



Quality Control during Filter Manufacturing Using the example of Sintered Metal Filter (SMF®)

2016-06-16

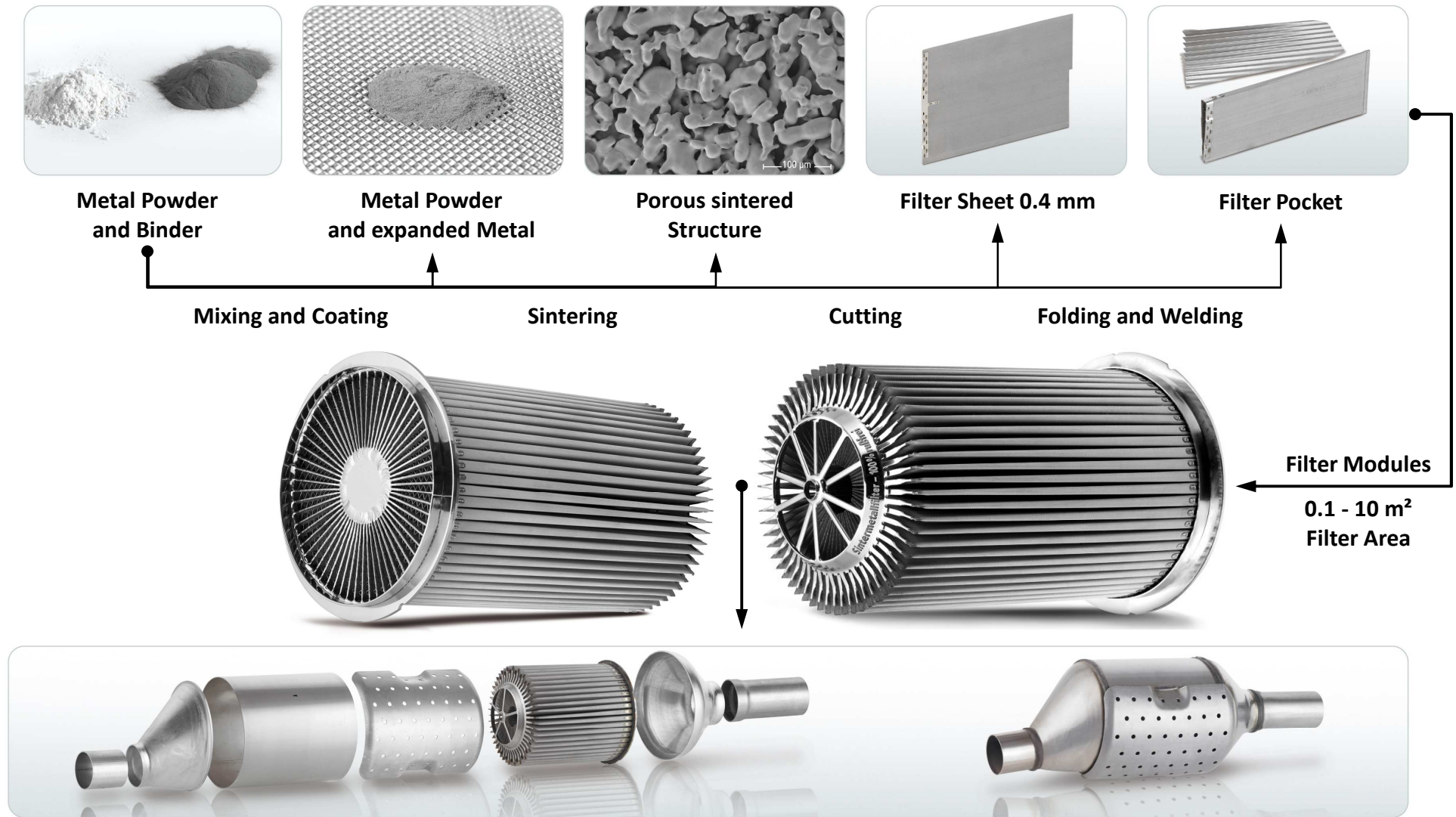
Rafael Rienks

Quality Control during Filter Manufacturing

“You cannot inspect quality into a product!”

