

New NF-Duroplast Prepregs

A successful synthesis of nature and technology



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Agenda

- Short introduction to company J. Dittrich & Söhne Vliesstoffwerk GmbH
- About our cooperation with Mr. Manfred Lahm
- Nafacryl - a forward looking NF-fabric class
- What is Nafacryl?
- Nafacryl - from the NF-nonwoven to the final product
- The multitude of Nafacryl variants
- Potential application fields for Nafacryl
- Which technical properties can be achieved with Nafacryl
- The eco-balance in comparison
- Nafacryl as a material with very low emissions
- Cost comparison
- Perspective
- Thanks

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Short introduction to J. Dittrich & Söhne Vliesstoffwerk GmbH

- Founded 1980 as a manufacturer of cleaning cloths for industry and household
- 1998 starting of a finishing line for the production of nonwovens with added values like non-slip, adhesive or abrasive coatings
- Since 2000 supplier of flame retardant nonwovens for automotive applications
- Since 2000 also manufacturer of light weight Kenaf/PP nonwoven (200 g/qm), used as part of a trunk liner.
- Since 2002 development and production of Nafacryl®
- **The annual capacity for Nafacryl at present is 5000 to**



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Short introduction to Mr. Manfred Lahm

- Master craftsman's diploma in textile finishing
- production manager of a well-known textile processing company in Krefeld till 1996
- head of department and developments at a producer of car décor textiles in Trier
- Self employed since 1999. Since then
 - consulting of a laminating factory
 - developments of natural fiber treatments and NF composites in connection with a regional project in cooperation with the FH Kaiserslautern/Pirmasens and the IVW Kaiserslautern.
 - Since 2002 development and marketing of Nafacryl in cooperation with J. Dittrich & Söhne

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Nafacryl[®] - a forward looking NF material class

- Nafacryl[®] reduces the dependency from petrochemical raw materials which become more and more expensive
- Due to its broad adaptability, Nafacryl fabrics can be useful in a lot of applications
- The processing costs can be reduced significantly because of short pressing cycles



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What is Nafacryl[®]?

- **A natural fiber prepreg - mat with an acrylic binder matrix.**
The basic composition is:
- 38,5 % hemp
- 38,5 % kenaf
- 23,0 % matrix

Modifications can be made on the fiber-side as well as in the matrix. Binder formulas and concentrations can be adapted to the requirements of the end products.

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Nafacryl[®] - from the nonwoven substrate to the final product

- Carding and needle-punching of a natural fiber nonwoven with a mass between 60-77 % of the final weight
- Impregnation with acrylic binder mixtures
- Drying to a certain degree of remaining humidity
- Tailoring according to customer demands



[Click here to see this two videos](#)



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Nafacryl[®] - from the nonwoven substrate to the final product

- Insertion of a prepreg cutting in a mould heated to 180 - 230°C
- Pressing with pressures between 5-11 kg/cm²
- Removal from the mould after 50-70 sec, depending on weight, temperature and pressure)
- Further processing, e.g. lamination

[Click here to see this video](#)

Pressure Table		
Pressure	Density	Required Pressing Power
5,50 kg/ cm ²	0,70	55,00t
8,33 kg/ cm ²	0,85	83,30t
11,11 kg/ dm ²	1,05	111,10t



- Significant investment - savings by low required pressures!

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The multitude of Nafacryl® variants

Nafacryl® basic

A plain prepreg, suited as an alternative to known fabrics.

Its advantages:

- Weight reduction of moulded parts up to 30 %
- Reduction of emissions, esp. toxic emissions, during processing and use
- Increase of productivity due to shorter cycle times



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The multitude of Nafacryl® variants

Nafacryl® color OS

Same as Nafacryl - basic, however with coated surface and - depending on customer demand - colour dyed. OS stands for one-shot (patented process with exclusive licence for company J. Dittrich.)

The advantages:

- durable, spray-water protected surface
- Nf-character remains visible
- no further surface treatment necessary



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The multitude of Nafacryl® variants

Nafacryl® color OSL

Same as Nafacryl - basic, however in combination with a separate dyed surface-nonwoven or other textile fabric. OSL stands for one-shot-laminated (process protected by J. Dittrich & Söhne)

The advantages:

- durable, spray water resistant surface
- Nf character is covered
- Suitable as an alternative for injection moulding



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Potential applications of Nafacryl®

Automotive interior:

- door panels, instrument boards, hat racks, trunk panels, a.s.o.

Furniture:

- seats, shelves, cupboards, lockers, a.s.o.

Consumer products:

- suit cases, spectacle cases, caskets, trays, instrument shells, a.s.o.

Construction:

- separation walls, panellings, door blades, facades, a.s.o.

Others:

- interiors of trains, ships, boats, caravans, a.s.o.

