BOPP
Betamesh-PLUS

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«THE ART OF SWISS PRECISION»

BOPP – World leaders in high tech meshes

Zürich Headquarters

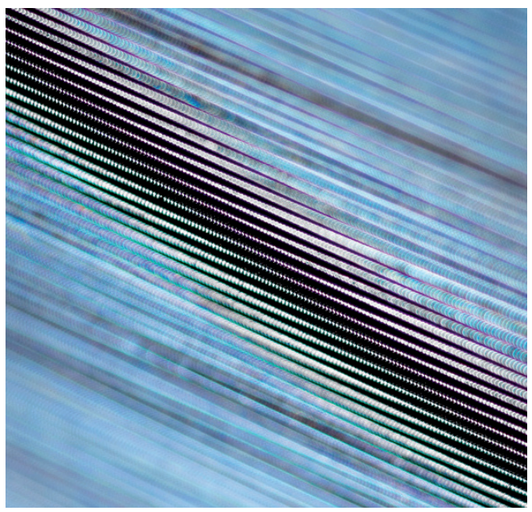
Headquartered in Switzerland, G. BOPP + Co. AG is one of the world's leading manufacturers of precision woven meshes developed for a wide range of applications. Established in 1881, we have evolved from the production of coarse wire mesh into producers of technically advanced fine meshes, with the smallest wire diameters measuring less than 0.015mm, equivalent to just a quarter of the diameter of a human hair.

A history of developing experience

Over time, thanks to intensive research into the most diverse applications, we have acquired invaluable knowledge and experience. Blue chip industrial companies soon came to rely on our filter meshes, including NASA for the construction of the Saturn-V rockets used for missions to the moon in the 1960s and 1970s. 760 filters equipped with BOPP meshes travelled on board every mission to space. This mammoth project was a milestone in BOPP's corporate history.


Filter elements on board the Saturn V rocket

Uncompromising precision

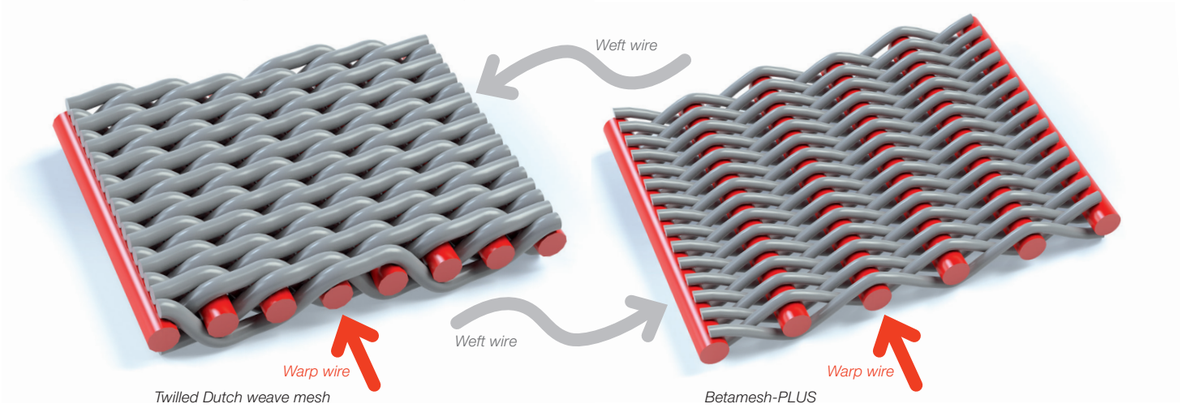

Betamesh-PLUS

This level of experience enables us to understand the filter mesh demands of our customers in every industrial sector. Our knowledge and insight impacts on product development, which is where the properties and benefits of BOPP meshes are derived from:

- High stability
- Smooth surface structure
- Advanced abrasion resistance
- Regular pore distribution
- Narrow pore size distribution
- Good plasticity
- High flow rates
- No particle detachment
- Chemical and thermal resistance
- Easy to clean
- Advanced levels of reliability

Filter mesh comparison

Twilled Dutch weave meshes are the established norm for applications in filtration. Thanks to multiple pore levels they deliver an extremely good filtration result. However, they have a tendency to block due to the geometry of the mesh, which reduces flow rates significantly. This is in sharp contrast to the Betamesh design, where filtration takes place on the surface of the mesh due to the externally smaller pore size. This characteristic improves flow rates and dirt removal capacities as well as backwashing properties. Betamesh-PLUS is the pinnacle of a long range of technical achievements at BOPP.



Twilled Dutch weave mesh *Betamesh-PLUS*

The «PLUS» is a promise

Our established Betamesh range has expanded and is now known as Betamesh-PLUS. The «PLUS» promises even finer pore sizes. Until now, our finest available pore size was 15 µm. Our portfolio has been expanded with the addition of a further six specifications at **5, 6, 7, 8, 10 and 12 µm. With Betamesh-PLUS, you can now filter out particles on a scale previously not achievable.**

Using a detailed description of the relevant pore size for particle separation, or pore geometry, the underlying calculation rules for the geometric pore size have been refined, which is why the «PLUS» is now applied to the entire Betamesh range. Loyal Betamesh customers can however still obtain their tried and tested specifications.

