, supporting MSMEs (micro, small and medium enterprises) with a specific initiative via NSIC (National Small Industries Corporation) and hypermart." Jindal Steel and Power managing director V R Sharma said the price scenario is stable and might correct a little when demand picks up. Floods in southern regions of the country and restrictions on construction activities in Delhi-NCR region amid severe air pollution have impacted demand, he said.

"We have already passed on the benefit of the input cost reduction, especially iron ore,"

Sharma said. “Coking coal prices have gone down, and if it falls further that will be passed on to customers slowly and gradually.” Analysts said there is presently no pressure on Indian steelmakers’ margins, but the spreads could face further pressure in case of any more correction in the steel prices by the end of this quarter. “Domestic HRC spreads reduced as anticipated to around Rs 40,300/MT, 14.1% mom lower in mid-November 2021 while domestic rebar spreads reduced by around Rs 6,300/MT mom to around Rs 30,300/MT in mid-November 2021,” Ind-Ra said in its recent report.

Source: The Economic Times

## SteelZero

**SteelZero** is a global initiative bringing together forward-looking organisations to speed up the transition to a *net zero steel industry* and the Organisations that join SteelZero are required to make a public commitment to procure, specify or stock 100% net zero steel by 2050. By harnessing their collective purchasing power and influence, SteelZero is sending a strong demand signal to shift global markets and policies towards responsible production and sourcing of steel.

SteelZero initiative is aimed at driving market demand for net zero steel and has been launched with the support from eight major steel buyers and specifiers from across sectors including construction and renewable energy. This marks the beginning of a significant global business push for clean steel. The first companies to have signed up to SteelZero are:

| | | |
|---|---|---|
| ❖ | **BHC Ltd** | leading UK structural steel fabrication and construction company. |
| ❖ | **Bourne Group Ltd** | leading UK constructional steelwork company. |
| ❖ | **Grosvenor Britain & Ireland** | international property investor and developer. |
| ❖ | **Lendlease** | multinational construction, property and infrastructure company. |
| ❖ | **Mace Group** | global consultancy and construction firm |
| ❖ | **Multiplex Construction Europe** | international construction contractor |
| ❖ | **Ørsted** | renewable energy company and global leader in offshore wind |
| ❖ | **WSP UK** | engineering professional services consulting firm. |

Run in partnership with ResponsibleSteel, the Climate Group, an international non-profit organization.

SteelZero member organisations are required to make a public commitment to transition to procuring, specifying or stocking 100% net zero steel by 2050. Targeting net zero steel from the demand-side of the supply chain makes this initiative the first of its kind, with the potential for it to have significant impact on investment, policy, manufacturing and

production in the sector.

The steel industry is one of the largest contributors to climate change. Much greater investment and progress to cutting emissions is needed, but steelmakers also need to know their customers will buy new, cleaner products in future. By harnessing the collective purchasing power and influence of major steel-using organisations, SteelZero will send a critical demand signal that can shift global markets and policies towards sustainable production and sourcing of steel.

Corporate and public sector demand for responsible, zero emissions steel has a critical role to play in reducing global emissions, encouraging decarbonisation technologies and driving lower emissions from recycled steel and the re-use of steel-based products.

Steel is the world's most widely used material, with the sector selling over $2 trillion worth of products annually. But despite technologies existing for production to be decarbonised, steelmaking is currently one of the biggest emitters of $CO_2$ globally. Total greenhouse gas emissions from the sector alone account for 7% – 9% of direct emissions from the global use of fossil fuels, and this is set to rise significantly with end-use demand for steel projected to grow by almost 40% by 2050.

Steel-using organisations need to be prepared for inevitable changes across their supply chains if they're to remain economically competitive in the transition to a low carbon world. SteelZero also aims to encourage action and to support organisations in their journey to net zero steel.

Steel delivers to a truly circular economy with its unique re-use and near total recyclability. With steel producers continuing their efforts to decarbonise and eventually achieve SteelZero, steel will maintain its foremost position as the most environment friendly, economic and effective construction material of choice.

## JSW STEEL'S PLANNED EXPANSION OVER NEXT 4 YEARS IS EQUAL TO CAPACITIES IT ACHIEVED IN PAST 2 DECADES: SAJJAN JINDAL

JSW Steel's planned expansion over the next four years is equal to the capacities it achieved in the past two decades, Chairman Sajjan Jindal said recently. "We at JSW Steel are adding capacity at an unprecedented rate," Jindal said, speaking at the Bengal Chamber of Commerce and Industry. With over a trillion dollars of investment planned by India in infrastructure, the country's path to being recognised as a global economic powerhouse is paved in steel, the industrialist said. Raw material security, especially that of coking coal, is key, said Jindal. "Currently the only commercially viable way of producing steel from iron ore is by using fossil fuels such as coking coal as reducing agents," he said.

Global coking coal prices had skyrocketed to $432 a tonne in October from $280 in August,

after a disruption in the global supply chain. Jindal said India has got a new role as the factory of the world, as the world pursues alternatives to China. “We are the front-runners in replacing this East Asian giant given our skilled manpower, accompanied by our abundant natural resources and access to quality raw material,” Jindal said. Jindal also reiterated the importance of switching to renewable power sources and making of green steel, and said switching to clean hydrogen is the next solution towards net-zero emissions in India.

“And, while the prices of renewable electricity and green hydrogen are falling fast, the capital costs of setting up new plants—and shuttering old ones— I foresee will be a major barrier to change,” Jindal said. However, a sustainable transition will not come about on its own; “we collectively have the responsibility to take some bold steps towards developing sustainable solutions,” he added. Recently, JSW Steel maintained its rating of ‘A-’ in the 2021 CDP Climate Change assessment.

As per the company’s media statement, JSW Steel is the only company in India and in Asia ex-Japan to achieve a leadership-level rating (A or A-) from the metal smelting refining and forming category.

Source: The Economic Times

## CONCEPT TO HEAT STEEL WITH FOSSIL-FREE HYDROGEN

Ovako Steel, Sweden, claims to be first in the world to heat steel for rolling using hydrogen. Together with Linde Gas AB, Ovako have completed the world’s first successful full-scale trial in a production environment of using hydrogen to heat steel before rolling. The trial using hydrogen instead of LPG (liquefied petroleum gas) before rolling at the mill in its Hofors plant has proved that hydrogen can be used simply and flexibly, with no impact on steel quality, which would mean a very large reduction in the carbon footprint. The use of hydrogen in combustion would have a great positive effect on the environment since the only emission generated is water vapour.

Source : AIST Steel News Rewind

## ADOPTION OF VIABLE GREEN STEEL-PRODUCING METHODS A DECADE AWAY: SAJJAN JINDAL

It may take over a decade to adopt viable methods of green steel production to meet carbon-neutral goals, JSW Group Chairman Sajjan Jindal said a few days back. Jindal, who is also the Chairman of the World Steel Association, said even as switching to clean hydrogen-based steel making technique is the most likely immediate solution to achieve net-zero targets, the investment required to set up new plants while shutting down the old ones will be a major barrier in this transition. "Viable green steel production could be more than a decade away even though several of the world's major steelmakers, including us, are actively developing plans to adopt the process to meet carbon-neutral goals. In this context, switching to clean hydrogen seems to be the most likely immediate solution to get to net

zero.

"While the prices of renewable electricity and green hydrogen are falling fast, the capital costs of setting up new plants and shuttering old ones, I foresee will be a major barrier to change," he said in a statement. A sustainable transition will not come about on its own. The industry will have to take some bold steps collectively towards developing sustainable solutions, he added. At the recently held COP26 Summit, Prime Minister Narendra Modi pledged to achieve a zero-emissions rate by 2070. This was the first time India has set a target on climate action.

