

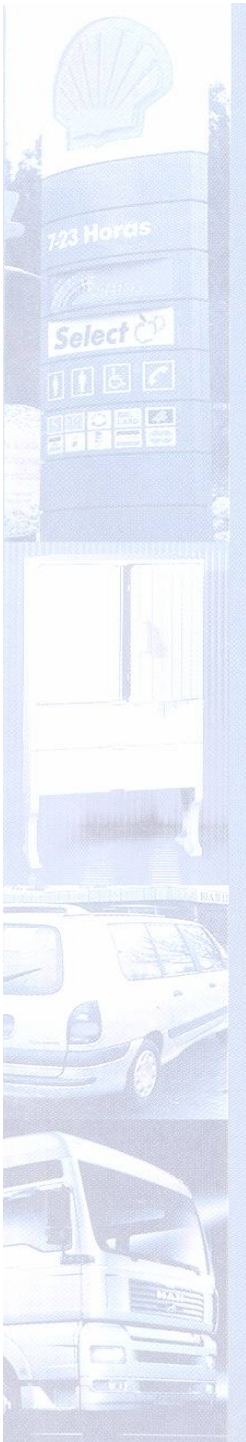


## **Advanced compounds for superior parts**

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Menzolit Compounds International  
BYK

July 2007



## Content

1	Rising demands
2	Finding answers to the new challenges
3	Automotive applications in Europe
4	Future challenges - outlook
5	The European Alliance for SMC/BMC



# Content



1	Rising demands
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## Rising demands

### The demands for the compound

- Excellent reproducibility
- High productivity
- Superior performance

### The demands for the part

- Emission of the car
  - Due to CARB etc.
- Fogging of the interior
- Smell of interior parts
- European legislation
- Low weight
- On-line paintability
- Excellent surface properties
- Complicated shapes
- Higher volumes with better reproducibility



## Content

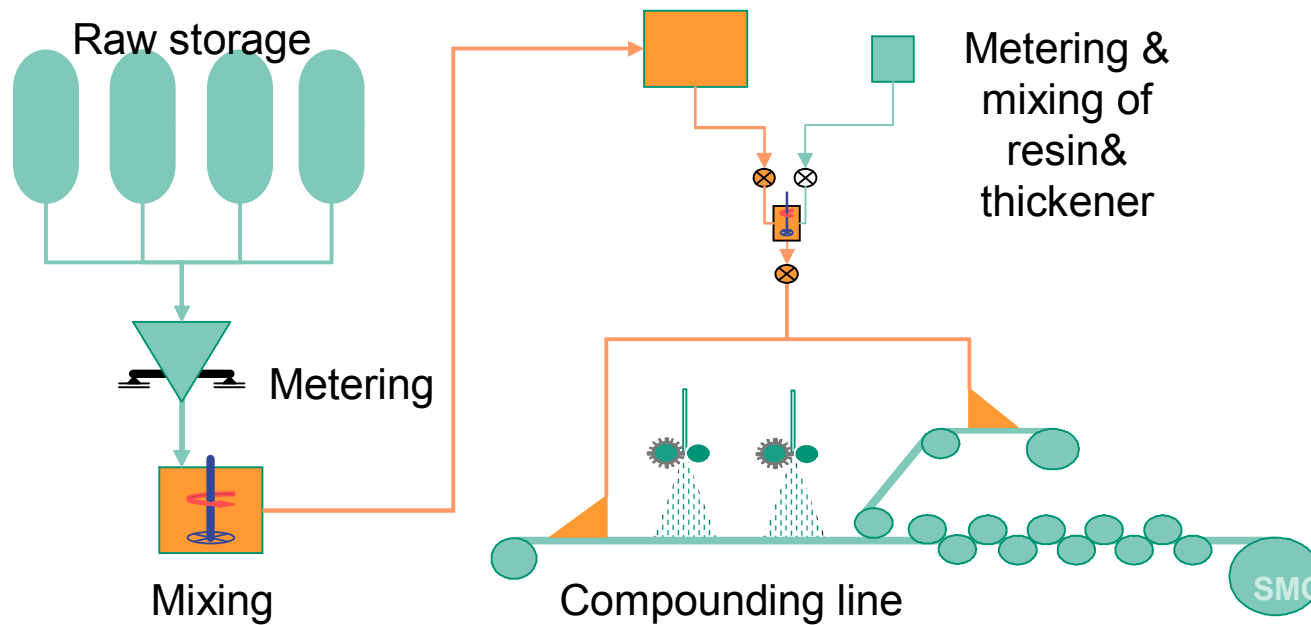
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# The demands for the compound

- Excellent reproducibility
- High productivity
- Superior performance

➔ By applying the results of several projects such as TripleC (with DaimlerChrysler) many improvements in the process were implemented

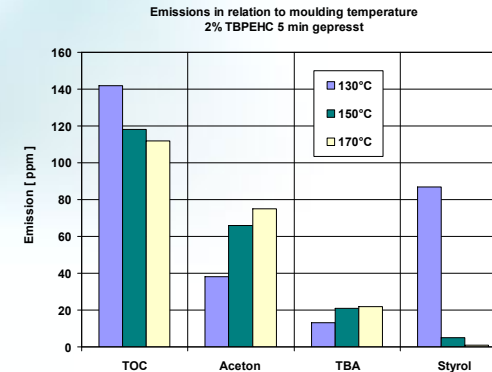
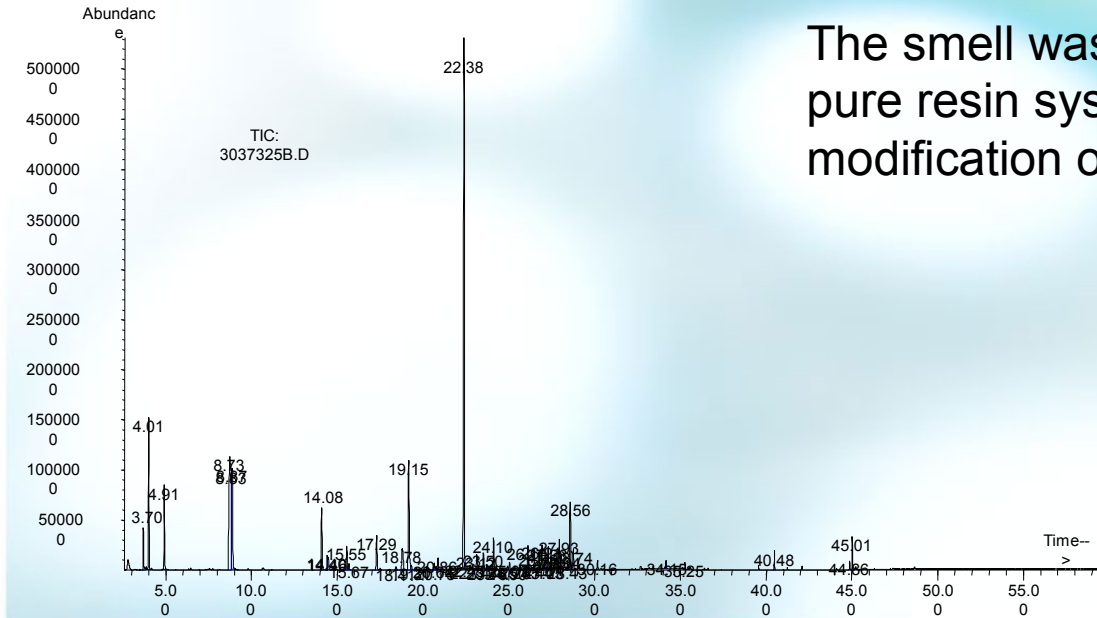


