HJS SMF® - Technology

Filtration Technology for Air Pollution Control (APC)

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March, 24th 2022

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HJS Emission Technology

Agenda

- HJS brief introduction
- Background
- SMF® basic characteristics
- Manufacturing process SMF®
- SMF® Material Specifications
- Variation in designs
- Application Areas
- Summary

Hubertus Borgmeier
HJS International Sales Manager

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HJS Profile, Site and Core Competences

- Number of employees 450, family business
- Wide range of emission control technologies
- Specialist in diesel exhaust aftertreatment
- High competence in research and development
- Flexible manufacturing structures and capacities

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HJS Business Areas

OEM

Upgrading Solutions

Aftermarket

Motorsport and Tuning

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New Business Area

Air Pollution Control (APC)

Background

- Currently also the industry remains a significant source of pollutant worldwide
- Aftertreatment technology for combustion engines is only a small part of the whole filtration market
- HJS has over 20 years experience with Sintered Metal Technology SMF® within this business
- Based on the Capabilities and Experiences in metal processing and production we would like to expand our business to the field of industrial filtration

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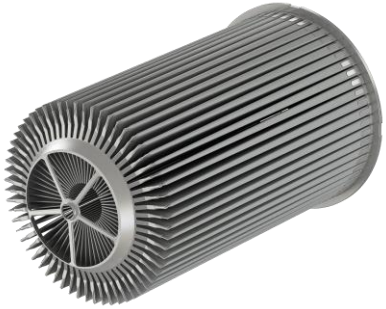
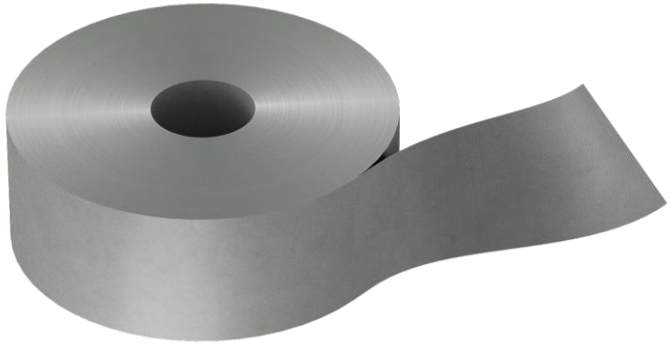
SMF® - Designs Today





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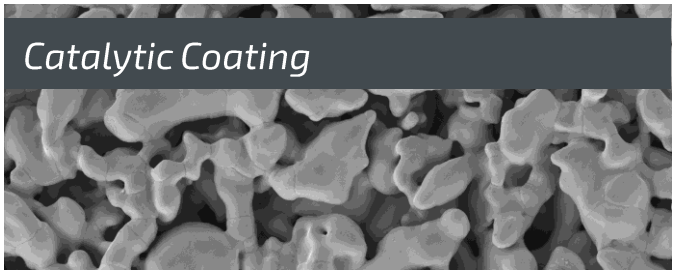
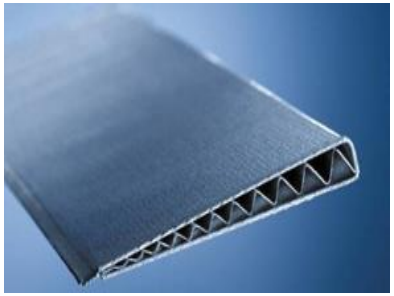
SMF® Basic Characteristics





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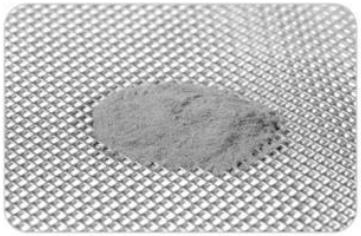
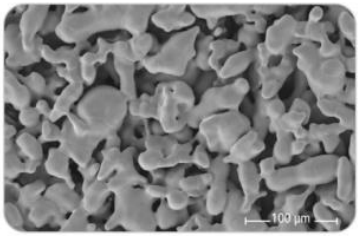
SMF® Manufacturing process

Step 1: For further processing the high alloy metal powder is mixed with a binder



Step 2: The pourable powder mix is applied to reinforcing expanded metal



Step 3: After the sintering process the powder particles are bonded with each other and the expanded metal

Step 4: SMF® medium is sintered in two steps and is available for further processing on coils with 170 m material length

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Metal – powder & binder

Metal – powder & expanded metal

Sintered, porous structure

Filter – material approx. 0,4 mm

<u>Coating</u>

All dimensions of SMF could be coated by HJS.

