

Opportunities For Bio Polymers & Natural Fibre Reinforced Plastics In Automotive Applications

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Founded in 1999, 'ADP' is an **Automotive design and engineering consultancy** which has grown to a team of thirty plus highly focused, experienced and motivated engineers.

From our UK office (Essex) our experience base has been built through working for a wide range of vehicle manufacturers and tier 1 suppliers throughout the world, developing interior trim systems through to complete body structures.

Our customer base has grown to include both major / high volume OEMs, and their supplier companies, as well as niche / low volume manufacturers and specialist products.

/ Bentley Motors Ltd.

/ BMW

/ Dennis Eagle

/ E-Cab Consortium

/ Ford

/ Jaguar Cars

/ Johnson Control- Interior trim systems

/ Land Rover

/ Lear Corporation - Interior trim systems

/ Lotus Engineering

/ McLaren Automotive

/ Mercedes

/ Renault

/ Tesla Motors



- The automotive industry has a significant history of using naturally derived plastics, composites and natural fibre materials
- Materials such as soya oil based plastics and rubbers for general use, rubberised coir hair for seating applications, wood fibre formed components for interior trim etc.
- In 1935 Henry Ford had approximately 78,000 acres of farm land devoted to growing soya, to provide oil derived polymer materials for his cars (2000 acres in Boreham, Essex, in 1934)
- European manufacturers such as VW and Mercedes have utilised wood fibre products extensively since the 60's for instrument panels and door trims



