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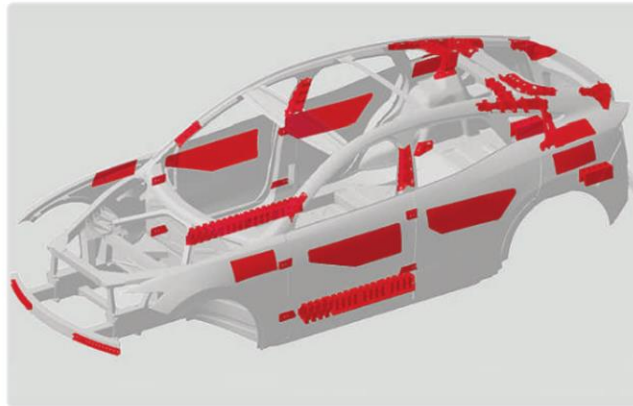
Best lightweighting initiatives **Page 38**

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CV OEM revs up EV strategy **Page 56**

LIGHTWEIGHTING SPECIAL

Henkel and RLE show automakers how to shed weight rapidly



German technology partners combine innovative hybrid structural design using advanced material science and engineering expertise to enable significant weight savings while maintaining structural integrity and safety. And they are making headway in India, having been awarded three programs set for launch in 2023 **Page 20**

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Indian start-up's new e-mobility platform

Chandigarh-based mobility start-up EVage develops India's first exoskeleton structure as an affordable common architecture for SUVs, vans, delivery vehicles and even trucks **Page 28**

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EXCLUSIVE

Ajay Kapur: 'Indian OEMs have a huge opportunity to scale up their use of aluminium, which comes with its 'green' benefits.'

Versatile aluminium has several benefits over traditional materials and it is today the metal of choice for some of the world's top automakers. However, compared to the global average of 160kg of aluminium per passenger vehicle, India lags at just 40kg. The **CEO – Aluminium & Power Business, Vedanta**, tells **Mayank Dhingra** why this alloy can be the silver bullet for vehicle and component lightweighting.

How much does aluminium comprise in the overall weight of a typical passenger vehicle – a mid-sized sedan or an SUV?

Globally, transportation accounts for the largest share of aluminium consumption at 27 percent. Although the demand for aluminium in automobiles has always been there, it surged after the oil crisis of 1970s. Obsessed with fuel economy, car designers started replacing heavy steel parts with lighter aluminium substitutes. Since then, the share of aluminium used has constantly been on the upside – from 35kg per car in the 1970s to today's average of 160kg. Experts project that by 2025 average aluminium content in a car will reach 250kg.

However, the domestic Indian market has a long way to travel when it comes to matching its global counterparts in aluminium consumption. The overall per capita aluminium consumption in India at 2.7kg is much below the global average of

11kg. Same is the case with the auto sector – India is at 40kg compared to the global average of 160kg of aluminium per passenger vehicle. Clearly, there is huge opportunity to scale up aluminium demand which comes with its 'green' benefits such as lower carbon emissions, reduced fuel consumption and better engine performance.

Can you give specific examples where aluminium is currently being used at the component level in vehicles?

Automakers worldwide are increasingly leveraging aluminium's versatility to produce multiple automotive components. A typical European passenger car has aluminium in almost every major component like body structure, engine, electricals, heat transfer elements, chassis and suspension, transmission, brakes, wheels, steering, trim and interior, closures and crash management reinforcements.

The Indian automotive

The average car weighs about 1,300kg. Without commercial limitations and abundant use of aluminium, it would weigh only 775kg.'

Aluminium is extracted from bauxite ore and the intermediate aluminium oxide is dissolved in molten cryolite at above 960deg C. The molten solution yields metallic aluminium after electric current is passed through it.



sector, however, is yet to catch up with the global trends. Aluminium consumption in the domestic automotive sector is only about 4 percent compared to 11 percent in the USA and 14 percent in Europe. Indian passenger cars use aluminium in some components of engine – block and head, battery boxes, bumpers and crash boxes, heat exchangers, front and rear subframes, brakes, wheels and some structural parts. It is quite evident that there is immense potential for exploring applications of aluminium in other components, given the

metal's obvious benefits over traditional materials.

What new areas of application can emerge as OEMs strive to make their vehicles more lightweight?

