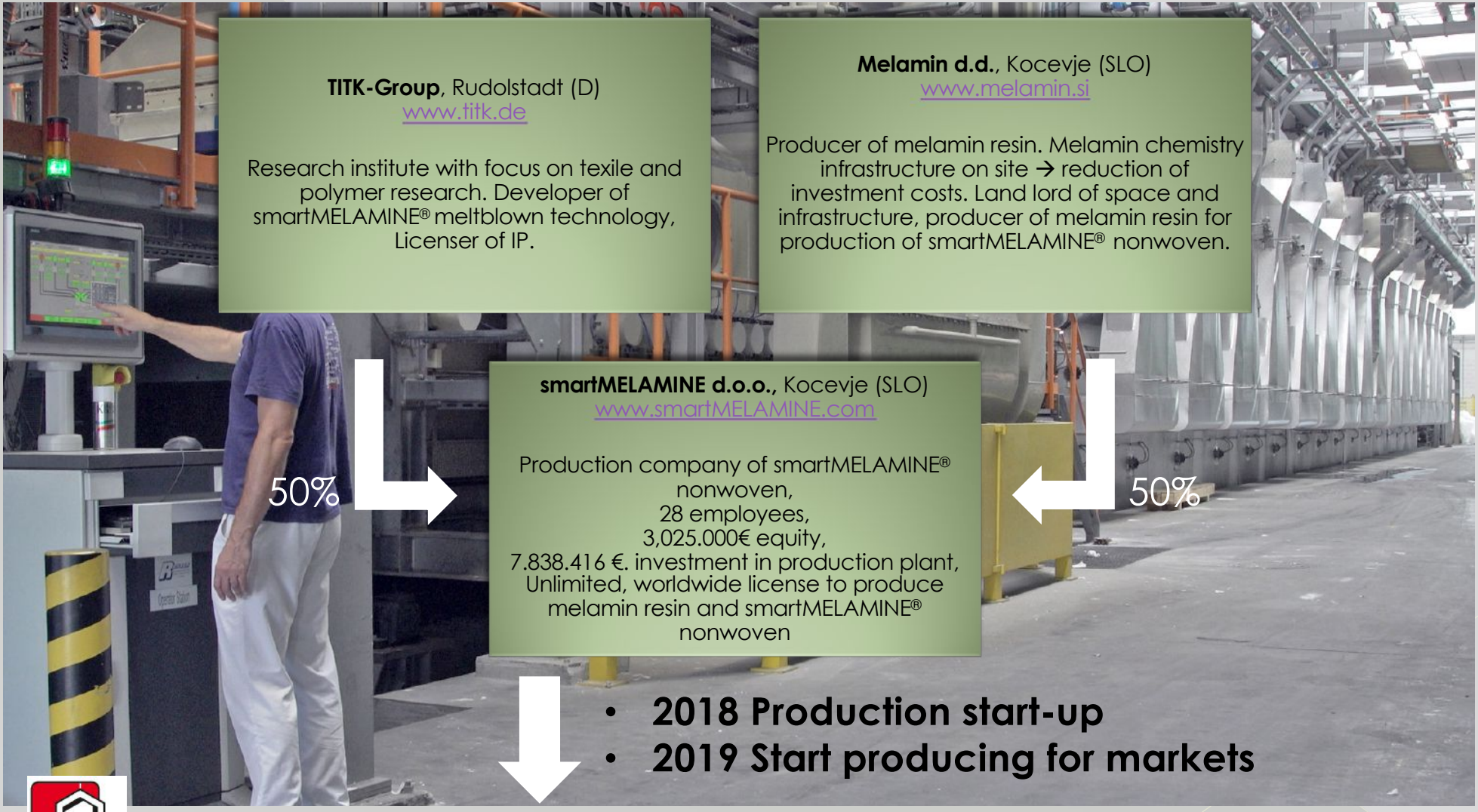
smartMELAMINE®
a novel Meltblown

Christoph Löning
November 6th, 2019

Introduction
Owners & Company



TITK-Group, Rudolstadt (D)
www.titk.de

Research institute with focus on texile and polymer research. Developer of smartMELAMINE® meltblown technology, Licenser of IP.

Melamin d.d., Kocevje (SLO)
www.melamin.si

Producer of melamin resin. Melamin chemistry infrastructure on site → reduction of investment costs. Land lord of space and infrastructure, producer of melamin resin for production of smartMELAMINE® nonwoven.

50%

50%

smartMELAMINE d.o.o., Kocevje (SLO)
www.smartMELAMINE.com

Production company of smartMELAMINE® nonwoven,
28 employees,
3,025.000€ equity,
7.838.416 €. investment in production plant,
Unlimited, worldwide license to produce melamin resin and smartMELAMINE® nonwoven

- **2018 Production start-up**
- **2019 Start producing for markets**

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Melamine Meltblown Industrial Production

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USP´s of smartMELAMINE®

- smartMELAMINE® is not competing with PET, PP or other commodities on the fiber market.
- smartMELAMINE® as a high-performance material is characterized by its ability to burn only at an oxygen content of 32% (oxygen level in our air ~21%). Properties are very much alike an aramid fiber.
- smartMELAMINE® as a meltblown with its fine fibers has excellent thermal and acoustic properties and is very much suitable for filtration.
- smartMELAMINE® has due to high temperature during the production process and the very fie fibers of a meltblown a low emission product.
- smartMELAMINE®´s unique combination of properties is resulting from the material melamine, the meltblown process and the specific production process.
- smartMELAMINE® is competitive to other high performance materials and competitive as it is available as a fabric ready to use and other materials only as fibers.

smartMELAMINE

Range of a smartMELAMINE®

Characteristics	smartMELAMINE®
Color	white, light amber (treated) or colored e.g. with ~1% carbon black
Texture nonwoven	paper like, wadding like, foam like, rollable, stackable → consistency and surfaces are largely customizable
Grammage	15 – 600 gsm
Volume Weight	60 – 10 kg/m^3
Thickness	up to 30 mm
Fiber diameter	0,5 - 25 µm
Width	2.400 mm

