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HIGH PERFORMANCE POLYPROPYLENE FOR EXTERIOR BODY PANELS

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Aspects of Using Polypropylene in Automotive Manufacturing, with Emphasis on Exterior Components

When Henry Ford introduced his famous "Model T" to the market, he could not imagine the quantum leaps that the automotive industry would take in the 20th century. Just as the first Ford caused a radical change in manufacturing techniques, the latest innovative material developments are heralding a new age for transportation systems of the 21st Century.

The whole transportation sector will be revolutionized by the use of plastics. Innovative materials and compounds will revise the realms of the possibility of a future generation of travellers by land, sea and air. In the future, aerodynamic trains with a speed of over 350 km/h will cross Europe almost soundlessly. Quieter and lighter Jumbo planes will cross continents using less Kerosene than used today, bringing a larger number of travellers quickly, safely, and comfortably to their destination.

Extremely light, comfortable, and safe 3 litre cars will enable personal travel which conserves resources and is environmentally friendly.

The material composition of a vehicle evolves from the demands which are made of each vehicle. On the whole, these demands are the result of customer expectations and statutory background and are demands on the environment, i.e. conservation of resources and ecological consideration. In addition to customer expectations, increasing sensitization, with regards to the rentability of the vehicle, will influence the material used, and therefore, the growing proportion of plastic materials.

Today, when a car leaves the assembly line, every tenth kilo of material used is plastic. Not only bumpers, dashboards, seats, cladding and, more recently, body parts, are manufactured from Polymer materials, but in addition to the obvious plastic applications, a real revolution has started to take place in the engine compartment over the last few years. The use of engineering plastics for engine components, accessories such as water pumps or oil pumps, for the cooling system or the intake equipment are just the beginning.

In the next fifty years, thanks to the use of plastics, cars which are safer, more comfortable and more economical to run will be a reality. By using plastic materials it will be possible to reduce the total weight to a quarter of the present weight. Plastics also offer body engineers the best opportunity of optimising the aerodynamics of the vehicle.

Weight and aerodynamics are decisive factors in automotive manufacturing and all these developments will only be possible because of the extensive use of plastic materials, as more plastic means less weight and better CW-values, and that in turn means lower consumption and less emissions.

Figure 1 – The evolution of the bumper system, is mainly based on the functionality and design. Because of this, requirements for material has changed.

Figures 2-3 – Here you see the development of the copolymers R-EMPP and PP/EPDM and the influence of filler content on part weight.

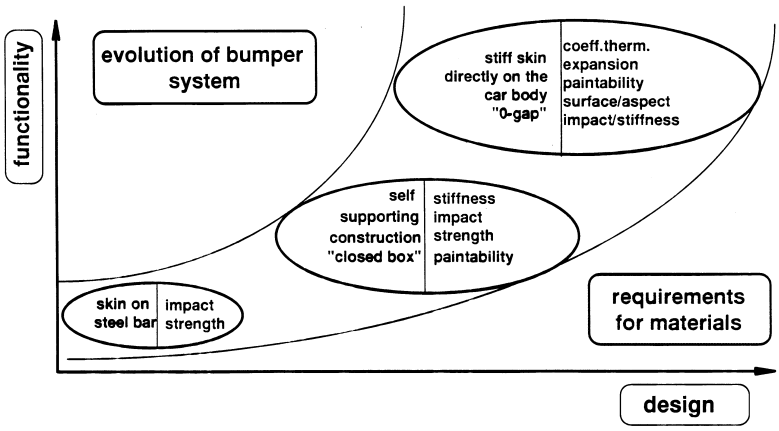

Figure 1. The evolution of the bumper system is mainly based on the functionality and design. Because of this, requirements for material have changed.