Key applications for Betamesh-PLUS at a glance

Betamesh-PLUS is the ideal solution for even the most diverse applications in filtration. A general overview of the areas of application of Betamesh-PLUS:

Water · Microplastics · Air · Chemicals · Biotech and pharmaceuticals · Laboratories · Dryers

Ballast water · Hydraulics · Air and space travel · Automotive · Fuels · Petrochemicals · Food and Beverage

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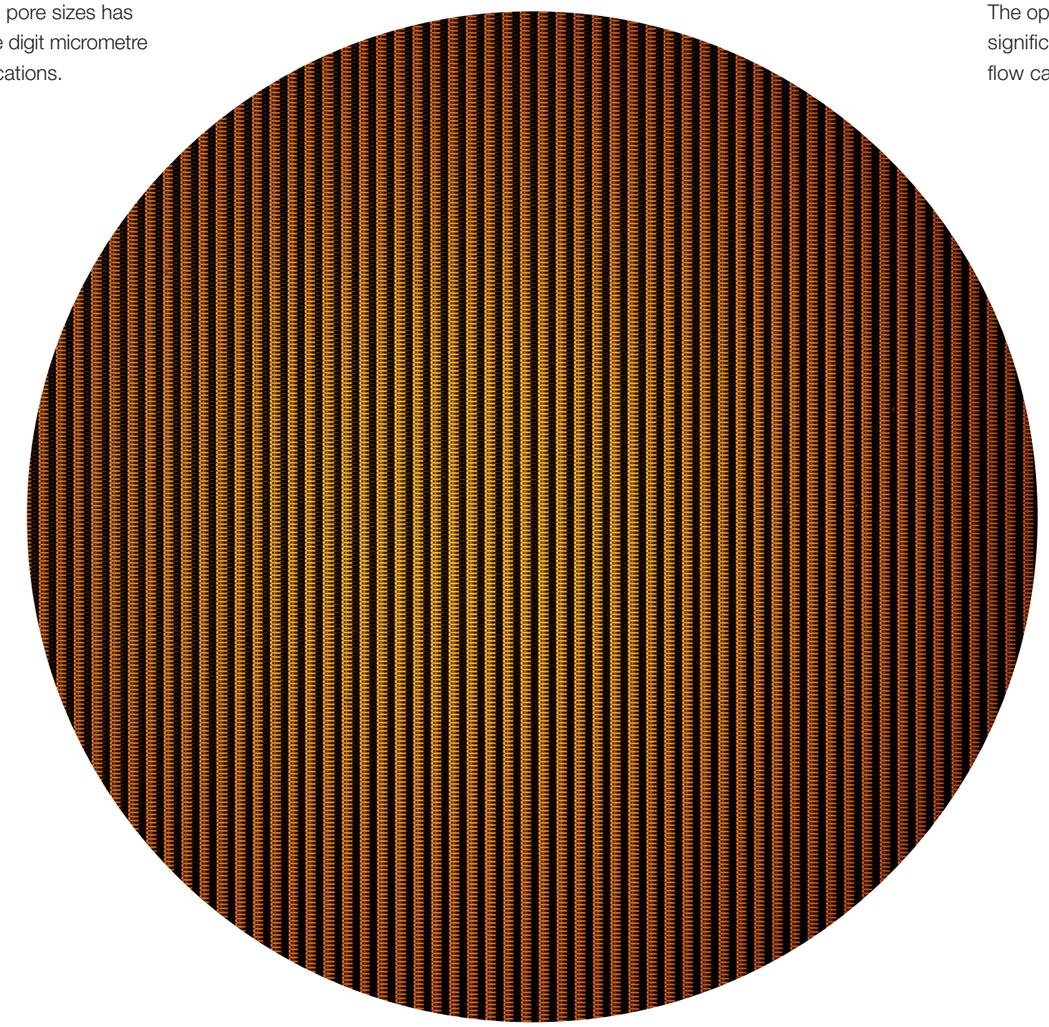
BOPP – The advantages of Betamesh-PLUS

Betamesh-PLUS is the first choice for precise and efficient filtration processes. The definition of the wire diameter ratios and wire spacings facilitate exceptional filtration properties. The corresponding graphics on pages 8–11 illustrate these impressive values.

Microscopic:
The availability of different geometric pore sizes has expanded the range down to a single digit micrometre size of 5 µm using additional specifications.

Streamlined:
The open cross section has been enhanced significantly, resulting in clear increases in flow capacity.



Premium separation performance:
Thanks to their pore geometry, Betamesh-PLUS meshes demonstrate exceptional dirt removal capabilities.

Economical:
The high number of pores enables exceptionally low pressure drop and therefore a high performance filtration process.

Optimal scaling:
The steps between the individual specifications have been matched to optimise the demands of differing applications.

Increased productivity:
The advanced dirt removal capabilities enable longer operating times. Your equipment has less downtime and a reduced number of filter elements requiring changing.

Long service life:
The increased number of slit-shaped pores prevent blockages and enable a longer service life. Even long periods of inactivity do not present a problem.

Surface efficiency:
Higher levels of permeability mean the filter surface area can be reduced, saving on space.

Economical and Ecological:
Targeted improvements in flow rates and minimising pressure drop reduce energy and material consumption accordingly, which is reflected directly in reduced operating costs and a reduced carbon footprint.

Cleanability:
Thanks to the surface filtration action and the pore geometry, backwashing capabilities are significantly better than conventional filter meshes.