Ford 1936 V8

Soya bean derived oils for paint plastics and rubbers



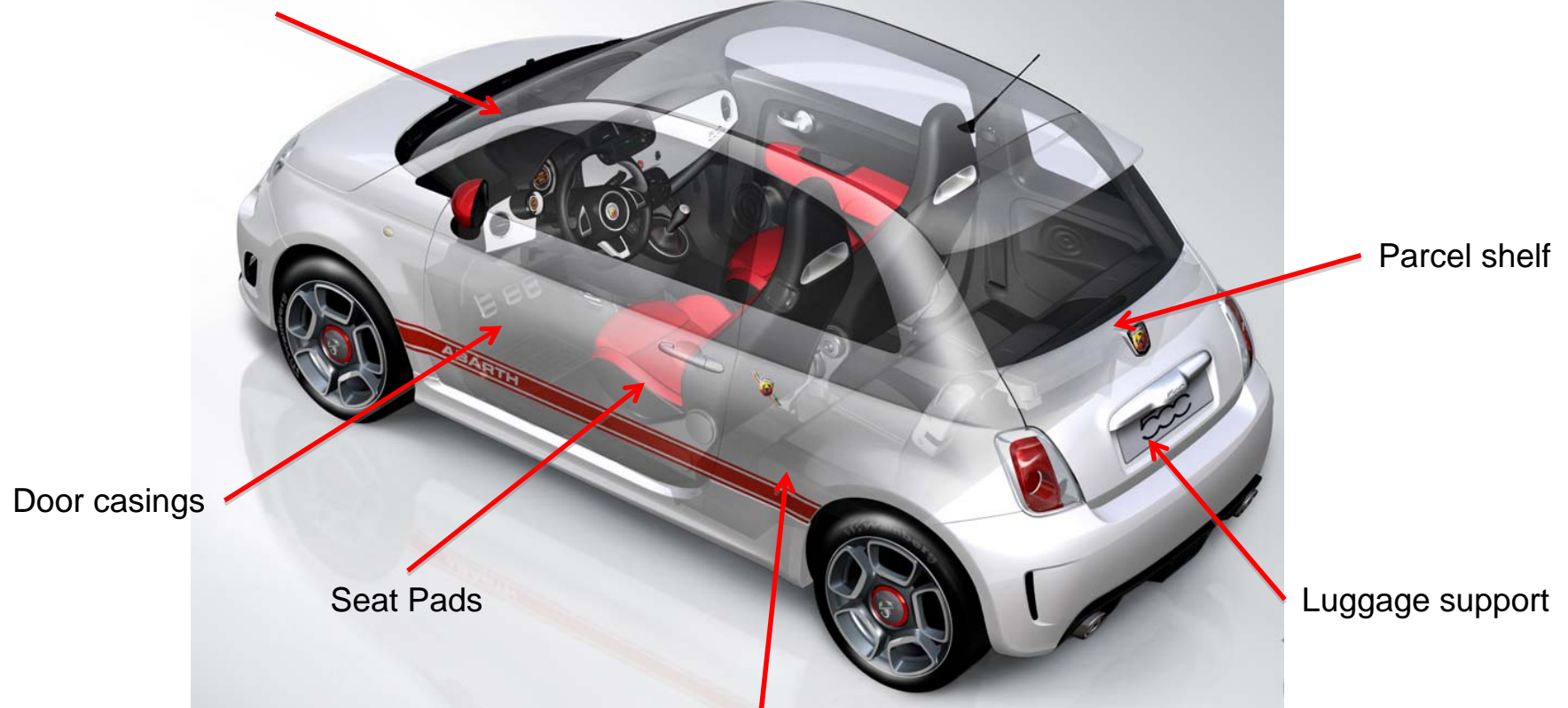
1925 Audi Type M

Extensive use of Beech wood for body frame



- Natural fibre composites are commonly used in contemporary road cars and are generally used in non or semi structural applications
- Composites make up between 10-20% of the total vehicle weight of a road car

Instrument Panel substrate



Door casings

Seat Pads

Rear QTR Panel

Parcel shelf

Luggage support

- With more stringent safety requirements from governmental organisations, the challenge to meet crash performance targets for road cars is significant without an increase in overall vehicle weight and fuel consumption
- Structural applications in conventional road cars have focussed on mainly steel and in some cases aluminium due to their known & proven properties, and track record of providing the right blend of cost, performance & weight leaving composites to be used in **semi-structural applications** to mitigate weight increases
- Composites have been the reserve of highly specialised products where weight advantage and performance is of a higher priority than cost, such as the McLaren-Mercedes SLR



- The European Parliament Environment Committee, has instated a 130 g/km CO₂ limit by 2012 and has called for a long-term target of 95 g/km by 2020, subject to review in 2014
- Under proposed US standards, manufacturers would be required to begin improving fuel efficiency by 5% a year from 2012
- By 2016, manufacturers would have to reach a fleet average of 39 miles per US gallon for passenger cars from 27mpg
- The \$140 per barrel oil price, as seen in late 2008, will not only prompt demand for more fuel efficient cars but more stable and cost effective natural alternatives oil based polymers



- European Union End of life Vehicle (ELV) Directive (2000), requires Member States of the EU to reuse and recover 85 wt% of the average vehicle weight by 2006, increasing to 95 wt% by 2015
- Conventional composite plastic materials are generally regarded as being unrecyclable owing to the reinforcing fibres
- End of life incineration of natural fibers could result in recovered energy and carbon credits
- Natural fiber production has lower environmental impacts compared to glass fiber production



- Conventional methods for processing natural materials are clearly possible for even high volume consumer goods such as the Apple 'iphone' 'Bamboo' Case, by INCASE, which is injection moulded
- Both thermoset and thermoplastic materials utilised within vehicle applications are well placed to utilise natural fibre materials
- Each process would clearly require a developmental cycle to fully understand the implications of utilising the material, but this may be, at best, marginally significant than a normal development process

Injection moulded Apple 'Iphone'
Case by INCASE
(PC + 40% Bamboo filler)



- Electric Vehicles (EV's) have the potential to provide a significant alternative to ICE engine vehicles in many applications, and EV efficiency's are well documented.
- In order to Mitigate the increase in vehicle weight due to the battery systems, composites have a significant role to play.
- 1 mile requires approximately 3-4Kg in battery weight