"As one of the biggest contributors to greenhouse gases globally, the steel industry has a crucial role to play in achieving this target. While the Steel Industry accounts for 0.7 per cent of the world's economic output, the industry also contributes 7 per cent towards global emissions. This needs to change and needs to change fast," Jindal said.

Curtailing carbon emissions, he said, will require major upgrades at the steel mills, and the initiative will have to be taken at the industry as well as policy level.

The industry will need an entirely new, transformative approach, which includes using carbon capture, utilisation and storage (CCUS) with the existing fossil fuel-based iron making (BF-BOF), substituting hydrogen for carbon as a reductant, and using renewable electrical energy, he added.

With the deployment of the best available technologies, low-carbon steelmaking would become competitive with respect to conventional methods.

While the transition period may involve high initial capital costs and Opex costs, proactive government support through well-designed policy will ensure that the industry is not discouraged from making this transition, the industrialist said.

Source: The Economic Times

## RECENT DEVELOPMENT IN ALUMINIUM FOR AUTOMOTIVE APPLICATIONS

### Abstract:

Aspects of material selection and innovative concepts of car construction using aluminium as best suited light-weight materials were presented, and recent development in established and advanced use of aluminium in passenger cars was discussed that help to meet economic and environmental requirements. 5xxx and 6xxx aluminium alloys were presented that have been improved for the increasing demands regarding higher strength and better formability, resulting in a mass reduction and improved crashworthiness. Furthermore,

advances concerning multi-material light weight design were presented by examples for aluminium solutions in advanced “Multi-material” Super-Light-Car (SLC) concepts, which reaches significant mass reductions.

## 1 Introduction

The European automotive industry is known worldwide as technically most advanced and highly innovative. Based on rising economic and political pressure to reduce fuel consumption and $CO_2$-emissions, the efforts for automotive lightweight construction have increased significantly and specific solutions are proposed based on the use of modified or newly designed aluminium alloys. During the last decade the average amount of aluminium used in passenger cars has doubled (Fig. 1), and based on the new design concepts progress will keep on following this trend in the coming years.

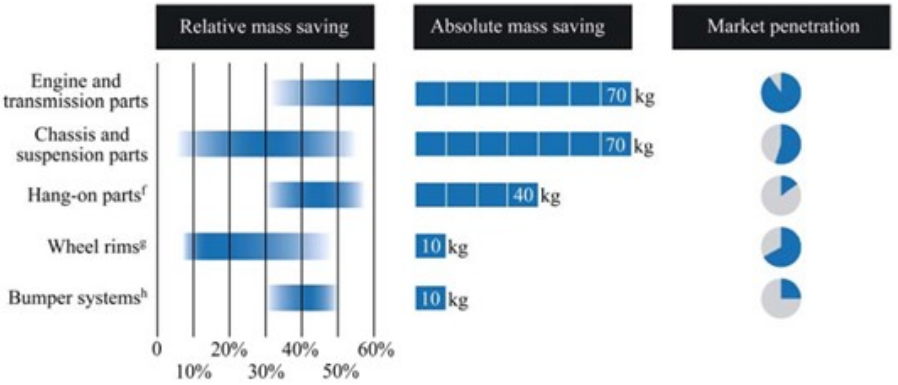


Fig. 1 Aluminium’s direct mass savings and market penetration

In parallel the European aluminium industry has developed and introduced numerous innovative light-weight solutions based on the established and further improved aluminium alloys and optimized aluminium-oriented car design. One of the main advantages of aluminium is its availability in a large variety of semi-finished forms, such as shape castings, extrusions and sheet, all suitable for mass production and innovative solutions. Compact and highly integrated parts meet the high demands for high performance, quality and cost efficient manufacturability.

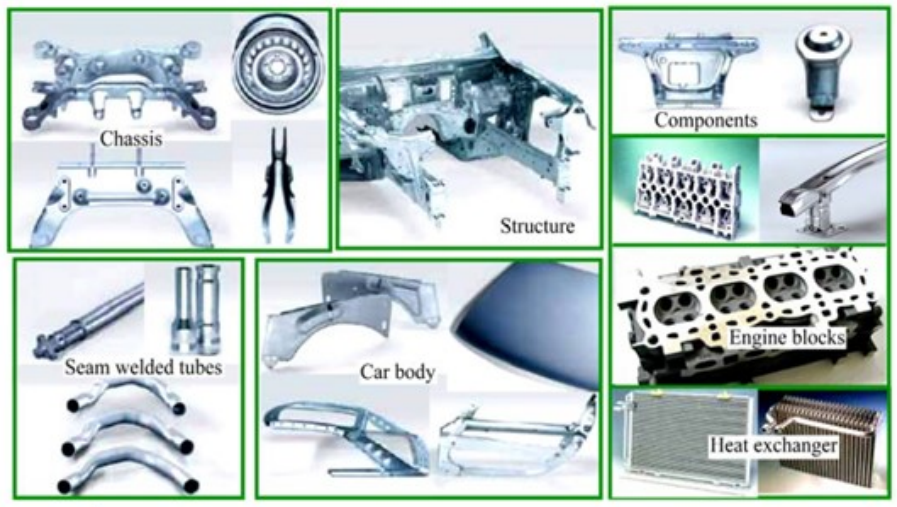


Fig. 2 Aluminium products for advanced automobile applications (Hydro)

Aluminium is in fierce competitive with other materials, like novel steels recently developed, claiming back the light weight potential by higher strength alloys suitable for reducing wall thickness. Other competitor materials are magnesium, titanium and glass or carbon fibre reinforced plastics. The latter has developed further in the aerospace industries, now heavy R&D efforts are made suitable for mass production also for cars, especially innovative electro cars. Innovative car concepts have adopted the multi-material design idea to use for each function the "best" material available.

Challenges involved here are mainly joining and surface treatment issues. Many suitable solutions have been developed. Application of semi-finished aluminium parts increases, e.g. in engine blocks and power train parts, space frames (Audi A2, A8, BMW Z8, Lotus Elise), sheet structures (Honda NSX, Jaguar, Rover) or as closures and hang-on parts (DC-E-class, Renault, Peugeot) and other structural components. Figure 2 shows a selection of aluminium parts used.

The average total aluminium content per car for European cars was 140 kg in 2012. Its distribution has been analyzed systematically as:

- Power-train (engine, fuel system, liquid lines): 69 kg (25 components analysed) in engine block and cylinder head, transmission housings and radiators.
- Chassis and suspension (cradle, axle): 37 kg (17components analysed) in wheels, suspension arms and steering systems.
- Car body (body-in-white (BIW), hoods, doors, wings, bumpers and interiors): 26 kg (20 components analysed) in bonnets and doors, front structure and bumper beams.

The analysis of the average compound annual growth rate (CAGR) indicates that for the body the highest potential exists. Seen as one component the BIW is the heaviest part of a conventional car with a share of between 25% and 30% of the complete car's mass, depending mainly on options installed, engine size, and integrated safety features.

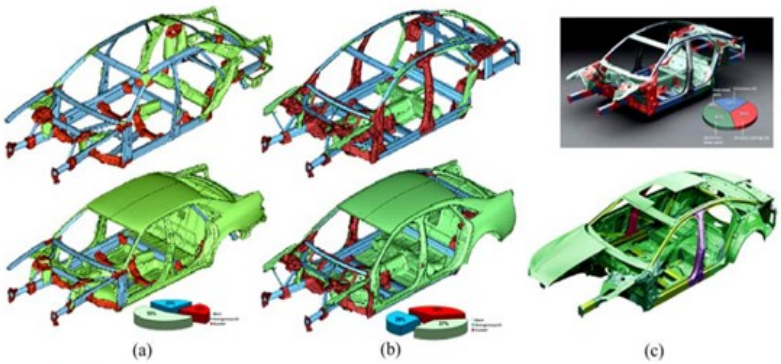



Fig. 3 Aluminium extrusions of AUDI space-frame (AUDI AS series): (a) D2. 1994, (b) D3. 2002, (c) D4. 2009

## 2 State-of-the-art design strategies for bodyin-white (BIW)

There are two principal variants as state-of-the-art for a BIW design.

