european aluminium association

ALUMINIUM IN CARS

Factsheet

Aluminum: a positive life-cycle

Transportation is a significant source of CO2 emissions, with cars producing a major share. Technological developments are among the most reliable measures to reduce CO2 emissions from cars, with light-weighting being one of the most effective.

As weight directly impacts fuel consumption, light-weighting can play a key role in reducing CO2 emissions. It takes energy to move a car (Energy = Mass x Acceleration x Distance). Therefore, the lighter the car is, the less energy (and as a consequence, the less fuel needed). A truck or car can be moved with less energy or move more cargo at the same energy if the vehicle itself is lightened. Aluminium is the ideal material as it allows a weight saving of up to 50% over competing materials in most applications, without compromising safety and strength.

- Using aluminium to reduce weight helps reduce fuel consumption and CO2 emissions in automobiles and other forms of transport.
- A 100kg weight reduction achieved on a passenger car saves on average 0.35 l of fuel/100 km and 9 g of CO2/km. Assuming an average fuel cost of 1.20€/l, every kg saved on the mass of a European car saves more than 8€ over 200.000 km through fuel saving.
- The amount of aluminium used in new European cars has risen from 50kg in 1990 to 132kg in 2005 and is predicted to grow by another 25kg by 2010.
- Looking at a car body alone, the ultimate weight reduction potential of aluminium is approximately 40%, which corresponds to about 150 kg saved for a vehicle in the compact class (primary weight savings). Keeping a car performance constant, this primary saving allows downsizing of other car parts (secondary weight savings). When aluminium is intensively used, secondary weight savings can exceed 50% of primary weight savings.
- In the case of the Audi A2, the intensive use of aluminium allowed direct weight savings of 134kg that allowed 75kg secondary weight savings. Some cars contain up to 500 kg of aluminium.

How is the industry contributing?

Together, the European Automotive and Aluminium industries are worldwide leaders in the development and application of innovative, safe and cost efficient light-weighting aluminium solutions. Intensive joint research and development activities have enabled the practical use of safe and cost efficient light-weight aluminium concepts both in high volume production and in the manufacturing of small series and niche cars. The concepts can be applied with little adaptations across all car models. EU producers have assumed global leadership in the light-weighing of cars and Europe is the leader for aluminium body applications. Today's European cars contain an average of 132 kg of aluminium components, with the car body representing 32 kg only, the other 100kg being found in engine, chassis, suspension and transmission. In the short term, many additional aluminium car body applications could be realised without significant re-engineering and extensive cost impact (e.g. by the use of aluminium doors, bonnet, wings, boot). This could easily reduce the cars' weight by 40 kg.

Long term vision: inverting the weight spiral

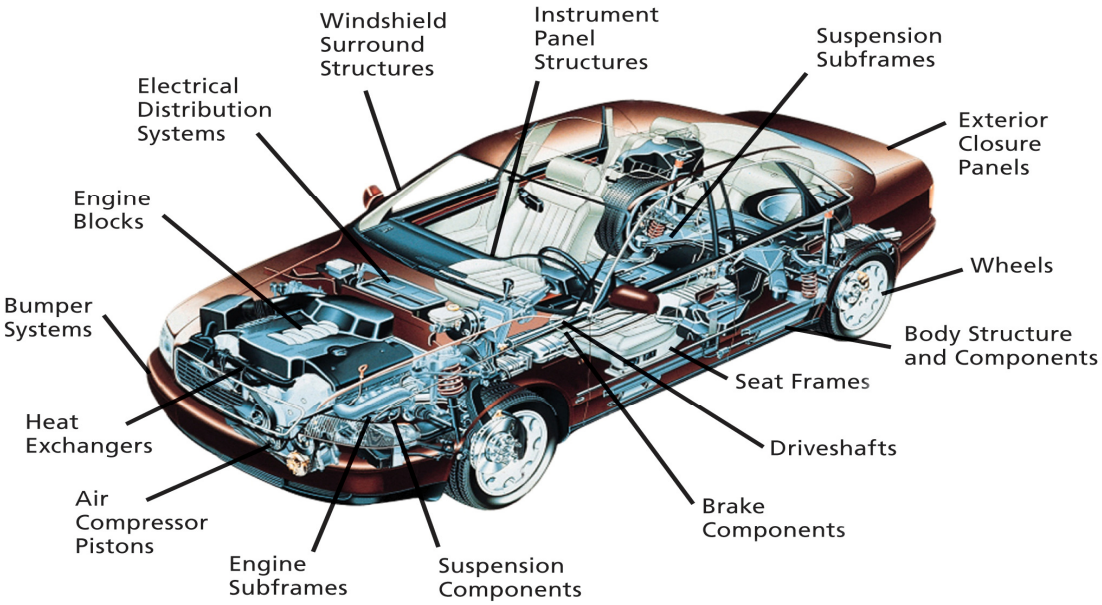
The demand for more comfort, more safety features and larger vehicles has caused a weight increase of other components (engines, brakes etc.) to keep the car performances constant. This phenomenon is known as the weight spiral. The Alumaximised Car Study carried out by the University of Aachen shows the potential for light weighting by using aluminium: based on the reference car which is an amalgam of five popular small family cars weighting 1229 kg, the Alumaximised Car's final weight is only 785 kg, demonstrating how the weight spiral can be inverted.

Addressing safety

To increase survival chances in an accident, vehicles include a strong passenger cell to ensure survival space and surrounding deformation zones where the crash energy can be absorbed. Aluminium alloys are well suited for these purposes. For the deformation zones, specially dedicated aluminium alloys were used in about 9 million crash management systems (bumper + crash boxes) in 2008, offering the same performance as competing materials, but being 40% lighter. For passenger cell, high strength and ultra high strength aluminium alloys already used in the aerospace sector are being evaluated in comparison with the strongest steel grades.

What does the future hold?

Many of today' s aluminium applications for cars are affordable (between €2 and 4 per kg lightweighting) and easy to apply being hang-on parts. A swift upgrade to aluminium is possible. The industry is also working on reducing the cost of cutting edge aluminium applications presently used in high end sports and luxury cars, so that they can find their place in standard car models. Today, first car buyers are also focused on purchase price and do not yet take total life cycle cost, fuel consumption and CO2 emissions into consideration. The right regulatory & fiscal initiatives aiming to stimulate the demand for low CO2 emitting cars would be beneficial.



Aluminium applications