## The demands for the part

- Emission of the car
  - Due to CARB etc.
- Fogging of the interior
- Smell of interior parts

With modifications in the compound and an optimization of the molding parameters the emission and fogging could be reduced drastically

The smell was reduced by more pure resin systems and modification of formulation



## European legislation

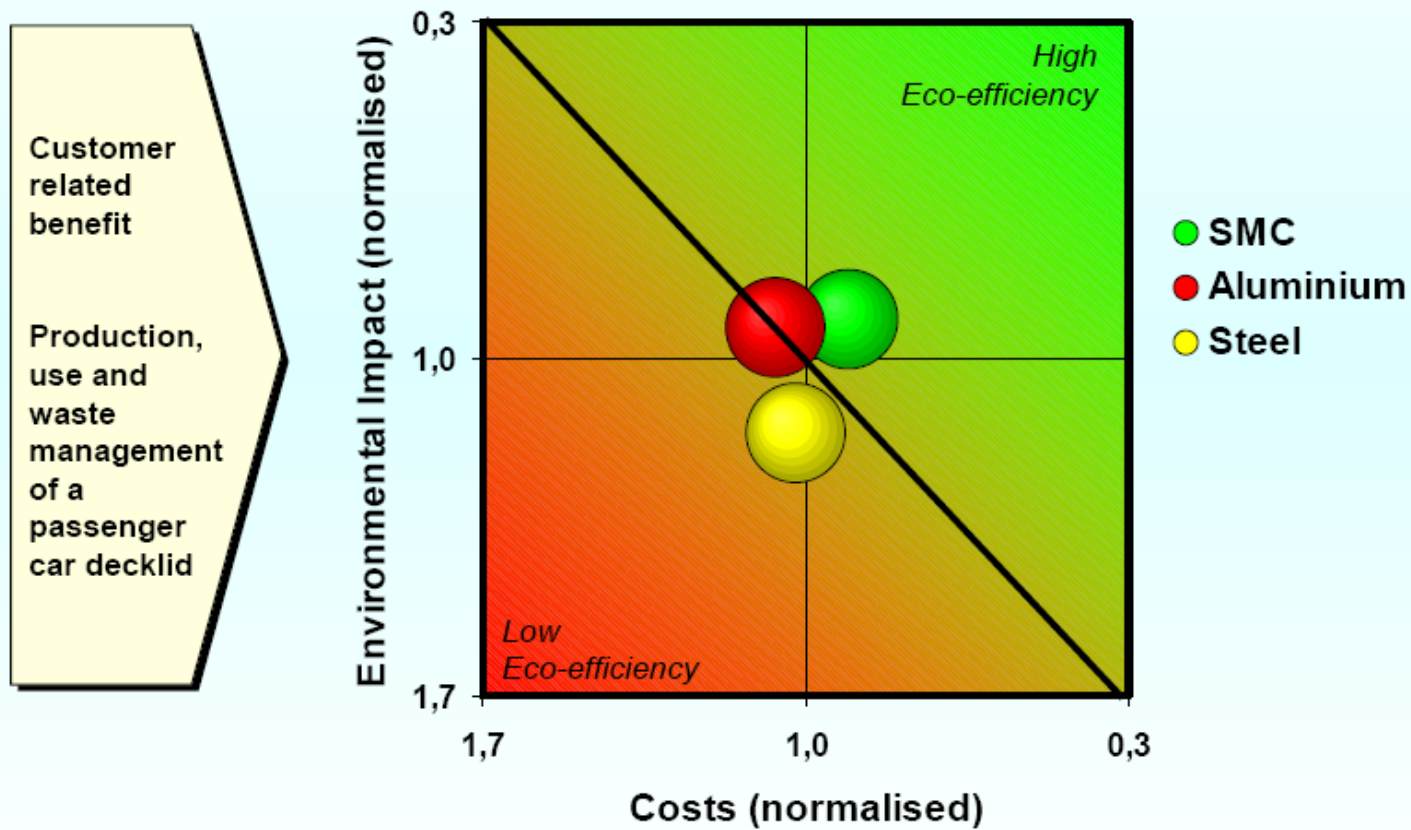


- The EU requires a detailed analysis of the total life cycle of a vehicle – which means an analysis of all parts
- Eco efficiency analysis (environmental impact of the part)
  - Energy and raw material demand to make the part
  - Energy consumption of the vehicle due to the part
  - Energy consumption at the end of life cycle
  
  - This was done by BASF in comparison of decklids made from sheet metal, aluminum and SMC
  