- "Extrusion space-frame design" for small to medium volume cars: The AUDI A8 (e.g. D3, model year 2002, Fig. 3(b)) is a classical example with a scheduled volume of 25000 cars/year, a BIW mass of 277 kg; consisting of 59 extrusions (61 kg), 31 castings (39 kg) and 170 sheet parts (177 kg). Riveting, MIG-, laser-, and hybrid welds, roll-folding and adhesive bonding are the main joining methods applied here.

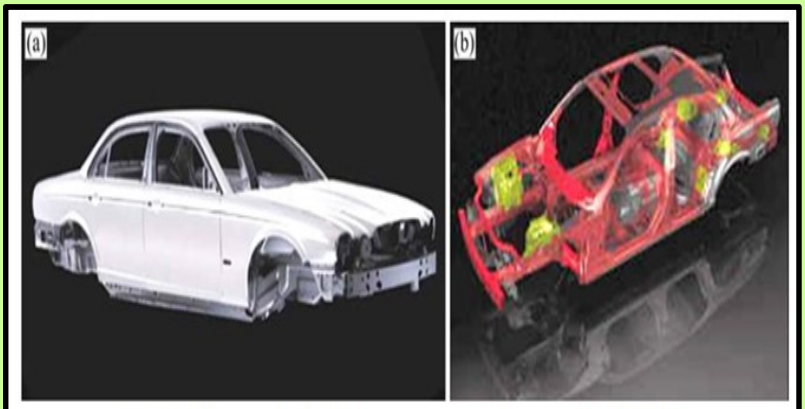


Fig. 4. Stamped sheet monocoque : Jaguar XJ (X350)

- "Stamped sheet monocoque" for medium to large volume cars, for example, the Jaguar XJ (X350), model year 2002 (Fig. 4), with 30000 cars/year and a BIW mass of 295 kg; consisting of 22 extrusions (21 kg), 15 castings (15 kg), and 273 sheet (259 kg). Joining methods are adhesive bonding, riveting, clinching and MIG welding.

## 3.0 Aluminium alloys for car body applications

### 3.1 Age-hardening Al–Mg–Si alloys

6xxx series alloys contain magnesium and silicon. Current 6xxx alloys used for auto body sheet are A6016 (Europe), A6111 (America), and A6181A, which were added more recently because of recycling aspects. In USA, A6111 is often used for outer panels in gauges of 0.9–1.0 mm which combines high strength with good formability. In Europe, EN-6016 is preferred and applied in gauges of 1–1.2 mm. It shows a superior formability and filiform corrosion resistance and allows flat hems even on parts with local pre-deformation. However, the bake-hardened strength of 6016 is significantly lower than that of A-6111.

New alloy and processing modifications have been introduced in recent years to meet the increased requirements. Higher strength alloys may allow outer panel thickness reduction with no loss of dent resistance, provided stiffness requirements are met. As paint-bake temperatures decrease, there is increasing demand for a significantly higher age hardening

response. However, for some parts formability remains the major difficulty. Therefore, special alloy modifications with either improved formability or strength have recently been developed by European aluminium sheet manufacturers and agreed upon as standards by the automotive industry.

## 3.2 Non heat-treatable Al−Mg−Mn alloys

Al−Mg−Mn alloys show an optimum combination of formability and strength achieved by the mechanism of solid solution and deformation-hardening due to their specific high-strain-hardening. Further improvement in properties required for specific applications (e.g. surface appearance, corrosion resistance, thermal stability) has been achieved by small additions of other alloying elements and/or modified processing routes, e.g.stretcher strain free ("SSF") sheet, avoiding Lüders-lines.

Non heat-treatable Al−Mg−Mn alloys are applied in Europe for automotive parts in larger quantities as hot and cold rolled sheet and hydro-formed tubes due to their good formability which can always be regained during complex forming operations by inter-annealing where quenching is needed for age-hardening. In chassis parts or wheel applications the benefit is twofold since the mass reduction in the unsprung mass of moving parts additionally enhances driving comfort and reduces noise levels.

A well-established alloy with high magnesium content, AlMg5Mn (A5182), is used for high strength and complex stampings. For 5xxx alloys containing >3% Mg the precipitation of $\beta$-Mg5Al8 particles at grain boundaries can result in susceptibility to intergranular corrosion cracking (ICC) by long term exposure at >80 °C. For these conditions special high-Mg-content alloys have been developed with a good compromise for sufficient strength and ICC resistance.

For all other cases, special high-Mg-content alloys (>6% Mg) have been introduced which show high strength and strain-hardening, thus also enhancing formability. Al−Mg−Mn alloy sheet has also been successfully applied or is currently being tested in many parts for structural support, pedal boxes, heat reflectors, lever arms etc. Al−Mn EN-AW 3xxx alloys are applied to heat-exchangers which is another success story of aluminium sheet and extrusion applications that started in Europe many years ago. It is an increasing market with intensive R&D, established for advanced lightweight technology for radiators and air conditioning systems in cars (and elsewhere) worldwide.

## 3.3 Extrusions

A wide field of aluminium solutions and applications is opened by making use of the well established technology of aluminium extrusions. Here quite complex shapes of profiles can be achieved, thus allowing innovative light-weight design with integrated functions. In Europe completely new and flexible car concepts (e.g. the aluminum space frame, Fig. 3(a)) and

complex sub-structures (e.g. in chassis parts, bumpers, crash elements, air bags) have been developed using aluminium extrusions. Their high potential for complex design and functional integration is most suitable for cost-effective mass production. Medium strength 6xxx and high strength 7xxx age-hardening alloys are used since the required quenching occurs during the extrusion process. Formability and final strength are controlled by subsequent heating for age-hardening. Extrusions are applied to space-frame design (Fig. 3), bumper beams and crash elements/boxes.

## 3.4 Castings

The highest volume of aluminium components in cars is castings, such as engine blocks, cylinder heads and special chassis parts. The substitution of cast iron engine blocks continues. Even diesel engines, which continue to gain a substantial increase in market share in Europe, are being cast in aluminium, due to the high requirements on strength and durability. Cast iron has generally been used before. However, progress in aluminium alloy development (Al−Si−Cu−Mg−Fe type) and new casting techniques come up with improved material properties and functional integration that enables aluminium to meet these requirements. Aluminium castings are also gaining acceptance in the construction of space-frames, axle parts and structural components. Complex parts are produced by special casting methods that ensure optimal mechanical properties and allow enhanced functional integration.

For high pressure die cast (HPDC) new AlSiMgMn alloys have been developed with enhanced strength and ductility combination. In the SLC project structural parts in the wheel house architecture have been designed using advanced aluminium die cast with an integrated striker plate.

## 4.0 Aluminium in competition with other lightweight materials

The new BIWs concept of “Multi-material designs”, consists of a suitable application of any available material, under the principle idea to use the “best” material for each function, which means aluminium applications together with high and ultra-high strength steels, magnesium and plastics or composites. An additional major goal is to achieve an overall cost efficient light-weight design. This is the main objective of the “Super Light Car” (SLC) project.

Sustainable production technologies of emission reduced light-weight car concepts were initiated in 2004, started in 2005 and ended in 2009. 38 partners: 7 OEMs (CRF, DC, Porsche, Renault, Volvo, Opel and VW as project coordinator), 10 R&D companies, 10 suppliers, 8 universities and 3 SMEs, came together to evaluate current and new technologies and to design and construct new light-weight car with the motivation to design and construct a weight reduced vehicle structure to a reduction in $CO_2$ emissions and fuel consumption as a global ecological and local economical and customer benefit. The SLC car should be suitable for large series productions as an economically producible advanced

(multi-) material vehicle structures.

