The realization of natural fibre-reinforced plastics in the automotive exteriors

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Rieter Automotive Systems

Presentation Content

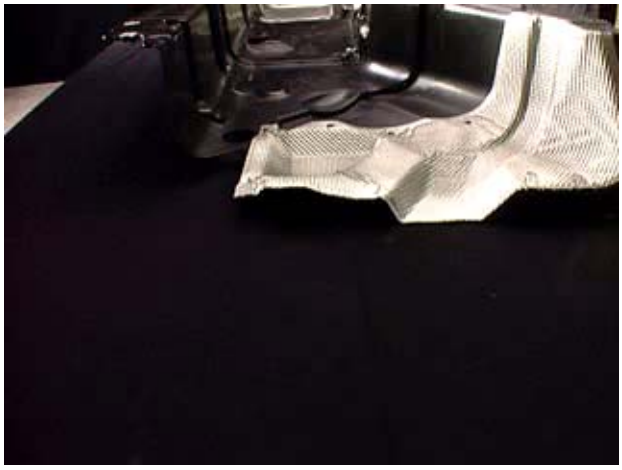
- The Abaca Project
- The Adapted Production at Rieter Sevelen
- The Development Improvement Loops
- The Way to Serial Production
- The Life Cycle Assesment
- The Conclusions & Outlook

Products of Rieter Sevelen

Products

Under Floor Systems

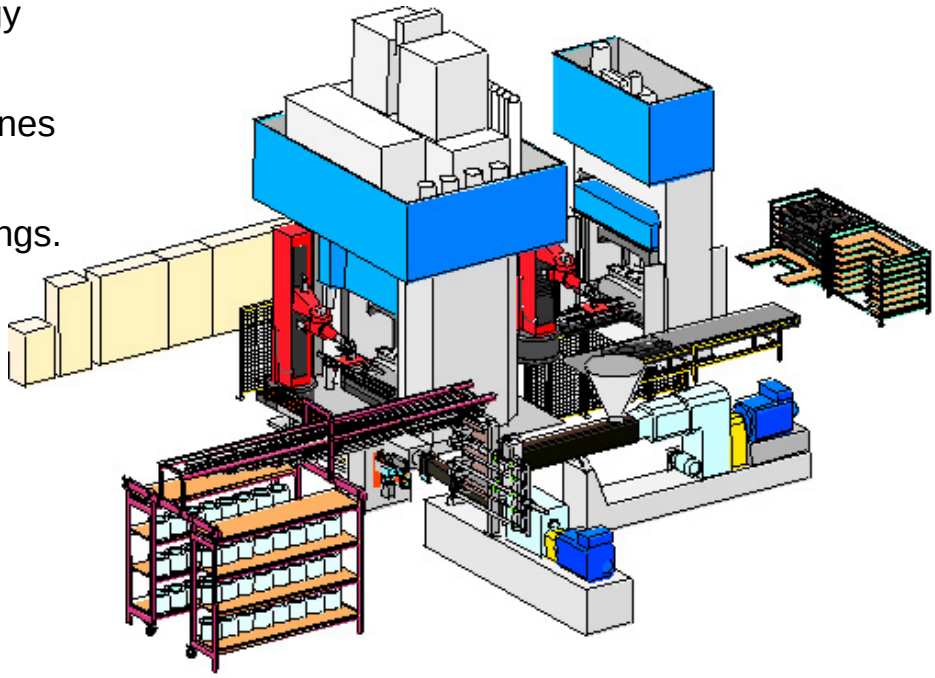
Thermal Management



The Serial Process

The LFT Process

- Two Machine Technology
- Twin-Screw Extrusion Lines
- Endless Glassfibre Rovings.



Project Start

started in January 2003 as a development project

Partners

Mercedes-Benz

RIETER

Manila Cordage

Source: DC

Background to the Abaca Project

- ***South-South-North Natural Fiber Dialogue***
  was founded with partners from Brazil and South Africa as a forum for the exchange and transfer of experience

- ***The Abaca cooperation***
  is the latest project in DaimlerChrysler's Global Sustainability Network, which started twelve years ago with the POEMA project in Brazil and has meanwhile spread to projects in South Africa, India, the Philippines

- ***on the Philippine Island of Leyte - Public-Private Partnership***
  DaimlerChrysler has been working on a public-private partnership (PPP) since January 2004 with the German Investment and Development Association (DEG) and Hohenheim University

The goal is to achieve sustainable planting of abaca bushes while optimizing production processes for abaca fibers.