  - The SMC part has a very positive eco balance



# European legislation on eco efficiency

Comparison of passenger car decklids : Base Case



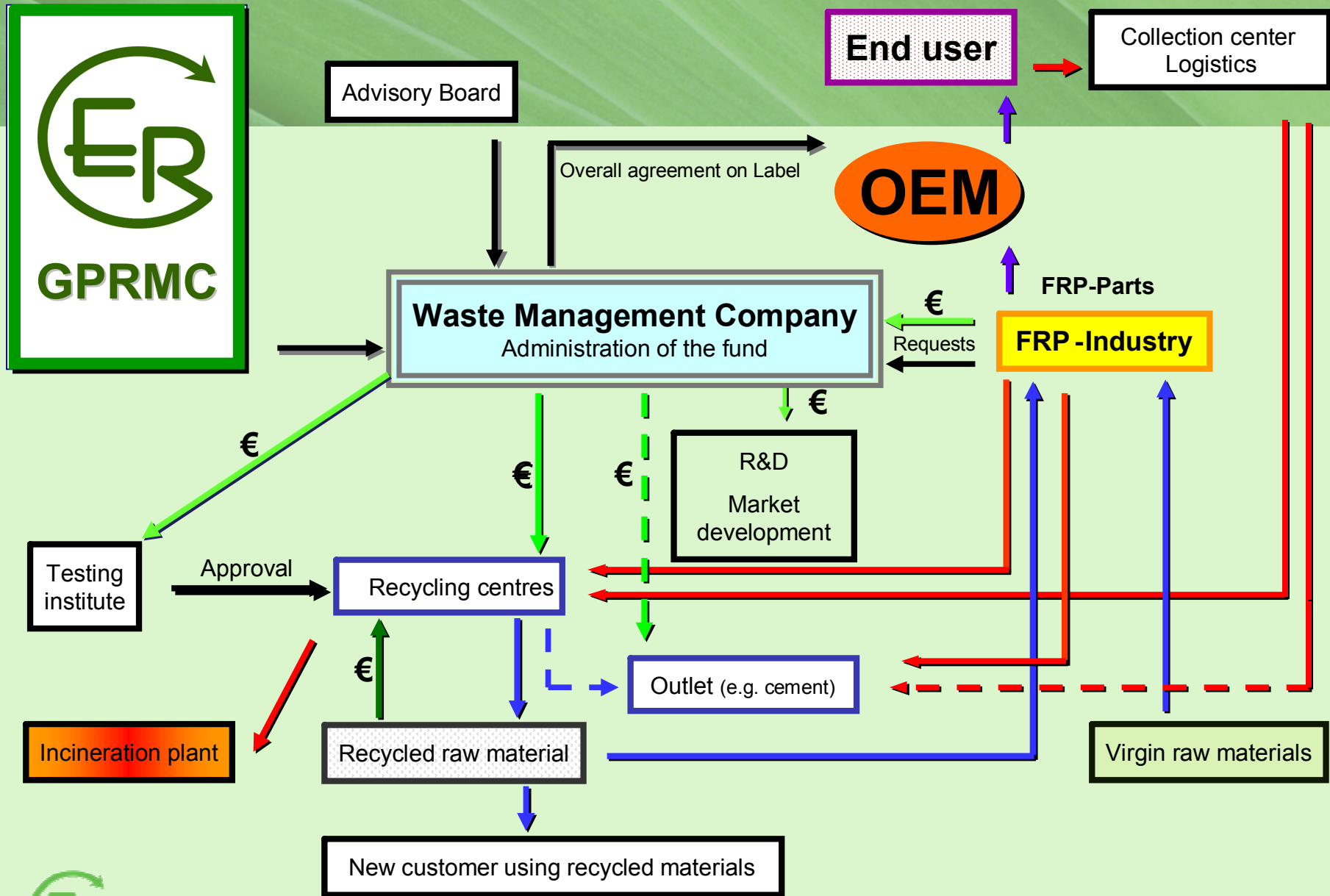
Eco-efficiency Analysis



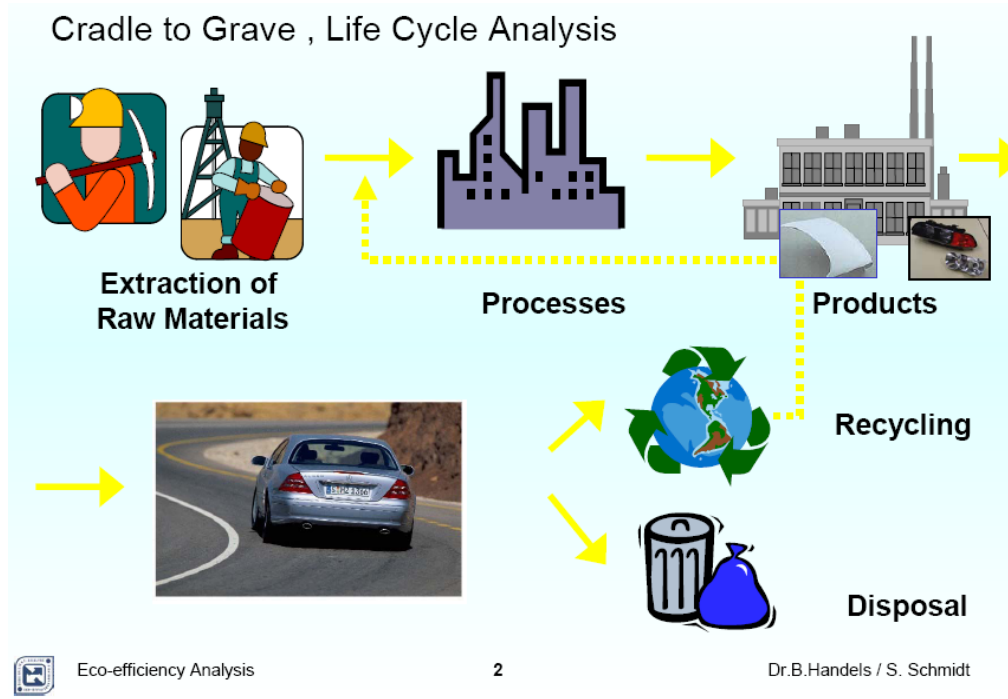
## The EU regulation End of Life cycle (ELV)

- 1 Due to the EU demand for 85% re-use the FRP industry will face a growing pressure on how to deal with their waste:
  - Landfill of composite waste will be forbidden by end of 2004 by most EU member states.
  - Incineration will have limits imposed on the level of energy content.
  - To comply with the various EU directives on end-of-life waste, customers especially in the field of automotive are asking for a waste management solution.