Size comparison:
1 µm = 0.001 mm

Pore
Betamesh-PLUS
5 µm

Red
blood cells
8.5 µm

Smallest
pollen grains
10 µm

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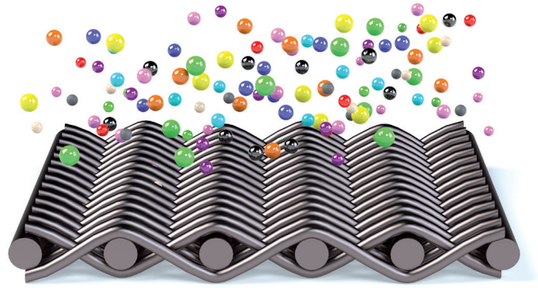
BOPP – Product range

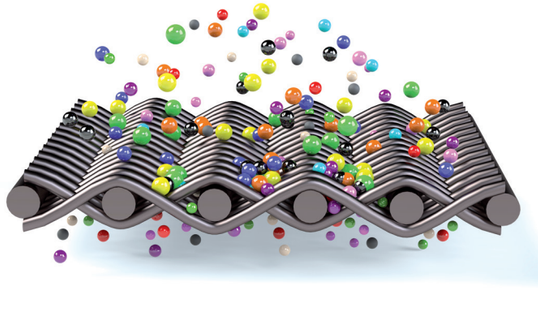
Betamesh-PLUS products offer an impressive depth and diversity. The logical increments in geometric pore size cover a diverse range of applications. We are also happy to consider bespoke requirements, in order to best align our product offer to your requirements.

Mesh Description	Geometric pore size x_{geo} [µm]	Yield point warp/weft $R_{p0,2}$ [N/cm]	Mesh count N_{Poren}/cm^2	A_{sK} [mm^2/cm]	A_{sS} [mm^2/cm]	Porosity [%]	A_{Orel} [%]	Weight [kg/m^2]	Mesh thickness [mm]	Specific flow coefficient Eu
Betamesh-PLUS 5	5	65/90	154’000	0.10	0.18	68	18	0.23	0.07	1’683
Betamesh-PLUS 6	6	65/85	146’000	0.10	0.17	68	21	0.22	0.07	1’242
Betamesh-PLUS 7	7	65/70	140’000	0.10	0.16	68	23	0.22	0.07	1’136
Betamesh-PLUS 8	8	70/90	92’000	0.15	0.21	66	22	0.30	0.09	880
Betamesh-PLUS 10	10	70/90	82’000	0.15	0.21	66	25	0.30	0.10	727
Betamesh-PLUS 12	12	70/95	72’000	0.15	0.22	66	25	0.32	0.10	615
Betamesh-PLUS 15	15	80/85	81’000	0.14	0.18	65	31	0.27	0.09	421
Betamesh-PLUS 20	20	95/80	55’000	0.17	0.22	64	31	0.33	0.11	366
Betamesh-PLUS 25	25	140/100	30’000	0.27	0.28	64	32	0.47	0.15	265
Betamesh-PLUS 30	30	175/125	17’000	0.35	0.36	65	32	0.59	0.20	193
Betamesh-PLUS 35	35	220/160	12’000	0.45	0.46	64	31	0.77	0.25	164
Betamesh-PLUS 40	40	305/205	8’000	0.53	0.56	65	31	0.91	0.30	134
Betamesh-PLUS 50	50	325/275	5’000	0.69	0.72	65	30	1.18	0.38	108
Betamesh-PLUS 70	70	435/285	3’000	0.82	0.79	65	33	1.35	0.46	89
Betamesh-PLUS 100	100	395/405	2’000	1.24	1.15	64	33	2.00	0.66	68
Betamesh-PLUS 125	125	475/440	1’000	1.47	1.41	65	33	2.40	0.82	52

- **Geometric pore size x_{geo}**
  Based on characteristic mesh parameters including style of weave, wire diameter and division of calculated value. Describes the diameter of the largest spherical bead capable of passing through the mesh.
- **Yield point $R_{p0,2}$**
  Maximum permissible loading on the mesh in warp or weft direction, without significant permanent deformation.
- **A_{sK}**
  Actual material cross section on the cut surface of a vertical cut in the warp direction through the mesh. This material cross sectional area transmits the tensile forces in the warp direction.
- **A_{sS}**
  Actual material cross section on the cut surface of a vertical cut in the weft direction through the mesh. This material cross sectional area transmits the tensile forces in the weft direction.
- **Porosity**
  Proportion of the open area of the mesh to the given total volume of the mesh. The total volume is defined by the external dimensions length, width and thickness.
- **A_{0rel}**
  Theoretical free flow area, through which the filtrate can pass, in relation to the flow surface.
- **Eu**
  Dimensionless property (Euler’s number) to assess the relationship of the pressure to the inertial forces of each respective mesh specification. Higher values denote higher pressure differential values under the same conditions (Air, 20 m/min, 20 °C). The values are merely intended to compare the meshes in terms of flow resistance.
- We reserve the right to make technical changes. The latest data can be found on our website.
- On request, bespoke meshes can be manufactured to individual customer specifications in all formats.