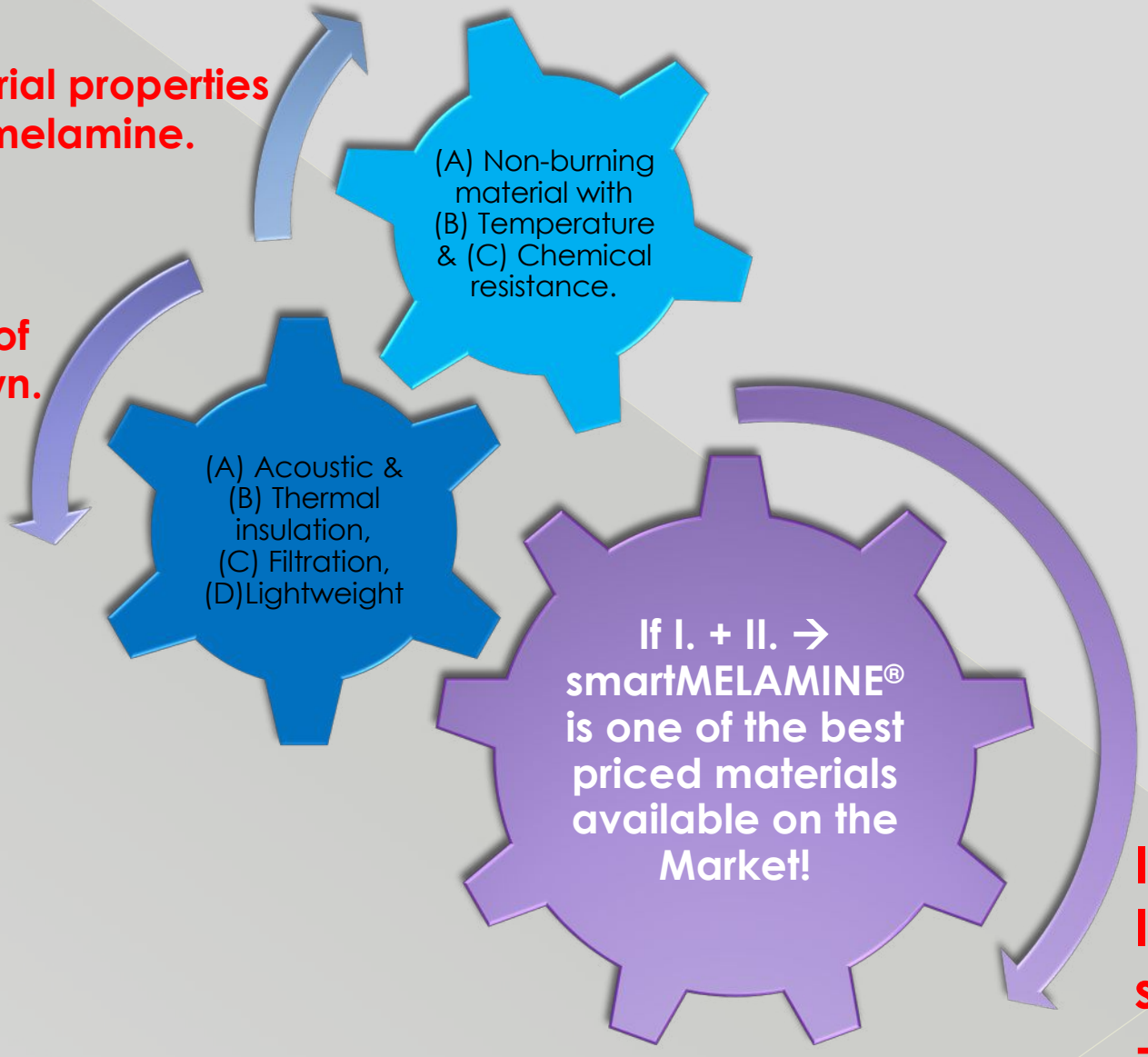
smartMELAMINE®
Filtration properties

Properties	smartMELAMINE®
Inherent flame resistance	LOI 32%
Heat dimensional stability	non-shrinking, non-melting, non-dripping → non-burning
Thermal decomposition	~400°C
Continuous use temperature	up to 240°C
Thermal conductivity	excellent → 0,028 W/(mK)
Acoustic insulation	excellent
Chemical resistance	excellent
Smoke gas	very low
Emissions	very low → ÖkoTex 100 Class 1, VDA 275

smartMELAMINE®
in Mobiltech – Acoustic & Thermal Insulation

I. Material properties of a melamine.

II. Properties of a meltblown.



Conclusion:

If properties of I. & II. needed smartMELAMINE® → competitive.

smartMELAMINE®
in Mobiltech

Advantages of a smartMELAMINE®:

- Flame Retardancy
- Thermal Resistance

→ **INCREASED SAFETY**

- Acoustic Insulation
- Thermal Insulation

- Leightweight
- Low Emission
- Sustainability

smartMELAMINE®

smartMELAMINE®
in Mobiltech

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→ **BETTER PROPERTIES**

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- Low Emission
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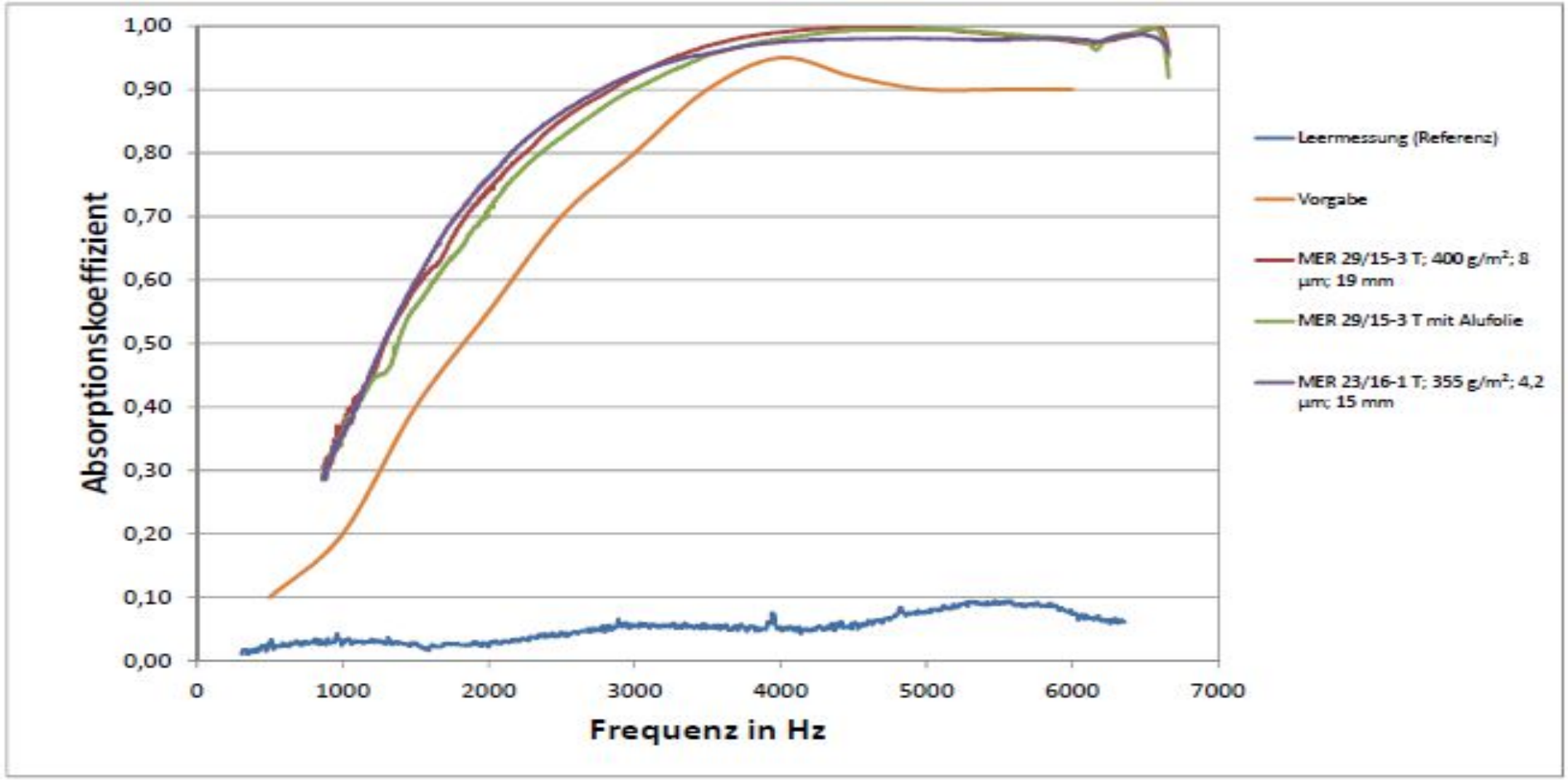
smartMELAMINE®
in Mobiltech - Acoustics



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smartMELAMINE®
in Mobiltech – 3D Forming

3D formability of a thermoset nonwoven by using e.g. melamine based binders added in quantifies of up to 10% to the nonwoven before shaping in a conventional forming process. Sample 100% melamine and could be replacing a multi layer composite.

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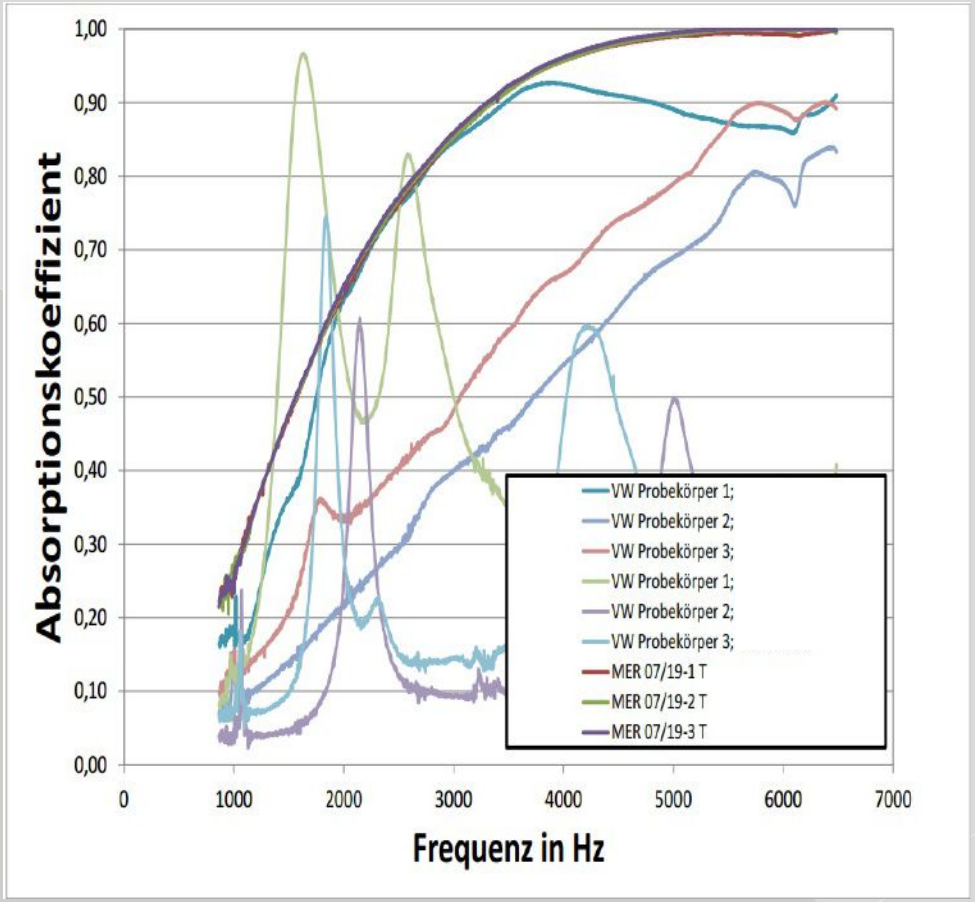
smartMELAMINE®
in Mobiltech – Acoustic & Thermal Insulation



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in Mobiltech

Advantages of a smartMELAMINE®:

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→**FORWARD-LOOKING**

smartMELAMINE®
in Mobiltech - Sustainability

- smartMELAMINE® contains over 50 wt.% of nitrogen 35 wt.% of carbon, rest is mainly oxygen and hydrogen.