What is Abaca ?

A Natural Fibres from the Banana Tree Family

“ Musa textilis “

source: DC

The ABACA Project

Project Targets

Industrialization of the part “ Cover Rear“, reinforced with the natural fibre Abaca. Using the existing LFT process, reaching the mechanical requirements.

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The Challenges

The Challenges with the Natural Fibres

There are many unique challenges, like thermally instability, processing conditions, tendency to absorb humidity and fibres impregnation.

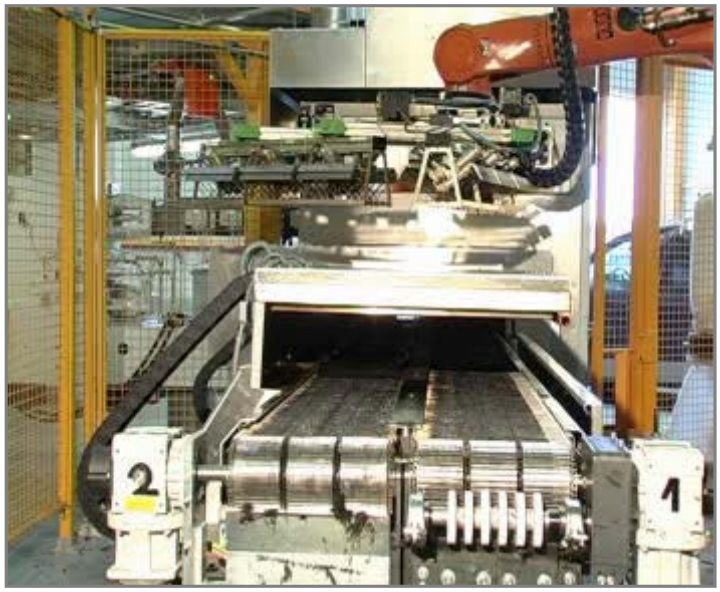
- the **Feeding Problems** of natural fibres into the standard LFT process
- **higher Fibre Content** - flow and heat generation issues
- **higher Shear Levels** caused through higher fibre content
- **Moisture** - tendency of natural fibres taking up moisture
- **Compatibility and Adhesion** of natural fibres on PP is very poor
- **Mechanical properties** - natural fibres embedded in PP
- **Degradation** physically fibre length
  chemically fogging & odor

The Abaca Fibres

Instead of using semi finished products, the endless Abaca-rovings are directly fed into the second extrusion line.

The Material – ServoDie

The homogenized composite material comes out of the die, continously and is brought to a conveyer belt.



The Adapted Process

The Automatisation

A fully automatic process is a prerequisite for a reproducable part production. Based on different trial-loops, it gave us the possibility for direct comparisons.
Improvements could be reached through evaluating different material positioning.