# The solutions for the environment



European Composite Recycling  
Services Company



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# Automotive applications



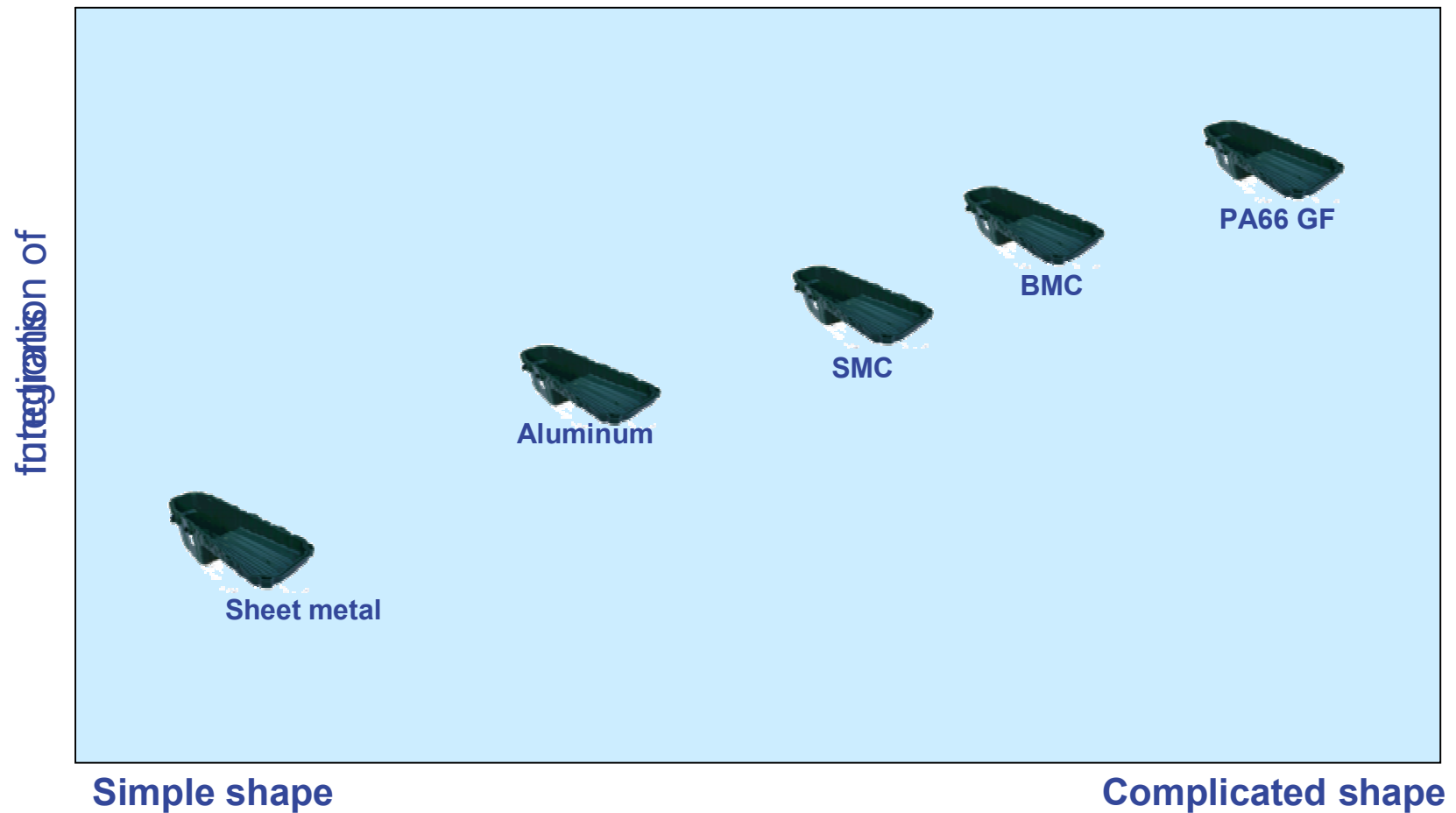
Design freedom and integration

For many parts a very positive cost performance ratio is achieved by an extremely high degree of integration of functions

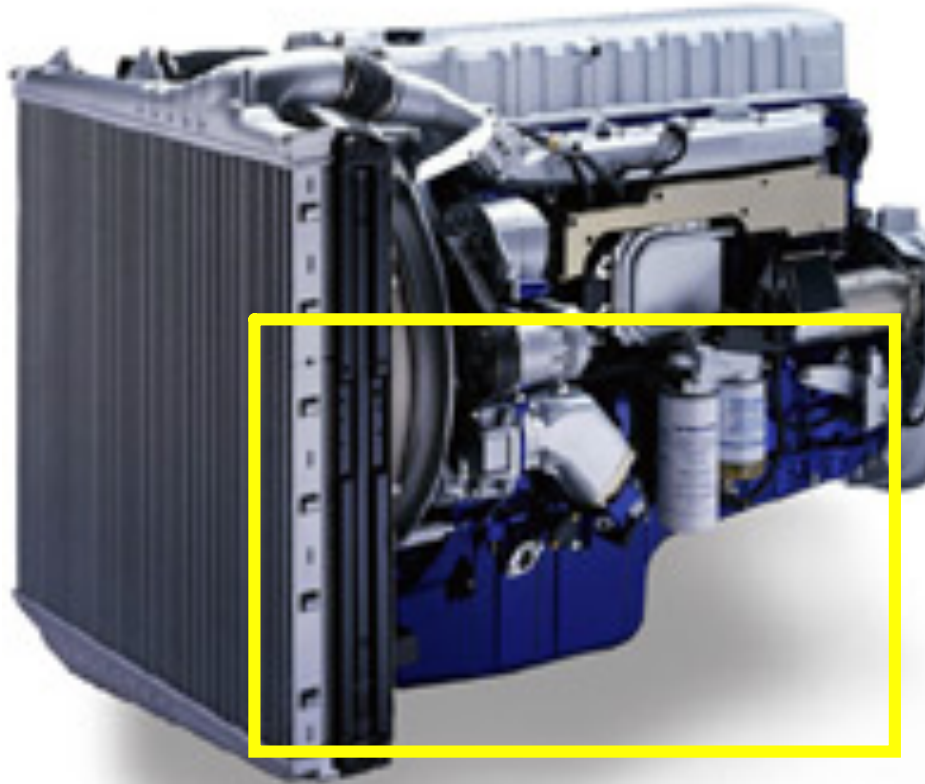
Typical examples are the Volvo / Renault truck oil sumps