(Harold F. Dodge)

SMF® – Sintered Metal Filter



Best praxis example of retrofitted vehicle in everyday driving



Gasoline direct injection

2.0 liter	Euro 4
Total mileage:	≈ 150,000 km
Engine overhaul	≈ 128,000 km
New muffler:	≈ 145,000 km



Turbo diesel direct injection

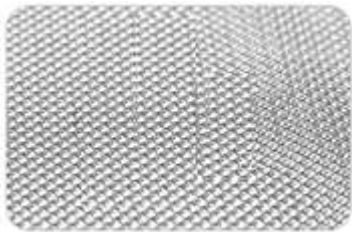
2.5 liter	Euro II
Total mileage:	≈ 300,000 km
New HJS SMF®-AR	≈ 150,000 km
new muffler:	≈ 260,000 km

Incoming goods material inspection



**Metal Powder
and Binder**

- acceptance test certificate in accordance with 3.1 EN 10204
 - flow behaviour of metal powder
 - bulk density
 - knock density
 - particle size distribution



expanded Metal

- acceptance test certificate in accordance with 3.1 EN 10204
 - flatness
 - tensile strength longitudinal
 - tensile strength cross direction
 - straightness
 - mesh size
 - thickness

Laboratory test equipment

- ✓ Microscopes with camera for metallographic analysis
- ✓ Equipment for permeability monitoring (media pressure drop)
- ✓ Tensile testing machine for analysis of material characteristics



Microscope with camera



Grinding of samples



Sinter powder characterization

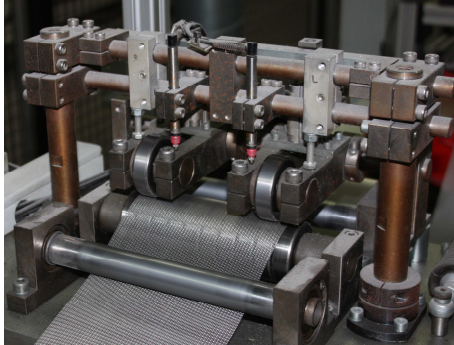


Testing machine for permeability

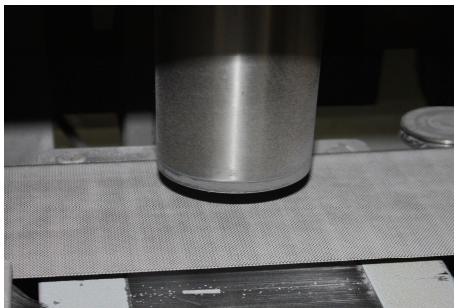


Tensile testing machine

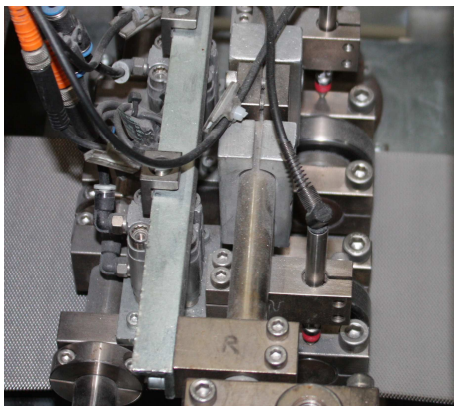
Continuous inspection during sintered metal production



- thickness of incoming expanded metal



- coating weight (non-impact sensor technology)

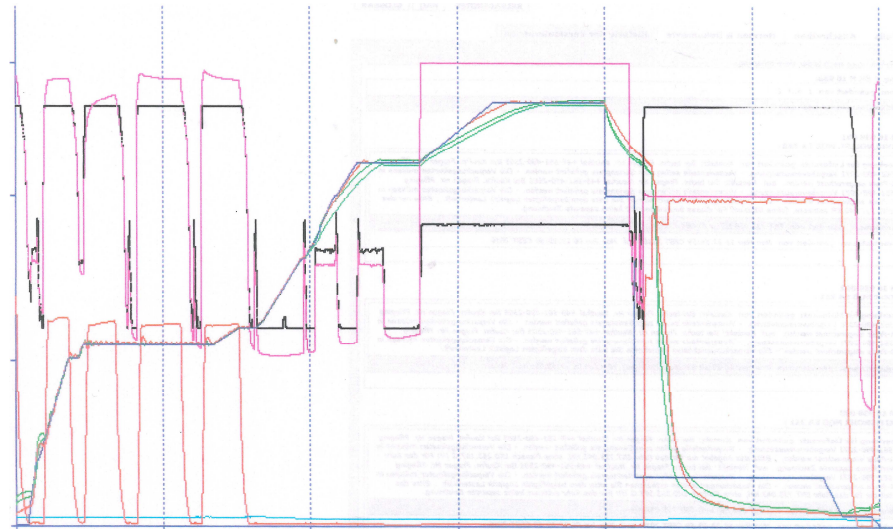


- thickness of coated metal (resolution 1 μm)