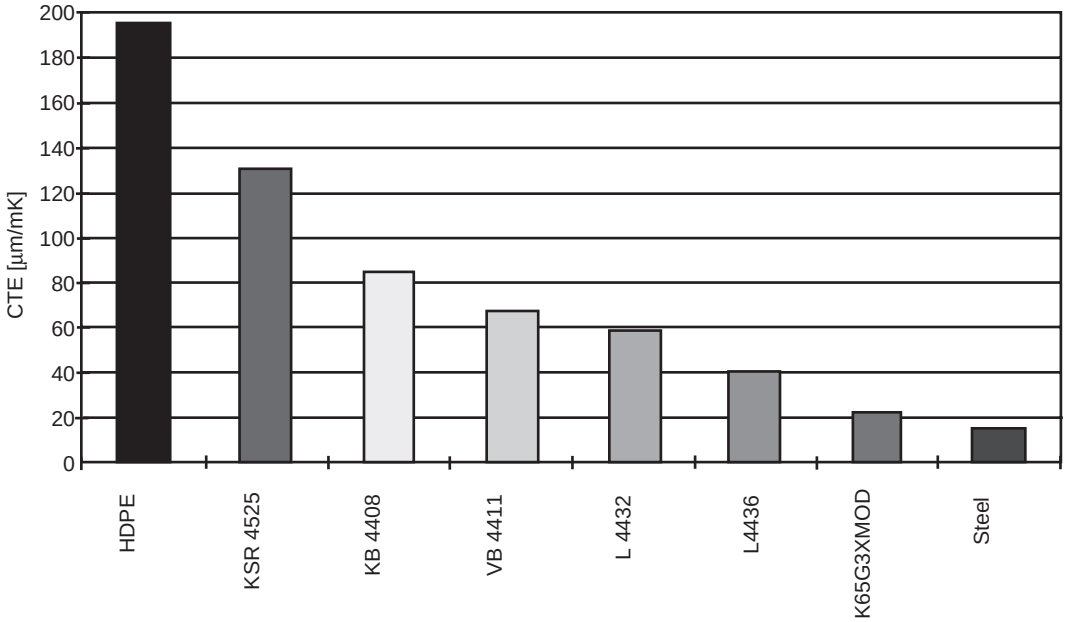

Figure 2. PP-performance in car exterior, thermal expansion.

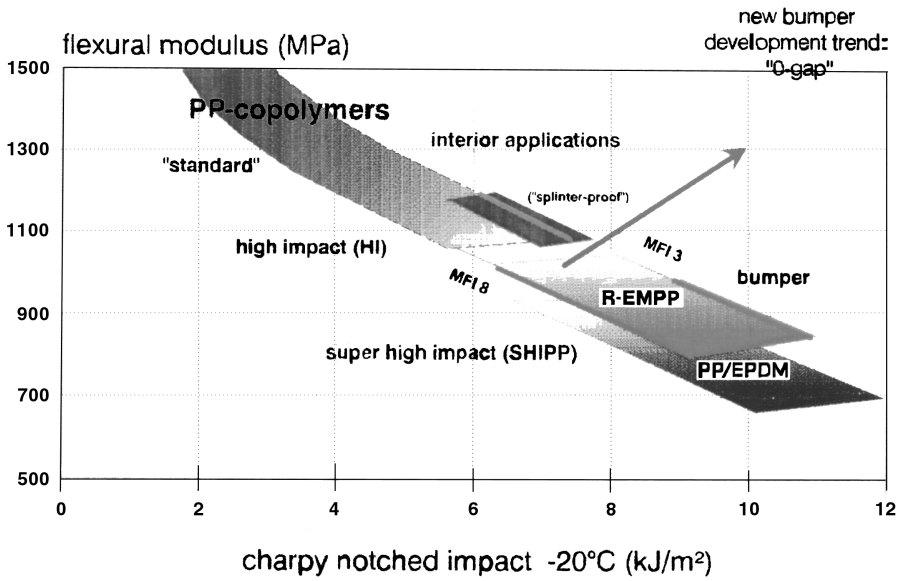

Figure 3. The development of the copolymers R-EMPP and PP/EPDM and the influence of filler content on part weight.

R-EMPP: influence of filler content on part weight (at constant part stiffness)

