

THE ROLE OF ALUMINIUM AND ALUMINIUM
ALLOYS IN ENGINEERING INDUSTRIES (*)

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The measure and recognition of the importance of Aluminium to India can be illustrated by the fact that India produced the prime metal at the rate of 18,000 tonnes in 1960 rising to 96,000 tonnes approximately in 1967, the Planning Commission target for production by 1970/71 fluctuates between a tentative 330,000 tonnes and a now discussed 275,000 tonnes.

Against these figures must be placed the actual consumption which was roughly 15,000 tonnes in 1951 rising to 127,000 tonnes in 1967 and estimated to increase to 320,000 tonnes by 1970/71.

These very approximate figures are mentioned to demonstrate the impact that Aluminium has had on the electrical and engineering industries. 35 to 40% of the 1970/71 figure is attributed to engineering requirement as opposed to electrical engineering and from this fact alone it can be deduced how the engineering industry has figuratively clasped this metal to its bosom and made it its own.

The fact that aluminium has made such an impact on our civilization is of course because of the obvious advantage it offers for many applications in its weight to mass ratio, and it took vision to see that this extremely light metal which in its first emanation was so soft that it would not hold its shape under stress could be modified by alloying so that it could withstand strains and stresses and temperature variations in excess of traditional metals. Once this was recognised the utility of the metal became self evident and its use virtually created a revolution in the Engineering Industry.

The fact that it could be rolled, cast, extruded, formed and machined as readily if not more readily than competing metals, together with its weight to mass ratio contributed to its popularity.

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Experiments showed that the aluminium oxide film which forms on the surface of aluminium inhibits corrosion and that it will also take, when treated, an anodic film which can be either bright aluminium finish or coloured in any shade of the spectrum. This has given many ingenious ideas to fabricators and we find engineering organisations making trays, beer mugs, lipstick containers and a thousand and one other items for consumer use, which are anodised to attract the eye of the consumer and give an enduring and pleasing finish to the product. Similarly this type of finish contributed to the idea of using aluminium sheet and aluminium extruded sections in architecture and here in India there are several notable examples of this particular use in modern buildings.

Because of the special characteristics of aluminium and because it demands special and particular techniques in casting, forming, extruding or fabrication it has greatly increased the body of knowledge which was traditionally held by the Engineering Industry. The fact that the problems associated with producing items in this particular metal have been overcome has given a stimulus to research, widening the horizon of engineers and enlarging the possibilities of specialised production in other metals which had heretofore apparently represented problems beyond solutions; such metals which readily come to mind are Magnesium and Titanium.

Another characteristic of aluminium which has been exploited by the engineering industry is its ductility and its free flowing characteristics. Under pressure this has been found to be great utility in impact extruding vessels and containers of various types from a simply formed slug of metal. The impact extrusion presses built by the engineering industry have brought about a revolution in the Canning Industry in America and to some extent has also had some impact on the Container Industry in India; particularly containers for difficult products. Instances which come readily to mind are containers for agricultural chemicals and pesticides, which unless packed in leak proof containers can by oozing or other emanations cause deterioration in comestible products if stacked together in transit or storage.

Extruded sections to almost any shape are possible today. The complexity of the profile being only limited by the expertise of the die maker. These extruded sections have gained very substantial acceptance in the building and electrical industry over and above their well recognized utility in the engineering industry.

In engineering and fabrication it is most necessary that component materials can be welded and joined together, the special techniques demanded by aluminium have revolutionized welding systems and equipment and increased the body of knowledge on the electrolytic action which arises between dissimilar metals in contact.

The fact that the properties of Aluminium include, resistance to corrosion, it is colourless, non-toxic, light weight, has high thermal and electrical conductivity, presents a smooth easily cleared hygenic surface, has no sparking properties, is available in all forms, in sheet, strip, foil, plate, extruded sections, tubes, rods, bars, wire, forgings, castings and slugs, makes it self selecting for very many uses, notably in the chemical, brewing, and dairy industries.

The introduction of aluminium foil in the Packaging Industry where its outstanding protective characteristics and its brilliant surface capable of superb decoration with its resultant high impact on the Consumer and the impulse buyer has had its attendant impact on those engineering industries which fabricate packaging machines. The demand of the industries which supply the consumer is for faster running, trouble free packaging machines, designed to the free flow technique.

Today in India, there is hardly an industry which does not use aluminium. This means that there is hardly an engineering establishment which does not work on aluminium. It can be stated with a fair degree of certainty that most of the young engineers who are entering on their careers today, are familiar with at least some of the characteristics which make aluminium self-selecting for very many vital end uses.

It is to be hoped that these young engineers who are our hostages of the future will take the story of the development and exploitation of aluminium and regard it as an inspiration to them in the appreciation of the fact that man's ingenuity recognizes no barriers, that man's will to do and will to overcome can solve all problems. The story of aluminium and its impact on the Engineering Industry and indeed on our total civilization has by no means ended. New Alloys and new techniques providing new end uses for aluminium, arise almost every day making demands on the vision, ingenuity and inventiveness of the engineering industry, posing a perpetual challenge to our technological expertise. From ancient times the story of man's progress has been a story of challenge overcome, this too is the story of aluminium and the engineering industry.