UK Automotive Industry ..... sunset or sunrise?

Jon King, Director, Corus Automotive Engineering
Automotive World Conference @ IMechE
30 October 2007

Sunset or sunrise?
- Roll over and die
  - New technology and innovation will save us?
  - Not a chance
  - Greenfield economies can do it better and faster

Steel – last year’s material ..... or part of the solution?

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We need a bigger sweet spot

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We need to be much better at what we already do
- Balance technology and innovation across both existing and new areas of UK competence
  - Identify ‘core’ areas to provide focus
  - Bring industry and academe together
  - Put easier funding routes in place
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Wouldn’t it be nice??????

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Last year’s material – fantastic!
• Steel is last year’s material
  – Last year, 99% of new cars had steel body structures
    – 0.5% had hybrid aluminium/steel body structures
    – 0.4% had aluminium body structures
    – 0.1% had composite body structures
• Steel is also next year’s material, and will continue to be, provided it continues to tick the right boxes
• Steel is part of the solution

“Forming to” technologies (F2x)

These factors influence structural performance, particularly for AHSS

Corus has developed a range of F2x technologies…
  – F2C® Forming to Crash
  – F2F® Forming to Fatigue
  – F2S® Forming to Strength

Side Impact – 5 Star safety achieved only using Ultra High Strength Steel
Front impact – adaptive concept

- Peak acceleration reduced by up to 21g
- Reduced footwell intrusion

New joining technologies

- Steel to aluminium joining – aluminium roof for lighter weight and lower Centre of Gravity
  - Fluxless laser brazing
  - Manages thermal expansion differences

Weld optimisation for cost/efficiency

- Efficient Optimisation Scheme
  - Automation & Integration:
    - Weld pattern generation
    - FE model creation
    - FE analyses
    - Weld fatigue analysis
    - Result extraction
  - Optimisation achieved in much shorter time:
    - More reliable design
    - Minimum weld coverage
    - Cost reduction
    - Weight saving

Developments in steel

- Strength v Formability
  - Advanced High Strength Steel
  - Formable Steel

What about the environment?

- Globally, we’re getting there
  - 49% reduction in energy consumption per unit of production in last 25 years (developed steel industry)
- But production is growing fast
  - EU pc consumption is 300kg, India is 20kg!
- New global commitments required…

Customer Engineering – VAVE

- Ideas Database
  - Analysis
  - Development
  - £15/vehicle
  - £80/vehicle & 14kg
  - £10/vehicle & 10kg
  - £20/vehicle
  - £30/vehicle
  - £70/vehicle

- Savings
  - Customer Input
  - VAVE
  - Savings
  - Corus Input
  - £20/vehicle
  - £30/vehicle
  - £70/vehicle

- Corus Task
  - £20/vehicle
  - £30/vehicle
  - £70/vehicle

- Savings
  - £20/vehicle
  - £30/vehicle
  - £70/vehicle
IISI global commitments

- Share best practice globally for low emissions steelmaking
- Research breakthrough CO2 reduction technology
- Optimise and maximise scrap recycling
- Maximise use of by-products
- Develop new steels to help our customers
- Develop and implement common/verified reporting systems
- Adopt a global approach to CO2 reduction

But
- Needs government support for all of these to work – particularly to replace cap and trade schemes and encourage efficient expansion
- Needs customers to support – working in closer partnership

Wouldn’t it be nice……

………..if the UK automotive industry already had most of the answers?

Let’s assume we can fix this bit

Changing Patterns of Car Usage

- Public transport cannot compete with personal mobility convenience, needs to evolve
  - Flexible pick up and drop off
  - Comfortable bus stops with real time info
  - Accommodates electric bikes/wheelchairs
- Hiring/sharing schemes - commute in an economy car, weekend in a lifestyle car(s)
- Once the (currently suggested) 70mph speed limiter for motorbikes becomes acceptable, apply to all motor vehicles
  - Older cars will hold a premium until modified to comply
  - Stored power then becomes the market differentiator = ‘performance hybrids’

Changing Consumer Demands

- Market fragmentation will continue – highly profitable niche products that we didn’t realise we couldn’t live without
- Volatile/unpredictable demand is best suited to the platform engineering concept with reduced risk of lost investment
- Cost of fuel will continue to rise faster than inflation, we will start to choose a vehicle based on the lifetime ownership cost
- Lifestyle driven styling will drive more innovation, especially in interior design and materials
- Competing hybrid designs and alternative fuels will eventually rationalise

Europe – CO2 target missed

![Graph showing CO2 emissions from 1995 to 2012 with targets and actual reductions.](chart.png)
CO₂ from passenger vehicles

Typical Life Cycle Greenhouse Gas Emissions of a ICE Passenger Car

<table>
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<tr>
<th>Percentage</th>
<th>CO₂</th>
<th>O₂</th>
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<td>4.3%</td>
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</tr>
<tr>
<td>85.3%</td>
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<tr>
<td>0.1%</td>
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</table>

Opportunity area
This will reduce

Source: Development Bank of Japan, 2004

Vehicle Layout

Motors and Powerpack mounted under the floor

Carbon neutral ICE

Electricity

CO₂

O₂

CO₂

O₂

Carbon

Hydrocarbon

Microbes

Plenty of opportunity

- Transport solutions for the future
  - Radical approach to public/personalised transport (trains, trams, buses, taxis, trikes, bikes and Segways)
  - Understand first and last mile (and everything in between)
- More volume niche manufacturing for the above
  - Coachbuilders sharing high-tech, affordable platforms
  - Use volume techniques (Nissan ‘secrets’)
- ‘Premium economy’ for affluent Europeans
- Hydrogen economy without the infrastructure

Future Hydrogen Fuel Cell System
(on-board, no infrastructure)

38 litre Water Storage Tank 45Kg

48 volt 95Kg Ultra capacitor Energy Module

200 Litre 550kg Hydrogen Nano storage unit (450km range)

Demountable Pallet Assembly total weight approximately 890kg (unit probably leased)

Hydrogen Surge Tank 86Kg

65Kw Electric motor with regenerative braking

89Kw Electric motor with regenerative braking

How?

- All the small business start-ups in the world won’t save UK plc if we let go of fundamental manufacturing excellence
  - New technology and innovation is not enough on it’s own
- We are already good at many things – innovation will help us maintain a leading position. The technology exists, it’s
  - Knowing about it
  - Deploying it
- New and improved technology, products and manufacturing methods
  - Share IP, it’s the only way to exploit it
  - Partnership and collaboration throughout the technology and manufacturing supply chains
  - Improve the way we do collaborative research
New challenges
New Technologies
New Solutions