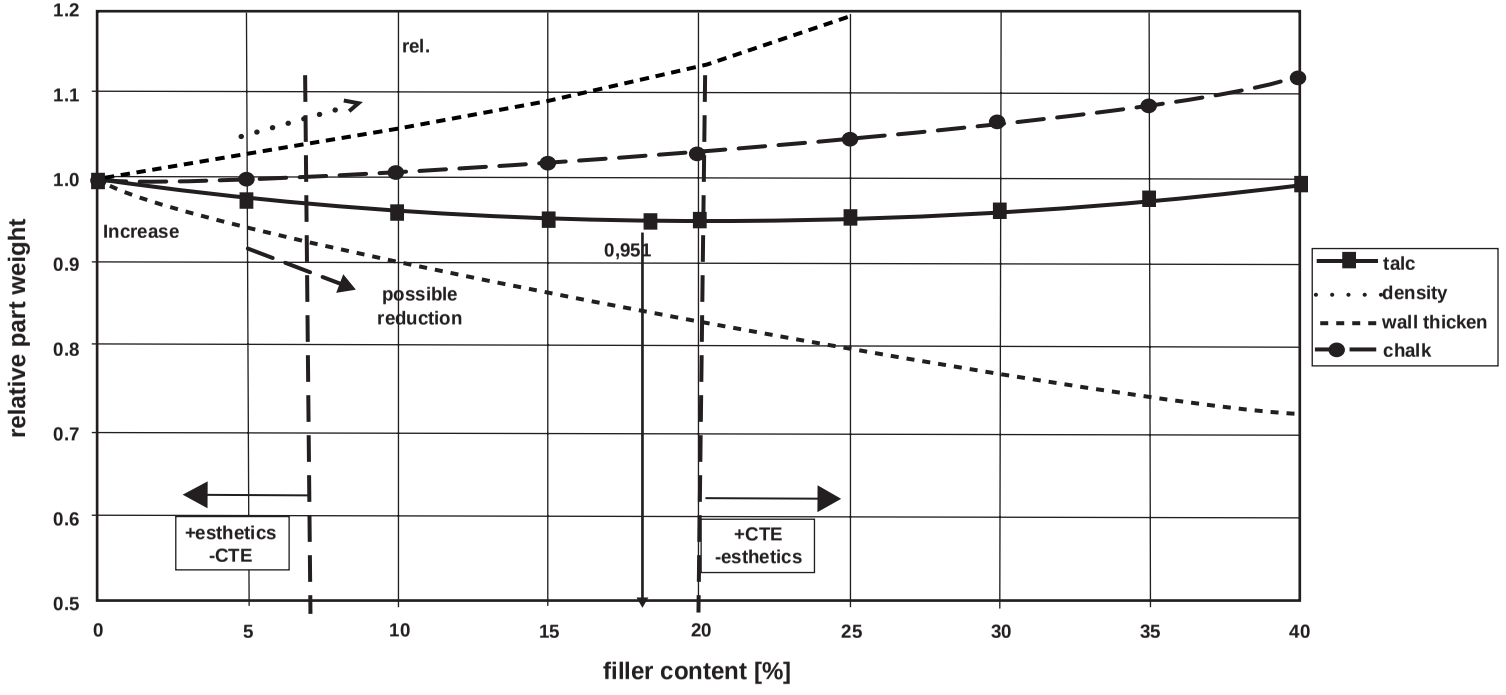

Figure 4. Stiffness versus impact of PP-copolymers, R-EMPP and PP/EPDM.

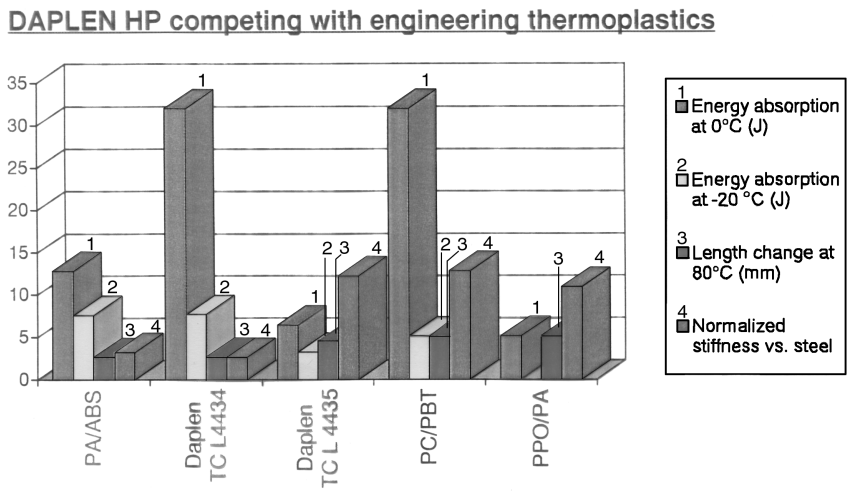

Figure 5. Material comparison for body panels.