- 14C carbon is constantly produced in atmosphere from nitrogen. Bio-based products contain this carbon isotope – this is the way to determine bio-based source of carbon in final products.

- Melamine resin is already today produced out of methanol, formaldehyde and melamine:
  - Nitrogen from air with natural gas is converted to ammonia. Renewable ammonia production is also possible. Ammonia is converted into melamine.
  - Methanol is produced from natural gas, bio-based sources e.g. wood chips or CO_2.
  - Formaldehyde is produced from methanol and air.

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smartMELAMINE®
a Low Emission Nonwoven

Examination	Standard	Limit	Reading Melamine-Meltblown
Fogging test	DIN 75201 a) reflectometric b) gravimetric	a) >95 % b) <2 mg	a) 97,2% b) 0,4 mg
Determination of formaldehyde release*	VDA 275	<10 mg/kg	3,6 mg/kg
Determination of the emission of organic compounds	VDA 277	<50 µgC/g	28 µgC/g
Thermodesorption organic emissions	VDA 278	VOC: <100 mg/kg FOG: <250 mg/kg	< 1 mg/kg < 1 mg/kg
Determination of odor behavior	VDA 270	Rating ≤3	Rating 2 – 3

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smartMELAMINE®
in Mobiltech

Advantages of a smartMELAMINE®:

- Flame Retardancy
- Thermal Resistance

→ **INCREASED SAFETY**

- Acoustic Insulation
- Thermal Insulation

→ **BETTER PROPERTIES**

- Leightweight
- Low Emission
- Sustainability

→ **FORWARD-LOOKING**

→ **3D Forming**

"FUTURE-ORIENTED"

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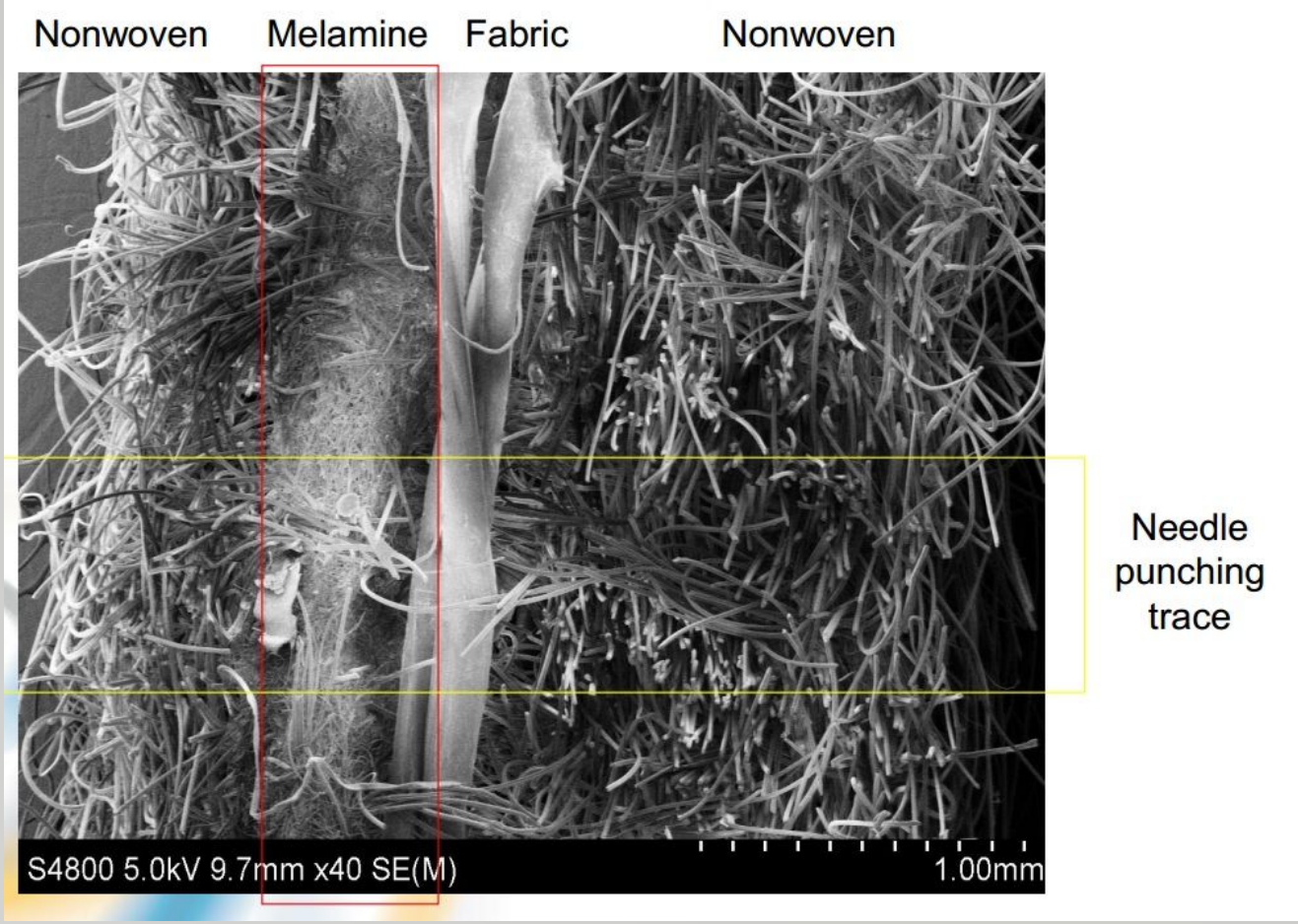
Filtration property - fiber diameter



The adjustable fiber diameter from 25 µm down to **1 µm and below.**

Outlook: The fiber diameter can be further reduced by using a finer nozzle.

