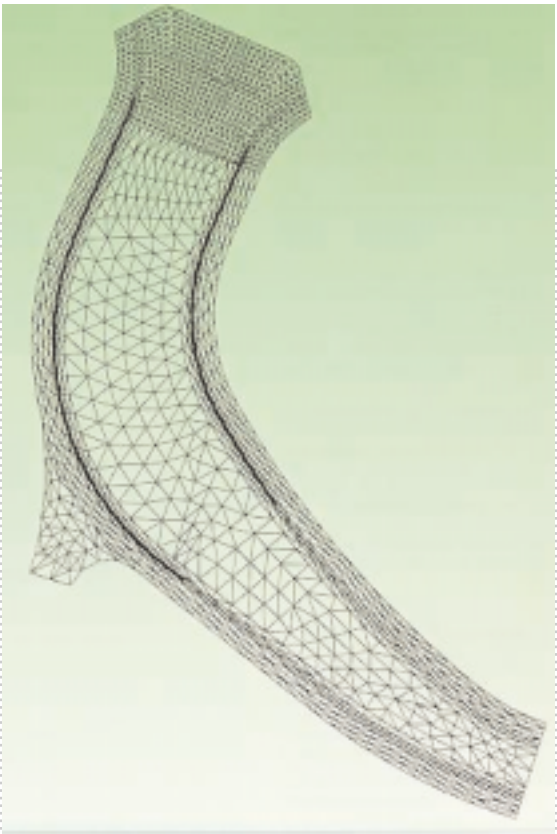
euro inox
The European Stainless Steel Development Association

Examples of Stainless Steel Design

by Pierre-Jean Cunat, Technical Director, Euro Inox, Brussels, Belgium

Paper on the occasion of the Euro Inox presentation
Stainless Steel in Structural Automotive Applications
– Properties and Case Studies –
at the Paris Motor Show Mondial de l'Automobile, 2nd October 2000

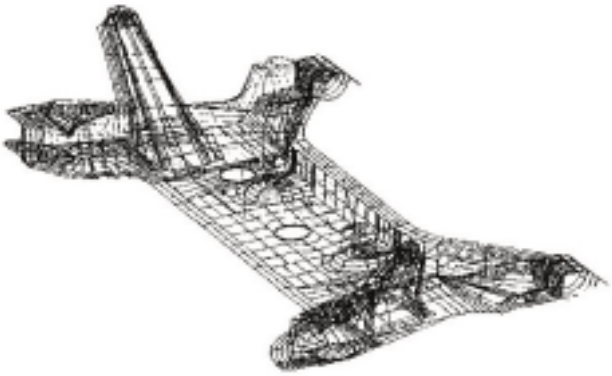


Introduction

To illustrate the case of novel applications, a few practicable design examples shall be discussed, which are taken from the Euro Inox CD-ROM *Stainless Steel in Structural Automotive Applications – Properties and Case Studies*. They were selected in view of demonstrating the combined advantages of mass saving, safety enhancement and ease of formability.

Engine Cradle

The first example of dramatic weight reduction is an engine cradle, which is one of the heavier parts in the car structure. The carbon steel reference part is 7.5 kg, whilst with optimised stainless steel design, 4.9 kg are reached. In this example, the weight reduction is 28%. At the same time, engine cradles are part of the crush zone of vehicle. So that the combined weight and safety advantages have to be taken into account.

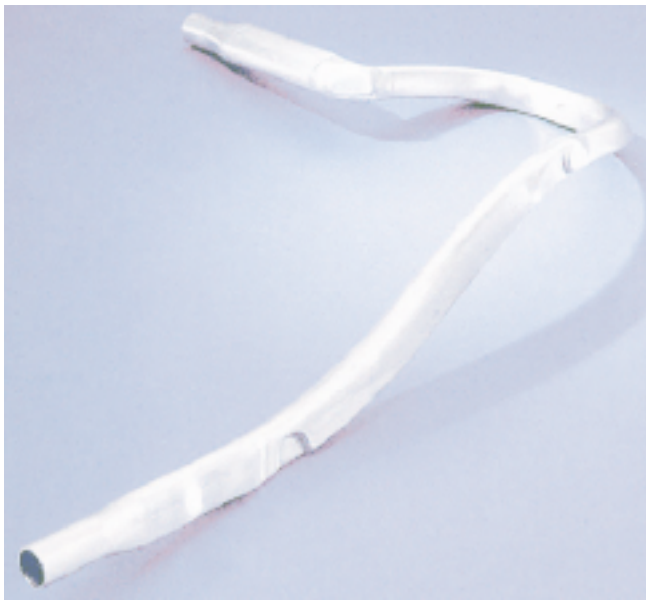


Suspension Arm

Suspension arms are components where weight is an issue. The reference carbon steel part weights 2.730 grams while a design optimised for stainless steel can reduce the weight to 1.740 grams. This means a weight reduction of 36%.

Roll-Over Beam

A second set of examples highlights the potential in safety enhancement.
This is the picture of a hydroformed roll over beam part for a sports vehicle. As we understood from earlier papers today, the deformation of the tube leads to strain hardening. The result is high strengths and consequently high resistance to impact.



Energy Absorber

The second example is an energy absorber. It is the function of this component to absorb energy in the event of a crash. Traditionally, these are designed as rectangular columns. Others are based on tube expansion or work hydraulically. But this is where the crash absorption potential of stainless steel can be used to the greatest benefit of the manufacturer.

Side Member

A third set of examples shows the excellent formability of stainless steel components, as illustrated in a side member. Compared with more conventional counterparts, this body part is fairly complex. This was made possible through the high ductility of the material and the excellent formability, which is a characteristic feature of austenitic stainless steels.

Summary

As a conclusion, it can be said that stainless steel has gone beyond the blueprint stage and is gradually making its way from more traditional applications into structural design. The case studies are to encourage automotive designers to think about new and forward-looking application of this technically outstanding material.