Two important boundary conditions are to be taken into account.

## 1) Affordable cost

Mass is a major factor, besides aerodynamic drag, rolling resistance, engine efficiency, electric consumption, that contribute to $CO_2$ emission. Investment will be target in the factor that yields a maximum $CO_2$ reduction per invested Euro: so for each factor, a maximum allowable cost increase can be calculated. It strongly depends on the material selection and the slope must be decreased by an intelligent multi-material approach that can meet the increasing limits of the CAFÉ regulations on an acceptable level (Fig. 5). For mass reduction, the cost target for SLC is specified as <5 €/kg mass saved. The costs are calculated including material cost, production cost, investment depreciation and recycling revenues. An effective cost model has been developed based on the traditional production methods for the present steel body taking into account the new materials, parts with integrated functions and production methods.

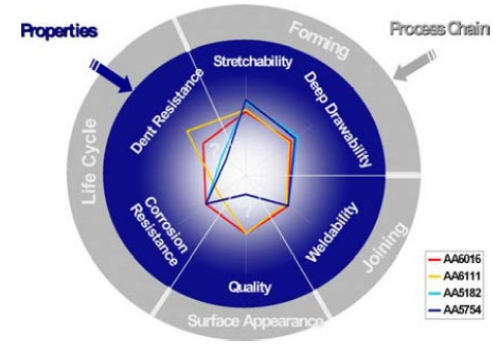



**Fig. 5** Specific properties of EN-AW 5xxx and 6xxx sheet alloys competing for car body and hang-on-part applications

## 2) Optimum performance

In order to make an appreciable contribution to worldwide $CO_2$ reduction, the reference BIW selected is a high volume car (Golf V). The present Golf V meets the stringent European standards on crash, obtaining a 5-star rating in the Euro NCAP test. This is achieved in part by making extensive use of high strength steels. Steel, however, has a limited mass saving potential of 55 kg. The challenge for the SLC project is to see if other materials can provide similar crash performance and 5-star rating for a mass optimised BIW. The SLC project included a broad pre-competitive technology screening, testing and also new development in special aluminium alloys for BIW structural application (5xxx, 6xxx and 7xxx alloys). Aspects here are high strength, formability, energy absorption and excellent crash characteristics, e.g., a new hot forming 5xxx alloy, a high strength 6xxx alloy with fast paint bake response for roof and body applications.

Suitable technologies were evaluated and developed by up-scaling of most promising and improving of existing aluminium and magnesium sheet and warm forming technologies, HPDC for complex structural parts forming technologies, aluminium–steel TWB's for crash-beams, joining and assembling for multi-material high production BIW.

The SLC project has first designed three different concepts (Fig. 6) with priorities for mass reduction through specific material design and joining methods and part count and cost targets (material, part production and joining):

- A steel intensive "light-weight" concept (promoted by Arcelor) with increased utilization of high strength steels delivered a maximal mass reduction of 55 kg (19%) with minor additional costs of <2.5 €/kg. The highlights here are a strut tower in X-IP 1000 steel, a tunnel in hot-formed high strength steel (Usibor 1500), bodyside and B-pillar in dualphase-steel, a roof in Quiet steel and fender in Usilight.

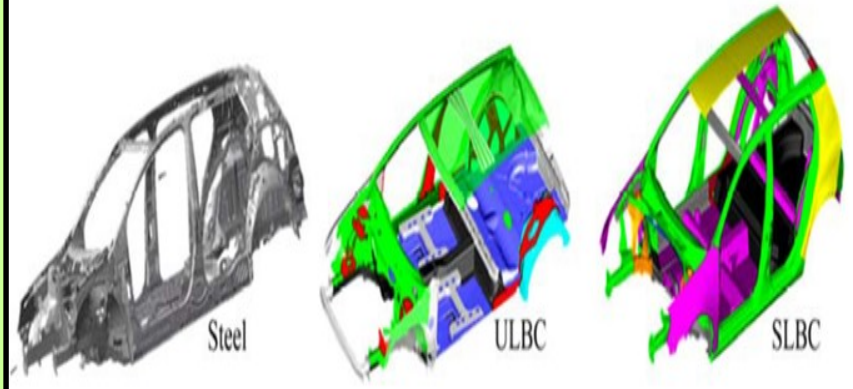


Fig 6. Three basic SLC-body multi-material concepts (SLC project)

- An intermediate light-weight concept called Ultra-Light Body Concept (ULBC), which achieved a further mass reduction of 77 kg (27%) but with higher (but limited) additional costs (<5 €/kg). Here the highlights are a longitudinal rail in FeMn steel tailored welded sheets, a suspension-strut mount as Al-diecast (Silafont 36), a tunnel in FeMn-blank steel, a rear wheelhouse and an inner B-pillar in Al-diecast and a roof in Al-sheet. In this light-weight concept a new multi-material design was applied for a significant mass reduction, using steel in the loading paths and lightweight design materials such as aluminium for the front end and roof with cast parts of high functional integration.

- An intensive light-weight concept called Super Light Body Concept (SLBC), which achieved major mass reduction of 112 kg (39%) with the highest additional costs (<10 €/kg). Here highlights are a longitudinal rail in high strength Trip800 steel in tailored welded blanks, a strut tower as Mg-diecast, floor panels in Al- and Mg-sheet, a wheelhouse and rear longitudinal rail in Al-sheet, the inner B-pillar in Usibor (PHS) steel and a roof in Mg-sheet.

## 5.0 Final SLC body concept

The final SLC-body concept (Fig. 7) shows an optimum between mass reduction of 95 kg (34%), i.e. a mass saving of 41% vs reference (from 65 kg to 110 kg) and an additional part costs of 5 €/kg. It has a magnesium roof and a steel floor frame (i.e. lighter on top than underneath) and a torsion ring in the side structure made of form-hardened high strength steel combined with an aluminium sheet frame. For the inner B-pillar TWB steel sheet is used with an external aluminium skin. Aluminium is used as sheet panels and as extrusion in front rails, bumper, crash elements, in the rear underbody rail, and in the wheelhouse structure as HPDC (high pressure die cast).

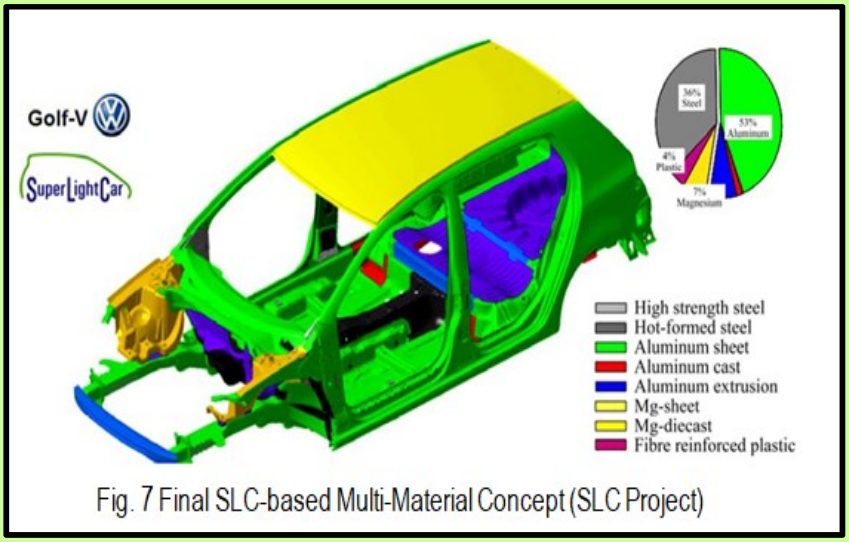


Fig. 7 Final SLC-based Multi-Material Concept (SLC Project)

## 6.0 Aluminium innovation in SLC concepts

In the multi-material SLC design the contribution of the aluminium concerns new alloys as well as alternative production methods for aluminium parts. Aluminium sheet is predominantly used for BIW panels and closures. Despite the existing “all aluminium vehicles” like Audi A8 and Jaguar XJ, aluminium in mass produced vehicles needs to reduce development time and other additional costs in new production methods and/or new alloys. Innovative aspects investigated are as follows.

