testori®
TESTORI GROUP

LIQUID FILTRATION

Special solutions for
Pressure and Vacuum Filtration

INTRO

Since its foundation in 1905, Testori Group has specialized in **solid-liquid separation** technologies. Initially, the company focused on seed oil pressing, catering primarily to the domestic market, with a product line based on natural fibers.

Over the years, Testori Group market expansion has been consistently driven by innovation in raw materials research, production technologies development and process optimization thus allowing us to stay at the forefront of industry advancements.

Testori historical headquarter, located in Novate Milanese (Milano), is equipped with cutting-edge machineries, and operated in compliance to the most stringent protocols to ensure safety and respect health and environment. Nowadays our outreach is global, with 8 companies spread across 5 continents.

Our **vertically integrated operations** enable a thorough control over the production process ensuring that the most challenging quality standards are consistently met. Furthermore, it provides the opportunity to accommodate **high levels of customization** across the full product range.

Testori is an industrial group active for over 120 years in the technical textile field; more specific, in industrial filtration for production and environmental protection processes. Manufacturing of technical textile products has always required processing yarns and fibers with “tender, love and care”: dedication and expertise is central to any of our production processes, both with purely manual methods or in modern environments equipped with the latest generation machinery.

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Testori supports **all type of industry players**, whether they are end users, original equipment manufacturers (OEMs), or ready-made item producers.

We are proud to serve a wide range of **applications**, like:

- Mining & Refining
- Waste and Water treatment plants
- Food & Beverage
- Pharmaceuticals
- Chemical
- Oil & Gas
- Power generation
- Pulp & Paper

FILTER MEDIA DESIGN & DEVELOPMENT

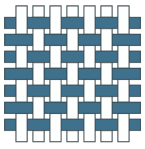
A team of technical experts will guide our customers in the developement and selection of the best suited filter medium.

Testori boasts a long and unrivaled experience in textile weaving processes and the use of a wide range of polymeric (and natural) materials as yarns for industrial filtration applications:

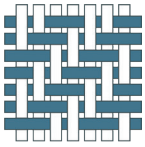
- **Polymers**: polypropylene, polyester, PBT, various grades of polyamide, PTFE, PEEK, etc.
- Type of **yarns**: monofilament, multi-filament, staple fiber, special yarns
- **Area weight**: from less than 100 to more than 1.600 g/m2
- **Weave patterns**: plain, twill, satin, double layer, special irregular patterns

Unless specified as loom state (for special high-shrink purposes), all our fabrics are duly **heat set** to ensure **dimensional stability** at process temperature and are calendered to the desired air permeability (from 1 to +5.000 L/dm^2/min at 200 Pa differential pressure).

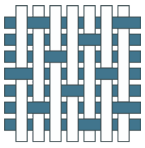
The innovation and expertise that has made Testori distinctive in the filtration industry is exemplified in our "flagship" product: in addition to conventional double-layer structures, Testori has pioneered a **unique irregular satin weave**.



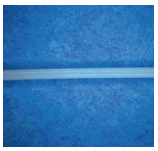
Plain - Represents the most uniform pattern offering homogeneous pore distribution for unrivaled separation efficiency.



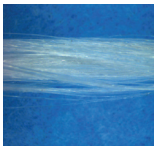
Twill - Provides high flexibility and versatility in the range of possible combinations of yarns.



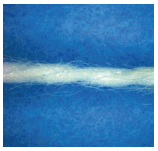
Satin - Provides effective yarn functional arrangement in a single layer, along with unmatched smoothness on cake side.



Monofilament for enhanced cake discharge

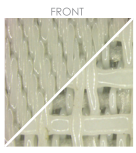


Multifilament for increased mechanical strength



Spun yarn for utmost solid particles retention

Special irregular satin with integrated backing cloth represents a true "2-in-1" solution



Double layer weave pattern combines mechanical strength with filtration performance

This mono-layer fabric integrates the drainage effect typically provided by a separate backing cloth, offering a true "2-in-1" solution. The result is significant operational efficiency for our customers, reducing downtime for cloth changeouts compared to traditional cloth-and-backer installations.