Pt or Pd loadings up to 3 g/m² are available.

Further active surfaces with other coatings can be developed

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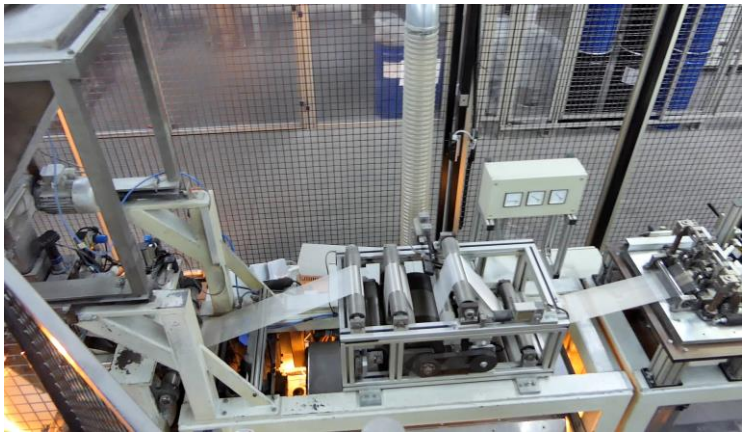
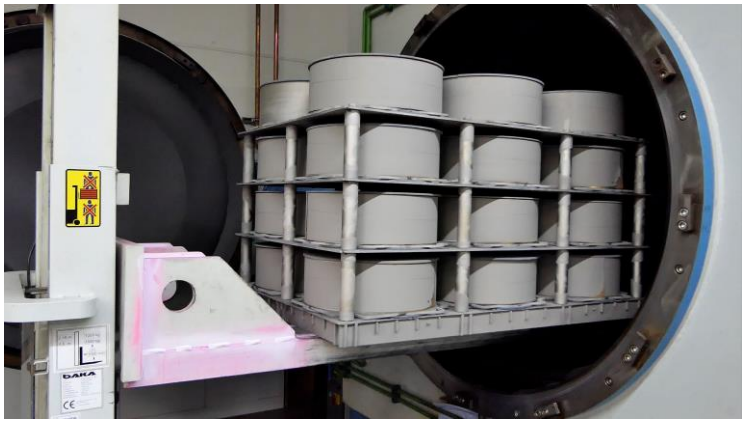
SMF® Manufacturing process



Expanded metal (calibration)

Powder coating (Funnel)



Sinter process

Industrial manufacturing (Roboter line)

