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The Commercial Metal Of Choice

Over the past several years, usage of aluminium in automobiles and light-weighting of trucks has witnessed the highest growth in comparison to other aluminium applications, in any segment of use.

Story by: Ajay Kapur, Chief Executive Officer, Vedanta Aluminium & Power Business

Ajay Kapur, CEO,
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Aluminium is the second most used metal in the world after steel. It has the potential to become the most important commercial metal in the future. Aluminium holds strategic importance for the economy as the commercial metal of choice for all kinds of transportation, power, aerospace, defence, infrastructure and packaging needs. Backed by rich bauxite deposits, India has the second-largest aluminium production capacity in the world after China. Vedanta's Aluminium Business produces more than half of India's aluminium at an estimated output of 1.9 Million Tonnes Per Annum (MTPA) in FY20. Most developed countries have already designated aluminium as a core industry. Given the role, aluminium plays in supporting the core sectors and in the success of government's visionary initiatives like 'Make in India', 'Smart Cities', 'Power for All', and the indigenous space programme, use of this metal in India is only going to increase with time.

Aluminium in the automotive industry

Aluminium in automobiles has been used for several years and its consumption in new vehicles is increasing steadily. Over the past several years, usage of aluminium in automobiles and light-weighting of trucks has witnessed the highest growth in comparison to other aluminium applications, in any segment of use.

High strength to weight ratio, lightweight, 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 unique selling properties 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 high fuel consumption, high maintenance and environmental impact, and aluminium ensures this to a great degree.

Aluminium remains the fastest-growing automotive material over competing materials and

The first smelter for primary foundry alloy production

is entering its most unprecedented growth phase. This is mainly because the global economy is swiftly moving towards a cleaner, greener, and more sustainable lifestyle.

Demand drivers

Aluminium is the second most used metal in the auto industry today. Its usage has been rapidly increasing because it offers an environment-friendly and cost-effective way to increase performance, boost fuel economy and reduce emissions while maintaining or improving safety and durability.

Aluminium is substantially lighter than its counterparts, offering a significant reduction in weight. The metal has a higher strength-to-weight ratio compared to traditional materials that enables it to absorb twice the crash energy of mild steel, ensuring vehicular performance enhancements do not come at the cost of safety.

This has a direct impact on fuel consumption, range, and carbon emissions making it the top choice for automobiles. Coming to Electric Vehicles (EV), the need for lightweight battery casings and heat exchangers in electric vehicles, combined with autonomous vehicles' demands for high visibility and structural integrity, is expected to further boost the use of aluminium in cars, trucks and buses going forward. Further, thanks to the metal's thermal and anticorrosion properties, aluminium is ideal for battery frames. Aluminium is also likely to witness an increase in demand on account of growth in infrastructure for serving EVs since the metal is commonly used as a housing material for EV charging stations as well.

With stricter safety and emission norms alongside the demand for light-weighting and electric vehicles, we foresee, the aluminium industry segments like extrusion, casting and rolling playing major transformational roles soon. Additionally, nearly 90 per cent of all the aluminium used in a vehicle is recycled at the end of its lifecycle, ensuring value at the end of the vehicle's lifecycle as well.

According to WardsAuto and DuPont Automotive survey, every kilogram of aluminium used reduces the weight of a car by a kilogram, if not more. This makes it the first preferred material of choice among engineers and designers to help meet the expected fuel economy and emission standards by 2025.

Aluminium in auto components

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 the advent of EVs, OEMs worldwide are focussing on exploring and applying new uses of aluminium in the emerging industry.

Today, globally, transportation accounts for the largest share of aluminium consumption at 27 per cent. According to experts, this will increase exponentially with the average aluminium content in a car reaching 250 kg by 2025. India is behind the global benchmark when it comes to aluminium usage in vehicles. Aluminium consumption in the Indian auto sector is only about four per cent, against 11 per cent in the USA and 14 per cent in Europe.

Aluminium alloys are used by the domestic auto industry majorly as alloy wheels. Around 95 per cent of two-wheelers include aluminium, averaging at seven kilograms per bike, taking the total consumption of aluminium alloy in this segment to 115 Kilo Tonnes Per Annum (KTPA). On the other hand, only 20 per cent of four-wheelers use aluminium, majorly in high-end models, which max out at 40 kg per car.

This presents immense scope for domestic producers like Vedanta Aluminium, to tap into the emerging market in the automotive sector. Currently, India's foundry market for automotive components is small (only 10 per cent of total foundry market — 10 million of cast iron + aluminium) in comparison to USA's foundry market, which is at 14 million tonnes per annum, of which 3.3 million is aluminium (24 per cent). With an increasing focus on higher

performance with better safety and lower emission, this gap is going to shrink in the coming years.

