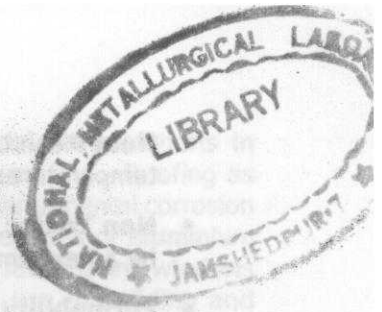


# ALUMINIUM AND ITS USAGE

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## INTRODUCTION

Aluminium is the most abundantly available metal in the earth's crust (8%). Aluminium was separated in metallic form in the 19th century. It was brought into commercial and common usage form through the process developed by two celebrated scientists viz. Hall and Herault. Thanks to globalisation, the world is now wide open witnessing phenomenal changes in the aspirations and life styles of our people. As a new metal, Aluminium has come up, in this era, with a great significance, particularly with respect to improving and shaping the life styles of people in various shapes and forms.

## ALUMINIUM : THE METAL OF CHOICE

The versatility of aluminium as a metal is indeed unparalleled and for which it is poised to acquire a very prominent position in the years to come in the field of industry and day to day life. Some of the major properties of this unique metal is highlighted below:

- **Light weight & high strength** : Is one third lighter than steel of equal volume but at the same time can outperform steel in strength when alloyed with copper, magnesium, zinc etc.
- **Corrosion Resistance** : Has excellent corrosion resistance due to the presence of a thin, hard protective film of aluminum oxide that bonds tenaciously to the surface. It, therefore, does not rust like steel. The corrosion can occur only when this film is damaged and prevailing environmental conditions prevent it from forming.
- **Aesthetics** : Has attractive natural appearance and therefore has a mass appeal. It can take easily different finishes, painting, powder coatings, anodizing, electroplating, chemical conversion coating, porcelain, enamel etc.
- **Conductivity** : Conducts twice as much electricity as copper of equal weight. This along with its lightweight characteristics has been extensively used in power transmission lines, bus conductors. Is an excellent conductor of heat.
- **Non-Magnetic** : Is non-magnetic and therefore used in various high voltage applications.

- **Heat Resistance** : Does not ignite or burn, even when at extremely high temperatures
- **Non Toxic** : Is not toxic and does not harbour organisms, thus found to be an extremely suitable material for food packaging.
- **Formability** : Can be formed by any metal forming process like rolling, extrusion, forging, drawing etc.
- **Weldability** : Can be joined by welding, soldering, brazing, as well as through use of adhesives, clips, bolts, rivets, or other fasteners.
- **Recyclability** : Can be recycled at a fraction of the initial production costs. It can be recycled over and over without losing any of its characteristics. It is recyclable and takes only 5 % of energy required for making from the ore.

## ALUMINIUM AND ITS APPLICATIONS

Broadly speaking, there are about eight major end use segments where application of aluminium is extensively found. They are transport and automobiles, building and construction, packaging, consumer durables, machinery and equipments, electrical, electronics and defence.

**Transport** - Use of aluminium in land, sea and air is extensive. Automotive sector, represents the largest opportunity for aluminium usage. Marine transport such as passenger liners, fast ferries, yachts, boats medium size tankers all use aluminium. The most promising application in this end use segment is passenger cars and commercial vehicles of all sorts. For ever rising high price of fuel, everyone desires fuel efficient vehicles.

Aluminium's unique property of lightweight and high strength when alloyed, enables auto makers to reduce weight of car. Already aluminium castings have been used for wheels, engine blocks and rolled products for auto trims, radiators, air conditioners, bumpers, reflectors etc. Cars with aluminium chassis and body panels have also been built. Today the giant automobile makers are thinking in terms of doubling the usage of aluminium that is from a level of 100 kg/car to 200 kg by 2010.

The modern commercial aviation industry would never have succeeded without aluminium. Its combination of lightness, strength and workability makes it the ideal material for mass produced commercial aircraft. Aluminium is the primary aircraft material, comprising about 80 per cent of an aircraft's unladen weight. The standard Boeing 747 jumbo jet contains approx. 75,000kg of aluminium. Because the metal resists corrosion, some airlines don't paint their planes, saving several hundred kgs of weight. Today, there are around 5,300 commercial passenger aircraft flying in the world, and many thousands of light aircraft and helicopters.

Aluminium in the form flooring sheets, cladding sheets, body structure is finding major place in the railways with respect to wagon making, compartment making, flooring etc.

**Building Construction** - Use of aluminium structures and sections in construction reduce load on foundations. Exterior Cladding paneling - Roofing as well as Facades and windows make use of its ability to resist environmental corrosion and to accept decorative and protective finishes. Extruded sections of aluminium are widely used in Interior decoration of building. While roofing, facades and windows are considered among the largest segments of aluminium's use in building and construction, the metal is also used in a variety of other ways. It is used in doors, curtain walls, sun-shading elements, beams and supports, balconies, heating and air-conditioning, drain pipes, spacing elements, ceilings and elevators. Now, it is also being used in the construction of high-rise buildings abroad. With the increased awareness, availability and ease of use, aluminium roofing sheets are being extensively used in the rural housing and urban complexes such as stadiums, railway stations, bus stands etc. Needless to mention that all factories today would prefer to construct their roofing with corrugated aluminium sheets.