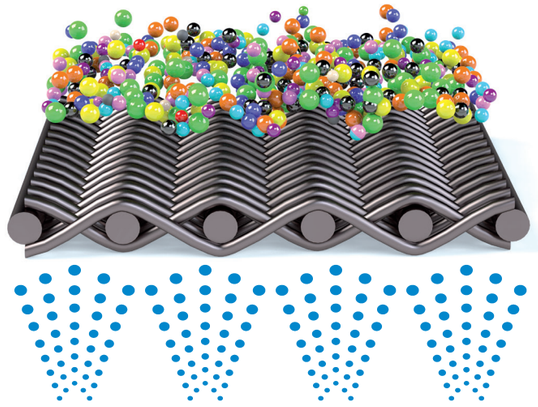


Filtrate arrival phase
Particles of varying sizes are carried in the direction of Betamesh-PLUS filter meshes.



Surface area filtration
Thanks to the narrow, elongated Betamesh-PLUS pores, filtration takes place on the surface of the mesh. This eliminates the possibility of blockages.

Filter Cakes
Continuous filtration processes enable the particles to build up a filter cake. Increased loading means smaller particles can also get caught up in the filter cake. Backwashing is advisable.



Backwashing
When individual parameters are reached in terms of loading or pressure loss, Betamesh-PLUS can be backwashed easily thanks to the surface filter cake.

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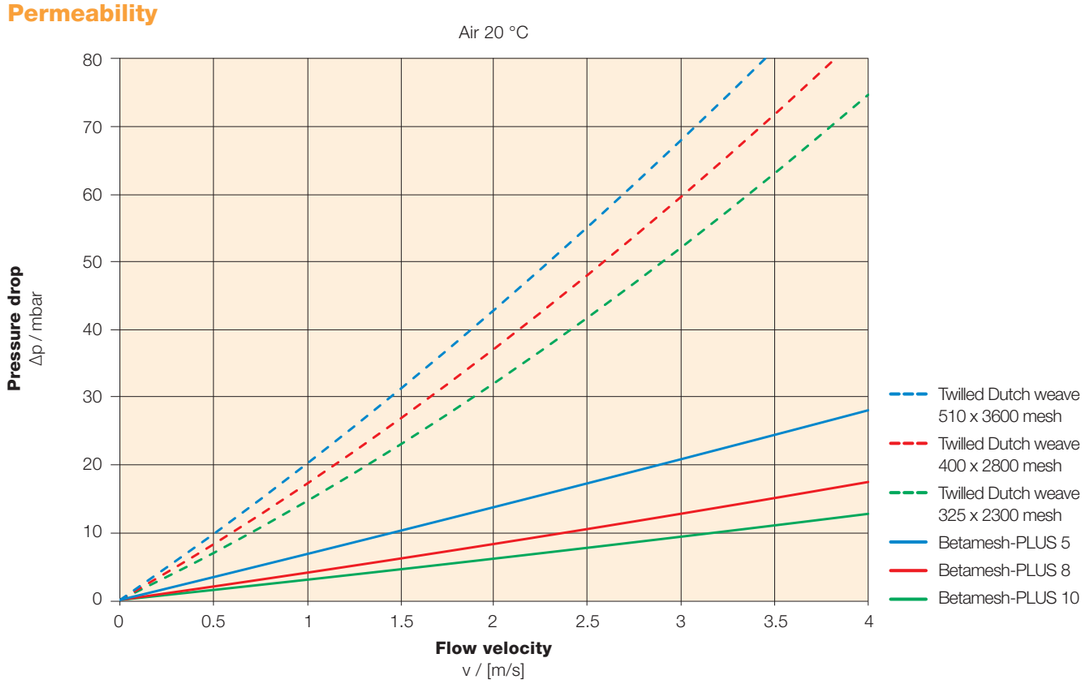
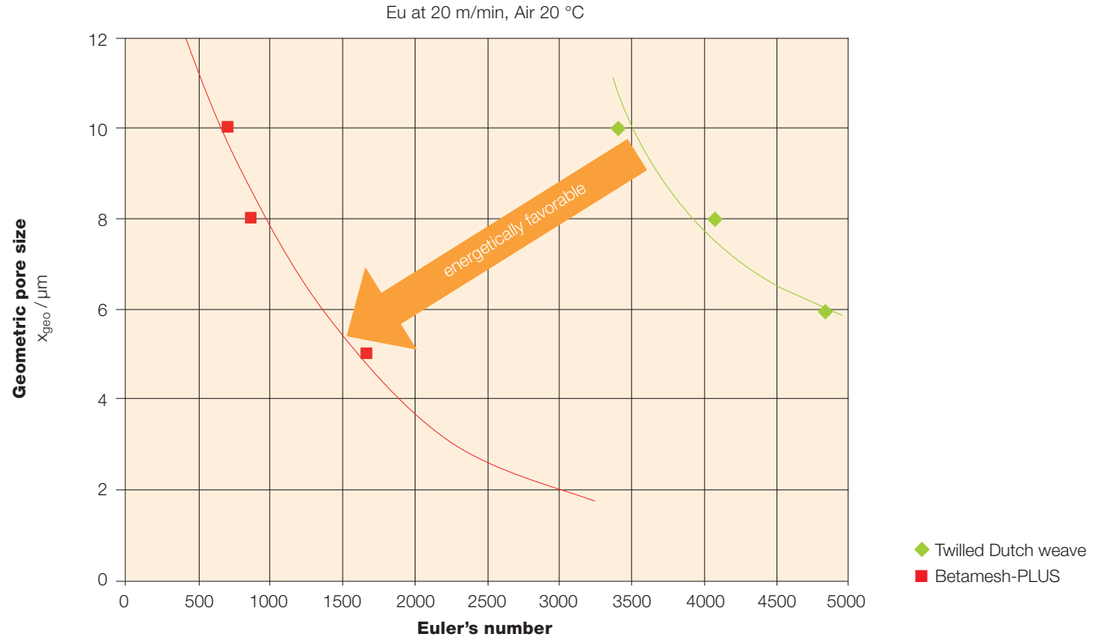
BOPP – Demonstrating impressive values

