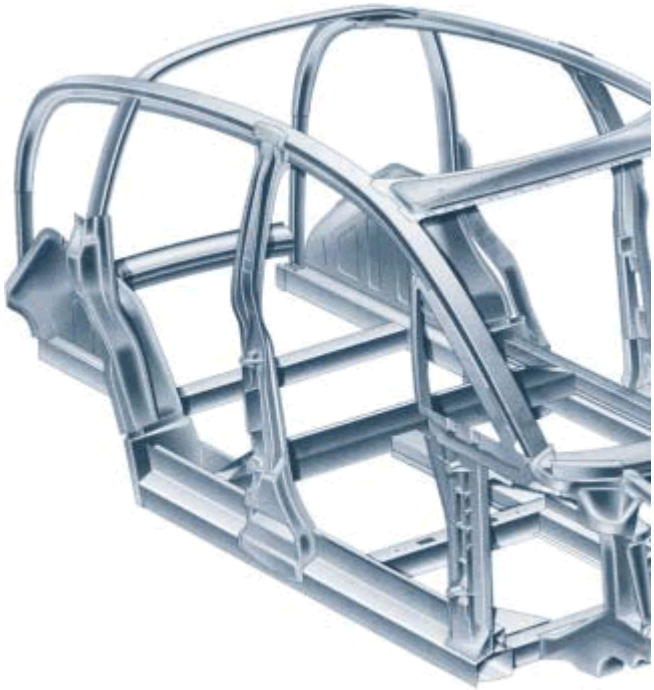

more energy efficient vehicles. Aluminium has a specific gravity of only 1/3 of that of steel or cast iron. By the time thicker sections in aluminium have been designed the overall weight saving is usually half of a comparable steel component. For every 1 kilogramme of aluminium that replaces 2 kilogrammes of steel then over the life time of the vehicle, a saving of 20 kilogrammes of CO_2 will be made. The vehicle user notices this in reduced petrol bills, society benefits because of reduced emissions and further energy is saved when the valuable aluminium is recycled at the end of the vehicle life.

While most vehicles now run on petrol or diesel, the all aluminium cars are very adaptable for a switch in fuel use to LPG and, perhaps later, to electric powered or hydrogen powered.

Whilst the automotive passenger car market is capturing all the headlines concerning aluminium sheet and extrusion uses, other areas of transport are steadily increasing the usage of aluminium in all its forms.

Passenger coaches for rail transport are now virtually all aluminium in construction. On the road, tankers and freight carriers of all kinds are increasingly turning to aluminium for chassis and subframe design. It is estimated that 25% of the aluminium used in transportation is used in road and rail commercial transport; much of this product is in the form of rolled products and extrusions.

In the air, aluminium has been the natural choice for aircraft construction for many years. Indeed without aluminium there would not be a commercial aircraft industry. The European Airbus consortium is a fine example of aluminium usage in aircraft. Their new A380 employs 66% aluminium in the airframe, and the projected range of short and medium haul aircraft where up to 76% of body weight is aluminium, ensures a healthy future.

At sea, the use of aluminium for the construction of ships, hulls and superstructures, is increasing year on year. Modern developments feature new families of vessels, the so-called high speed ferries, single hulled boats and catamarans, made entirely of aluminium alloy. The largest can carry cars and trucks, and be over 100 metres in length. A standard Boeing 747 Jumbo contains 75 tonnes of aluminium.

Shipping gives the most per capita use of aluminium in a single transport item. A 96 metre wave piercing catamaran can contain up to 400 tonnes of aluminium compared to 1 tonne in a large, all aluminium car.

Military applications too, are increasingly turning to aluminium as an alternative to steel. Specially formulated high-strength alloys having a combination of light weight and good ballistic properties are now regularly used for vehicles such as armoured troop carriers and mobile rocket launchers.

Properties and Characteristics of Aluminium

Aluminium alloys with great durability and high strength, some with a tensile strength as good as that of constructional steels, are available to the designer in the form of extruded profiles, rolled sheet and plate, castings and forgings. The majority of these alloys consist of aluminium with carefully controlled additions of copper, magnesium, silicon, manganese, zinc and more recently lithium (See Fact Sheet 1 Aluminium the Metal).

High strength joints with great structural integrity, can be readily made with aluminium by welding, brazing, riveting and by adhesive bonding.

Where a specific surface finish is required, aluminium can be anodised either to a natural finish or a wide range of light fast colours, or alternatively, coating treatments are available using powder or wet techniques, again with a wide range of durable colours.

Aluminium is the preferred material for many basic transport applications, including; panelling for buses, vans, coaches and caravans, lorry bodies sides and floors, tankers, trailers, engine heads and components, ships, hulls and superstructures and many marine components.

Aluminium was the preferred panelling material for many vintage cars. The 1924 Vauxhall, with an unpainted all-aluminium body, is a good example and is still in excellent condition. In more recent times, the aluminium bodies of the Land Rover have been giving excellent service since the model was first introduced in 1948.

As a material of construction for the mass production vehicle, aluminium was once dismissed as being too costly and impractical. This is not the situation today, and aluminium has made rapid inroads into the car designers' thinking. With the ever-rising cost of fuel, and increasingly stringent international environmental legislation, steel is becoming far less attractive as a construction material for cars. The last decade has seen something of a design revolution in that car-makers such as Audi and Jaguar have introduced the concept of the total aluminium car, designed from the onset around the properties and values of aluminium