Aluminium is the second-most consumed metal in the automotive sector today. Currently, the demand for the metal is steered by alloys. For more than a decade now, concerns about fuel efficiency have encouraged OEMs to replace steel with aluminium in vehicle bodies, doors, trunks, hoods, bumpers, crash boxes, brakes, cables, and wheels. With stricter environmental norms coming in and consumers demanding more for less, OEMs look to exploring newer applications of aluminium across diverse auto components.

Currently, there is potential to convert steel wheels to aluminium alloy wheels as the trend of using tubeless tyres is growing in popularity. There are also opportunities in manufacturing of cylinder



heads, anti-lock braking systems and certain other applications where traditional materials can be substituted by suitable aluminium alloys for lightweighting and fuel efficiency. Over time, there is ample scope for Indian automakers to use aluminium in a variety of vehicle components.

What are the key properties and USPs of aluminium over conventional metals such as steel?

Aluminium is a metal of strategic importance to almost all sectors of critical importance to modern life. Key industry segments like aerospace, aviation, defence, transportation, building and construction among others are already using aluminium as a crucial raw material. Today,

aluminium is also the second-most important metal in automobiles. Aluminium usage in the auto sector has been accelerating because it offers the fastest, safest, most environment-friendly and cost-effective way to increase performance, boost fuel economy and reduce emissions while maintaining or improving safety and durability.

High strength-to-weight ratio, corrosion resistance, supreme formability, high ductility and conductivity, stylish finish and infinite recyclability, coupled with the fact that bauxite (aluminium ore) mining is sustainable and eco-friendly are some of aluminium's USPs, which have made it a metal of choice for some of the most iconic automakers. High performance and elegance

need not come at the cost of fuel consumption, high maintenance and environmental impact, and aluminium ensures that.

What specific benefits can it offer, especially in terms of weight reduction and improved structural rigidity in vehicle frames compared to other metals?

Aluminium is lighter than its counterparts, offering significant reduction in fuel consumption and therefore, carbon emissions. Every kilogram of aluminium used in a car reduces the overall weight of the vehicle by one kilogram. The average car weighs about 1,300kg. If there were no commercial limitations and aluminium was used in abundance, it would weigh only 775kg.

Aluminium also has a higher strength-to-weight ratio compared to traditional materials that enables it to absorb twice the crash energy of mild steel, ensuring that vehicular performance enhancements do not come at the cost of safety. Furthermore, aluminium's formability into myriad shapes, both simple and intricate, and the resulting elegant finish make it an automaker's dream metal.

How do you view the rate of aluminium adoption by the automotive industry over the past few years and where is it headed in the future? Which vehicle segments currently place the maximum demand and which ones show the most potential?

Of the global aluminium consumption of 90 million tonnes per annum, nearly 26 percent finds utilisation in the transportation sector. With advancements in this segment, especially targeted innovations in developing safer, high-performance and fuel-efficient vehicles, the

applications and volume of aluminium usage is only going to increase.

The future of the automotive sector will be electrified, autonomous and efficient and, with that, the demand for aluminium is expected to grow exponentially. Electric vehicles (EVs) are poised to transform every aspect of transportation including fuel saving, carbon emission, costs, repair and driving habits. We would be seeing more primary aluminium, extrusions and rolled products entering the EV space for lightweighting vehicles and improving battery technologies, while also transforming the traditional models as consumers increasingly grow environmentally conscious, demanding more fuel-efficient, low-maintenance and low GHG-emitting models.

Are stricter safety and emission norms going to act as enablers in faster adoption of aluminium in modern-day automobiles?

Yes. With stricter safety and emission norms alongside demand for lightweighting and EVs, we foresee the aluminium industry segments like extrusion, casting and rolling playing major transformational roles soon. To meet these norms, Indian auto industry will have to incorporate significant changes in engine technology to improve combustion, calibration, injection and cylinder pressure. This in turn, would entail higher per-unit usage of aluminium, going forward.

Higher use of aluminium directly offers clear benefits in terms of lightweighting of vehicles which improves fuel efficiency and carbon footprint. Furthermore, aluminium is infinitely recyclable with minimal loss in quality. So, even at the end of their lifecycle, automotive parts can be

'Aluminium consumption in India's automotive sector is only about 4% compared to 11% in the USA and 14% in Europe. There is ample scope for Indian automakers to use aluminium in a variety of vehicle components.'

recycled and reused in many other applications, including automobiles themselves, thereby creating a circular economy.

