eDICT – evolutionary design in chassis technology
Innovation in Chassis Design

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Company Introduction ~ Thyssenkrupp Tallent

### Capability
- **Design**
- **Simulation**
- **Testing**
- **Prototyping**

### Locations
1. **Bourn**
   - ThyssenKrupp Automotive (Tallent Chassis)
   - Chassis Pressings and Assembly plant
2. **Cannock**
   - ThyssenKrupp Body Stamping (UK)
   - Body Pressings and Assembly plant
3. **Fareham**
   - ThyssenKrupp Body Stamping
   - Just-in-time manufacturing facility
4. **Llanelli**
   - ThyssenKrupp Stamping Pressings
   - Body Pressings and Assembly plant
5. **Newton Aycliffe**
   - ThyssenKrupp Automotive (Tallent Chassis H2)
   - Chassis Pressings and Assembly plant

### Products

#### Body Applications

#### Sales Breakdown (2009)
- **Volkswagen** 3.9%
- **Ford Volvo** 15.3%
- **Toyota** 14.9%
- **Jaguar Land Rover** 16.7%
- **General Motors** 4.7%
- **Nissan / Vauxhall** 11.6%
- **BMW** 7.4%
- **Honda** 3.4%
- **Other Sales** 0.8%
- **Renault** 0.9%
- **General Motors** 4.7%
- **Saab** 1.6%
- **Porsche** 0.1%
- **Volkswagen** 3.9%
- **General Motors** 4.7%
- **Jaguar Land Rover** 16.7%

A Company of ThyssenKrupp Steel

Thyssenkrupp Tallent Ltd
Overview of the Group

The optimisation Challenge

- The eDICT solution
- The results so far
- Summary
The Challenge

Recent Demands

- Today more than ever, the automotive industry has to cope with the following demands.
  - Reduce Mass
  - Reduce Development Time
  - Reduce Costs

Currently by the end of the initial development stages around 70% of the final product cost has been committed, whereas product performance knowledge is still limited to approximately 20%.

The need for early optimisation is clear.
The critical first step in eDICT is to determine the optimum solution from the outset and place material only where it is needed defining the clear loadpaths.

- This means the first CAD design is light and the designers are now guided by the function of the part.
The Challenge

The mathematical problem

- After understanding the need to identify the optimum solution, the challenge was to develop a product suitable for high volume manufacture.

- The key was to define the performance of the perfect design and measure the efficiency of the copy against this perfect design.
Overview of the Group

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Summary
The Final Solution

The eDICT method

Optimum solution

Translated solution to aid manufacture in sheet.

CAE optimisation model set up with as many targets as possible included.

Package space

CAD or FE complete solution

Further optimise design to reduce mass and improve strength.

Final production intent design.

Translated solution to aid manufacture in sheet.
The Final Solution ~ The Standard Process

The Altair Plugin

Standard process available to all.

Four stages and tools to guide the user from setting up the optimisation, guiding the translation to a sheet solution and re-design on week areas and fine tuning on a complete design.
The Final Solution ~ The Standard Process

The Altair Plugin
The Final Solution ~ Efficiency

Tracking efficiency and Driving Targets

One key tool to the design improvement is the efficiency tracker. Each change made to the solution is quantified by giving the design an efficiency and comparing this to previous iteration.
The Final Solution ~ Efficiency
Tracking efficiency and Driving Targets
The Final Solution ~ The Algorithms

Planefinder

The planefinder algorithm analyses the Optistruct density output and searches for regions of density that all lie on the same plane and represents this area with a connecting surface.

The algorithm also identifies the best location within the solid area to place the midsurface.
The Final Solution ~ The Algorithms

Optianalyzer

The second algorithm generated, again analyses the final density results but this time replaces the solid volume result with an equivalent sheet metal structure. The second stage of the analysis is to grow the sheet solution until connecting surfaces are formed.
The Final Solution ~ The Algorithms

Optianalyzer Results
Overview of the Group

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The Results

Reduce Mass

Recent projects using the eDICT approach have shown a 25% mass reduction when compared to a conventional design.

The solution gives the customer the component they ask for NOT overdesigned achieving many other unknown important performance metrics. The customer must know what they want.
The Results

Reduce Mass

- The average subframe designed with this method is 4kg lighter, giving lower fuel economy, lower vehicle taxations and lower CO2

Reduce Cost

- Reduction in material cost ~ 10% overall reduction.
- Competitive against current aluminium solutions by designing steel right.
- The design overhead is reduced with solution developed in a reduced period of time.

Efficient and Fast

- Unique KPI
- Reduced redesign by using a right first time approach leading to a reduced development phase.
Summary

- Early optimisation of structural parts is essential to developing cost competitive lightweight structure.

- It is possible to use solid topology results to design sheet metal components using the tools and techniques in the eDICT process.

- Thankyou to all involved in the project and your attention.