Presentation Content

The Fibre Adjustments

➔ *twists/meter & tex weight*

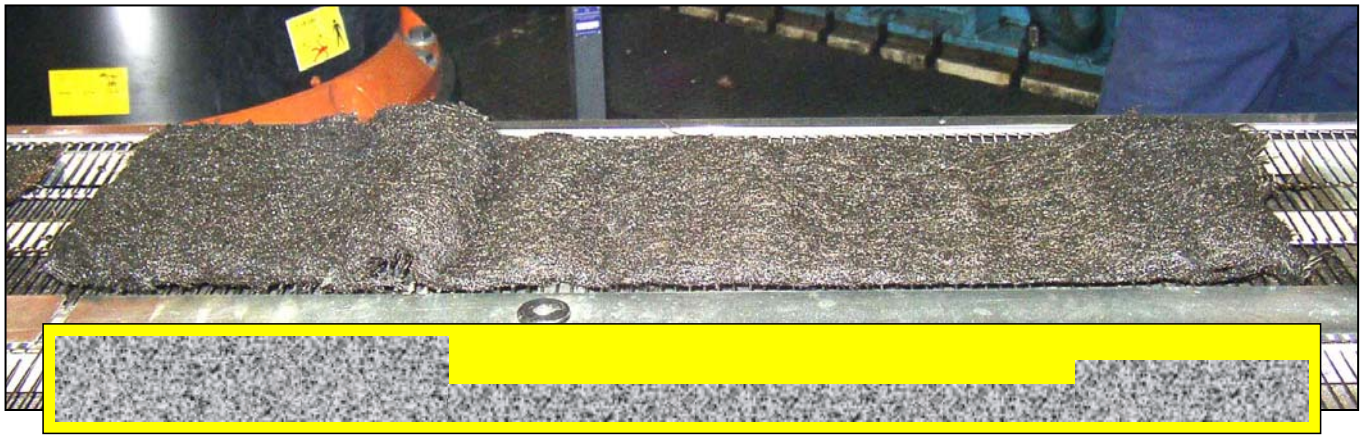
➔ *process stability*

➔ *no avivage on the fibre surface*

➔ *fungizide resistance*

The Material Strand

To create the Optimum of material shape and form to realize a good part filling and reduce the specific press force.



The material strand - positioning

The highest influence for an optimized part filling

➔ *the correct position, specific to the part*

➔ *transfer it to the automatisation*

➔ *the part design*

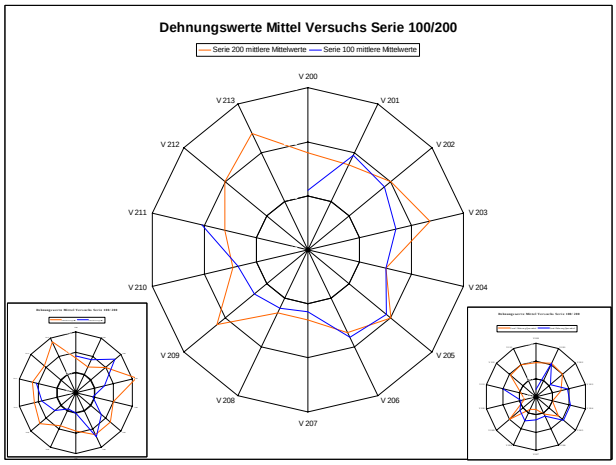
➔ *the complex 3-dimensional part geometry*

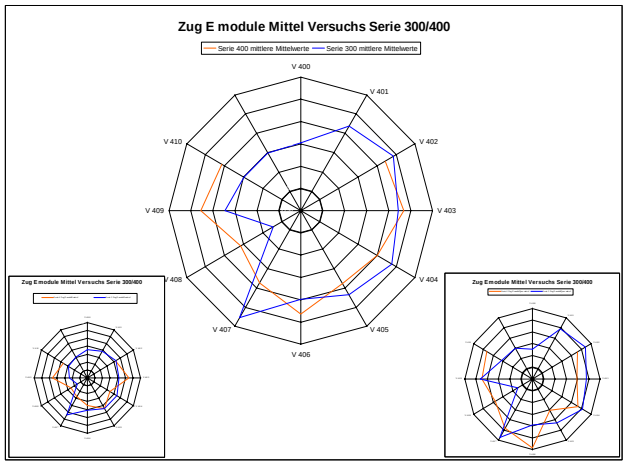
➔ *mechanical properties / fibre orientation*

The Continous Improvement Loops

Mechanical properties:

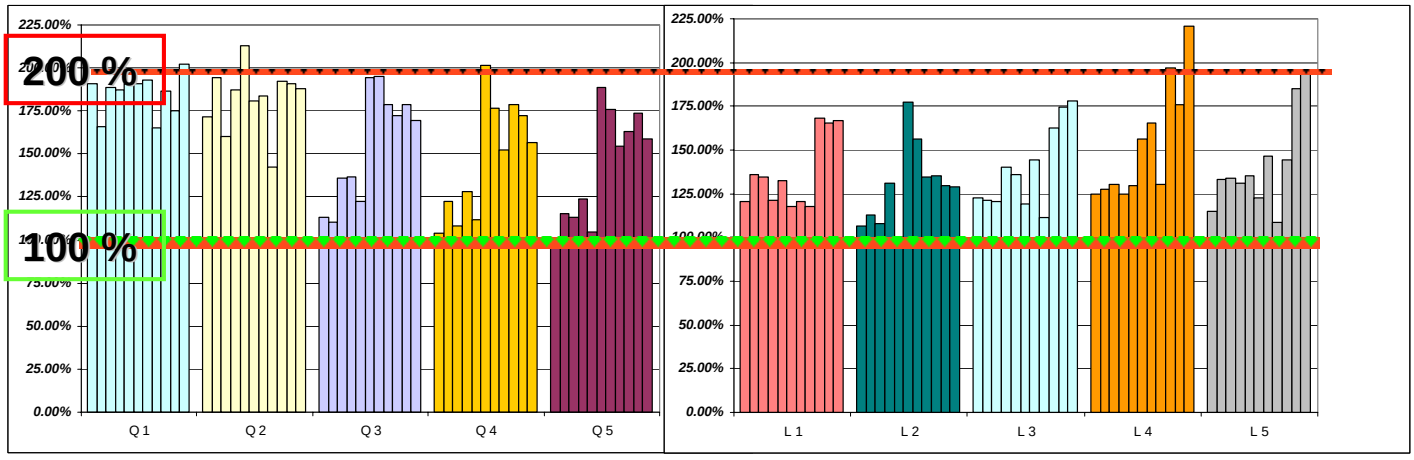
- ➔ variations of matrix components and fibres
- ➔ variations of screw designs