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smartMELAMINE®
… like a chameleon

smartMELAMINE® can be adapted to correspond to filter requirements in multiple ways …..

As a pure nonwoven

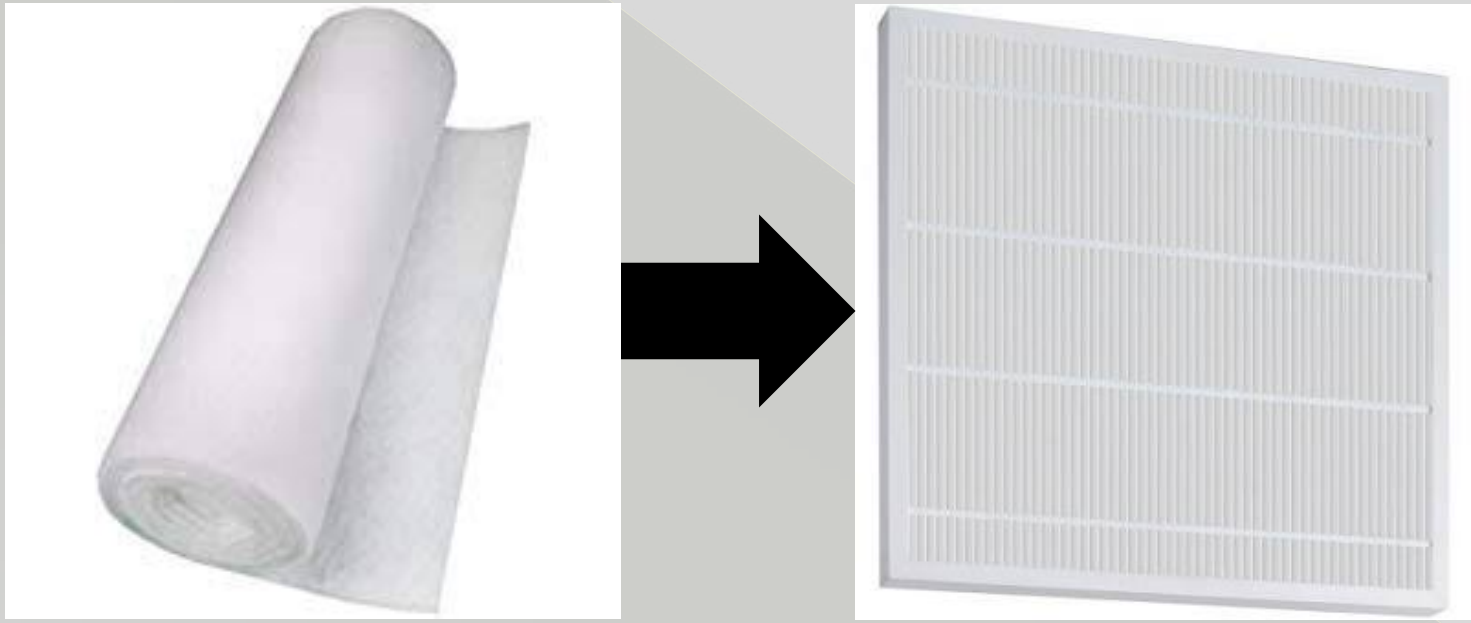
Characteristics	smartMELAMINE®
Color	White or colored e.g. with carbon black
Texture nonwoven	paper like, wadding like, foam like, rollable, stackable → consistency and surfaces are largely customizable
Grammage	20 – 600 gsm
Volume Weight	60 – 10 kg/m^3
Thickness	up to 30 mm
Fiber diameter	0,5 - 25 µm
Width	2.200 - 2.400 mm

& through later modifications.

- As ready to use non-woven used in → **pleated or plain air filters**.
- As spunlaced or needle entangled layer in composites used in → **hot-gas-filters**.
- As short cut fibers or powder in a kind of pulping process used in liquid filtration of e.g. hydraulics → **paper filters** or insulating papers.

smartMELAMINE®
as pleated filter

smartMELAMINE® nonwoven have been developed to fulfill filter classes form M6 to E10.



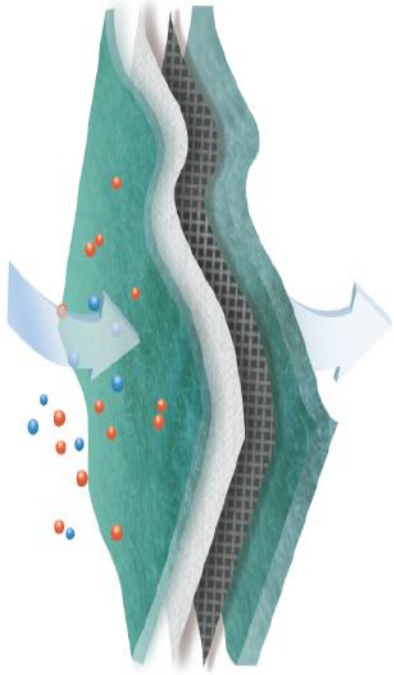
smartMELAMINE®
as pleated filter

Today I had the opportunity to determine the aerosol efficiency of the sample. Both the multipass and aerosol results are very good. The material reaches class F9 with a very low pressure drop of only 37Pa (common is 45 + Pa for glass). For hydraulic applications, the material may also be interesting. There it reaches a fineness of 13.5 microns with a dirt capacity of about 210 gsm.