We offer comparative on-site and off-line filtration performance tests (in accordance to **VDI 2762 protocol**) to identify the most suitable filter media for full-scale equipment. This protocol increases the chances for the success of the field-testing activities, reducing the impact on routine operations of the equipment.

In our internal **quality control and R&D laboratory** the full characterization of brand-new filter media is carried out as well as a thorough analysis of the filter medium after being in operation. The development of any innovative solution starts from the identification of the root cause for failure or premature end-of-lifeofthefabricunderexamination. Moreover, comprehending the specific conditions of each industrial process allows us to successfully drive the **continuous improvement of our filter media** operational performance.

TAILORING MANUFACTURED ITEMS

Testori product offering spans across the various solid-liquid separation technologies employed in the industry:

- **Pressure filters**: horizontal filter press, vertical tower press, belt press, pressure vessels, etc.

- **Vacuum and hyperbaric filters**: drum, belt, disc, pan

Thanks to Testori's extensive and close collaboration with leading equipment manufacturers, we have integrated **OEMs' typical designs and specifications** across our entire product range.

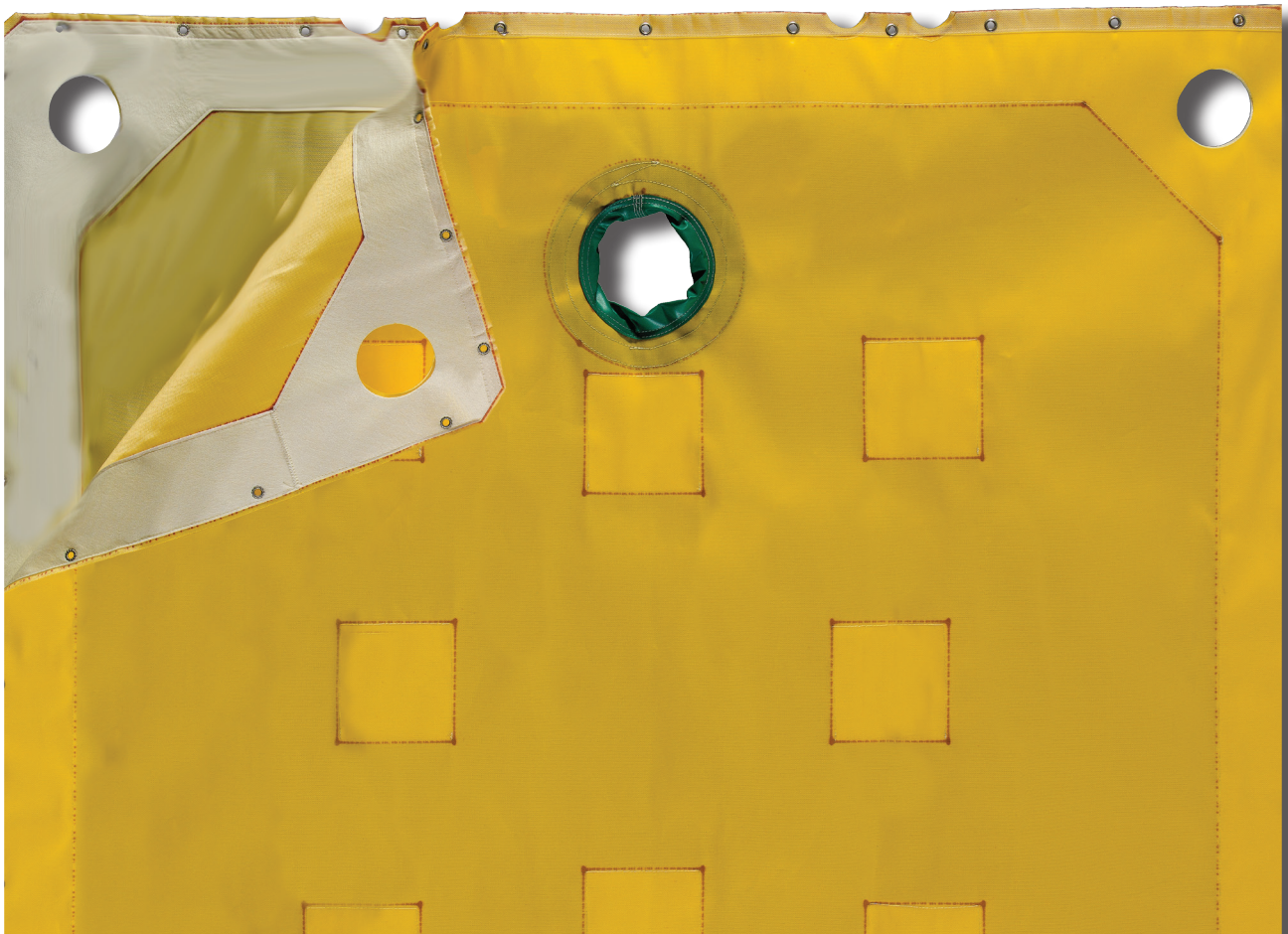
Through continuous collaboration with our customers, our design engineering team collects requests for improvement, which are uniquely translated into tailored and special