Pressure and temperature monitoring during sintering



sintering furnace

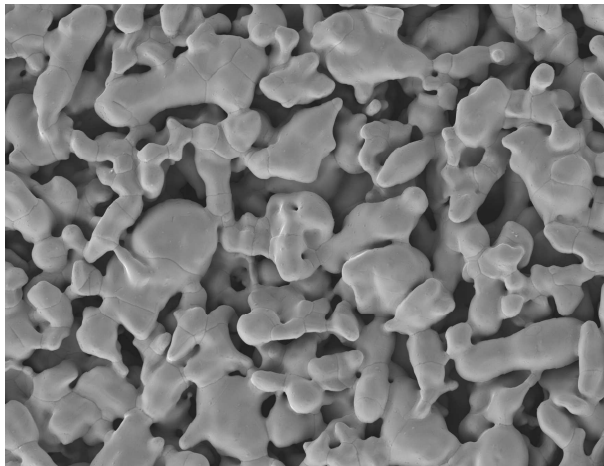


Furnace control with calibrated thermocouples and PTCR (Process temperature control rings)

Inspection of sintered metal



released coils of sintered metal



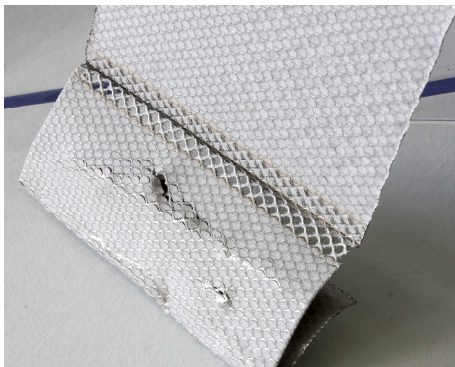
photomicrograph of sintered metal

- thickness
- specific weight
- porosity
- structural persistency
- tensile strength longitudinal
- tensile strength cross direction