## Design freedom for engine materials

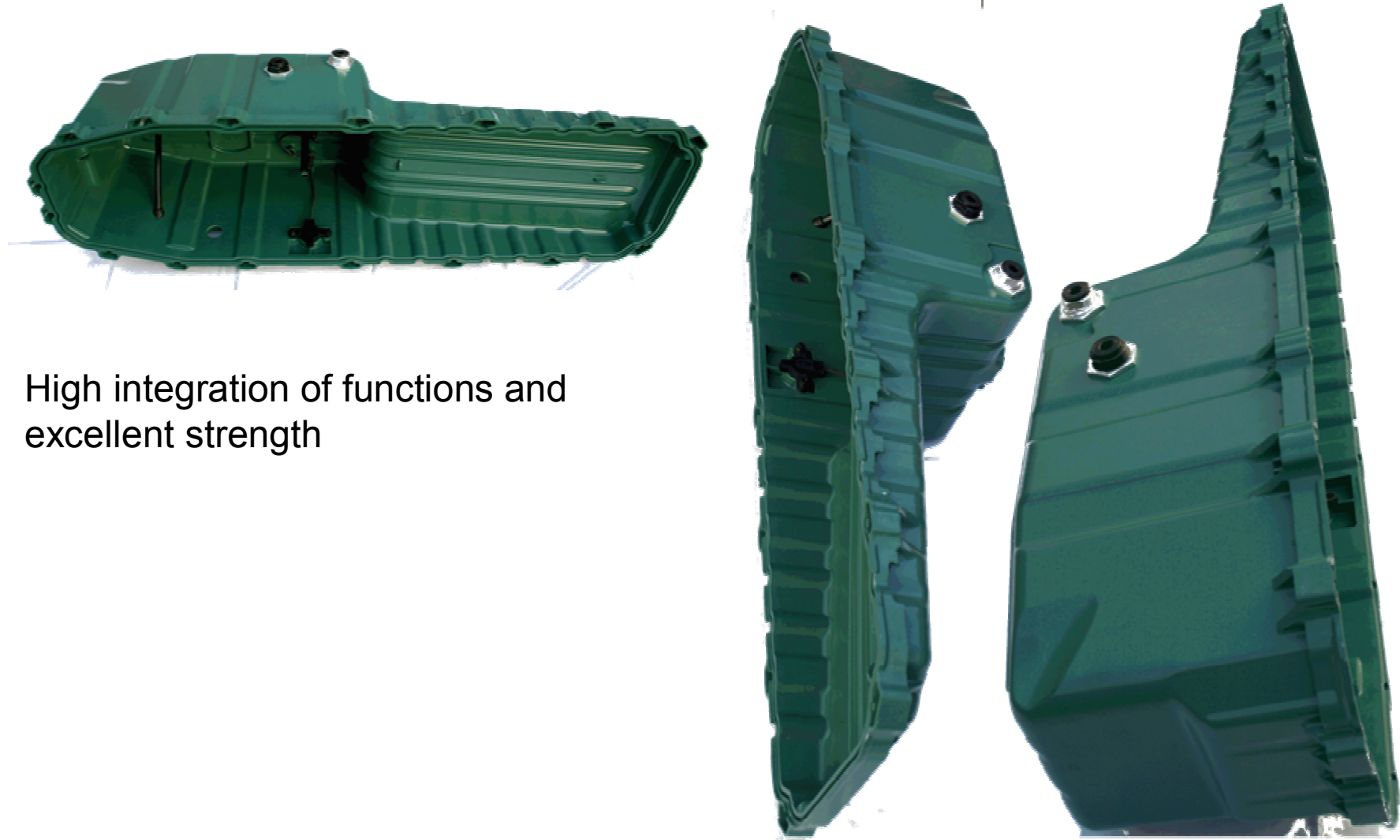


# VOLVO FM / FH oil sump of D12 engine





## VOLVO / RENAULT oil sumps



High integration of functions and excellent strength



## VOLVO / RENAULT oil sumps



Type	engine	VOLVO truck	RENAULT truck
MD 9	9 l	FH / FM	
MD 11	11 l		Premium
D 12	12 l	FH / FM	
MD 13	13 l	FH / FM	Magnum



## Semi structural parts with high integration of functions in passenger cars

### Sunroof frames of Mini One

- Integration of rail for shade
- integration of belt for opening / closing sunroof
- Integration of devices

### Side step of Mercedes Sprinter / Dodge Sprinter

- High strength required → load of 1,5 to
- Anti slip on top side
- Excellent stiffness required (part of body in white)

### Citroen Berlingo roof module

- high integration of functions (boxes, storage, devices)