smartMELAMINE®
in Indutech – Hot-Gas-Filtration

Needle punching trace

Aramid-Melamin-Scrim-Aramid



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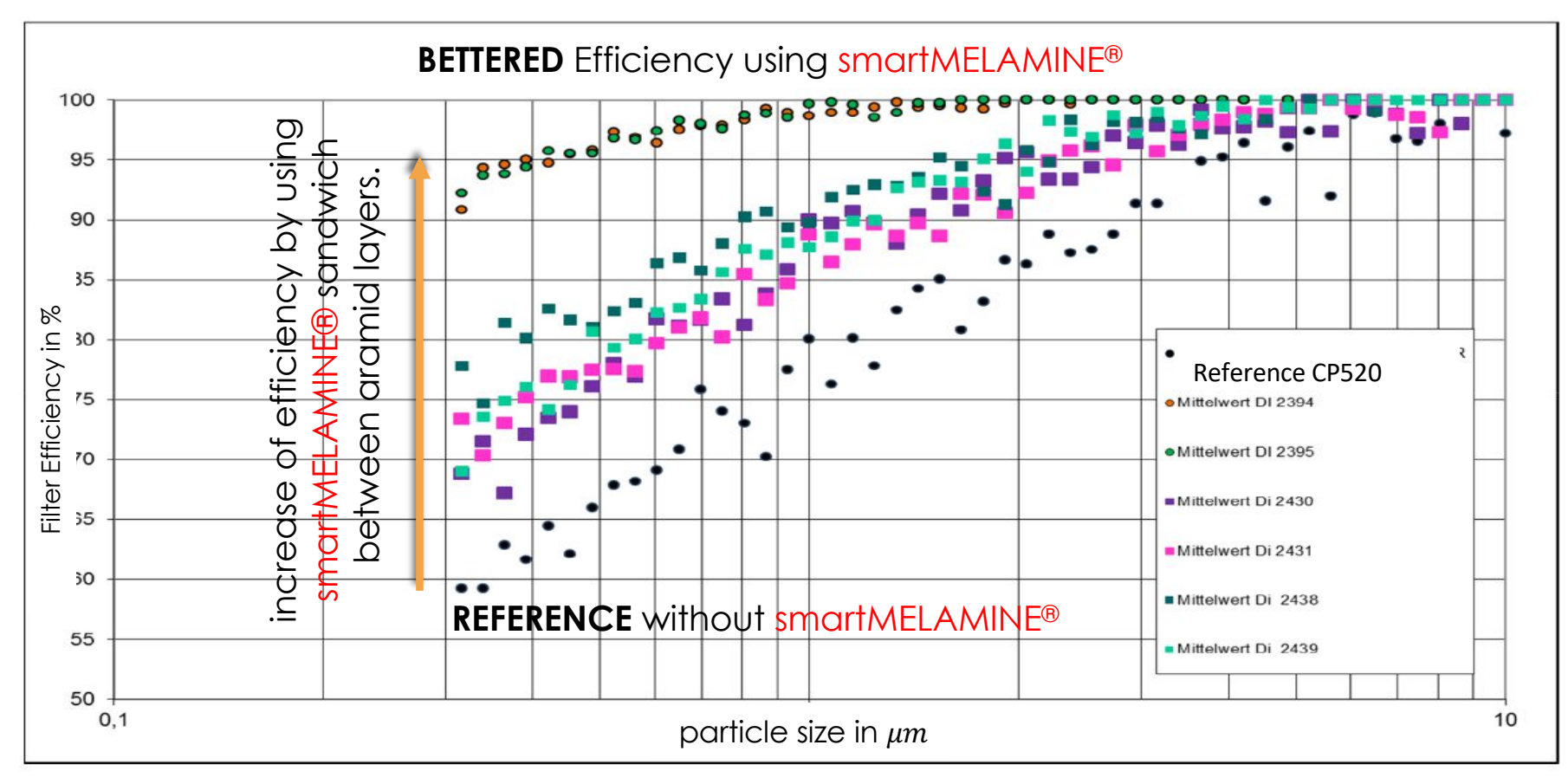
smartMELAMINE®
in Hot-Gas-Filtration