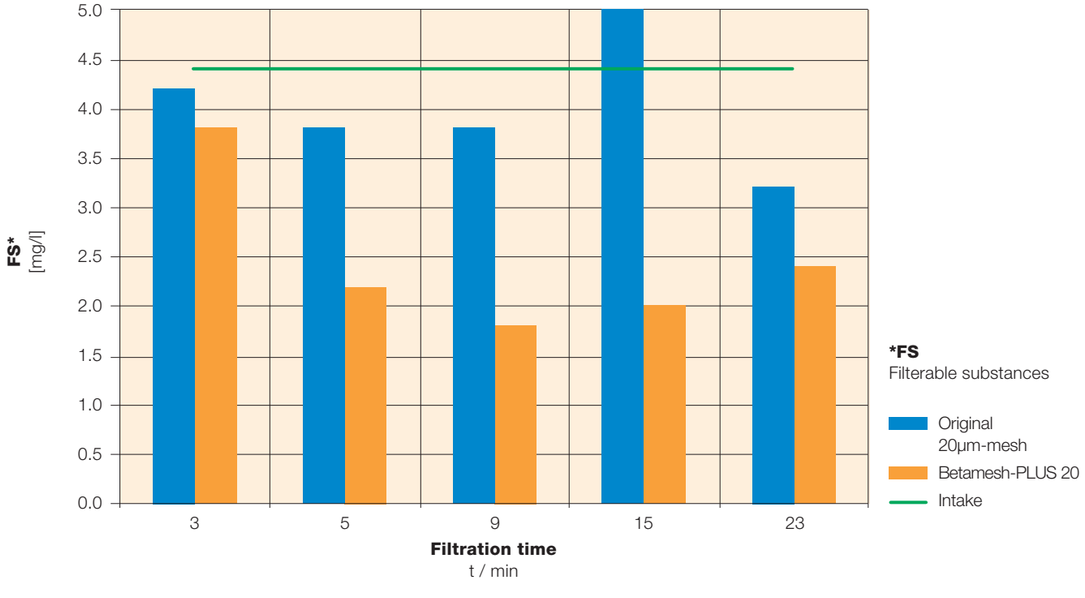
In direct contrast with the Twilled Dutch weave mesh often used for filtration applications – irrespective of supplier – our Betamesh-PLUS delivers impressive improvements. Pressure drop and energy consumption in the filtration process can be dramatically reduced with Betamesh-PLUS.

Permeability





Comparison tests Betamesh-PLUS 20 in a test sieve at LFKW University Stuttgart



Increased permeability – benefits

Increased permeability in comparison with Twilled Dutch weave mesh results in:

- reduced pressure drop
- higher flow rates, whereby the amount of filtrate and therefore the productivity of the filtration process increases
- reduced energy requirements, use of resources and operating costs
- reduced environmental impact through the filtration process and therefore the product itself
- reduced filter area. With an identical pressure drop and power requirement as per the use of a Twilled Dutch weave mesh, when using Betamesh-PLUS the required filter area is significantly smaller. This saves on space as well as reducing the weight of the filter element.

Comparison test at LFKW (Teaching and research sewage treatment plant), University of Stuttgart

- Comparison tests at the Teaching and Research sewage treatment plant, University of Stuttgart demonstrated an average 40% reduction in FS (filterable substances) in comparison with previous filter media with identical pore sizes
- Findings of the Teaching and Research sewage treatment plant substantiate a 55% longer filtration time to achieve the maximum permitted pressure drop

Continued on page 10 & 11

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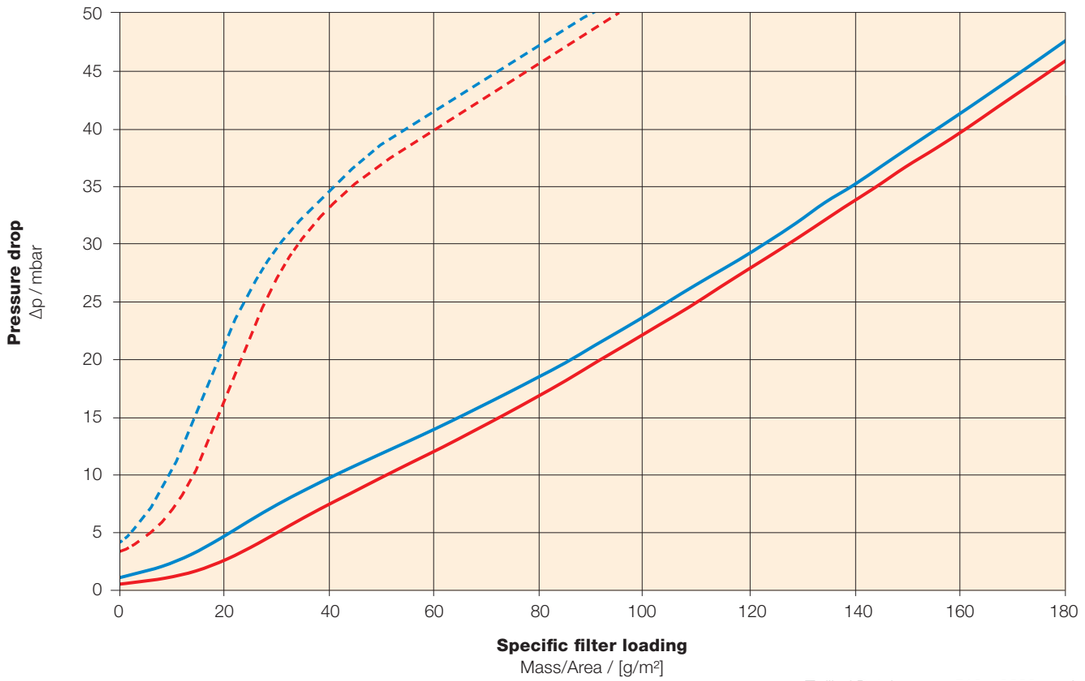
Continuation from page 8 & 9