# Mini One sunroof frame



## BMW / Mini sunroof frames



## Mercedes-Benz / Dodge Sprinter side step



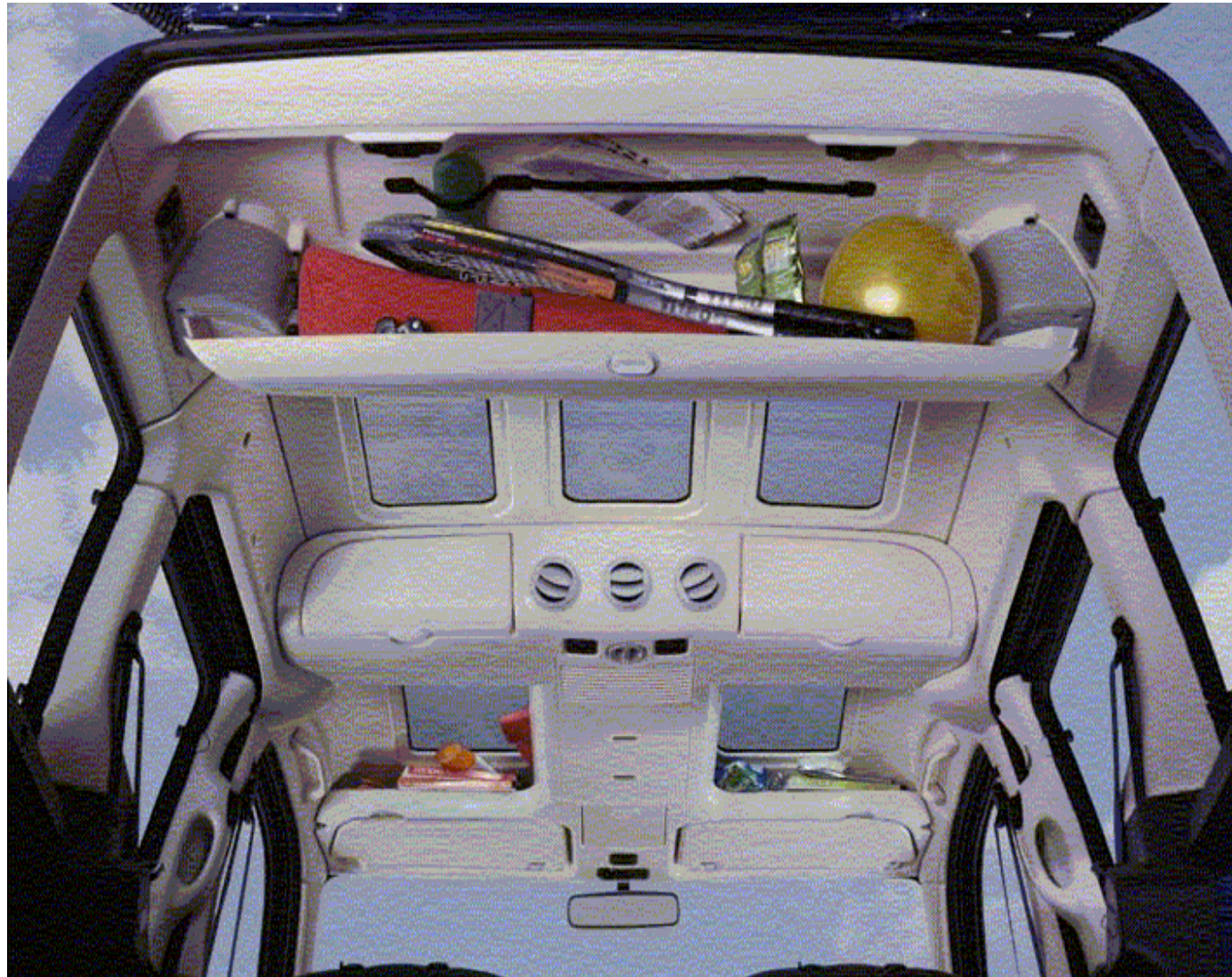
## CITROËN Berlingo roof module outside



The SMC roof module (inner and outer shell) is completed with windows and railing and



# CITROËN Berlingo roof module inner side with storage boxes





## The new Mercedes-Benz CL 500 / 600 decklid



Extreme difficult shape

Extreme high demands for surface quality

On-line painted

Antennas integrated in part



## Mercedes-Benz CL decklid



## MERCEDES-BENZ SLR McLaren



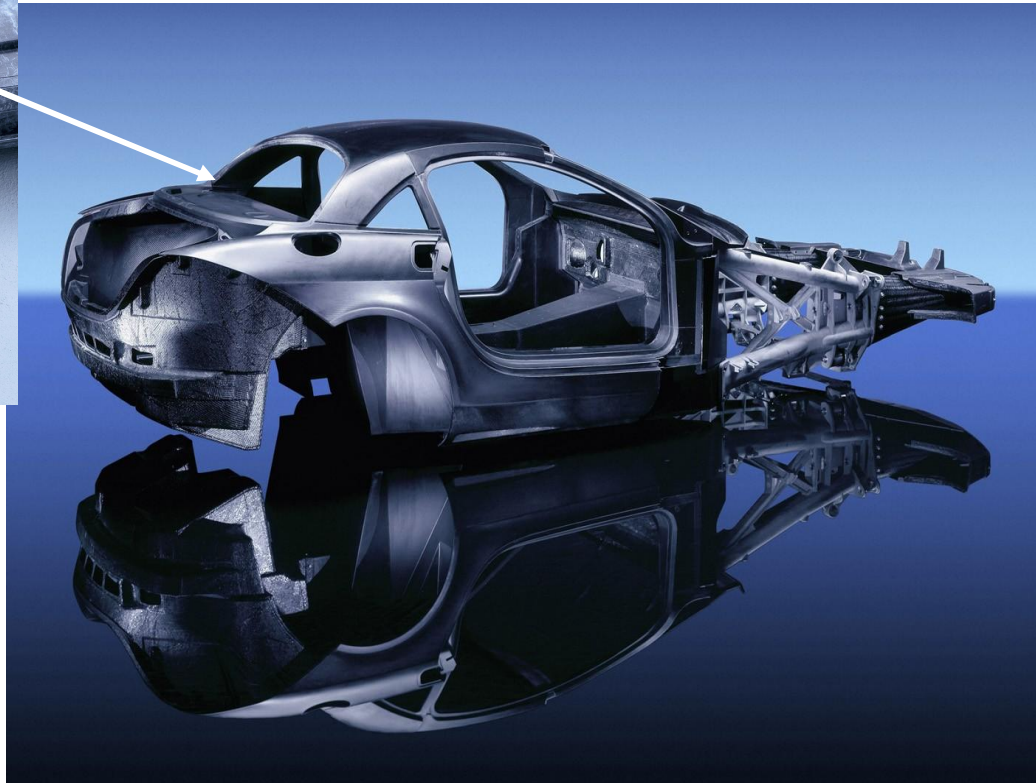
Body in white designed like a racing car monocoque

Scuttle panel as part of the rigid structure of the body-in-white from carbon fibre SMC (Menzolit AdvancedSMC)

Exterior parts for weight reasons in low density SMC



## SMC using carbon fibres → AdvancedSMC



Mercedes Benz SLR  
McLaren  
“Scuttle panel”  
Using  
AdvancedSMC  
Very high stiffness at  
low weight.



## MERCEDES-BENZ SLR McLaren

Front side panels  
Front vent panels  
Cover mufflers



## Hiding the antennas

Modern vehicles have several antenna systems for

- Radio
- Telephone
- GPS
- Remote control of lock and alarm system
- Automatic identification system

Antennas were often damaged by vandalism → antenna are hidden nowadays

SMC parts are permeable for antenna waves → antenna are mounted behind the exterior shell of SMC parts

Examples are:

- Mercedes GL, M, R, CL. CLK convertible
- Volkswagen EOS
- Renault CC



## Mercedes-Benz ML rear roof section



## Safety and maintenance

In town often accidents happen in stop and go traffic



Most often rear and front of vehicles are damaged



To save repair cost and lower insurance Renault integrated a rear crash panel on the Renault Megane





# RENAULT Megane crash panel



## Convertible Coupés → a new trend

Car makers introduce vehicles that are a coupé with a rigid roof which can be opened and then this vehicles become a convertible

Examples are

- Cadillac
- Mercedes SLK
- Renault CC
- Volkswagen EOS
- Ford Focus CC

The decklid opens both ways to enable the roof to be stored in the rear or to use the rear for luggage. Therefore the demands for stiffness are high.