features, resulting in **enhanced performance, increased production efficiency, and a minimized total cost of ownership for our products.**

Our Quality Control team supervises all manufacturing steps to ensure complete traceability of the product along with full compliance to design parameters and process technical specifications.

Based on the industry requirements, declarations of conformity can be issued in accordance to:

- EU (EC 1935/2004 e EC 10/2011) and FDA (CFR 177) regulations
- Implemented GMP protocols
- Conductivity test for items to be installed in ATEX environment
- Additional specific testing & analysis upon request



CLOTHS FOR HORIZONTAL FILTER PRESS

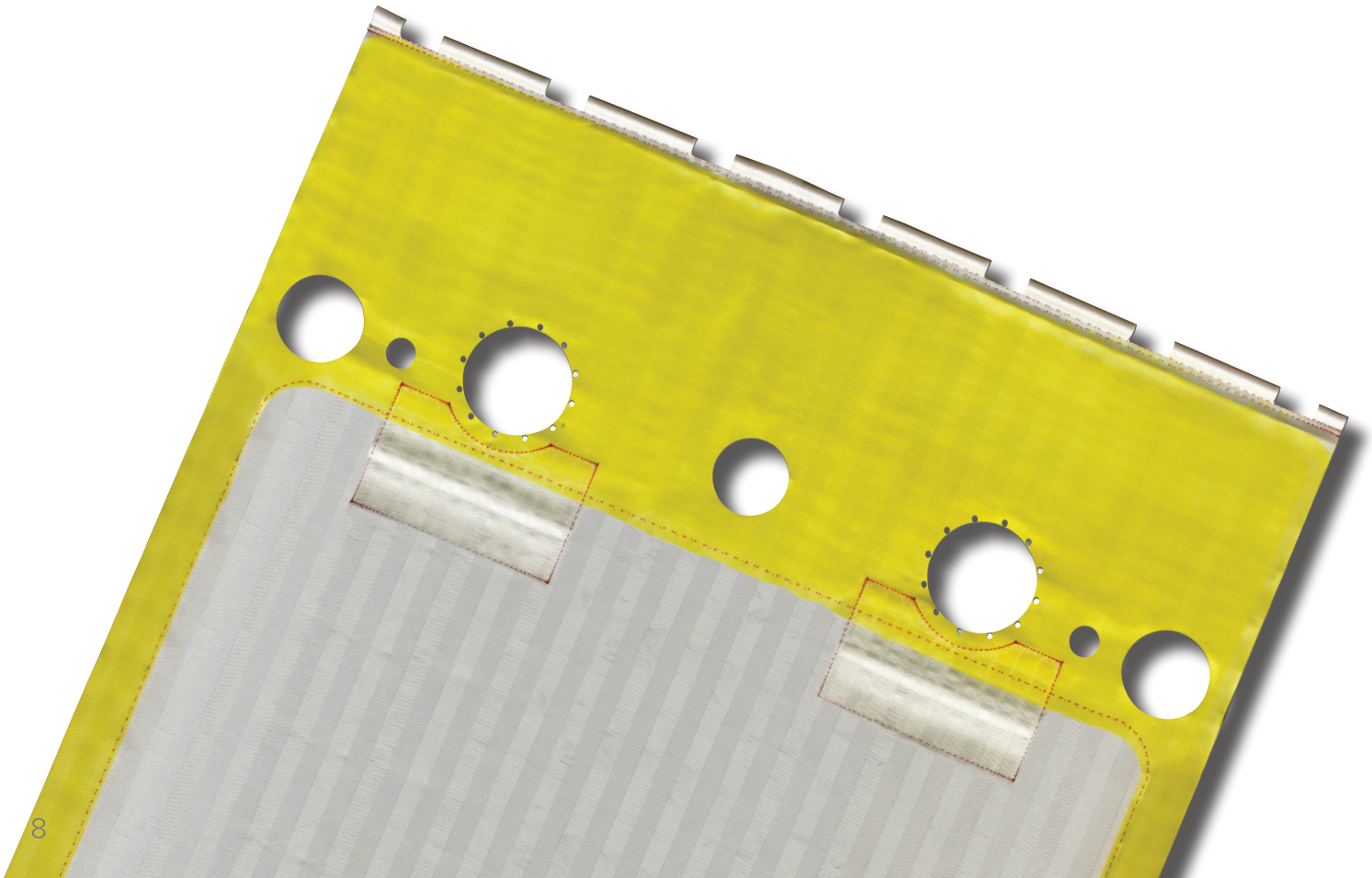
The horizontal filter press has been the first equipment used on industrial scale for solid-liquid separation. Filter cloths for horizontal filter press indeed represent the core product in Testori's offering for solid-liquid separation and process filtration.