The Continous Improvement Loops

Mechanical properties vs. Fibre orientation



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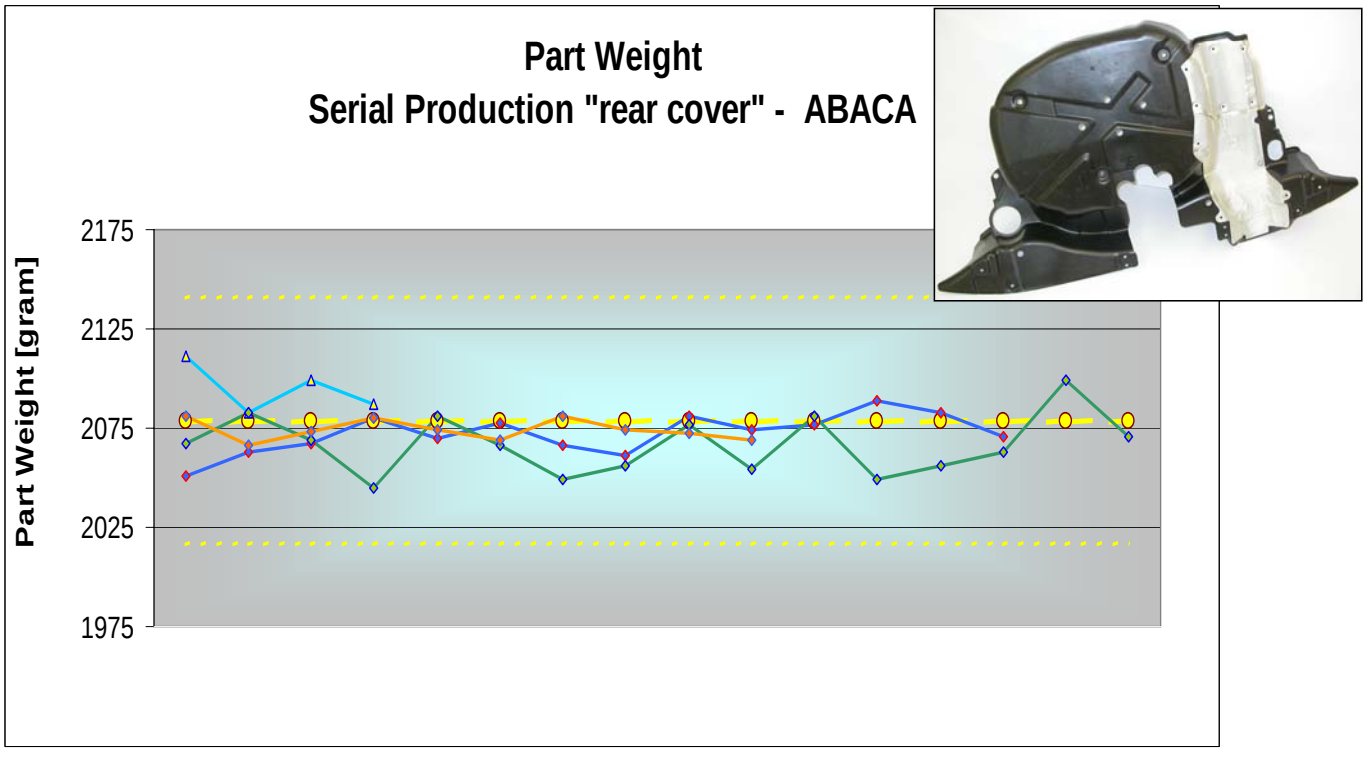
Start into the Series