# RENAULT Megane Coupé Cabriolét decklid



## VW EOS decklid



## Volkswagen EOS decklid



## Demands for high performance parts

Superior surface

High annual volume

→ High demand  
for reproducibility



High degree of  
automation required



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## Higher annual volumes and more often body facelifts of the same vehicle

Sheet metal: The 2 part design of exterior passenger car details requires at least 10 up to 12 steel tools for stamping and forming the sheet metal inner and outer part



Source: Dieffenbacher, DE



SMC: The 2 part design of exterior passenger car details requires only 2 tools if SMC moulding technology is used







Source: Dieffenbacher, DE



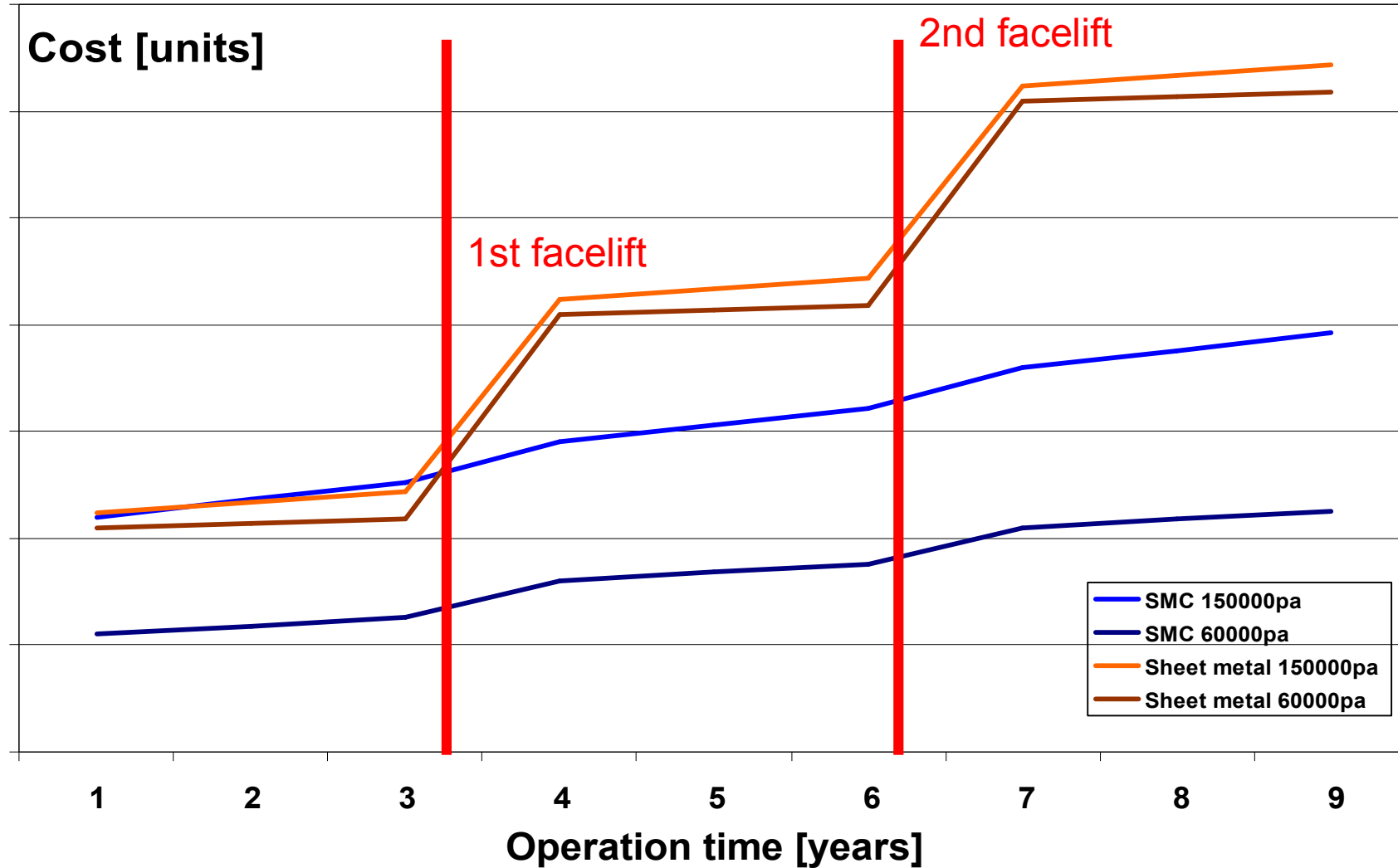


## Investment cost comparisons between sheet metal and SMC

Outer panel moulded from SMC			Outer panel stamped from sheet metal	
< 80.000 p/a	> 80.000 p/a	> 80.000 p/a	0 – 20.000.000	
Equipment: 1 press	2 presses	2 presses	6 presses	
Tool: 1 tool	2 tools	2 tools	6 tools	
Postmoulding: 1 line	1 line	1 line	1 line	
<b>Cost: 22 %</b>	<b>40 %</b>		<b>100 %</b>	
Inner reinforcement moulded from SMC			Inner reinforcement stamped from steel	
< 100.000 p/a	> 100.000 p/a	> 100.000 p/a	0 – 20.000.000	
Equipment: 1 press	2 presses	2 presses	5 presses	
Tool: 1 tool	2 tools	2 tools	5 tools	
Postmoulding: 1 line	1 line	1 line	1 line	
<b>Cost: 30 %</b>	<b>45 %</b>		<b>100 %</b>	