- Heat forming is a new technique for producing complex aluminium tubular shapes using internal gas pressure to form hollow bodies or tubes within a warm environment. It provides a competitive alternative to hydro- or superplastic forming (SPF).

- Tailor welded blanks (TWB) are a mature product for steel automotive applications which is easy to adapt also to aluminium. There is one example of aluminium TWBs in series production: the back plate of the front wheel house of the Lamborghini Gallardo. The SLC project proved that aluminium TWBs can be applied for demanding deep drawn parts at higher volumes. Figure 8 shows the door inner panel of the Volkswagen Golf V produced from TWBs for the SLC prototype. The aluminium tailor welded blanks have been successfully stamped to produce inner door panels,

using a two-step laser welding operation to obtain 140 mm deep drawing depth without breaks in the laser welded seam (Fig. 8(b)).

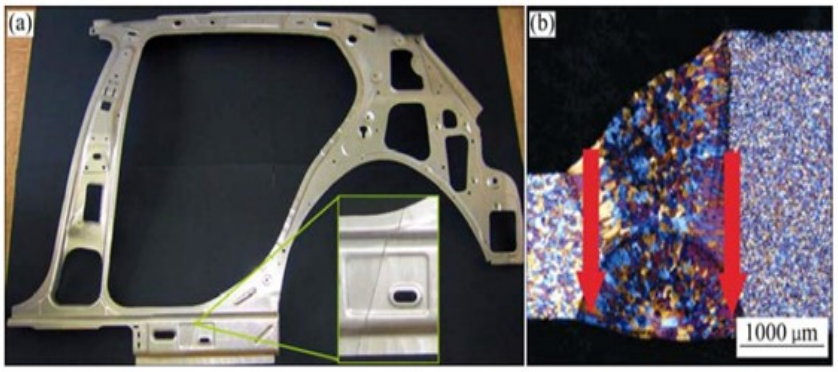


Fig. 8 Door inner panel produced from tailor welded blanks (TWB) (a) and double sides laser weld (b) ensuring excellent forming properties (Hydro)

Geometrical accuracy of stamped panels is acceptable for production use, showing that the process is technically feasible for mass production.

- **Laser brazing steel–aluminium** The next logical step after steel TWBs and aluminium TWBs is a combined steel–aluminium TWB.

However, this is more complicated because of the joining of steel to aluminium. Conventional fusion welding gives poor quality joints due to the formation of brittle Fe–Al intermetallics. Besides the well-known technologies such as mechanical fastening and adhesive bonding, a recently developed technology called laser brazing shows good potential for joining steel to aluminium.

## 7.0 New aluminium alloys for automotive applications

Several new product developments were introduced in the SLC project to meet specific demands of the BIW that cannot be met by the present aluminium alloys. For instance, a high-Mg-content 5xxx alloy especially dedicated to warm forming. New 6xxx alloys for structural applications were introduced, used for the crash members in the front structure of the SLC model, or a new 6xxx alloy has been introduced as 'Roof alloy' when placed on a steel structure with fast paint bake response to withstand thermally induced plastic deformation.

## 8.0 Summary and conclusions

Due to its low density, good formability, and corrosion resistance, aluminum is the material of choice for many automotive applications such as chassis, autobody and many structural components. Aluminum alloys tailored by suitable variations in chemical composition and processing best fit many requirements, like the non-heat treatable Al–Mg alloys used in chassis optimized for superb resistance against intercrystalline corrosion and concurrent

high strength or the heat treatable Al−Mg−Si alloys for extrusions and autobody sheet modified for improved age-hardening response during the automotive paint bake cycle. With a sound knowledge of the specific material properties and effects, excellent light-weight solutions for automotive applications have been successfully applied by the European automobile industries. Intensive R&D and continuous collaboration of material suppliers and application engineers provided optimum solutions for sometimes contradicting aspects of the specific requirements, e.g. for the specific material selection and optimum combinations of strength and formability.

Material specific processing routes and individual solutions have been developed in close cooperation with OEM partners and suppliers. Applying the full knowledge about the physical processes involved and the microstructure/properties correlation, a tuning of properties is possible in order to produce optimum and stable products required for the high demands in automobile applications.

The examples given for the successful implementations prove the major breakthrough in automotive applications of aluminium that have been achieved during recent years by developing innovative light-weight and cost-efficient solutions. With the reference of the SLC project results, it is expected that in the near future the use of aluminium with specifically improved properties will grow in many automobile applications, meeting the increased economic and ecological demands. Due to the positive experience gained in the project and from the former successful applications, its volume fraction used in cars of all classes and all sizes will grow significantly.

The SLC concept shows clearly that aluminium can be used for the car body structure and that there can be a mass advantage of at least 30% without losing performance. For most parts the present grades used for exterior panels can be applied. In some cases, when very high strengths are demanded, 7xxx series alloys can be used to maintain this significant mass advantage. For large volume applications, aluminium solutions are most cost effective. Castings will be applied in areas where strong part integration is feasible. Extrusions can be easily applied as straight profiles, but also forming of an extruded profile is a competitive process for high volumes, e.g. as bumper beams as used in the SLC prototype car.

Aluminium is the ideal light-weight material as it allows a mass saving of up to 50% over competing materials in most applications without compromising safety.

Source: www.researchgate.net

## BASE METALS SCALE LOWER IN NOVEMBER 2021

Base metals Industrial metals have been a favourable investment option in 2021, with most of them giving double figure returns (YTD). Mounting supply uncertainties coinciding with

promising demand prospects has led to the solid rally in the industrial metal prices this year. Aluminium and Zinc have one of the top picks as lowering supply from major producer China has kept the supply market tight in times of booming demand. The demand for Industrial metals is set to proliferate in the years ahead following the transition away from fossil fuels. A shift towards a clean and green ecology by many nations i.e. towards a low carbon future is going to keep the demand for industrial metals elevated.

However, mounting inflations worries, disruptions in China's property sector, increasing bets towards a potential interest rate hike by the US Federal Reserve and discovery of the new variant of the Covid 19 virus pressured the Base metal prices in the month gone by. Disruptions in China's property, construction and manufacturing segments (the major consumers of Base metals) pressured market sentiments. Moreover, enforcement of production limitations and power usage curbs hampered the domestic demand for industrial metals in China which further pushed prices lower. Liquidity concerns reflecting the debt worries in China's property segment and chances of sooner than expected increase in interest rates undermined the outlook for the Base metal complex.

## Zinc Prices ease

Zinc prices eased after a solid rally in in early October'21 in line with the fall in most of its peer metals. Zinc slipped lower by 4 percent on the LME and MCX last month despite disrupted supply amid resumption in global economic activities.

Along with the Limited supply of Zinc from major producer China, production cuts announced by major suppliers like Glencore, Nyrstar and Trafigura kept the Zinc supply chain tight. Also, the recent power crisis witnessed in major economies pressured smelting capacities around the globe and helped Zinc prices advance to record levels in October'21. Disrupted supply came in line with the resumption in global economic activities which further strengthened market sentiments. Easing pandemic forced restrictions raised expectation of revival in global demand which added to the upside in Industrial metal prices.

