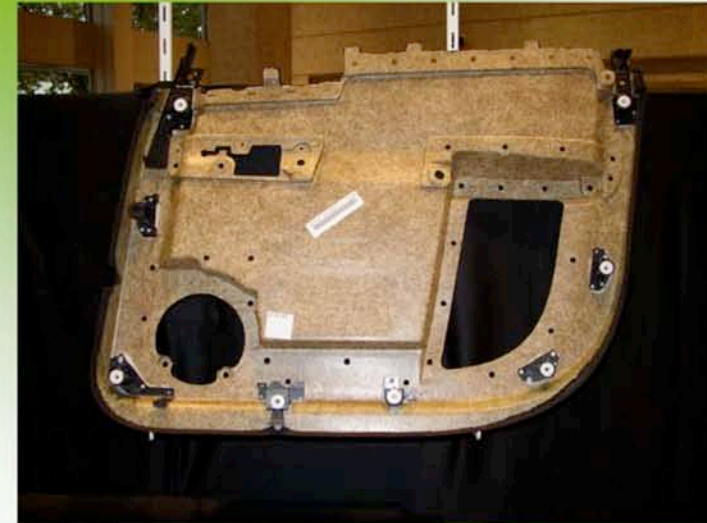


## NF-PP injection moulding - overview on the results of different round tests

based upon research in 2002 and 2003 by nova-Institut

presented by  
Dipl.-Ök. Sven Ortmann  
(economist, market research)

## Typical modern natural fibre compound application: door panel



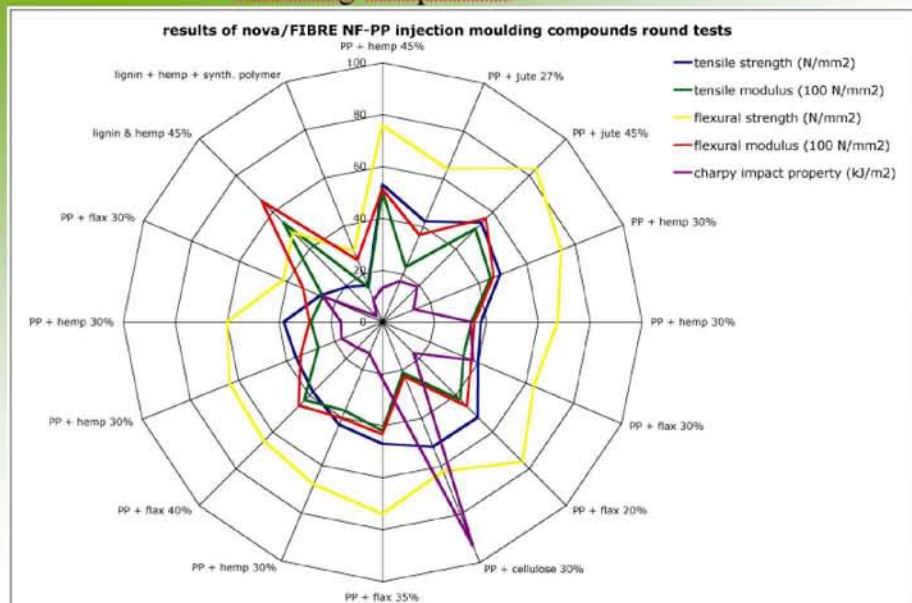
## Relative advantages of press moulding and injection moulding

natural fibre press moulding in quantity production <i>„state of the art“</i>	natural fibre injection moulding not yet in quantity production <i>„ready for production“</i>
very low density ( 0,85 g/mm <sup>3</sup> and less )	lower density than glassfibre compounds ( 0,95 g/mm <sup>3</sup> and more )
better mechanical properties	mechanical properties can surpass compounds consisting of PP with talcum filler
fibre content up to 75%	fibre content usually 25 to 50%
simple shapes only	additionally usable for complex parts and small parts

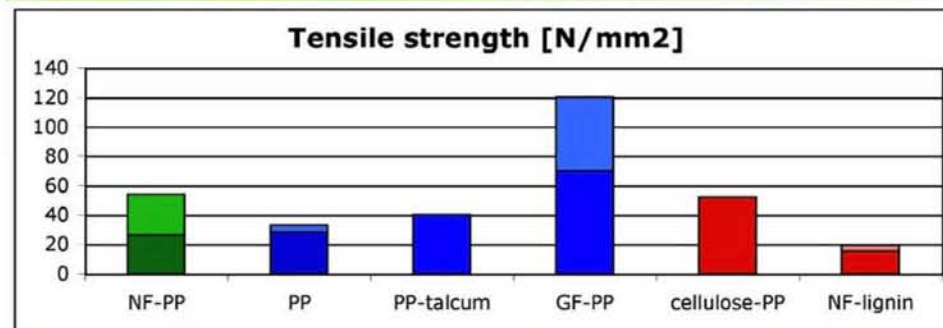
The nova-Institut has done several round tests with 18 different  
natural fibre injection moulding composites  
(tested by the FIBRE laboratory):