**Packaging** - Aluminium has been the material of choice for growing segment of the packaging, from beverage can to foils in various gauges for beverages, foods, medicine etc. Aluminium's unique properties - light -weight formability, absolute moisture barrier, ability to withstand high temperatures including direct flame applications, and the ability to be coated and embossed for functional and decorative purposes - combine superbly to create a totally effective and economical food service system. Beverage can is the single largest application of rolled products. In the pharmaceutical sector usage aluminium foil as strip and blister and aluminium sheet as closure stock finds extensive usage in packaging of all types of medicines.

There is an increase in applications for packaging food. Even in the middle class urban households receive extensive use of household aluminium foil is witnessed.

**Electrical** - This sector is one of the major demand drivers for the aluminium industry particularly in India. The metal is used in different forms in this industry. Wire is used in power transmission and distribution network. Foils are used to produce jelly-filled cable wraps. Extruded products are used in bus bars, and high power transmission. Aluminium sheets are being used for making lamp caps, to suit the lamps of various forms and sizes.

**Consumer Durables** - All white goods such as pressure cookers, utensils, fan blades, washing machines, air conditioners (fin stock), cooking range, television, music system etc. use aluminium in the form of rolled products.

**Machinery & equipment** - Aluminium, particularly GEQ sheets, finds wide usage in the manufacture of capital goods.

**Electronics** - Aluminium is used in the manufacture of printed circuit board sheets and various electronically driven control equipment/instruments.

**Defence** - Missiles, rockets and spacecraft all use aluminium. Besides the above mentioned usage, aluminium also finds its application in the manufacture of bridges, pre-fabricated houses etc.

## Aluminium Consumption - World vs. India

Although aluminium has such unique properties, the per capita consumption of aluminium in India is much less compared to iron and steel. There are about 3000 uses of aluminium worldwide but India at present has only 270 applications.

The end use wise consumption of Aluminium in India in comparison with World is as follows

*End use wise Aluminium consumption - World and India*

No.	End use Sector	Aluminium consumption in %	
		World 2000	India 1999-00
1	Electrical	9	35
2	Transport	29	21
3	Building	18	9
4	Packaging	18	11
5	Machinery & Equipment	9	6
6	Durables	6	8
7	Others	11	10

Aluminium smelting is a power intensive industry. Constraints in availability of power and high costs in India have caused a slow growth of the aluminium sector. Primary producers namely, Indal and Nalco were compelled to curtail production due to high power costs. For the same reason of non availability of assured steady power supply and high cost of power, no greenfield smelter has come up in India even after globalisation and economic reforms. High metal cost has been a deterrent for expansion and development of the downstream sector such as sheet, extrusions, foil etc. Thus the per capita consumption of aluminium in the country has been very low at 0.6 kg. In comparison, even a developing country like China has a per capita consumption of 2.6 kg. The aluminium industry in India is slated to grow at 6 - 7% CARG by 2007-08. The per capita consumption in this period is expected grow 1.0 kg whereby the aluminium consumption in India would cross 1 million tonne per annum.

## ALUMINIUM - GROWTH POTENTIAL

Globalisation is improving the quality of life of people. This in turn is increasing consumerism as purchasing power of people is increasing. Therefore, demand for consumer goods like cars, houses, beverages, canned food etc. are on the increase. This will certainly drive the demand for aluminium products in all forms in future.

The demand for aluminium is dependent upon the growth of end user segments like building and construction, power, consumer durables, automobiles, packaging etc. Hence demand for aluminium is dependent on the overall growth in the economy especially infrastructure spending and per capita income. Awareness of the usability and importance of the metal also drive the industry towards growth.



Suggestions or popularisation of aluminium usage in India :

- Stress on development of new manufacturing process to make aluminium cheaper.
- Stress should be put on new product development.
- Eco-friendly refining technology for aluminium scrap re-melting.
- Alloy development including Metal Matrix Composites for specialised applications.
- Modern processing technologies such as semi-solid processing
- Improving the quality of downstream products.
- Master alloys for grain refining in Al castings
- Development of can stock material.
- Standardisation of extruded products for use of Aluminium in building/ construction industry.

Growth is expected to be higher in consumption of downstream products and semis, particularly for sheets, extrusions and castings. To meet this growth, primary producers and potential downstream producers together with new players are to consolidate, strengthen and expand their manufacturing process. R & D efforts for cost reduction, and better quality are to be put to remain competitive in both domestic as well as international market. With WTO regulations and likely competition from Korea and China the sectors have to grow and develop.

## CONCLUSION

The need of the hour is to render aluminium affordable to one and all. To this end, the primary task is to reduce the cost of production through adoption of the state-of -the-art technologies and world class scale of operation. Increased application of aluminium in various forms relating to the diversified end use segments through R&D efforts and joint promotion of processes and applications.