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Practicable technical properties

Technical property	Lowest value	Highest value
impact strength:	6 kJ/m ²	40 kJ/m ²
bending strength:	30 N/mm ²	80 N/mm ²
E-modulus:	3.000 N/mm ²	12.000 N/mm ²
Water absorption after 24 h under water:	20 %	90 %
Swelling after 24 h under water:	10 %	25 %

The technical performance can be adapted in a wide range to the respective requirements by modifications of matrix formulas and - contents and fiber blends.

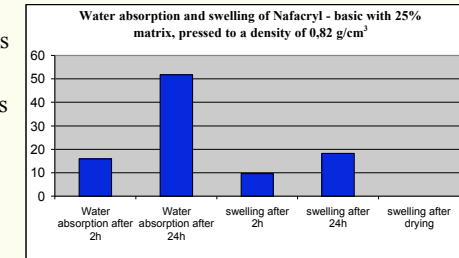
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Practicable technical properties

Observations about water absorption and swelling

- even with water absorptions up to 90 %, the original dimensions are regained after redrying
- After Redrying the material gets back its original technical properties
- Even when wet, the material maintains sufficient stability.

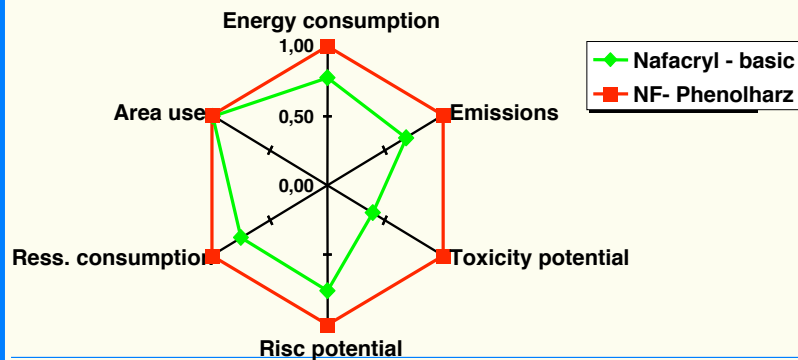


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The eco-balance in comparison

For the analysis a specific hat rack, one with NF/phenolic resin and one with Nafacryl-basic, has been compared

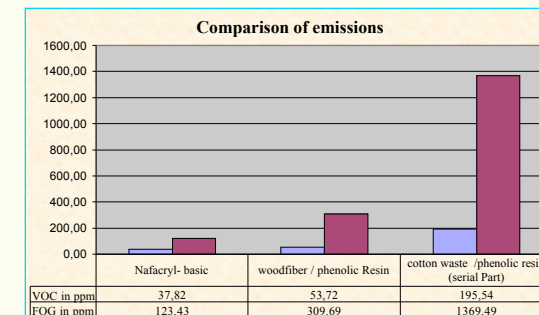


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Nafacryl® - a material with very low emissions

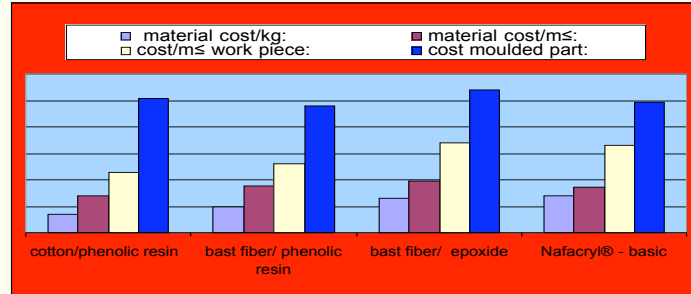
Comparison between Nafacryl-basic and wood fiber/phenolic resin moulded parts



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Cost comparison



Explanation:

material cost/kg = cost of raw materials / kg work-piece
 material cost/m² = raw material cost / kg necessary mass for same techn. performance
 cost/m² work-piece = material cost/m² + processing costs
 cost moulded part = cost/m² work-piece + pressing cost / parts/h

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Outlook

- With the Nafacryl® product family we have a group of natural fiber based material in hand, which can be applied in a lot of different fields and which can be called a successful answer to short running petrochemical resources and parallelly rising prices.
- We are optimistic about a rapid spread of Nafacryl®
- We consider it also as a small contribution to the domestic industry to produce the material here and hope as well for a positive effect on the labour market.

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Thanks

We want to express our thanks for the engaged support to our development to:

- IVW (institute for composite materials) Kaiserslautern and the companies
- Alwomotive, Chemo, Faurecia Interiors, Ideal Automotive, Johnson Controls, Lear Corporation and Polytec Automotive (the names list follows the alphabetic order and does not mean any grading of esteem).
- For the opportunity to present Nafacryl here, thank you also very much to the organizer:



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Thank you

**Thank you for your attention
and patience**

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