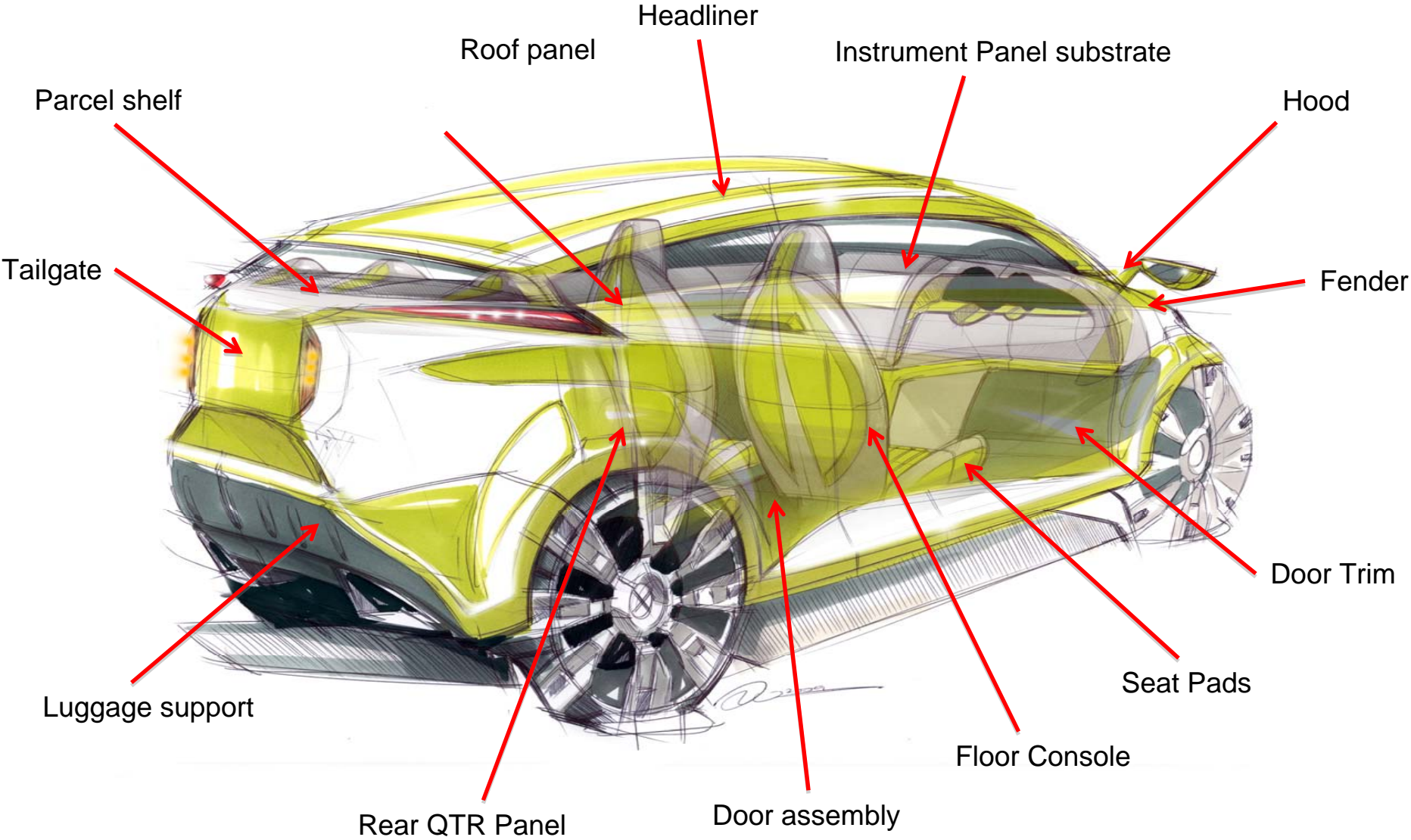


Tesla Roadster

Composites have been used extensively throughout the body structure in order to reduce weight

Automotive Applications

Future Applications



Questions & Answers....