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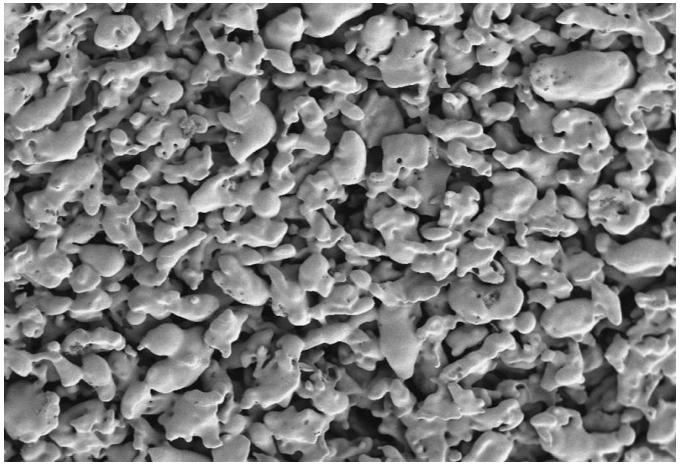
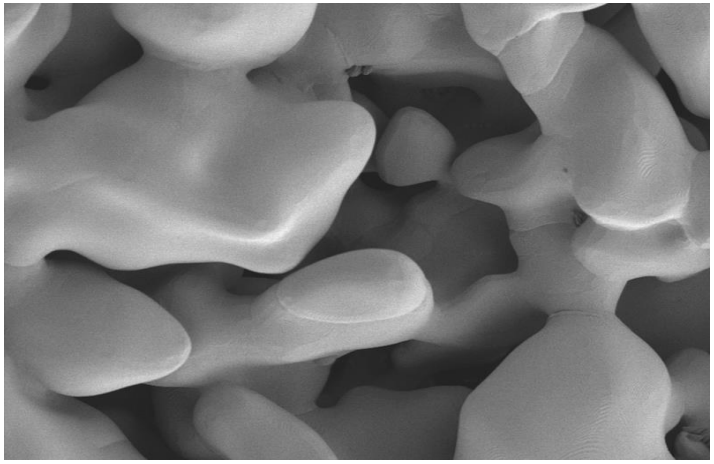
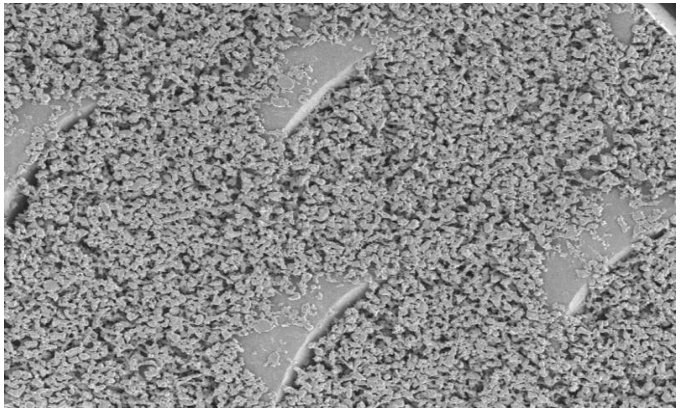
Material Characteristics SMF®



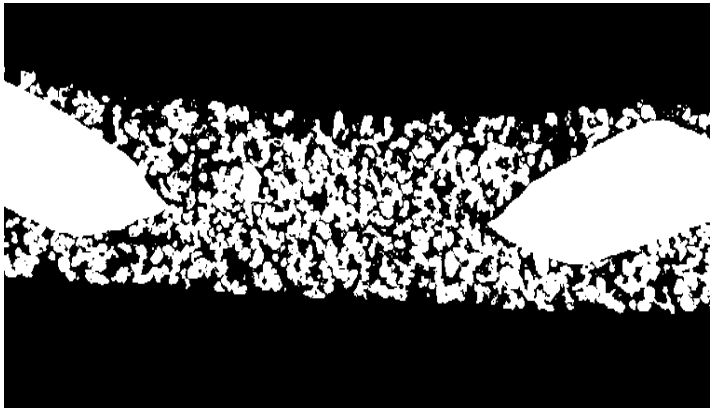
SEM-Picture, Flow in side



Micrograph, SMF®-sheet cut (equal pore sizes)



SEM-Picture, flow direction out side (back view)



SEM-Picture, Detail (Powder filled gaps)

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SMF® Material Specifications

Parameter	Unit	Value	Test Method
Weight	g/m² g/inch²	1650 / 1.1	
Thickness	mm / inch	0.38 / 0.015	
Porosity	%	45	
Alloy		310S / 1.4845*	
Air permeability @ 200 Pa	l/ dm² min	20	ISO 4022
Bubble Point	mbar	35	ISO 2942 Isopropanol
Conductivity @ 20°C/ 70°F	S/m*	0.5×10^6	
Operating temperature	°C /°F	450/ 840 (air, 50% rel. hum)	
Peak Temperature	°C / °F	800 / 1500	