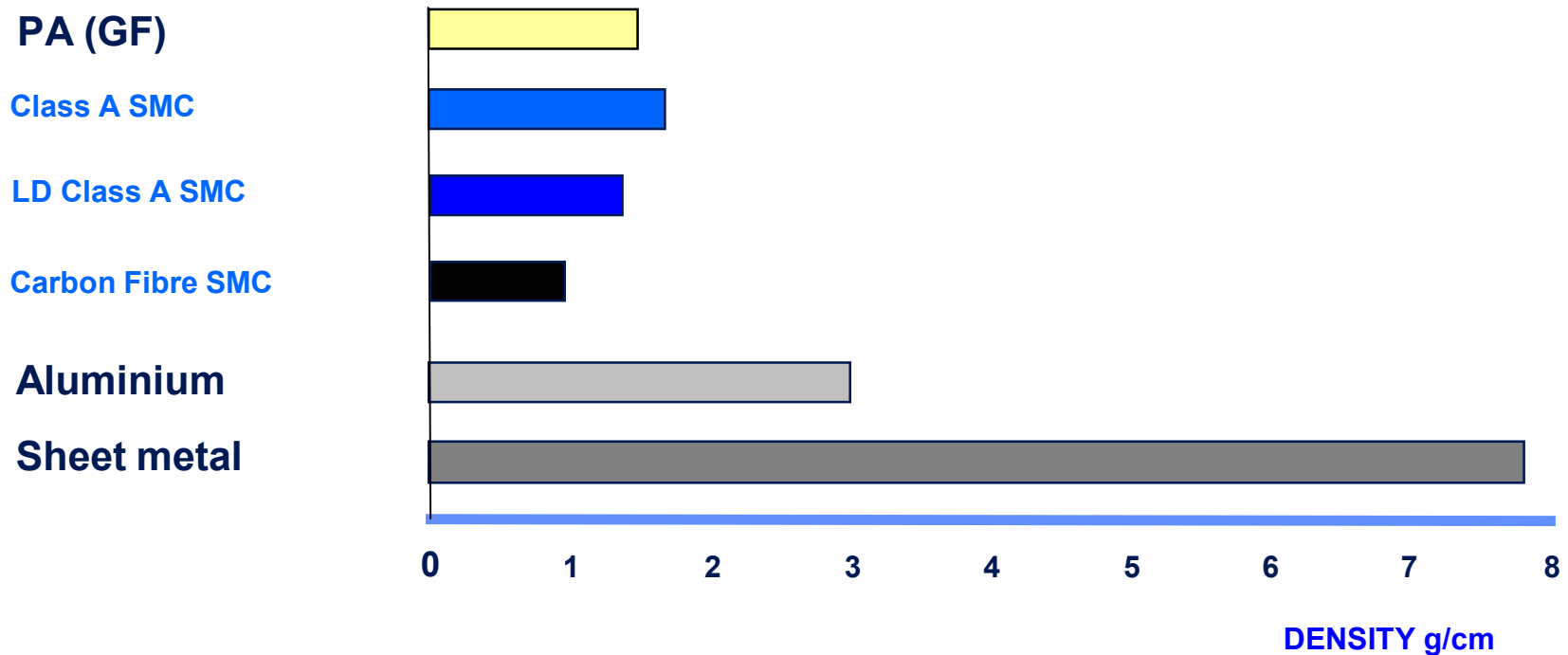
# Cost comparison with face lift after 3 + 6 years SMC vs sheet metal



# Reduction of CO2 Emission of new future vehicles

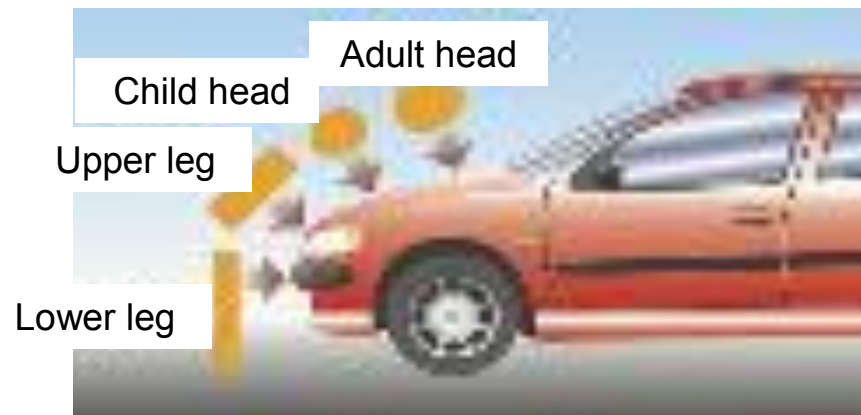


New future vehicles in Europe will have a limit of CO2 emission  
This means that fuel consumption has to be reduced  
Engines are already very effective → more weight reduction is required  
This means that more sheet metal will be replaced by other materials:



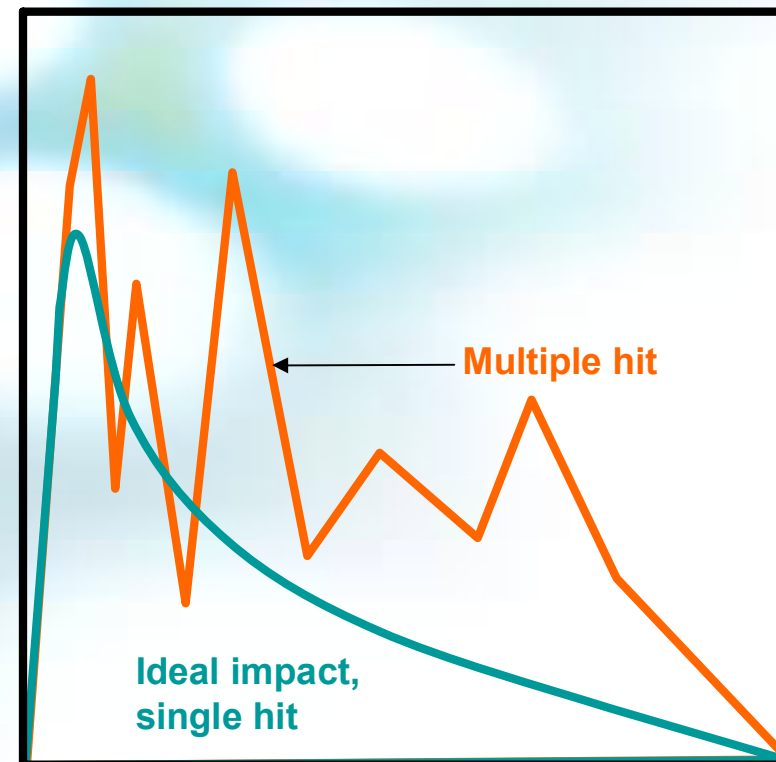
## Pedestrian head impact

- In a pedestrian – car collision the EU requires new safety standards
- The European administration requires that certain damages to a human body are not exceeded in a collision.
- To assess the damage done to a human head colliding on to a bonnet the so called HIC (Head Injury Coefficient) is used.
- High impact forces, long impact duration and multiple hits make large HIC value.
- It is required that a HIC value of 1000 is not exceeded.
- The HIC value corresponds to damage done to a human brain.



## Impact management

- To manage the energy of such a human – car collision basically deformation or a downwards movement of the bonnet is required.
- It is required that the impact is not multiple.
- Larger deformation or movement results in less impact forces and lower HIC values.
- Impact energy should be taken out off the system to avoid multiple impacts.



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# The members



Leimontec



## Menzolit compounds



### Success needs high performance

**Composite materials made by Menzolit®, to give you the competitive edge.**

Whatever you plan to develop and produce, reinforced composite materials fit your applications. Take benefit of properties like strength, fire retardancy, colour, paintability or low weight. Material systems made by Menzolit® allow you to make new designs for cars, commercial vehicles, electrical industry or for general machinery and auxiliary equipment.

## Thank you for your attention