However, the rally in Zinc and other industrial metals soon ended reflecting the increasing inflation concerns and China's move to ease power prices. Easing coal prices in China, which is a key component used for powering smelters and other production activities, somewhat took the pressure off the supply chain. Also, slow growth in China's industrial sector further pressured the Base metals. Increasing energy usage limitations hampered China's steel production which clouded the outlook for Zinc which is majorly used for galvanization.

## Supply worries persist

The supply threats for Zinc continue to intensify following reports suggesting a halt in operations at Glencore's zinc sulphide operations in Italy for Maintenance work. The Zinc

plant has an annual capacity of 100,000 tonnes.

Also, the Swedish miner Boliden stated that its Tara Mine in Ireland (one of Europe's largest Zinc reserves) had to stop the output activities after large amounts of water enter the mine while drilling of the ventilation shaft. The Mine produced 127,000 tonnes of Zinc concentrate in 2020. Even the reports from the International Lead and Zinc Study Group (ILZSG) showed that the deficit in the global zinc market deficit climbed up to 44,000 tonnes in September'21 from a deficit of 14,000 tonnes in August'21.

## Outlook

While the supply worries from China have eased in the past few weeks; weaker demand prospects from their property sector still remains a considerable headwind for industrial metals. Moreover, a stronger US Dollar following bets over an early hike in interest rates by the US Federal reserve might further pressure the Base metals complex. Higher interest rates could trim the liquidity in the financial markets. Markets are expected to have a keen eye on the developments in the US economy for cues on FED's upcoming move. Bleak demand from China, worries over the Omicron virus and bets over a tighter monetary policy might keep Zinc prices under pressure in the coming weeks. We expect Zinc prices to trade lower towards Rs.260 per kg in a months' time frame. (CMP: Rs.274)

Source: Metalworld

## HEATING WITHOUT GAS - SHIFTING TO ELECTRIC HEATING SYSTEMS FOR MORE ECO-FRIENDLY PRODUCTION

The green revolution is accelerating in many industries, as next-generation electric heating systems gradually replace gas burners. But how can a furnace help achieve a business's sustainability goals? Here, Daniel Burton, business manager at Kanthal, a provider of industrial heating products and services and part of Sandvik Group, explains how helping customers switch from gas to electric furnaces has achieved results that are worth celebrating.

The integrated steel plants of today use many different thermal processes for steel production. For primary and secondary production, processes require heat to galvanize, anneal and heat treat steel products in general. Extreme heat requires extreme power and, because of this, furnaces play a vital role in fuelling steel production. However, all of this heat comes at a price. Most commonly, the furnaces that deliver the temperatures needed for steel production are powered by fossil fuels. While fossil fuels are effective, their negative impact on the environment is no secret. Yet demand for steel is rising. To support this potential, and also to further it, steel production must undergo some environmental improvements. One is to switch from fossil fuels to electric-powered furnaces.

Electric heating systems by Kanthal are designed for a range of industrial heating applications, including steel processing. They are shown to deliver significant reductions in energy consumption compared with gas-heated systems. In fact, the net efficiency of Kanthal electric heating systems is 70 per cent, compared with only 20 per cent for gas. Electric furnaces can also help achieve a cleaner, safer and quieter working environment, making it a much healthier place for employees.

## Go green

While electric furnaces demonstrate "a new dawn" of sorts for steel, the material's long and unchanged history makes it difficult to realise new innovations. To help its customers begin the process of switching from fossil fuels to electric-powered furnaces, and to help them reach their own sustainability targets, Kanthal has developed a service portfolio that includes a customised, onsite evaluation service. The service provides calculation models, reports and recommendations to help identify the best electric furnace for each customer's specific needs. The services are helping to deliver a measurable and lasting environmental impact for Sandvik, its customers and the planet. This is backed-up by data from measuring 34 installations of Kanthal electric furnaces across the globe. Kanthal tracks a running total of the $CO_2$ savings that these furnaces have achieved. The total, which updates every second, has counted hundreds of millions of kilograms, so far.

## Winning results

To recognise the success of Kanthal's sustainable innovation, Kanthal Services was nominated for the first Sandvik Sustainability Award in Memory of Sigrid Göransson, named in honour of the famous Swedish philanthropist (1872-1963) who was born, and died, in Sandviken, Sweden, the town where the Sandvik Company was founded. Award entries came from all three of Sandvik Group's business units — Sandvik Materials Technology, Sandvik Rock and Mining Technology, and Sandvik Machining Solutions — all of which have made considerable progress towards the group's sustainability goals. These objectives include halving Sandvik Group's $CO_2$ impact by 2030, towards which Kanthal Services significant contribution saw it crowned as the winner of this year's award.

In addition to aiding Sandvik's goals, Kanthal's evaluation has helped its customers meet their own sustainability and workplace targets, comply with regional emissions rules, and have even facilitated support from the Government of Sweden for expansion projects. Creative collaboration and identifying the need for change is a key to breaking age-old traditions, which include those relating to sustainability and steel production. While it's clear that we need to change our approaches to industrial heating, executing these changes isn't always easy. That's why, by implementing a progressive evaluation process, Kanthal and Sandvik have demonstrated that a simple switch can deliver significant progress. Using electric heating for processes such as anode preheating, the right equipment can contribute

towards reducing $CO_2$ emissions, even in unlikely applications.

Source: www.steel-technology.com

## FORTUNE 500 INDIA: SURGING METALS SUPER CYCLE

*Infrastructure build-up, production cuts in China, domestic capex have changed the fortunes of metal companies over the last few quarters. Will the trend turn into a multi-year boom for the sector?*

That metal prices move in cycles is well-known. Still, the uptrend after the outbreak of Covid-19 has been nothing short of spectacular. Consider this —US Midwest domestic hot rolled coil steel prices have risen more than three times since April 2020. Copper is up 44% since October 2020 on the London Metals Exchange (LME). Aluminium is up 65%. But why Covid-19? The pandemic was a giant demand killer but brought good tidings for metal companies after the initial hit as nations started stimulating their economies, pushing excess liquidity into commodities and other financial assets. Then, China cut back production of metals, especially steel, to protect its environment, even as governments such as India's went on a construction overdrive to manage social distress from job losses due to pandemic lockdowns.

In India, average price of hot rolled coil (steel) rose 55% from ₹44,880 per tonne in November last year to ₹69,600 a tonne in October this year. Cold rolled coil prices rose 81% to ₹90,880 per tonne from ₹50,060 per tonne in November 2020. With prices showing no signs of abating, metal producers such as Tata Steel are laughing all the way to the bank. In the first half of this financial year (April– September), listed metal and mineral companies reported an all-time high net profit of ₹82,500 crore, close to 14 times the ₹6,000 crore in the same period of the previous financial year. With metal makers getting pricing power, demand remaining high, and profitability rising, is the metal sector in the middle of a super cycle?

After all, LME prices of metals such as zinc, lead, nickel and tin, too, have seen a similar trend in the last one year. Tin prices on LME, for instance, have more than doubled to $3,772.30 per 100kg since October 2020. The benchmark S&P GSCI index, a barometer of commodities markets, has more than doubled from its April 2020 low of 241.45 to 567.13 (November 19).

The world has witnessed four commodity super cycles till date. Three – triggered by US industrialisation in early 20th century, rise of Nazi Germany in 1930s and re-construction of Europe after World War II – stemmed from social and geopolitical disorders. The fourth was led by infrastructure build-up in China after it joined the WTO in 2001.

Is the current cycle similar? Will it last?