Studies in environmental benefits arising out of aluminium show that an aluminium-intensive vehicle can achieve up to 20 percent reduction in total lifecycle energy consumption and up to 17 percent reduction in CO₂ emissions. In our quest for a greener tomorrow, aluminium has an essential role to play in catering to the needs of modern life in a manner that is both responsible and sustainable.

Cost has been one of the major inhibiting factors so far. How can the industry overcome this challenge for enhanced usage of aluminium in vehicles?

While it is true that higher cost of aluminium has traditionally been a barrier, it is also true that aluminium is increasingly replacing traditional materials in automobiles on account of its obvious benefits. Very simply, the increase in cost is offset by significantly reduced fuel consumption, reduced energy consumption, lower maintenance costs, increased safety, longer lifecycle and recyclability at the end of life.

How is Vedanta playing a role in innovating cost-effective grades of the metal for India, which is predominantly a small car and two-wheeler market?

Vedanta Aluminium is attuned to the needs of our customers in the auto industry. We work with our customers to develop customised high-performance alloys suited to their exact needs. Our products are created with best-in-class technology to conform to global specifications and



Vedanta has state-of-the-art PFA casting facilities in Chhattisgarh and Odisha producing ingots, billets, wire rods and rolled products.

standards. They undergo rigorous quality assurance checks to ensure that customers access products of world-class quality. Our Innovation and R&D cells work in close collaboration with Marketing and Cast House teams to develop new alloys and product variations to address the varying requirements of the auto industry.

With EVs, consumption of aluminium in engine-related parts is going to come down. How much is going to be the impact and how does Vedanta view the onset of EVs for its aluminium business?

We understand that the global economy is swiftly moving towards a cleaner, greener and more sustainable lifestyle. With the growing popularity of EVs, OEMs worldwide are exploring new applications of aluminium. As per market reports, currently plug-in hybrid and full-battery EVs use 25-27 percent more aluminium than the typical internal combustion engine (ICE) vehicles.

In the EV market, driving range is the biggest factor driving consumer preference. Therefore, the need for lightweight battery casings and heat exchangers, combined with autonomous vehicles' demand for high visibility and structural



Traditional materials can be substituted by suitable aluminium alloys for additional benefits like lightweighting and fuel efficiency.

integrity is expected to exponentially increase the use of aluminium, going forward. Secondly, it is estimated that every 100kg weight reduction in EVs can increase the fuel efficiency by 10-11 percent, lower battery cost by 20 percent and save 20 percent of wear-and-tear cost. Furthermore, owing to the metal's thermal and anti-corrosion properties, aluminium is an ideal material for increasing battery life. Forty million EVs by 2030 across the world will increase aluminium metal consumption by 10 million tonnes, a ten-fold increase from 2017.

Simultaneously, the demand for aluminium will also rise on account of infrastructure for serving EVs as the metal is commonly used as construction material for charging stations as well as in transmission lines which supply electricity.

What is the current installed capacity at Vedanta being allocated to automotive supplies? Also, what is the future roadmap including your investment strategy?

Currently, we supply aluminium alloys in the form of ingots and cast bars to alloy wheel manufacturing units from our state-of-the-art 240KT Primary Foundry Alloy

(PFA) casting facilities spread across Odisha and Chhattisgarh.

Soon, we will look to expand our alloy portfolio for supporting manufacturing of cylinder heads, ABS brakes and certain other applications where traditional materials can be substituted by suitable aluminium alloys to provide additional benefits in terms of lightweighting and fuel efficiency, also required in line with more stringent emission norms in the pipeline.

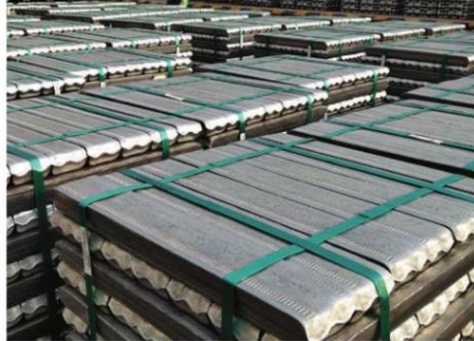
Coupled with sophisticated R&D facilities and technological prowess for developing customised high-performance alloys for their specific needs, and finally, having robust aftersales technical support, Vedanta is well positioned to cater to current and emerging needs of the automotive industry.

