european aluminium association

AluDrive

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NEWS

INTRODUCTION

Dear Reader,

Welcome to the second edition of Aludrive, the new newsletter from the *European Aluminium Association* (*EAA*). Aludrive will be providing readers in the automotive sector with updates on innovations and projects in the aluminium industry directly affecting the automotive sector.

This second issue brings you details of new lightwieghting alloys for bonnets and sub-frames, new safety and pedestrian protection applications and improved roof panels and much more. All the articles in this newsletter are free for further publication as long as they acknowledge the *European Aluminium Association* (*EAA*) as the source.

The Automotive Market Group at the *EAA* is responsible for this newsletter. This group comprises seven aluminium companies that are supplying the automotive industry.

We hope you will find it a useful and enjoyable publication. Feel free to forward it and invite others to subscribe.

To either subscribe or provide comments, email us at **auto@eaa.be**

STRONGER FORGING ALLOY

Alcoa has significantly improved the mechanical properties of a common 6xxx forging alloy by selective modification. With this new alloy, a yield strength of more than 380 MPa, a tensile strength of more than 420 MPa and a high elongation level can be safely reached simultaneously. This new alloy development will particularly be used for extruded and forged chassis parts.

5XXX ALLOYS FOR BONNET AND SUBFRAMES

As one of the most efficient parts for weight-saving in cars, bonnets in luxury cars are mostly made of aluminium. *Hydro* is now helping to establish this solution in large-volume compact-class vehicles by supplying PSA with sheet in alloy AlMg3-O (DIN EN AW 5754 H0) for the Peugeot 307 bonnet. This order – the largest single automotive order for 5xxx alloys in Europe – is a fine example of aluminium moving more and more into popular models.

New 5xxx aluminium alloys allow for further weight savings in chassis parts. At the same time, these alloys offer improved formability properties and ensure the required stiffness. *Hydro* is offering these 5xxx aluminium alloys as strip, sheet or Alutubes® – precise, extremely formable longitudinally seam-welded aluminium tubes.

The high-frequency welded Alutubes® in particular are used in hydroforming processes for the manufacture of chassis and structural parts. Mainly, they are applied in rear axle sub-frames, like for the BMW 5 and 7 series, Audi A8 and some VW all-wheel powertrain models. Now, also a first front axle frame for BMW 1 and 3 series contains longitudinally seam-welded Alutubes®.

Alutubes® can be furnished with a textured surface, making them even easier to reshape during hydroforming and subsequent shaping processes.

USE PHASE IS WHERE SAVINGS CAN BE MADE

80 – 90% of a car's energy is needed during its 'use phase' and any reduction in emissions will come by reducing the energy use. Therefore, measures to reach the CO_2 emissions targets need to focus on the use phase.

The car industry is currently committed to a huge challenge: to reduce the CO_2 emissions of an average fleet to 140g of CO_2 per km, per car by 2008. There is also a further option to make a greater reduction to 120g by 2012. Such targets require significant innovations at the cutting edge of technology.

It is widely accepted that lighter cars require less energy and aluminium helps produce lighter cars. Using 1 kg of aluminium replaces 2kg of standard steel, secondary weight savings included, and by saving 100kg of weight in a car, 0.38 litres per 100km of fuel are saved.

On average, a car of today, which uses 135kg of aluminium saves more than 2 tonnes of CO_2 emissions over its lifetime. This assumes the car is driven for 150 000 km. By using 100kg of aluminium the car's emissions are reduced by 10g of CO_2 per km, helping the car industry to reach the 140g target.

Not only does the use of aluminium help reduce CO_2 emissions, it maintains high safety levels and represents significant value for today's 'End of Life Vehicles'. It can also add to performance, improve the balance of a car, increase acceleration and enhance braking ability.

With ever increasing CO_2 emission targets looking likely, the choice of material to reduce weight will become increasingly vital in the designs of cars for future generations. Aluminium is clearly part of that mix.

MORE THAN BUMBERS: NEW SAFETY APPLICATIONS

Aluminium offers a lot of efficient crash management solutions. Recently, extruded monobeams combine the advantages of a crash-box and a beam. The mono-block beam, as brought to market by *Hydro*, absorbs enough energy to give a low repair cost in insurance repair tests by Allianz Zentrum für Technik AZT. This is achieved through the special swan-neck design. The system is especially designed for rear systems and works very well in tight packaging spaces. It is very cost-effective as it minimizes the number of parts and therefore is used throughout a wide range of vehicle classes, such as the Opel Corsa rear, Opel Astra rear and Saab 9-3 rear.

In shearbox systems the energy is absorbed as two steel bolts shear along the imprinted grooves in an aluminium crash-box. The shearing force is uniform along the shear distance, providing highly efficient energy absorption. Audi A4 and Opel Vectra are the first car models to use shearbox systems.

Active roll-over protection systems made from aluminium not only protect passengers in case of an accident, they also allow for fairly free design options, being "invisible" during normal driving. The systems consist of two cassettes behind the driver and passenger, which are only activated when the sensor indicates a dangerous roll-over situation.

LASER-CUT BLANKS IN INDIVIDUAL SHAPES

Traditionally, aluminium car body sheets have been supplied as rectangular blanks or coils. Trapezoidal shapes and chevrons were introduced later in order to reduce process scrap. With the start of production of the Jaguar XJ, *Novelis* supplied laser-cut aluminium blanks from four roboterized laser blanking centres in its Nachterstedt plant in Germany, to Jaguar and also other customers.