## Stimulus, Infrastructure Build-up

After the Covid-19 outbreak, governments across the world rolled out stimulus packages totaling about $20 trillion. Almost a third of this has found its way to infrastructure projects and supported metal prices, as per domestic steel industry estimates. The good news is that there is no sign of government spending moderating any time soon. The latest is the Joe Biden administration's $2 trillion plan to "overhaul and upgrade" the nation's infrastructure. India, too, has been very much a part of the global infrastructure boom. The central government, for instance, has announced a ₹5.52 lakh crore capital expenditure for FY22 with focus on highways, railways and health, pushing demand for steel and other commodities. It is likely to further increase these allocations in Budget 2022-23. Then there is the massive global push towards building green energy infrastructure. The domestic steel industry is also bullish on demand from renewable energy projects as well as the automobile sector. "We are already supplying for solar panels," says Tata Steel Managing Director T.V. Narendran. Another factor driving demand is government's thrust on laying pipelines for ensuring 24-hour drinking water supply, say industry executives.

## The China Trigger

At the other end of this demand boom is China, whose production curbs to reduce pollution have caused supply disruptions in global markets. China's crude steel production fell from 99.5 million tonnes in May to 73.8 million tonnes in September this year, according to data from the World Steel Association. The September production was down 21.2% YoY. This gives other nations a chance to fill its void in global markets.

Over the last decade, China had been a major disruptor in the global metals market, selling at ultra-cheap prices and forcing nations to impose import curbs to protect their producers. In June last year, India also imposed anti-dumping duty on various steel categories from China, Vietnam and South Korea. Steel prices went up from ₹47,325 per tonne (hot rolled coil) in June 2020 to ₹57,250 a tonne in December last year. However, with prices going through the roof and impacting small businesses, Finance Minister Nirmala Sitharaman announced reduction in customs duty on flat and long products of non-alloy, alloy and stainless steel from 12.5% to 7.5%. Benchmark prices cooled to ₹53,550 a tonne in March before rising again on account of domestic demand to ₹66,000 a tonne. India's top steel maker, Tata Steel, which reported a 661% increase in consolidated net profit to ₹11,918 crore in Q2 of FY2022 as against ₹1,565 crore a year ago, is confident of strong steel consumption in India. "India is well-positioned from the steel industry's point of view. We believe consumption of steel in India will grow quite strongly," says Tata Steel's Narendran. "With focus on infrastructure, I am seeing investment-led growth, which means steel consumption will grow at least on a par with the GDP growth rate," Narendran says, adding that renewables is also a good opportunity for steel makers. He says China may not remain a disruptor in global markets as it is pacing production to its domestic needs. He expects steel prices to remain higher than in the last 10 years.

Other industry representatives say India is on the threshold of a multi-year super cycle as far as metals, specifically steel, are concerned. “A transitional event is causing revival in demand in the market. Government response towards Covid-19 economic revival is metal intensive. That is one trigger. Another trigger is transition to green infrastructure, which requires steel. We are very optimistic on domestic demand,” says Seshagiri Rao, Joint MD and Group CFO, JSW Steel. Rao says current $15-16 million demand from renewables may grow to $90-100 million in coming years.

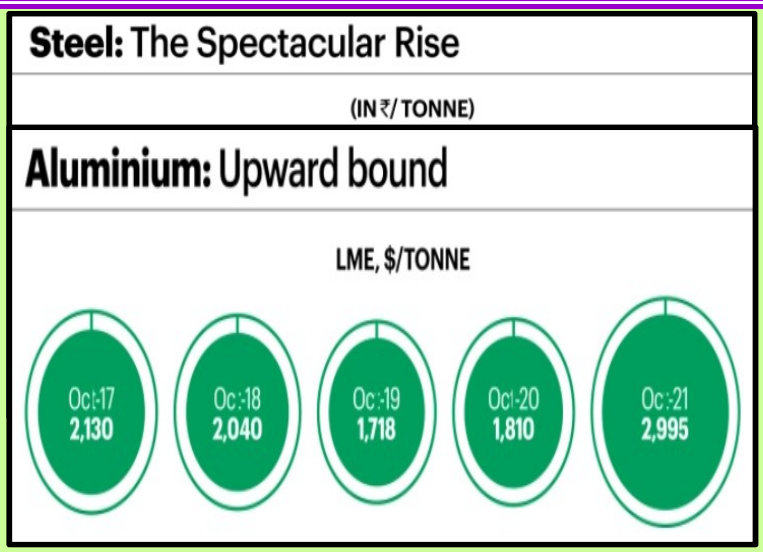
JSPL MD V.R. Sharma says steel demand is likely to sustain for at least a decade as $5-6 trillion out of the $20 trillion global stimulus will come to the steel sector. “This will translate into huge demand in the next one decade, which will pave the way for new investments. Additional capacities will start getting added by 2024-25. Global steel consumption will continue to rise 5-7% Y-o-Y,” says Sharma. He says Indian steel companies are not inking any memoranda of understanding with global partners and are playing mostly in the international spot market. “That sweet spot is available, so people are enjoying,” he says, adding that one of the major sources of demand is the central government’s drinking water supply project. “The largest demand is from water pipes. Large diameter water pipes are in demand under government plans to connect most of the rivers with rural and urban centres to prevent rain water from flowing into the sea,” says Sharma. The allocation for the Jal Jeewan Mission was enhanced more than four-fold to `50,000 crore in this year’s budget compared with ` 11,500 crore in FY2021. “Water supply for all is a big positive for the steel segment,” says Narendran. The World Steel Association has also projected a rise in demand for finished steel products in India this year as well as in 2022. The demand is projected to grow 16.7% to 104.3 million tonnes in 2021 from 89.3 million tonnes in 2020. In 2022, it is expected to grow 6.8% to 111.4 million tonnes.

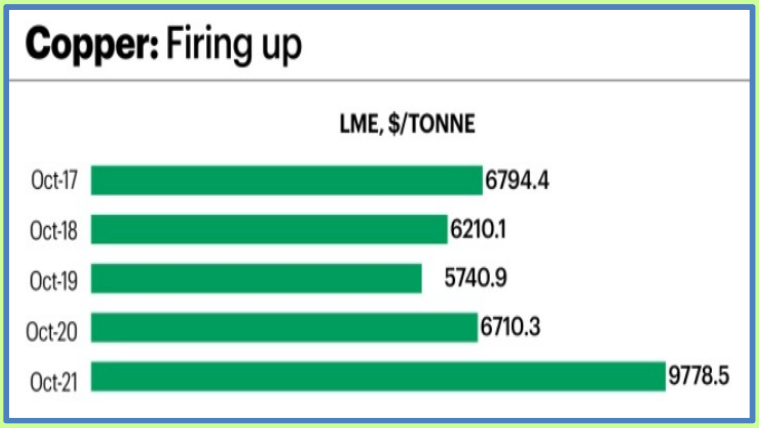
## Capacity Augmentation

The steel industry has made investment plans in line with demand forecasts. While JSW Steel will invest ₹30,000 crore by March 2024, JSPL will invest ₹18,000 crore. Tata Steel has said it will stick to its investment guidance of ₹10,000-12,000 crore next year.

“We will augment the Angul capacity from 5.4 million tonnes to 12 million tonnes in two phases at an investment of ₹18,000 crore,” says JSPL’s Sharma, adding that the entire expansion will be funded through internal accruals. JSPL also plans to become ‘net debt free’ by July next year. “We are aiming at cutting debt from ₹11,164 crore in Q2 to ₹5,000 crore by the end of the financial year,” says Sharma.

Sharing details of JSW Steel's investment plans, Seshagiri Rao says, "We have a capacity of 27 million tonnes. We plan to take it to 36.5 million tonnes by March 2024. In 2017, we had planned an investment of ₹48,000 crore to take us to 27 million tonnes. All projects under that phase have been commissioned. The ₹30,000 crore expansion we are planning now is over and above that." On debt, he says, "As of now, we have a debt of ₹55,000 crore. It is not big for the size of the company. Our Ebitda in first six months of the current financial year was ₹20,700 crore. If we repeat the same in the second half, we are talking about ₹41,000 crore Ebitda. The overall ratio is comfortable. Cash generation from hereon will be quite significant. We do not want to raise the debt to Ebitda ratio. We are at 1.6, in line with what we are guiding to the market."