Dirt removal capacity

v = 0.184 m/s. Air, Arizona Test Dust coarse



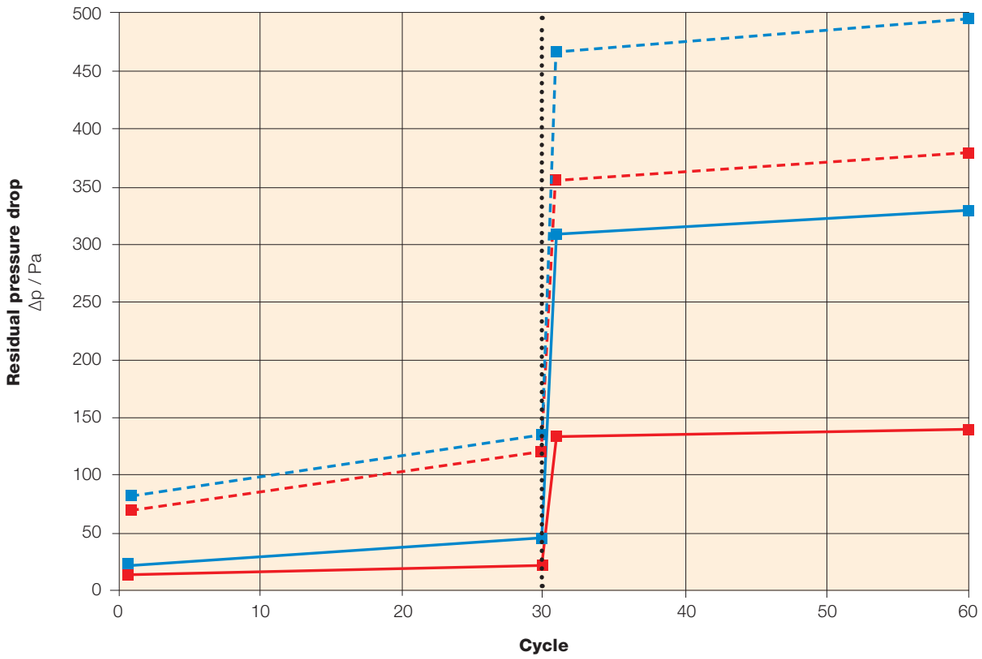
- Twilled Dutch weave 510 x 3600 mesh
- Twilled Dutch weave 400 x 2800 mesh
- Betamesh-PLUS 5
- Betamesh-PLUS 8

Advantages of greater dirt holding capacity:

- Betamesh-PLUS non-blocking properties and the resultant reduced increase in pressure drop during the loading of the filter medium saves on resources and also facilitates increased dirt holding capacity. This means the filtration process can run for longer, before the filter medium must be cleaned or exchanged.
- Reduced downtime equates to an increase in productivity
- Reduced cost due to a lower number of filters requiring changing

Cleaning behavior

In accordance with DIN ISO 11057



***Ageing over time**
Ageing over time covers 2,500 cleaning cycles, time controlled every 20 seconds

- Twilled Dutch weave 510 x 3600 mesh
- Twilled Dutch weave 400 x 2800 mesh
- Betamesh-PLUS 5
- Betamesh-PLUS 8
- Ageing over time*

Advantages of improved dedusting behaviour

- Pressure drop caused by residues left behind after multiple backwashes is significantly less than with Twilled Dutch weave meshes. This means maintenance requirements and the resultant emissions over the entire life cycle are reduced.
- The slit-shaped pores on the outer side of Betamesh-PLUS are also easier to backwash. Where the separated particles are a recyclable part of the process, a greater volume of the separated particles can be extracted.

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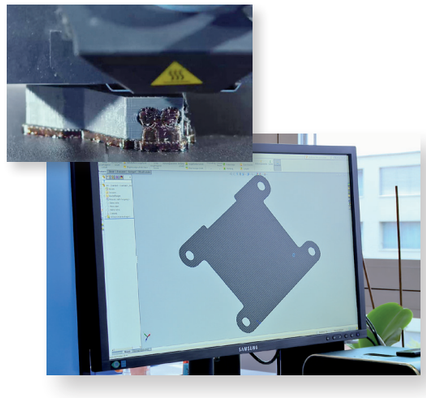
BOPP – Additional services

As well as enjoying a world beating reputation for our exceptional filter meshes, BOPP also specializes in fabricating these meshes. Sophisticated plant and equipment enable us to fabricate meshes into semi-finished goods to individual customer specifications, which can then be integrated directly into your production chain.