Laser cutting allows the production of blanks in any prespecified shape with excellent edge quality ready for stamping. The elimination of the blank cutting step in the press shop offers interesting cost reduction potential in particular for lower production volumes.

Furthermore, laser blanking allows cost savings in transportation as well as an optimized recovery of the off-cuts and their recycling into new car body sheets. For this reason, *Novelis* decided to invest also in a laser blanking centre for the production of up to 2 million blanks per year in Sierre, Switzerland, with a blank size up to 4x2 m. This investment is another customer-oriented step to improve the cost efficiency of aluminium sheet solutions in car body design.

ALUMINIUM BONNETS FOR IMPROVED PEDESTRIAN PROTECTION

The substitution of a steel bonnet by an aluminium one allows not only a weight reduction of up to 50%. The deformation characteristics of aluminium sheet also improve pedestrian protection compared to a steel sheet structure through smoother absorption of the impact energy. This material advantage can be exploited using a properly shaped aluminium bonnet inner panel.

If, for design reasons, the space available between the bonnet and solid components in the engine compartment does not offer sufficient deformation space, then active protection measures have to be considered. One solution is a pyrotechnic pedestrian deployable bonnet system as used in the Jaguar XK. In the event of a collision with a pedestrian, the bonnet automatically pops up within milliseconds to create a cushioning effect before hard spots are hit. In this case, the lightweight aluminium bonnet shows significant advantages over a steel one, having twice the mass.

Another solution developed by *Novelis* for improved pedestrian protection is the alloy Anticorodal®-118. The AlMgSi alloy Ac-118 enables the application of a uni-alloy bonnet design concept with the well-known advantages for process scrap recovery and the recycling of the end-of-life vehicle. Ac-118 is designed for very high formability and controlled energy absorption. Benefits are exploited first in the inner panel of the new DaimlerChrysler S class bonnet. The absence of a strong starting peak in the energy absorption curve lowers the HIC (head impact criteria) values significantly. Further potential applications are envisaged in the front-end or for inner door panels where the extremely good deep drawing characteristics of this alloy offer additional advantages.

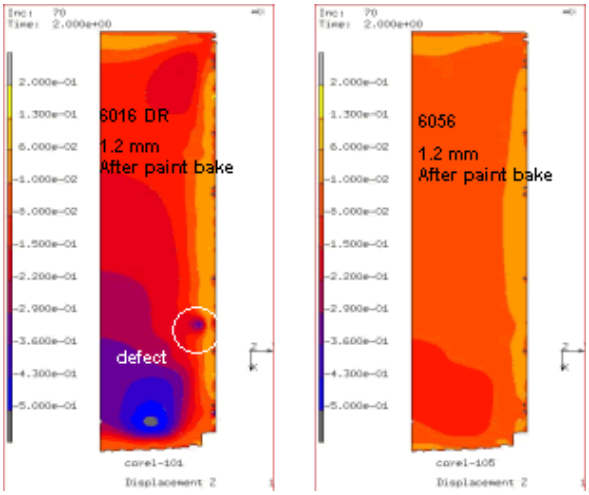
AIRCRAFT ALLOY BOOSTS ALUMINIUM ROOF SOLUTION

Alcan's wide experience in aerospace alloy development is set to benefit the auto market with a breakthrough for roof panels. A lighter roof lowers the centre of gravity, thus improving handling. The Neuf-Brisach plant in France, building on series production experience of aluminium for roof panels, has developed high-strength AA6056 for this application.

However, the use of aluminium for the roof on a steel structure constitutes a challenge: thermal expansion differences between steel and aluminium during the paint baking operation can lead to visible buckling of the roof panel. In addition to solutions based on design and assembly, the new 6056 alloy, initially developed for Airbus A318 and A340 fuselages, has been introduced. As shown in the numerical simulation, the *Alcan* 6056 alloy solves the buckling issue.

These results have been confirmed on several vehicle prototypes. This behavior is due to the remarkable mechanical properties of the 6056 alloy. The yield strength of 6056 alloy during the critical stage of paint baking is 50% higher than that of most advanced bake hardening alloys currently used in the automotive industry such as *Alcan* 6016 DR130.

Thanks to extensive aerospace know-how the aluminium roof panel is now ready for take-off.



[Alcan simulations of the sheet geometries for roofs after paint baking]

ALUMINIUM EDUCATION TOOL LAUNCHED IN BRUSSELS

aluMATTER, the high quality, interactive, innovative and freely accessible e-learning tool, was officially launched during a symposium in Brussels.

This partnership programme on aluminium science and technology, part of the EU Comission's Leonardo da Vinci programme, counts nine modules available for students and professionals alike, dealing with: Strengthening Mechanisms, Softening Mechanisms, Anisotropy, Surface & Physical Properties, Mechanical Properties, Machining Technology, Joining Technology, Forming Technology and Corrosion Control.

The last six modules will be available in English, Dutch, French and German.

To visit the aluMATTER website, please go to: **www.alumatter.info**

Aludrive is a joint newsletter of Alcan, Alcoa, Amag, Corus, Hydro, Novelis and Sapa, who are all members of the EAA Automotive Market Group.
The EAA, founded in 1981, represents the European aluminium industry. Its members are the European primary aluminium producers, the national associations representing the manufacturers of rolled and extruded products in 17 European countries and the Organisation of European Aluminium Refiners and Remelters (OEA) and the European Aluminium Foil Association (EAFA). The European aluminium industry directly offers jobs to about 236.000 people.