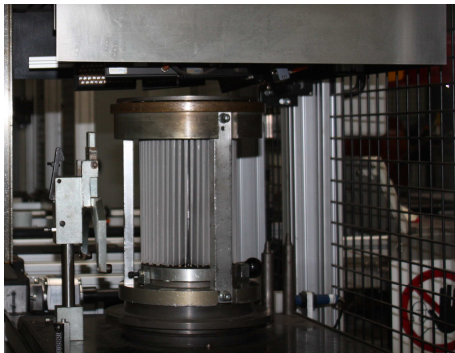
Inspections during filter production



- continuous automatic inspection of incoming sintered metal band

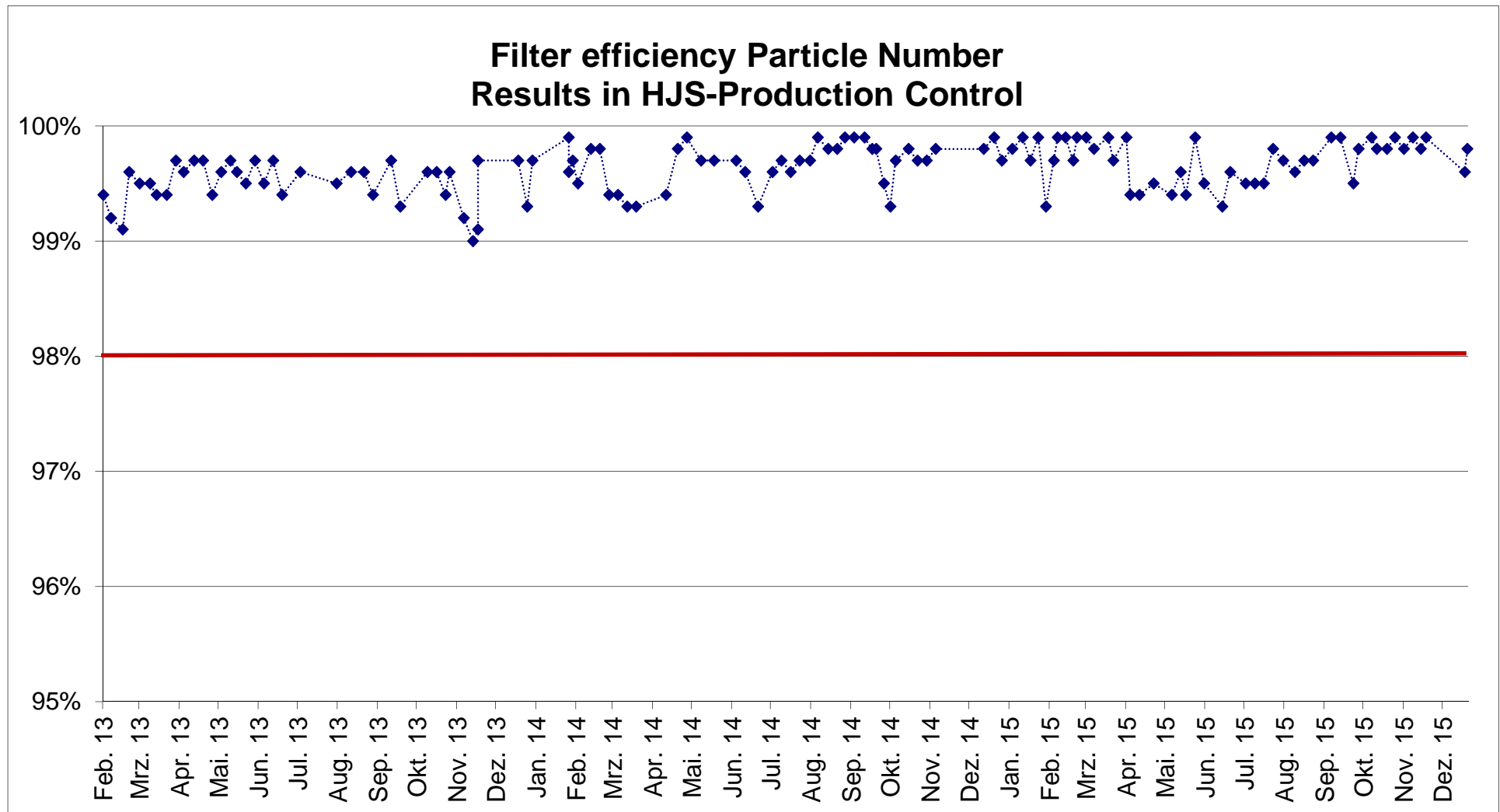


- periodical inspection of all resistance welds

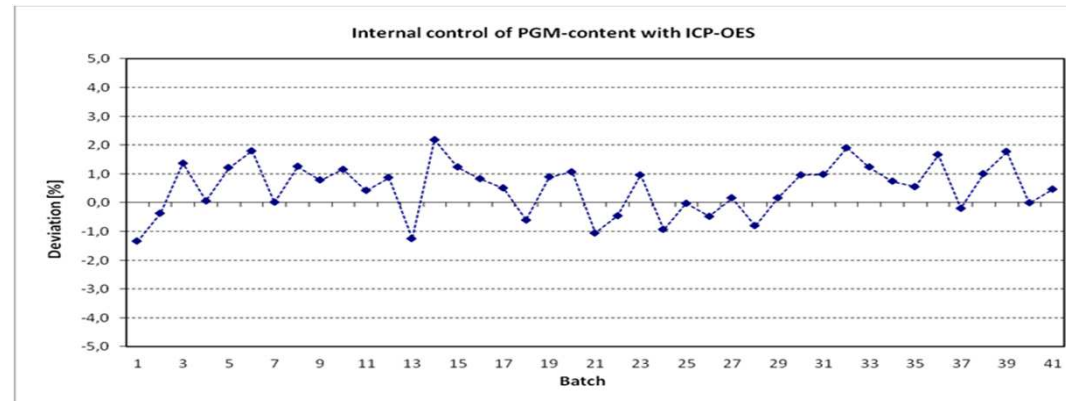


- automatic optical inspection of each filter module

Periodical filter efficiency tests



Inspections during filter coating



- Spectroscopic analyses of raw materials and slurry
- 100 % inspection of coating thickness by differential weighing
- automatic transfer and analyses of weights

Proven quality



HJS received the

MAN Truck & Bus Supplier Award 2011

after supplying more than 10,000 exhaust systems for buses based on SMF®

Diesel with HJS – into a clean future!

Vielen Dank

Thank You

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Company details

HJS Emission Technology GmbH & Co. KG, medium-sized and privately-owned. **Founded** in 1976. **Headquarters:** 58706 Menden, Germany.

Employees: 450. **Business fields:** Exhaust-gas after treatment. Design, development, production and marketing of modular systems for reducing pollutant emissions. The innovative environmental protection technologies are used either as original equipment or for retrofitting in passenger cars, commercial vehicles as well as in a wide range of non-road applications. In addition to systems for spark-ignition engines, HJS specializes in systems for diesel engines, predominantly for reducing the emissions of soot particles (PM) and nitrogen oxides (NOx). All systems meet the statutory requirements and are certified in accordance with the valid licensing regulations.

HJS SMF®

- High filtration efficiency fulfils Euro VI PN-levels
- Open structure is optimized for good ash distribution
- Slow increase in backpressure due to high ash storage capacity
- No loss of filter surface by ash for certain time
- With actual EEV / Euro VI application ash service time is typically >10.000 h
- Filter design and filter surface ratio allows proper OBD calibration (e. g. Euro 6-2)
- Easy cleaning due to open filter structure
- High alloyed stainless steel causes high resistance to thermal shocks
- Pt-coating delivers additional NO₂ for regeneration and downstream SCR
- Unique filter design and material enables autarkic regeneration: SMF-AR®