Figures 4-6 – The following three slides show how Borealis is prepared, with regards to materials, to meet the requirements for car exterior body panels and even compete with engineering thermoplastics.

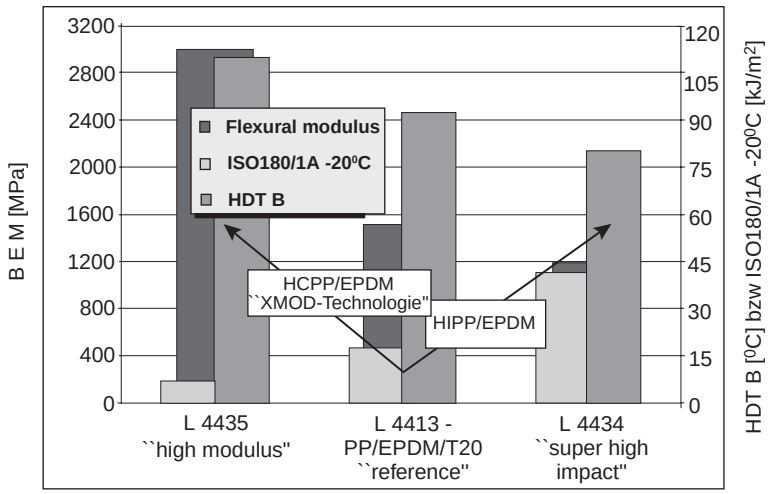

Figure 6. PP-Performance in car exterior, PP-compounds for body panels.

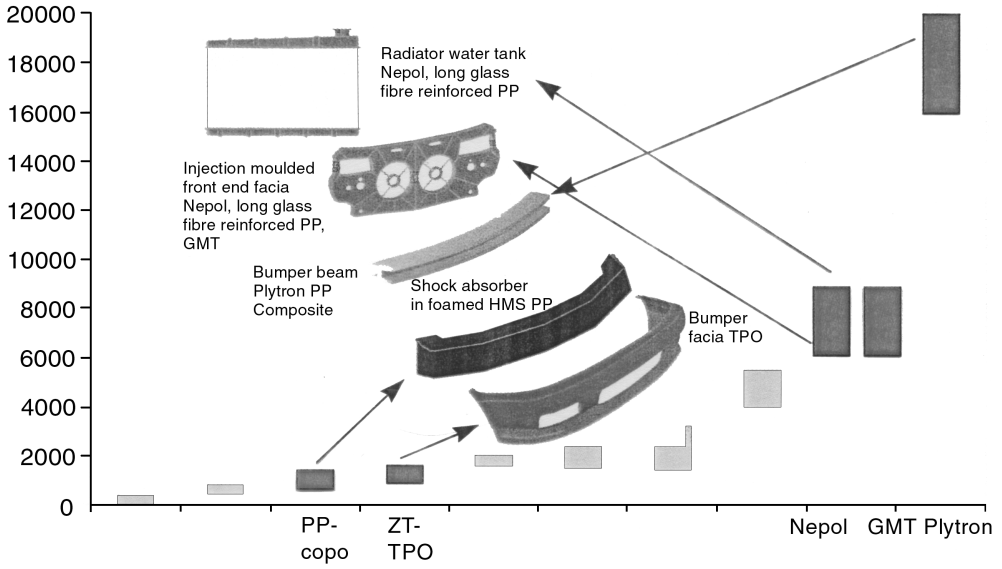

Figure 7. Monomaterials system for front end.

Figures 7-10 – These are typical applications for bumpers and exterior body panels like side trim and sidepanels.

Borealis is very prepared to offer a product range from supersoft PP to high stiff PP for monomaterials.