In fact, Vedanta Aluminium was the first in India to supply Primary Foundry Alloy (PFA) to the domestic auto sector. Until then, the country's entire PFA demand was being met through imports, even though India has the world's second-largest aluminium production capacity. Looking at the promise of the auto market and its import dependency, Vedanta Aluminium decided to tap into the opportunity and develop 240 Kilo Tonnes Per Annum (KTPA) indigenous capabilities at its state-of-the-art facilities in Jharsuguda (Odisha) and BALCO (Chhattisgarh) to meet that demand.

Internal combustion engine

Today, usage of high-performance aluminium alloys in crankcases, cylinder blocks, heads and pistons are commonplace. Aluminium alloys are the preferred material for ICE components due to characteristics like low density, high thermal conductivity, simple fabrication techniques (casting and forging), easy machinability, high reliability and recyclability. Proper control of the chemical composition, processing conditions and final heat treatment results in a microstructure which ensures the required mechanical and thermal performance, in particular the high thermal fatigue resistance.

Aluminium will continue to play a significant role in the continued evolution of ICEs along the lines of reduction in piston weight, increase of mechanical and thermal load capacity, lower friction, improved scuffing resistance, etc., as well as basic requirements like durability, low noise level and reduced fuel consumption.

Aluminium commodity outlook

Aluminium prices have strengthened during the second quarter of FY21 with recovery in the global economy, resilient Chinese demand and a weaker US dollar. Entering the third quarter, market experts predict that the prices shall drift lower as the global economic recovery goes back to its initial rebound phase. Analysts estimate that the upward momentum of LME shall fall through Q3FY21 and average out at USD 1,750 per tonne. On the demand side, outside China, North East Asia market and the US market are in the rebound phase. Globally aluminium production will increase by one per cent YoY in CY2020, with a 1.6 per cent contraction ex. China and three per cent growth in China along with an estimated surplus of 3.8 Mt in CY2020.

There has been a spike of 17 per cent in the London Metal Exchange (LME) price of aluminium, from USD 1460 per tonne in March'20 to USD 1721 per tonne in August'20. Parallelly, there has been a steady increase in demand for automobiles globally. With the Indian Inc. pulling out all the stops to emerge competitive in the post-Covid global order and efforts by the central govt. to revive the economy, aluminium has a big role to play in achieving the coveted V-shaped recovery of the Indian economy from approximately two per cent to seven per cent by next year.

Future potential

India is yet to fully explore applications of aluminium in the automotive industry akin to its global peers. There is immense potential for usage of aluminium in other auto parts like engine, suspension, front end carrier, instrument panel support, rear frame, chassis and many more.

In developed countries, around 21 PFAs are used in the automotive segment to achieve light-weighting in the form of various auto parts and components. On the other hand, in India, we majorly use PFAs only for manufacturing alloy wheels and to some extent, for cylinder heads. There is scope for Indian aluminium manufacturers to expand their aluminium alloy portfolio for supporting the manufacturing of cylinder heads, ABS brakes and certain other applications, replacing traditional materials.

Vedanta's aluminium business produces more than half of India's aluminium estimated at 1.9 Million Tonnes Per Annum (MTPA) in FY20.

As the market for aluminium alloys in the automotive segment expands with the inclusion of newer applications, aluminium manufacturers must also look for opportunities to leverage their technical expertise and R&D capabilities to develop products customised to the needs of the market. In this direction, they could explore collaborations with the downstream industry, to unlock the entire potential of aluminium used in the auto sector and cater to the rapidly evolving aluminium requirements of the Indian automotive industry. Staying ahead of the curve, Vedanta Aluminium is already developing indigenous capabilities at its state-of-the-art smelters in Jharsuguda and BALCO to create new products and product customisations attuned to emerging needs of the auto sector.

Challenges

One of the biggest challenges faced by the Indian automotive market is increasing imports of auto components from China and other countries. The size of the auto components imports was USD 17.6 bn in FY19. Asia, the largest source of imports for Indian auto-components, had a share of 61 per cent followed by Europe at 29 per cent; North America at eight per cent; Latin America and Africa at one per cent each in FY19. China with 27 per cent enjoyed the status of the largest exporter in the Indian automotive market.

Way forward

Aluminium is crucial to realise the vision of 'Make in India'. It can play a pivotal role in the changing face of the automotive sector. This makes it pertinent to acknowledge and recognise it as a core sector and leverage the potential of the entire aluminium value chain, from mining to end-users in critical sectors of national importance like transportation, defence, aerospace, aviation, infrastructure, electrification, housing, etc. With an array of impressive products which cater to key industries, homegrown brands like Vedanta are striving to bolster the country's self-reliance in all things aluminium, laying the foundation for India's greener and sustainable future. **ACI**

The views expressed by the author are his personal opinions and do not necessarily reflect the views of the ACI magazine.

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