*316 L as prototype, others on request

*Siemens per meter

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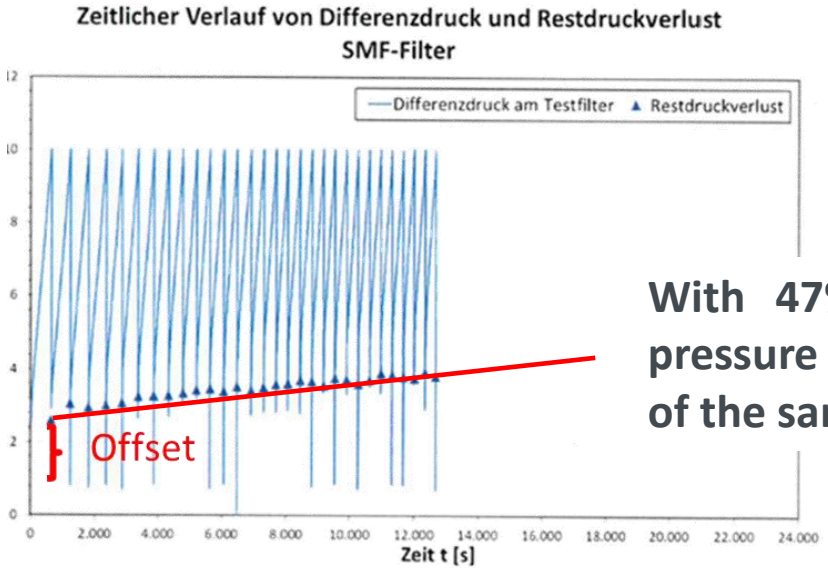
SMF® Material Specification and properties

Gas filtration

Filtration Parameters Air				
Parameter	**Unit**	**Value SMF**	**Test Method**	**Comment**
Efficiency	%	99.996	ISO 5011	Dust PTI fine acc. ISO 12103-1, A2
Efficiency	%	99,94	VDI 3926	Dust Pural NF
Δp @ 3,3cm/s, clean	Pa	260	VDI 3926	Dust Pural NF
Δp @ 3,3cm/s, after 30 cycles	-	+ 47%	VDI 3926	Dust Pural NF
Efficiency ISO ePM1 (80% - 95% anal. F9 EN779)	%	85% @ 4,0cm/s	ISO 16890 (sheet test up to Δp 450 Pa)	conditioning in 2/30 cycles acc. VDI3926



With 47% lower increase of differential pressure compared to metallic fleece media of the same filtration grade (65% increase).

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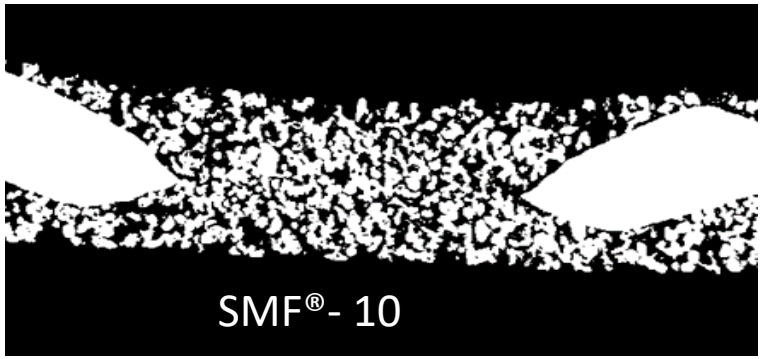
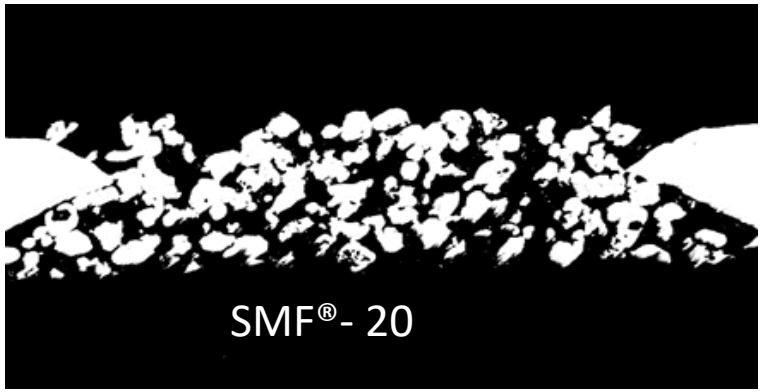
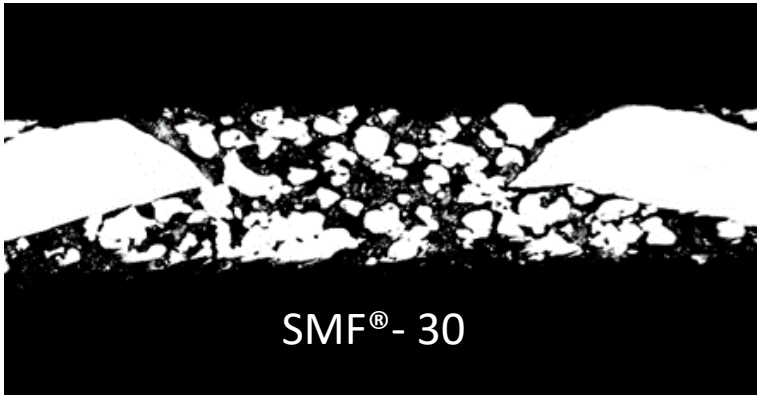
SMF® Media Variants - Development