The versatility of this equipment enabled a vast spread across various industries among which the main served by Testori are:

- **Mining & Refining**: alumina, iron ore, copper, zinc, lead, nickel, precious metals, and other ferrous & non-ferrous ores
- **Water treatment** for potable and waste municipal and industrial plants
- **Quarries** for inert material and **tunnel excavation** sites
- **Food & Beverage**: oils (vegetal and animal), sugar, wine, beer, juice, soft drinks.

Testori has been working closely with the main OEMs to develop filter cloth designs to accommodate all typical configurations of plate and equipment:

- **Design**: single, overhang (or drape-over), twin with barrel neck, leak-free gasketed
- **Size**: from lab scale press to 2.5+ m wide filter plates
- **Fixation**: distribution ring or feed hole flanges, hems for hanging bars, Velcro®, eyelets for zip-ties and plate pegs.



Horizontal filter presses are employed in a vast range of applications, thus requiring an equally diversified portfolio of filter media, each one fine-tuned to matching specific process conditions and performance requirements.

Our extensive experience and deep market knowledge enable us to identify the most critical aspects, leading to the development of several innovative solutions, such as:

- **GreenTes™ eco-friendly** water-based impervious resin for leak-free filter cloth frame
- **Anti-Corrosion Eyelets A.C.E.™** made by the same polymer (polypropylene, polyester, polyamide) as the filter medium to facilitate disposal of the finished product. They are applied by means of patented ultra-sound welding technology, which grants enhanced tearing resistance.
- **Resispam** coating to improve the abrasion resistance, whether at barrel-neck point or in highly stressed localized areas on the filter cloth.

BELTS FOR PRESSURE FILTERS

Testori range of products includes continuous belts to equip pressure filters apparatuses like **belt press and vertical tower press**. As a common trait, our belts feature the following:

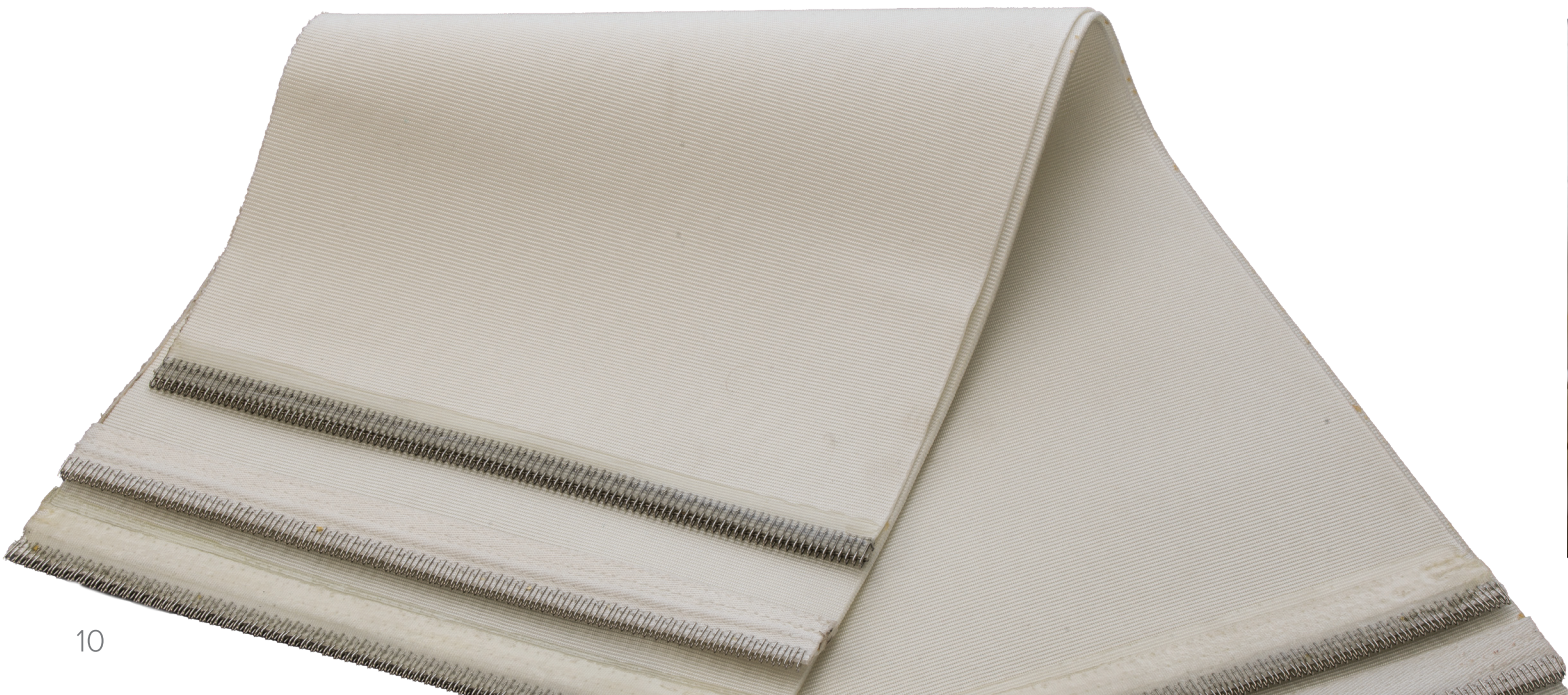
- A selection of **clipper materials**: stainless steel, Hastelloy®
- Polyurethane **resin layer to protect the fabric** at clipper joint interface
- Polyurethane **resin to seal the edges** of the belt and reduce leakage

Belt press technology finds widespread application in both **municipal and industrial wastewater treatment plants**; thus, the focus is strongly oriented towards dewatering a sludge with high content of colloidal adhesive suspended solids.

For this reason, **heavy weight and high permeable mono/mono fabrics** are the best suited. Available on request are also **spiral fabrics** dedicated to the filtration of suspensions characterized by coarser and/or abrasive particles, like in pulp & paper or mining industries, respectively.

Vertical tower press filters are commonly used for efficient filtration of high-value suspended solids, such as ore concentrates in mining and refining, or special powders in the chemical industry. They are particularly well-suited for applications demanding high purity, as they maximize the benefits of more consistent cake-washing capabilities.

Belts for vertical tower press can exceed a 100:1 ratio between length and width. It is of paramount importance that the belt preserves original dimensions and mechanical properties throughout the longest possible operating time.



BAGS FOR PRESSURE VESSEL FILTERS

Pressure vessel equipment find widespread in processes dealing with hazardous substances, whether the solids and/or the liquids, and where the plant layout requires large filtration areas within a confined floor space.