Engineering:

We are always pleased to support you in selecting the right mesh specification according to flow rates, material properties, geometric shapes and component design using:

- Demand analyses
- Material recommendations
- Design suggestions
- Working drawings
- Cost calculations



Fabrications:

- Precision cutting and stamping
  - Perfect cut edges and angularity
- Forming, bending, deep drawing and edging
- Welding, soldering and bonding
- Prototypes, one-off examples
- Economical mass production
- Process oriented packaging

Thermal Treatments:

Thanks to the most diverse treatments, mechanical properties including hardness, elasticity and malleability can be optimised for further processing.

- Optimisation of workability
- Variable hardness and malleability
- No loose wires with DKS meshes
- Tension free annealing

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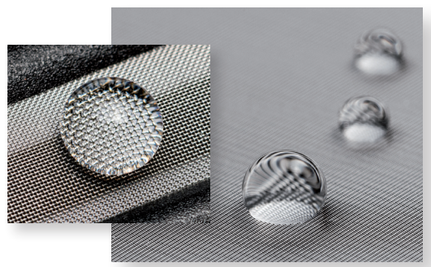
Shaped components:

On request, we can process our meshes into shapes components according to your requirements. For example:

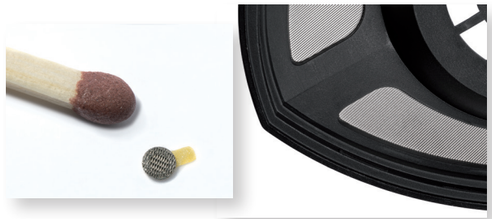
- For use in sintered laminates
- Filter frames
- Filter candles
- Star filters
- Blanks
- Pleated filters
- And many more



Coatings:

Our hydrophobic coatings increase perfomance in coalescing filtration systems – for example separating water from kerosene.

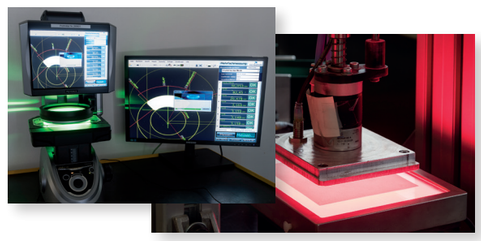
- Hydrophobic and oleophobic with HC8
  - Angle of contact up to 145 °
  - Temperature resistance from -50 to 200 °C
  - Chemical resistance
  - UV resistance



Partnerships:

Working with leading convertors worldwide we carry out further processing for tasks including:

- Back injection
- Component assemblies
- Etc.



Quality testing and measuring:

- Customer specific quality controls
- Issuing measuring protocols
- Certification, attestation
- Flow rate measurement
- Glass bead testing
- Bubble point testing

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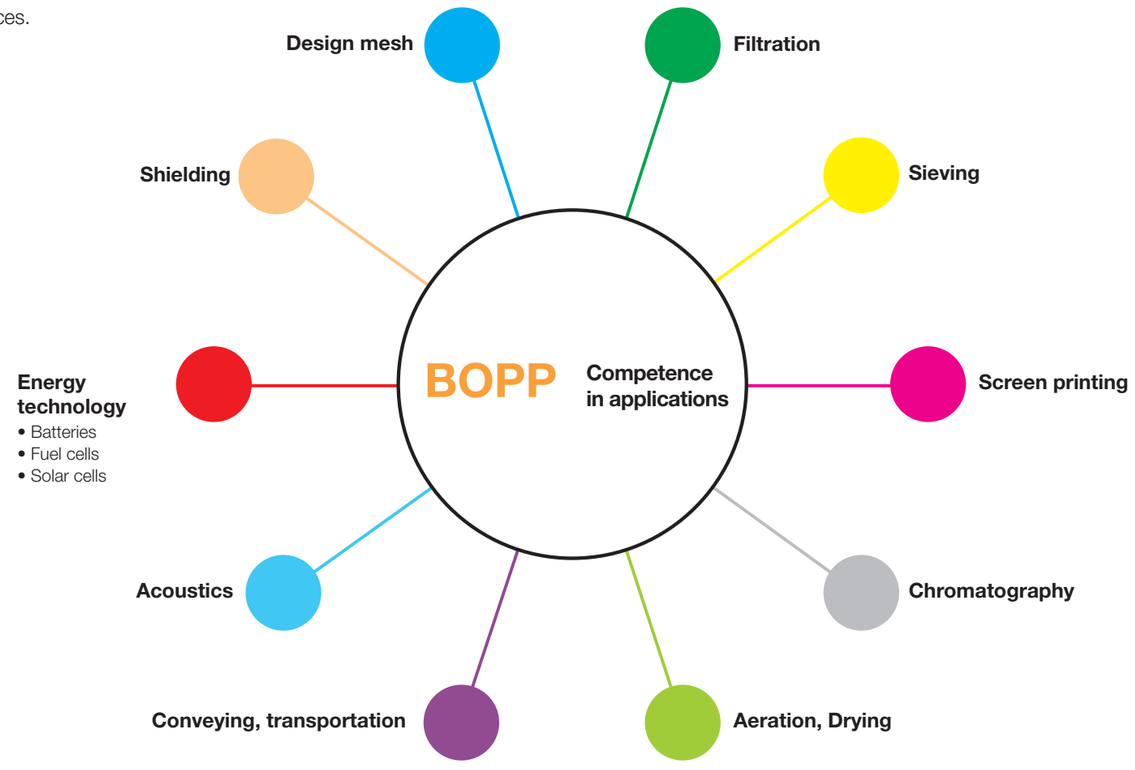
Seven good reasons to choose BOPP