Coarser SMF®







SMF media were produced from coarser 316 L stainless steel:
The SMF® material can be adapted via adjustments of the powder metallurgy process in three steps from 45% to 50% porosity.
As a result the permeability increases from 20 to 130 l/dm²/min.

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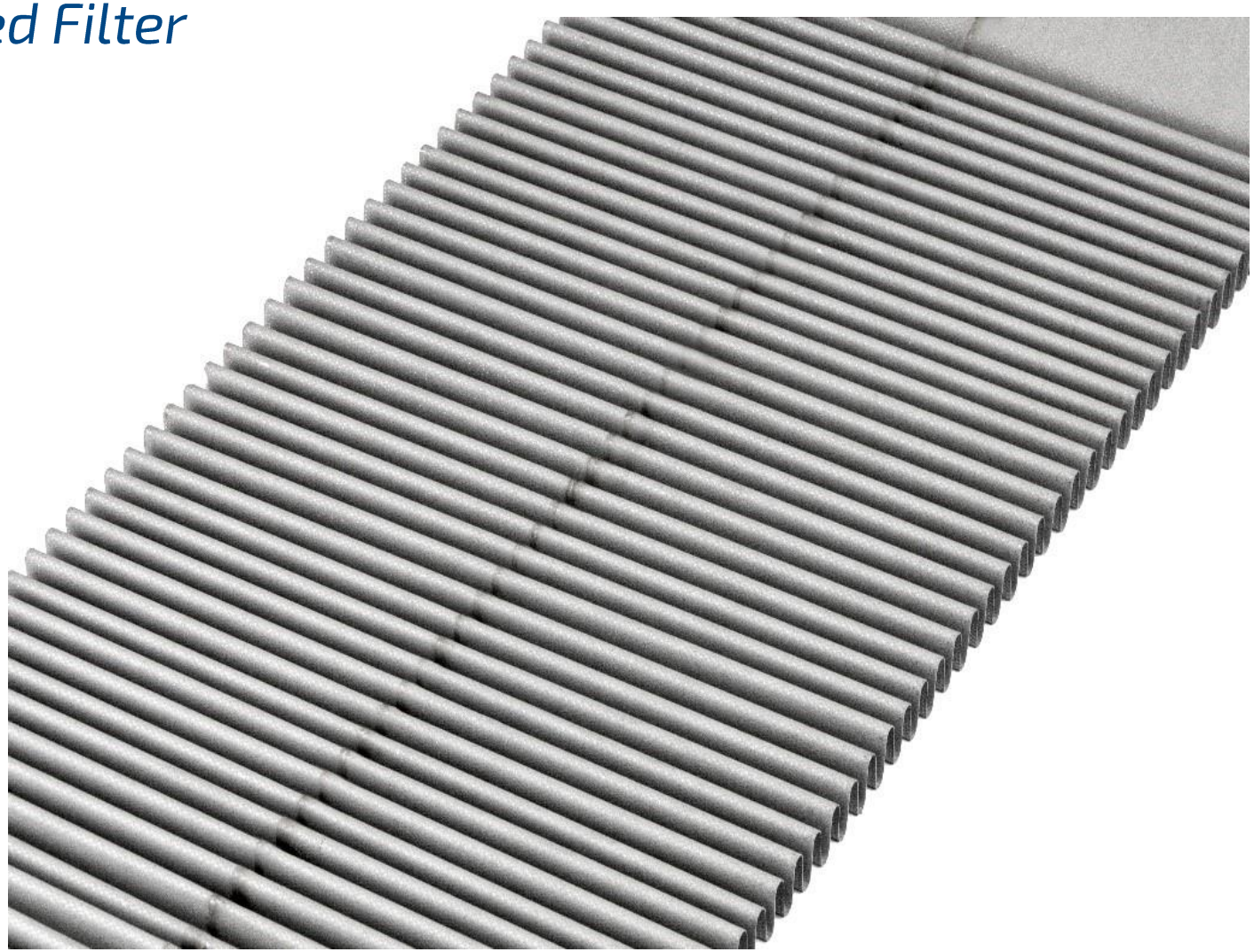
SMF® Variation Design