The filtration occurs from the outside towards the inside of the bag (round-shaped or manufactured according to different geometries), and the cake is homogenously forming along the entire useful filtration surface, ensuring a uniform flow and the utmost retention of the solid impurities.

Testori features a unique range of **polyamide and polypropylene fabrics** dedicated to sugar, chemical and mining & refining industries capable to ensure high specific throughputs and superior filtrate quality.

Thanks to our consolidated manufacturing experience, we are capable to create multi-channel bags of all sizes and configurations, implementing special features like:

- Wear-resistant **top cuff** to guarantee superior durability
- Inter-channel stitching lines made of **special sewing threads** resistant to high temperature and highly abrasive process conditions.
- Handle for easy fit on request

TRAPEZOIDAL BAGS FOR DISC FILTERS

Disc filters are generally employed in the beneficiation process of mineral concentrates, whose cakes can quickly form and be easily discharged, and that do not require a washing step during the filtration cycle. Besides the unmatched filtration area to floor space ratio, compared to other vacuum equipment, the disc filter is characterized by a high level of flexibility, both in terms of scale up (discs could be added to increase filtration surface) and in terms of efficient maintenance. When reaching the premature end of life of a single bag, it is sufficient to replace it with a brand new one within a very short downtime.

Testori proposes highly customized range of filter media and manufacturing features, to maximize the overall performance in operations for both vacuum and hyperbaric disc filters.

- Dedicated selection of fabrics to fulfill utmost filtration performance
- Tailored specific features to enhance durability against wear and mechanical stress
- **Optimized design** to ensure easy and quick fitting on frames
- Engineered **elastic** multi/multi as well as mono/mono **fabrics**, to improve cake discharge during back-blow

Testori also offers the possibility to manufacture **stainless steel frames** to fit on the original equipment in use as well as to develop an improved customized design.

BELTS FOR VACUUM FILTERS

Vacuum belt filters are widely used across various industries, particularly where the process requires **high throughput** and **efficient cake washing performance**.

Localized failure in the filter medium or poor-quality manufacturing of the belt have to be accounted among the most frequent reasons for premature replacement, causing machine downtime and creating bottlenecks in the filtration process. Therefore, ensuring the belt's physical integrity, durability, and reliable performance is crucial for the end user.

Testori products feature a range of **Double Layer Weave (DLW)** high tenacity fabrics to ensure the mechanical stability of large dimensions belts as well as their endurance in operations.

The adoption of exclusively selected components and design solutions allows to significantly extend our belts lifetime:

- Stainless steel and Hastelloy® **clipper** materials prevent from corrosion
- Polyurethane **resin layer** protects the fabric at clipper joint interface
- Polyurethane **resin seal** minimizes leakage at the edges of the belt
- Unique **flap cover** reduces leakage and damage at the clipper seam area

CLOTHS FOR DRUM FILTERS

The **vacuum drum filter** is a long-established, versatile technology used in various industries, including titanium dioxide, alumina, sodium sulfate, and other chemical processes. Testori offers a wide range of fabrics suited for this equipment. Additionally, the specific filtration requirements have led to **different cake discharge configurations**, such as scrapers, belts, rolls, strings, and back-blow, rising the consequent necessity to adjust the design and manufacturing of the cloth to be therein installed.

• **Belts**, whether made in one piece or by joining individual rolls through stitching or thermowelding in the machine direction, are manufactured with standard tailored components such as clippers, resin, and flaps. Upon request, a special mushroom-shaped gasket, fitting with the specific equipment design, can be applied to the edges to ensure proper cross-tensioning during operation.

• **Laser-cut covers** are designed to be installed on individual panels that make up the outer surface of the drum. The cover can be secured to the panel using a special cord caulked into a dedicated groove. Alternatively, a rubber gasket can be stitched along the cover's frame for easier installation, reducing equipment downtime.

TRAPEZOIDAL SECTORS FOR TABLE FILTERS

Table filters are best suited when dealing with fast settling solids (e.g. phosphates and alumina) which require multiple steps of washing to recover liquor (whether acidic or caustic solution): compartments separate the various zones to ensure that the separation is sharp and no mixing of mother, strong, middle and weak filtrates occur during the cycle.