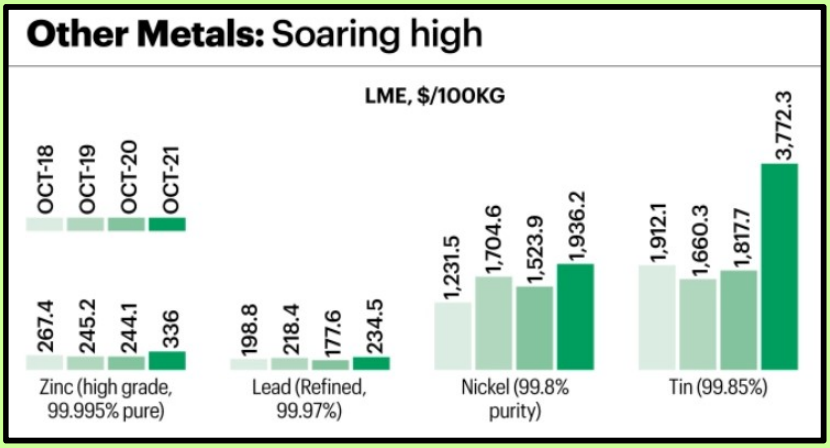



## Other Metals

Other metals such as aluminium and zinc are shining too. Credit Suisse recently revised its FY22 LME aluminium price forecast from $1,900 per tonne to $2,670 per tonne. Here, too, one of the reasons is supply side in China, the largest producer.

Earlier this year, Vedanta founder Anil Agarwal had said the group will invest ₹37,500 crore in the



next three years in oil and gas, aluminium, zinc, copper and steel. With prices on the upswing, Novelis, the US subsidiary of Hindalco, is planning to expand the downstream business. Nalco has lined up ₹30,000 crore investments by FY2028. It seems the bull run in metals is not going anywhere soon.

Source: www.fortuneindia.com

## FORTUNE 500 INDIA: "GAS IS THE ANSWER TO OUR ENERGY NEEDS FOR THE NEXT 10-20 YEARS"

*Before demand moves to electric or renewables by 2050 or 2060, the gas horizon is going to grow for the next 20-25 years, says BPCL CMD Arun Kumar Singh.*

### On EV Transition

The whole objective is to see if this transition is gradual or at least orderly. We don't know how much time it will take for the transition, but we need to be ready. It also makes sense for us to pursue this besides being environment-friendly. So it is a win-win situation for both sides. If economic growth is at 7-8% for the next few years, electric may chip in with some share. There are various factors and ecosystems which will work towards finding the right equilibrium. It will keep changing year by year in favour of something else. That is what we call dynamic equilibrium. We have around 20,000 energy stations across the country. There are infinite opportunities. We can use it anyway. In battery technologies, India is at least 15 years behind and we are exploring both organic and inorganic opportunities.

### On Capacity Expansion

We have done expansions in recent years and have a capacity of 35.3 MMT. Even if diesel and petrol demand grows, we don't have to expand refining capacity for transportation fuels for the next four-five years. We can increase further 10-15% due to good design of our refineries and that will take care of demand for 10-12 years. BPCL is the only company not importing motor spirit [MS]. We are ready with plans to add around 1.2 MMT of ethylene capacity. We also plan to do polypropylene in a big way. Our economy will continue to grow and our petchem demand will grow. For the West, population has saturated and demand is stagnating. It is natural for them to move to solar or electric. Our primary energy demand is growing and so demand for fuel and petchem will be there. Our per capita income is one-fourth of the global average and we are yet to catch up with them in quality of life.

### On Natural gas

Gas is the transition fuel and the answer to our energy needs for the next 10-20 years. Before we become a mature economy and demand moves to electric or renewables by 2050

or 2060, the gas horizon is going to grow for the next 20-25 years. Already we have 37 GAs awarded, including in JVs, and these are mostly in urban areas. We have kept aside a good amount for cross-country pipelines and GAs. We are converting our pumps into energy stations, offering at least five fuels — petrol, diesel, gas, flexi-fuels like ethanol and electricity charging stations. These 7,000 outlets will cover 80% of business volume from our pumps. We have balanced assets in exploration and production of gas and oil, an area we have been in for 15 years. In Mozambique, we have 10% stake in a partnership asset and are setting up a 12-MMTPA LNG terminal. We have invested in a producing oilfield in the UAE, and producing gas fields in Russia. We are developing assets in Brazil. Between Mozambique and Brazil, we are investing ₹18,000 crore.

### On Green Energy

BPCL is the industrial coordinator for ethanol procurement on behalf of all OMCs. We are on the verge of giving Letter of Intent (LoI) for 440 crore litres of annual production. Besides, we are going to procure 300-350 crore litres of ethanol from sugarcane. With the government mandating ethanol blending to 20% within three years, our demand for ethanol will go up to 100,000 crore litres per year on an industrial basis. In 2G ethanol, where there are commercial viability issues, all three OMCs are setting up one plant each. Our plant is coming up in Odisha with a capacity of 100 kilolitres per day, and we are adding another 100 KL/day 1G ethanol plant. Our refineries use lots of hydrogen to remove sulphur to make BS6 fuels. We have decided to set up 20 MW of electrolysers at the Bina refinery to make green hydrogen. We are also exploring green hydrogen as a transportation fuel. We are also going to have 1,000 MW of solar/wind capacity and aspire to reach 10,000 MW by 2030.

Source: www.fortuneindia.com

## ROOFTOP HYDROGEN GENERATION

A device on roof top, which has a chamber filed with water, converts it to hydrogen through electrolysis, which can be used as fuel for car or cooking stove. Emerging technology can make it happen in near future.

Electric power generation through rooftop solar units was envisioned to mitigate power losses along transmission and distribution lines and also control greenhouse gas emissions. However, rooftop solar power projects in India failed to take off. High cost, poor off-take for surplus energy generated and the low prices offered, hampered the growth of rooftop solar power.

As solar energy is subject to periodic interruption, traditional batteries are used to store energy, which is an expensive proposition. Traditional batteries have several drawbacks, such as low storage capacity and limited lifespan. With the world swiftly moving to hydrogen, many in the industry and scientific community believe hydrogen generators are a more viable alternative.

A rooftop hydrogen generator is a machine set up on the terrace that uses a process called electrolysis to produce hydrogen from water. The generator uses electricity to split the hydrogen atoms in the water molecule from the oxygen atom through electrolysis. The process is performed in a cell inside the hydrogen generator.

Although one can use the electricity from the rooftop solar plant to split water and produce hydrogen, scientists are also working on technologies that can make photolysis or splitting of water directly using sunlight, using photo-electrochemical cells without the use of electricity.

Solar Energy Research Group at IIT Madras, is developing a new material that could be used to split water under sunlight. IIT Guwahati had developed a catalyst that could be used as a "photo-anode" to split water into oxygen and hydrogen. With these emerging technologies, it is believed that small-sized hydrogen generators are not too far away from reality.

German company Enapter is reportedly making a device that can be attached to a rooftop solar plant for making hydrogen. Another company Hydrogenium Resources is reportedly deliberating with rooftop solar installers to use electrolysers with the solar plants to produce hydrogen from surplus solar power.

Due to the high cost of electrolysers, right now, the estimated cost of the rooftop hydrogen is around $7.50 (around Rs. 560) a kg. However, industry experts believe the price could come down once the manufacturing gains ground.

Source : CNBCTV18.com