Pleated Filter



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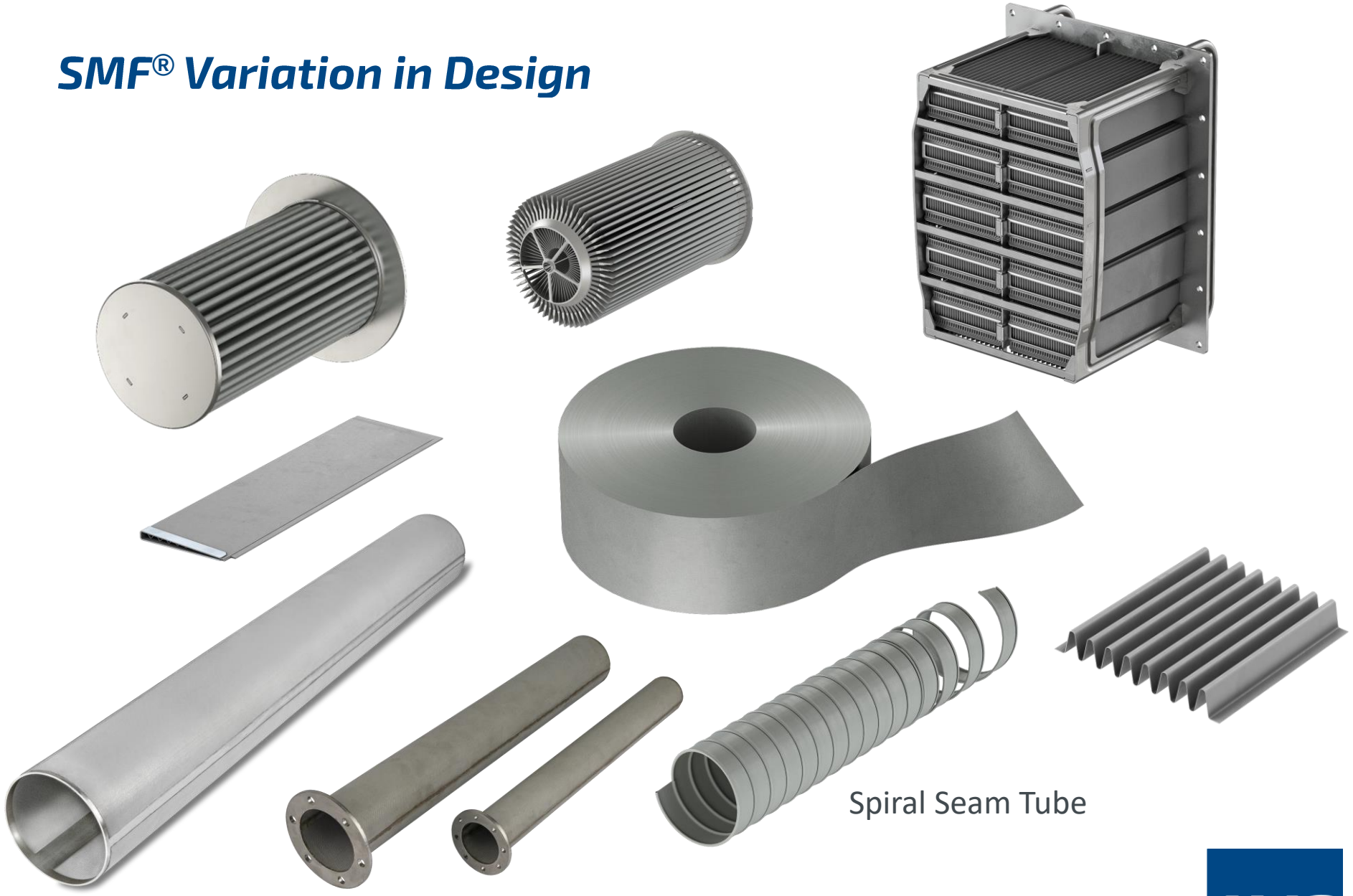
SMF® Variation in Design