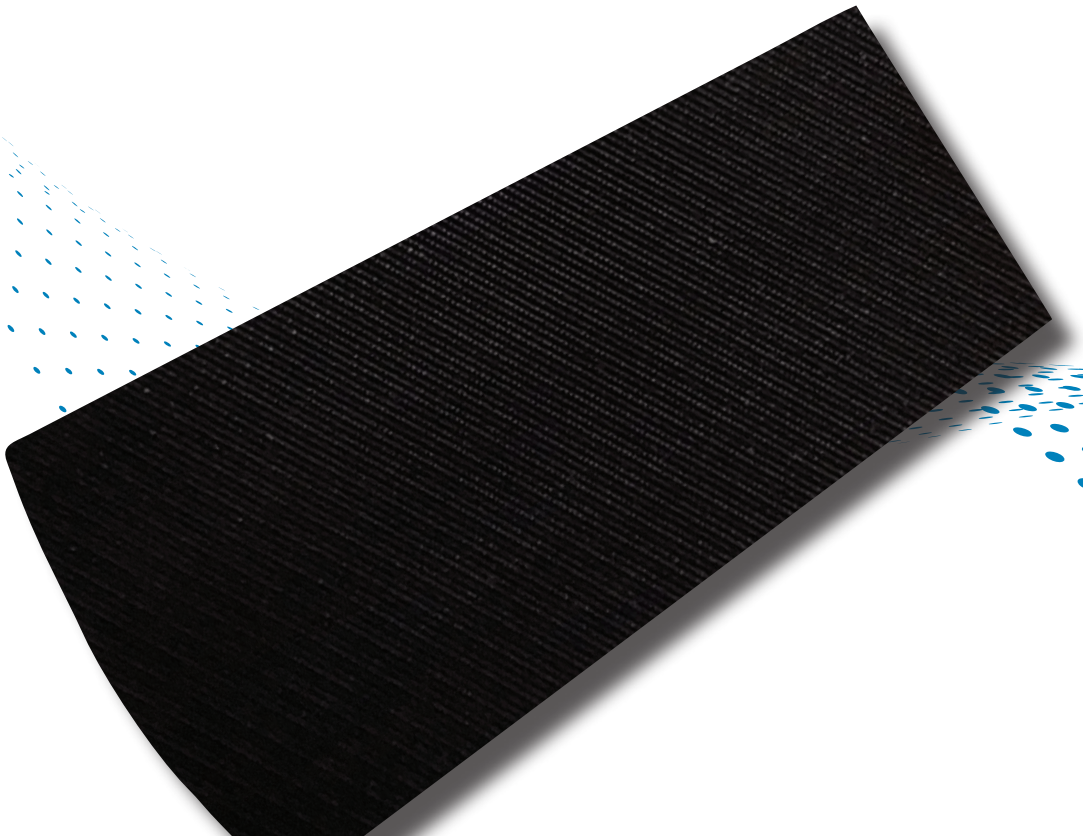
Testori's fabric range is expertly crafted to accommodate a wide variety of tray (pan) sizes and meet all original equipment manufacturer (OEM) specifications, offering versatile solutions for diverse applications.

Each fabric is tailored to deliver maximum performance and durability, regardless the complexity of the filtration process or equipment design. This comprehensive selection includes a dedicated range of **mono/mono fabrics**, which offer superior drainage performance while maintaining exceptional durability for long-lasting use.

For specialized requirements, Testori also provides **satin** design fabrics, which improve cake discharge, making them ideal for equipment with tilting pans.

As a special configuration, Testori offers a distinctively engineered fabric opportunely woven following an **irregular satin pattern**. This design combines a smooth cake-contact surface with a highly efficient drainage side for the tray. The woven provides the benefits of an integrated backing cloth, enhancing both performance and efficiency in filtration processes.

For more demanding applications, the product range includes **heavy-duty fabrics** designed to withstand more severe mechanical stress, such the one caused by endless screw scrapers.



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