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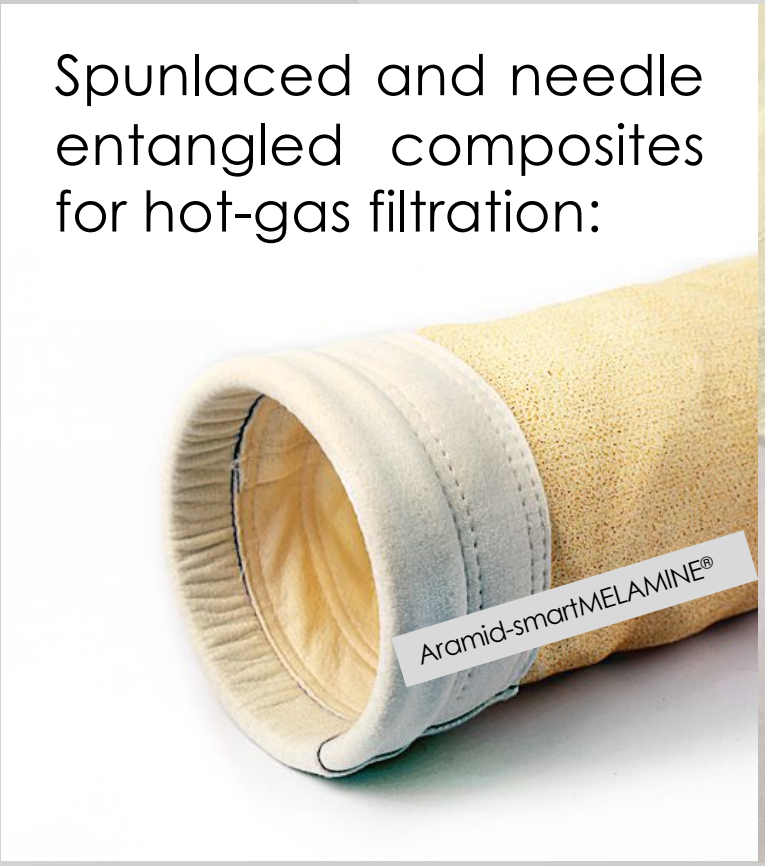
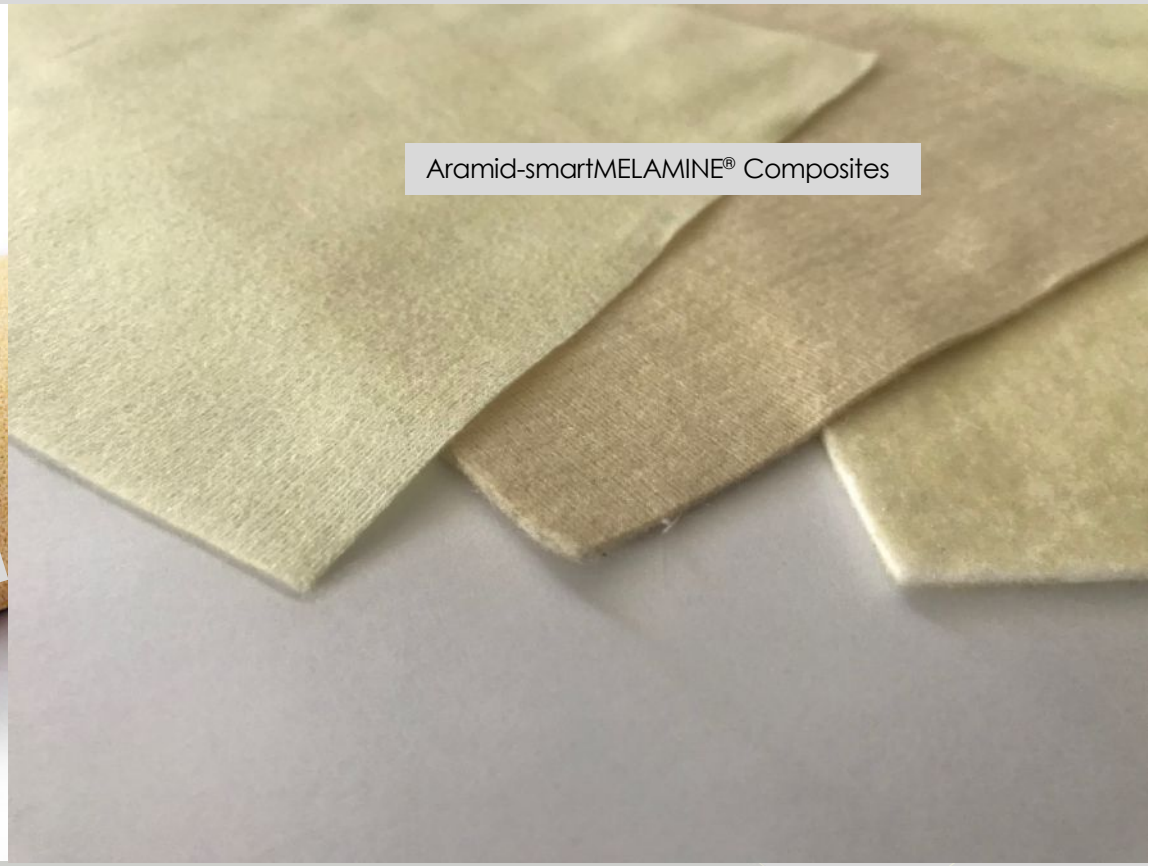
smartMELAMINE®
in Hot-Gas-Filtration

Spunlaced and needle entangled composites for hot-gas filtration:





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smartMELAMINE®
in Hot-Gas-Filtration

Needle entangled composites for hot-gas filtration:

VDI 3926	needle entangled 550gsm			
	unit	value		note
		0	30	
delta pressure	Pa	67	100	first 30 cycles
dust retention	g/m2	0	90,3	
dust emission	mg	2,66		
time	hh:mm	03:10		
dust leakage	mg/m3	0,45		
filtration efficiency	%	99,9910		
cycle		0	56	
delta pressure	Pa	357	393	last 56 cycles
dust retention	g/m2	172,1	203,2	
dust emission	mg	0,15		
time	hh:mm	02:02		
dust leakage	mg/m3	0,04		
filtration efficiency	%	99,9992		

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smartMELAMINE®
in Hot-Gas-Filtration

Spunlaced composite
for hot-gas filtration:

VDI 3926		spunlaced 520gsm		
	unit	volume		note
		0,0	30,0	
delta pressure	Pa	66,0	105,0	first 30 cycles
dust retention	g/m2	0,0	135,1	
dust emission	mg	0,56		
time	hh:mm	05:37		
dust leakage	mg/m3	0,05		
filtration efficiency	%	99,9990		
cycle		0,0	30,0	
delta pressure	Pa	386,0	408,0	last 30 cycles
dust retention	g/m2	162,3	177,9	
dust emission	mg	0,18		
time	hh:mm	02:08		
dust leakage	mg/m3	0,05		
filtration efficiency	%	99,9990		