Start into the Series

Start of Serial Production 09/2004

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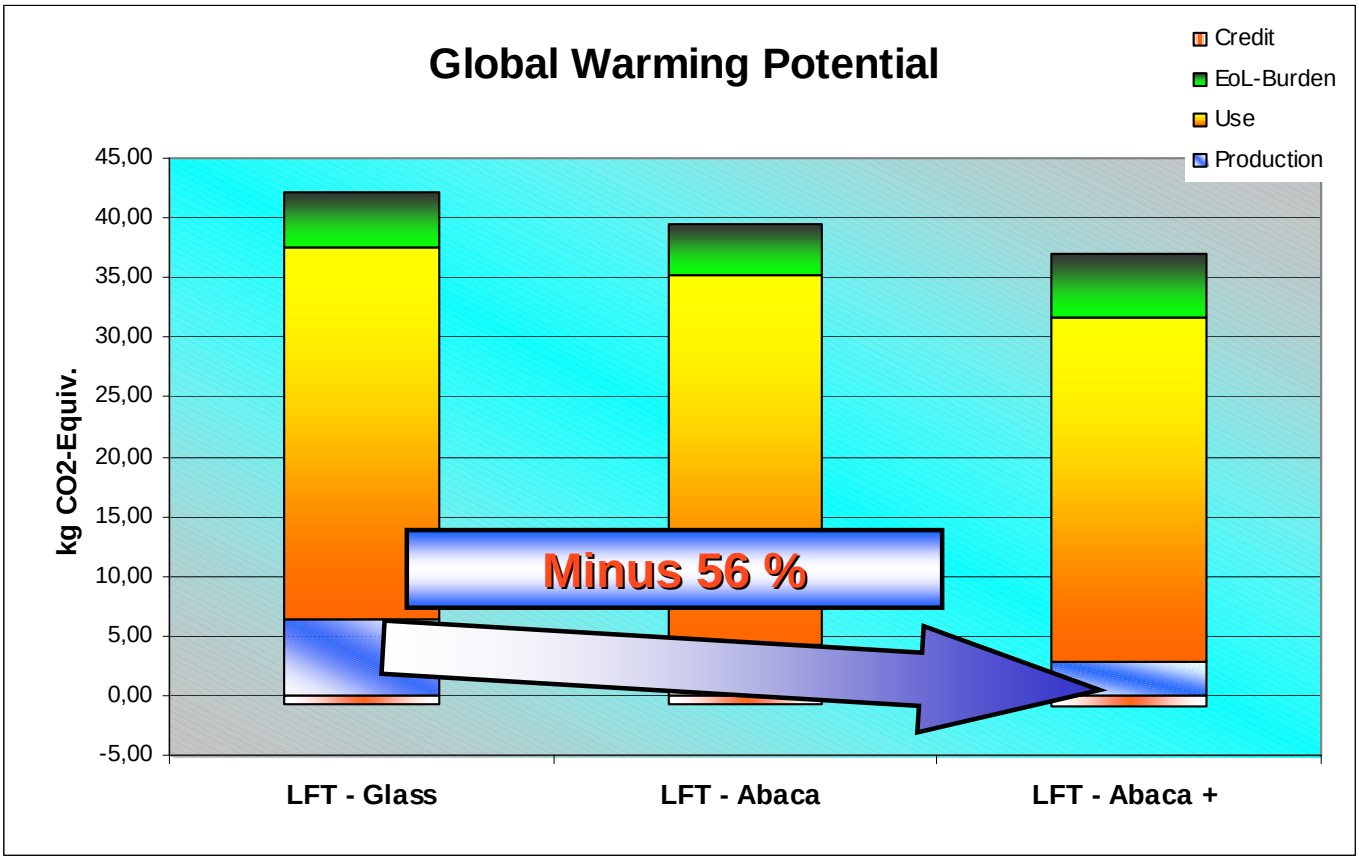
The Life Cycle Assesment – Glas vs. Abaca



The Life Cycle Assesment

The Outcome of the LCA, Glasfibres vs. Abaca

- (non)- renewable resources lowered by **60 %**
- CO_2 emissions reduced by **80 %**
- global warming, a potential more than **50 %**

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The Conclusions

- **the First Exterior Part realized with Natural Fibres**
- **a Highly Competitive Solution – no Semifinished Product**
- **High Volume in Serial Production**
- **Ecology and Sustainable Development**
- **Sucessful Implementation within a Short Time to Market (18 month)**

The Outlook

source: DC

The Abaca Project – a Successful Approach