In this regard, we are also open to the idea of collaborating with the downstream industry and unlock the entire potential of usage of aluminium in the auto sector and cater to the rapidly evolving aluminium requirements of the Indian automotive industry. We also welcome the prospect of long-term investments by auto ancillaries near the aluminium plants so that they may leverage cost savings in terms of freight,

'We are open to collaborating with the downstream industry and unlock the entire potential of usage of aluminium in the Indian automotive sector.'



With surplus production, India has the potential to fulfil alloy wheel demand globally by becoming a manufacturing and export hub.



Vedanta's FY2020 volume was 1.9MT; it exports 60KT annually to vehicle and component makers across Asia, Europe and America.

re-melting and electricity. **Is the company also jointly working with vehicle OEMs in research and development of future architectures for safe and fuel-efficient vehicles?**

Vedanta Aluminium has one of the finest and best-in-class R&D setups among peers in the aluminium value chain. We are already collaborating with customers in the auto industry to develop customised aluminium alloys and products, catering to their objective of achieving desired lightweighting for EVs and hybrids of the future.

Case in point, Vedanta pioneered PFAs (primary foundry alloys) for the Indian market. We were the first in India to supply PFA to the domestic auto sector and until we did so, the country's entire PFA demand was being met through imports, even though India has the world's second-largest aluminium production capacity.

Metal-air batteries are witnessing accelerated research around the world. Can you detail the efforts being made by Vedanta and whether it is partnering any academic institutions as well?

Yes, we are aware of metal-air batteries and the ongoing research to

substitute fossil fuel usage with aluminium. We are in talks with start-ups and R&D bodies which are working on it in India. We have been closely tracking the developments in this regard. Frankly, we are quite excited at the prospect of it becoming a reality in the near future and revolutionising the battery and fuel cells industry.

With the increased focus on self-reliance, where is India placed in terms of its aluminium production? Does Vedanta also export to vehicle OEMs or component manufacturers in overseas markets?

Backed by the world's fifth-largest reserves of high-quality bauxite and coal, India has the world's second-largest aluminium production capacity. We have always felt it a great travesty that India is the only country in the world that imports 60 percent of its aluminium demand, despite having surplus domestic production capacity and resources to produce it.

This unnecessary import dependence also results in forex outgo of US\$5.5 billion (Rs 38,000 crore), and China, directly and indirectly, flooding the Indian market with cheap and sometimes, even environmentally-

hazardous scrap. The potential of the aluminium industry should be acknowledged and recognised as a core sector with a National Aluminium Policy that will encourage, protect and boost the domestic aluminium industry.

Vedanta is India's largest producer of 'green metal' aluminium, producing more than half of India's aluminium or 1.9 million tonnes per annum (MTPA) in FY2020. We produce high quality primary aluminium and alloys in the form of ingots, billets, wire rods, rolled products, primary foundry alloys, flip coils and slabs. All of Vedanta Aluminium's products are global leaders in their respective segments.

We do export about 60KTPA to vehicle OEMs or component manufacturers in Asia, Europe and Americas. India has the potential to become an export hub for alloy wheels, given the size and scale of total global requirement and domestic production capacity. For instance, as India's largest producer of PFA, Vedanta can support this development by supplying against Advance Licences from our SEZ Unit in Jharsuguda (Odisha), helping domestic suppliers compete with pricing in the process.

It is a great travesty that India is the only country in the world that imports 60% of its aluminium demand, despite surplus domestic production.'

How would you assess the impact of Covid-19 on Vedanta's aluminium business, pertaining specifically to the automotive sector? What is your outlook for FY2021 and FY2022?

As a strategic metal, the demand for aluminium is directly linked with the country's economic activity and performance of core sectors. Although the pandemic and associated lockdowns brought their own set of challenges, Vedanta's aluminium business has sustained through all disruptions.

We have been resilient throughout, leveraging intelligent automation and smart technologies to maintain business continuity. With sustained production, we have, in fact, been very agile and adaptable in responding to the changing needs of the market and our customers. We have been focused on a dynamic product portfolio, R&D and innovation, working with customers, fast evolving our inventory to meet customer needs.

Talking specifically about the automotive sector, although the industry is in a state of flux, our own current exposure to the automotive segment is low, so we are not impacted greatly.

Although the demand for automotive components including aluminium wheels plummeted in April and May, with the gradual easing of lockdown conditions and opening up of the economy, the pent-up demand contributed to a substantial month-on-month improvement in sales through June. As of today, green shoots for a V-shaped recovery are appearing. Auto component manufacturers hope that steadily improving utilisation rates at car plants will support a further recovery in demand during the second half of the year. ■