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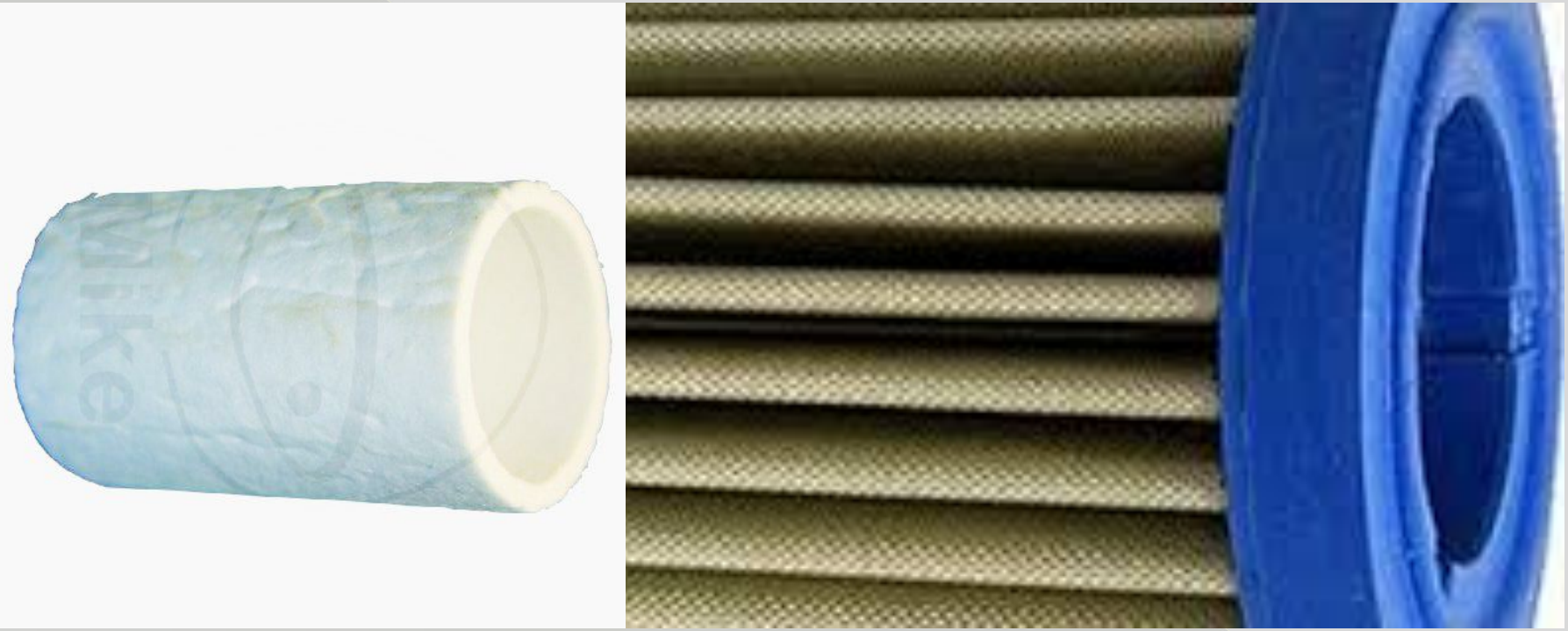
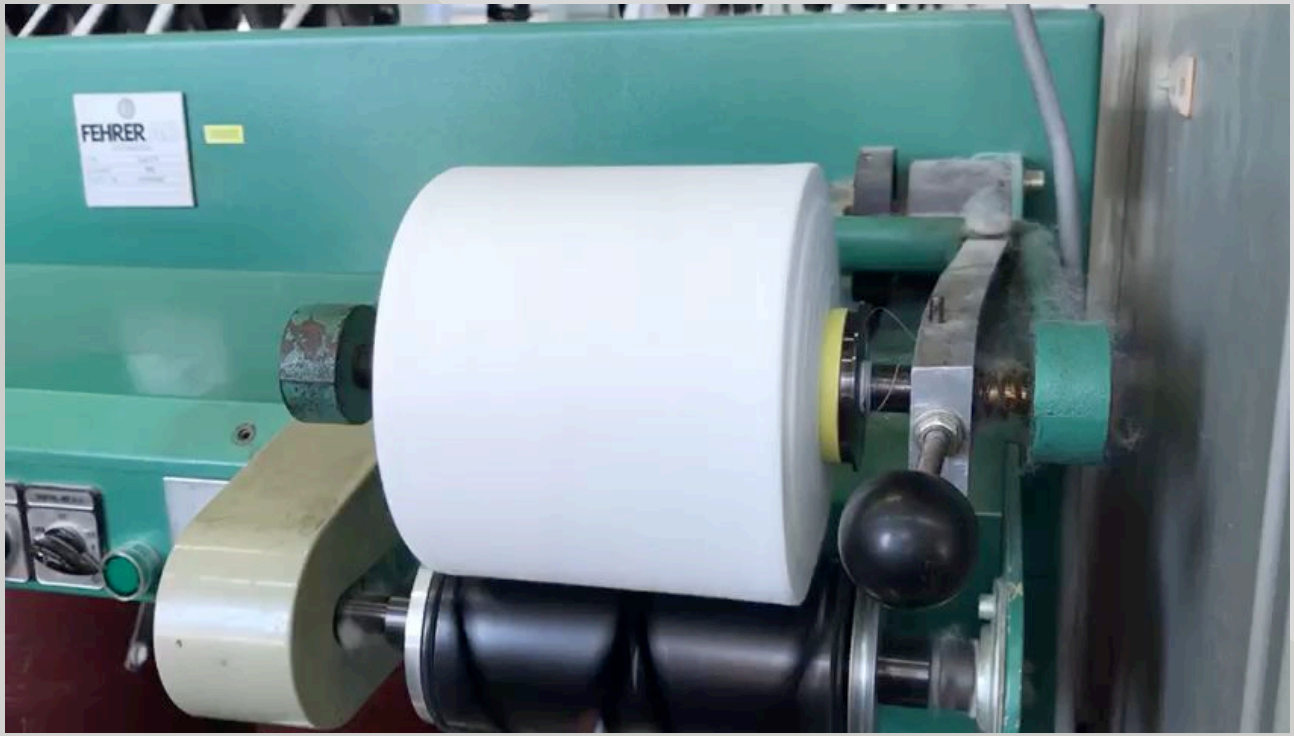
in Paper Filters



Fiber diameter down to 0,5 µm and a fiber defined fiber length.

smartMELAMINE®
in yarns

smartMELAMINE®
DREF spun yarn



- Classical spinning with a start-up cardening process enables spinning of a smartMELAMINE® nonwoven on DREF3 equipment.
- Direct DREF spinning out of a nonwoven ribbon is possible on DREF2 equipment.

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Contacts

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