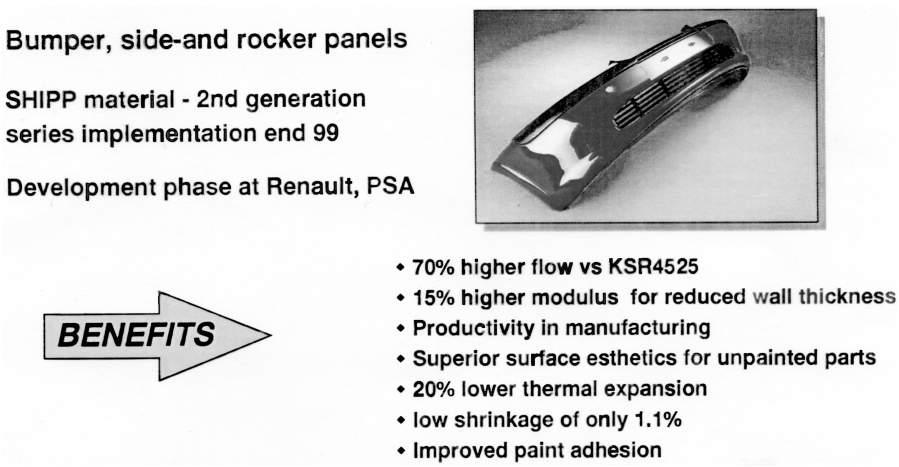

Figure 8. C4510-closing the gap between R-TPOs and 0 gap comp.

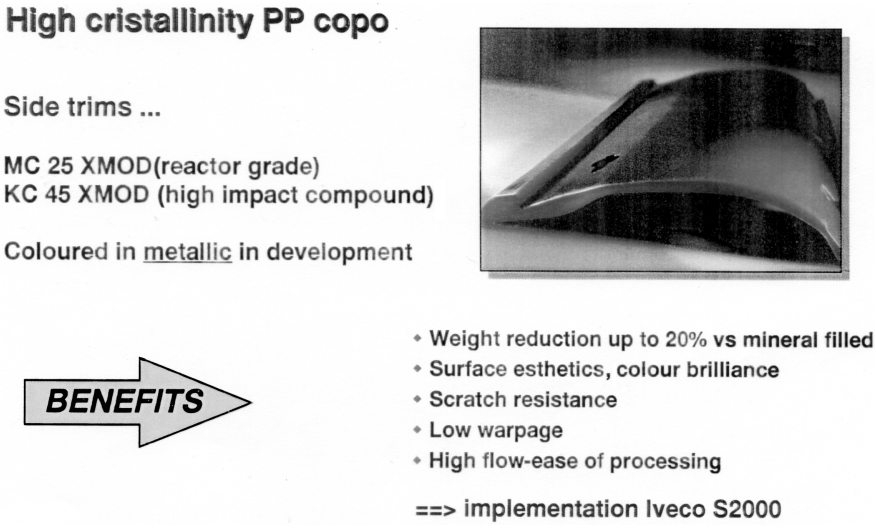

Figure 9. High crystallinity PP copo.

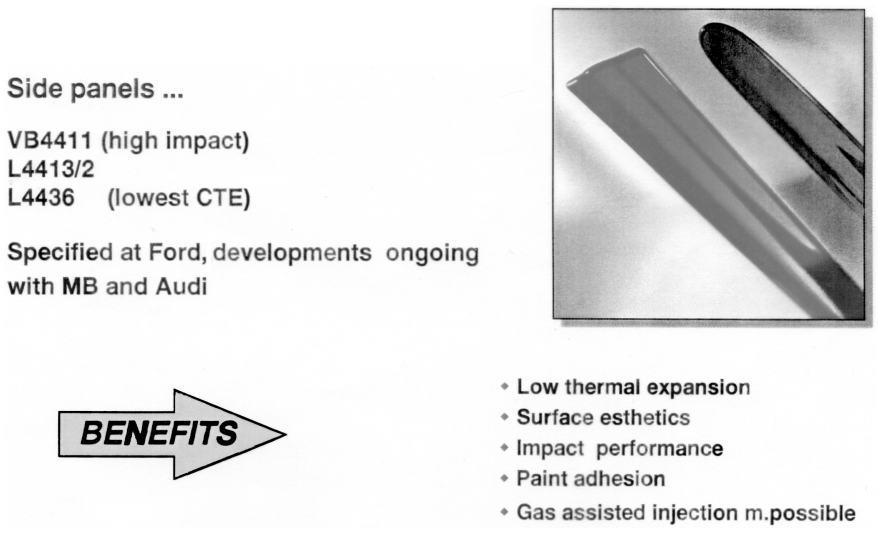

Figure 10. 0 gap compounds in car exterior.