The power to innovate at BOPP is based on decades of experience. Alongside exceptional product characteristics in the most diverse sectors, we also excel in terms of fundamental attributes and qualities.

1 **Quality**
We always maintain strict compliance with industry specific weaving standards. What's more, we have created our own in-house standards alongside each of these, which demand far more than the officially accepted values in terms of challenges and tolerances.

2 **Experience**
Thanks to in-house research and development and valuable feedback from our customers in diverse industrial sectors, we have acquired an enormous wealth of experience, which is used in consultancy as well as product development.

3 **Cost Efficiency**
We continue to find new ways to increase our production efficiencies with a simultaneous increase in quality standards.



4 **Reproducibility**
We maintain a process orientated approach to ensure optimum reproducibility.

5 **In-house Wire Drawing**
We are the only fine wire weavers to operate our own fine wire drawing plant. This means we can ensure reliable delivery schedules and maintain quality procedures totally independent of third party input.

6 **Security**
We manufacture in a trade-friendly and commercially stable environment, and are therefore able to guarantee above average levels of product availability, supported by extensive stockholding. In addition, the BOPP Group operates three separate production facilities, providing higher levels of process security in the supply chain.

7 **Protecting the Environment**
Our manufacturing plant complies with modern standards in terms of energy use and environmental sustainability. We are active participants in programmes to improve energy efficiency, and a member of Cleantech organisations.

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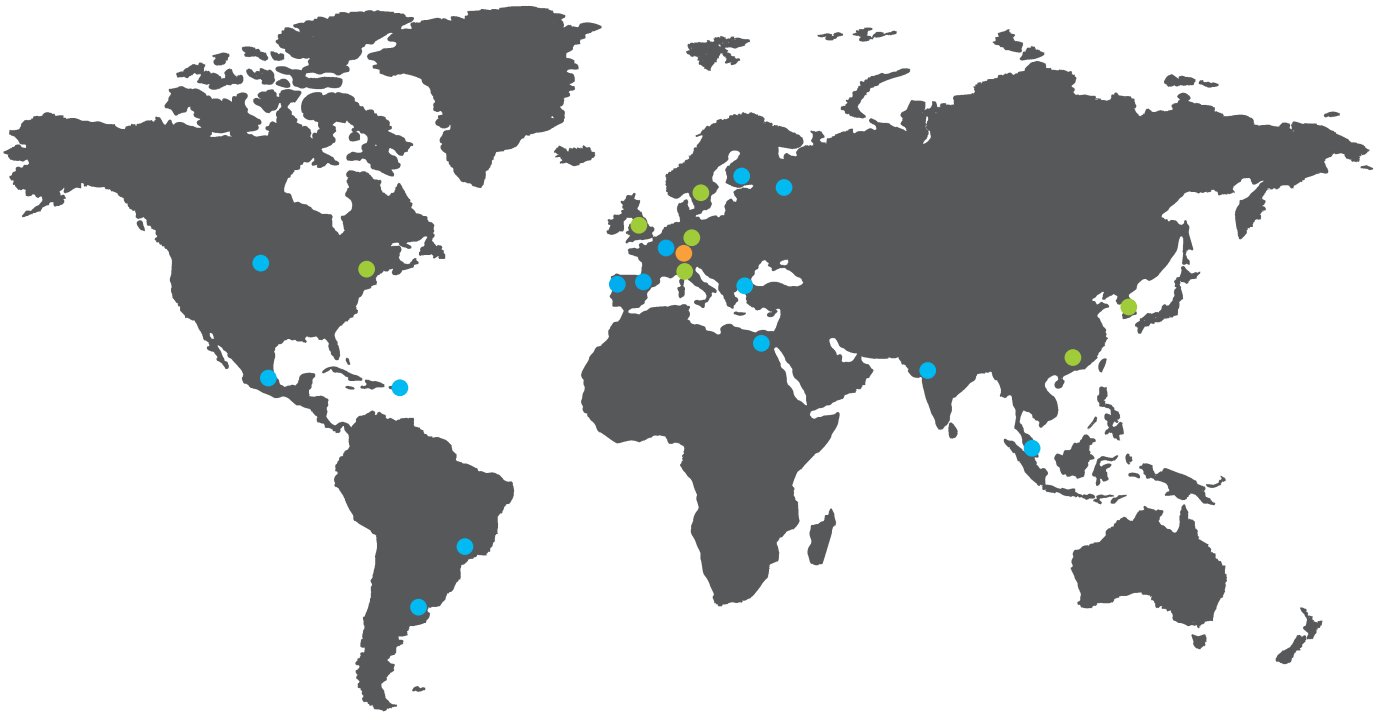
The BOPP Group



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