Spiral Seam Tube

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Variations in Design

SMF® Filter candles for Gas Filtration (standards)

Diameter 130 mm

SMF® Candle

Module length 1000mm

Diameter 160 mm

SMF® Candle

Module length 1500mm

Various Diameters

SMF® Spiral Seam Tube

Concept, length up to 10 m

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Application Areas

Hot Gas Filtration for industrial wood combustion plants

SWISS Project XyloClean III

The new **XyloClean III** study will focus on validating bag filter technology for wood combustion plants > 50 kW, defining an automatic cleaning system to ensure filtration quality and long-term performance, and finally resuming field trials.

Within the framework of this project, the characteristics of the newly designed SMF filter elements will also be studied at **HEIG-VD** at Yverdon-les-Bains (CH).

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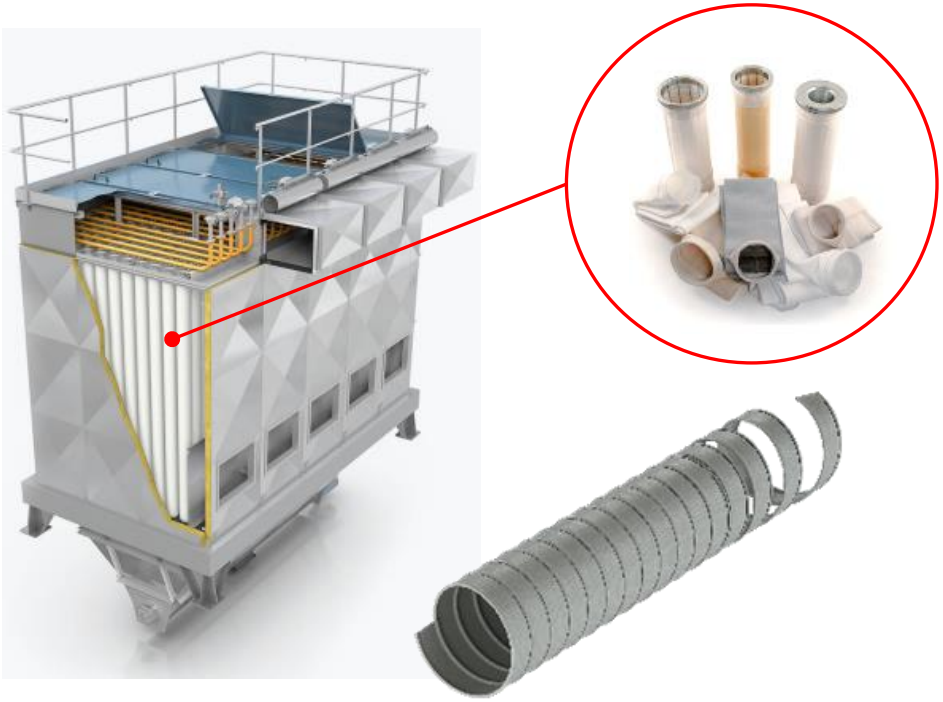
Application Areas

Hot Gas Filtration for Cement and Lime Industry

The cement and lime industry is one of the most emission-intensive industrial processes.
Due to the high inherent stability and strength of the SMF material, existing fabric filters can be replaced by SMF filter candles.