6 from Germany  
2 from the Netherlands  
1 from France  
1 from the USA

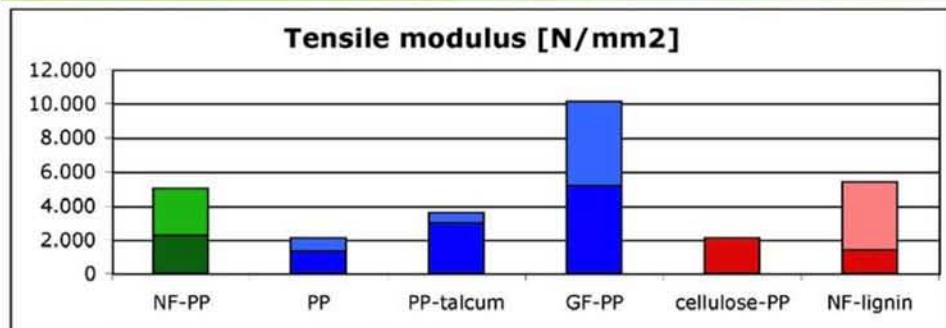
## Overview of the results of all tested natural fibre injection moulding compounds



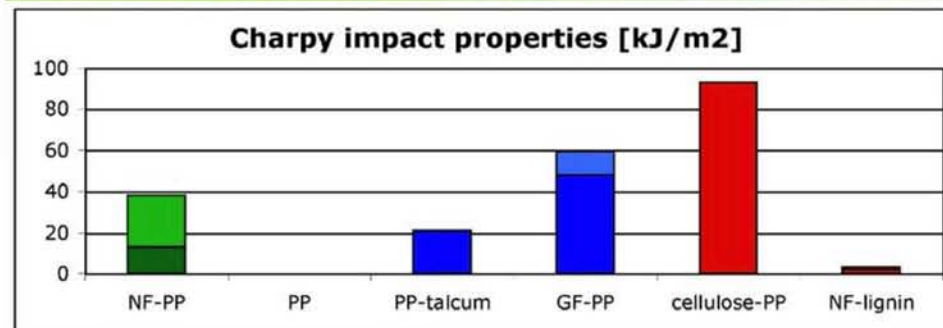
## Comparison of tensile strength of different compound categories



## Comparison of tensile modulus of different compound categories

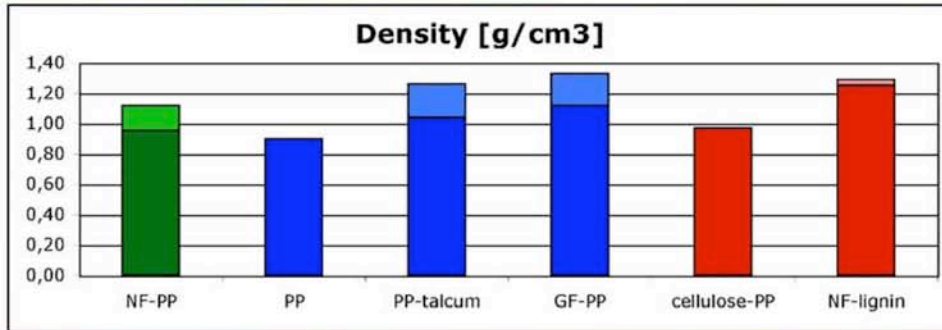


## Comparison of Charpy impact properties for different compound categories





## Comparison of density for different compound categories



## Example of cost calculation for natural fibre compound

(higher content of cheap fibres compensated by need for more of the expensive bonding agent)

	€/ kg raw material	% weight percentage	€/ kg granules
<b>PP</b>	<b>1,00</b>	<b>57</b>	<b>0,57</b>
<b>natural fibres</b>	<b>0,60</b>	<b>40</b>	<b>0,24</b>
<b>additives (incl. bonding agent)</b>	<b>7,00</b>	<b>3</b>	<b>0,21</b>
<b>process costs (incl. depreciation)</b>			<b>0,13</b>
<b>production costs</b>			<b>1,15</b>
<b>license fee (5%, for example)</b>			<b>0,058</b>
<b>profit (10%, for example)</b>			<b>0,121</b>
<b>market price</b>			<b>1,329</b>

## The effect of impact strength modifying additives and the similar performance of hemp and jute fibres

### The mechanical properties of natural fibre - polypropylene compounds of ATO and TITK