Application Requirements:

- Hi filtration efficiency of the filter media
- High air permeability @ acceptable △p
- Surface filtration w/ good back pulsing behavior
- Temperature resistance >350°C (400°C)
- Backwards compatibility of filter elements; i.e. geometric fit
  - ➢ OD: Ø120mm … 200mm
  - ➢ Length: 3.000mm … 9.000mm
- High mechanical / dynamic stability & wear resistance
- Applicability of catalytic coating
- Pleatability provides additional benefits → e.g. footprint reduction

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Summary and Advantages SMF®

- Metalband material avialable up to 170 m
- Reduced thickness 0,4 mm
- Surface filtration with narrow defined cut-off
- Backflushable in air and liquids
- Can be cleaned in-situ (in the process)
- Cleanable gas filter at temperatures up to 450°C
- Temperature shock resistant | durability ca. 800°C
- Conductive filter material
- Pleatable and combinable with further media
- High flexibility in element design
- Catalytic properties through coating (functional surfaces)

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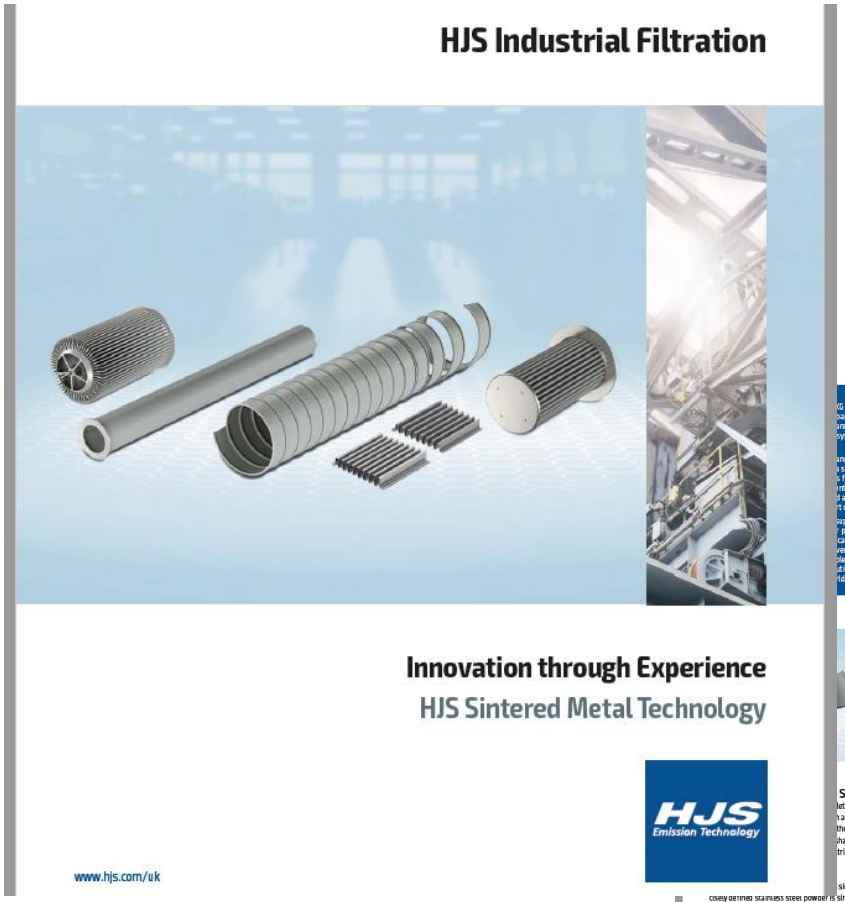
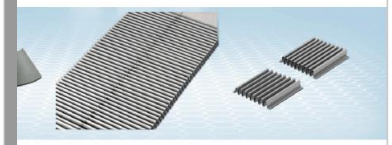
Technical Brochure





SMF® target segments & applications
Air Pollution Controll

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What we are aiming for:

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Thanks for you Attention !

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