

# Innovative Filter Fabrics For Recycled Fiber Applications

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## ABSTRACT

Filtration has an important role in achieving desired results in recycled fiber based units-DIP (Deinking Plant) & OCC (Old Corrugated Cardboard units); and fiber recovery in paper making. With varying raw material quality, rising expectations for high quality paper and increasing environmental pressures, filtration has become more challenging. Metso Fabrics, with a strong technological background inherited from Tamfelt, has developed innovative fabrics to enhance performance of filters in DIP/OCC process, Save-all filters in paper machine area and deckers in pulp dewatering filters.

Metso has developed a new fabric called Easy Clean to overcome the problems of reduced capacity, continual washing, and short life time in disc filters in more demanding recycling applications. Performance of Easy Clean is based on enhanced dirt repellence properties of modified Polyethylene Terephthalate.

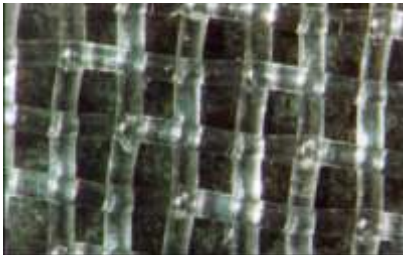
WavStar™ provides a cost effective and easy-to-incorporate solution to achieve high loading rates on existing disc filters. Installation of WavStar™ increases the sector surface area by 29%, enhancing capacity by 10 to 25%. The principle of WavStar™ lies on its unique fabric corrugation. TwinStar, a special kind of fabric manufactured from modified raw materials, has proved to be a reliable and cost efficient solution for dewatering on Twin wire presses in demanding conditions.

The paper illustrates in detail various developments in filtration fabrics which aim to improve final product quality, raise efficiency and reduce operating costs.

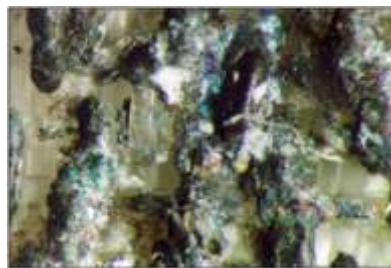
Metso Fabrics Inc. earlier Tamfelt, being a world leader in filtration fabrics, focuses extensively on R&D to develop solutions to overcome the challenges in filtration/thickening operations at different stages in a pulp and paper mill. One such development is aimed at enhancing the performance of filters in recycled fiber based units: DIPs & OCC lines. Owing to the nature of raw material fabric cloth in such applications is highly prone to wear affecting filtration results and operating capacity. Metso has developed 'Easy Clean': fabric with better washability properties for demanding recycling applications and **WavStar™**: corrugated filter fabric for enhancing capacity. Metso has also developed **TwinStar** from modified PET which has proved successful in demanding dewatering applications on twin wire presses.

**Easy Clean:** *Fabric with better washability properties for recycling applications*

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S1120-R1, 38 mesh  
Conventional Polypropylene  
New filter cloth



Same S1120-R1  
After 3 months in DIP proces  
Full of stickies, ink, filler etc

## Results and Discussion:

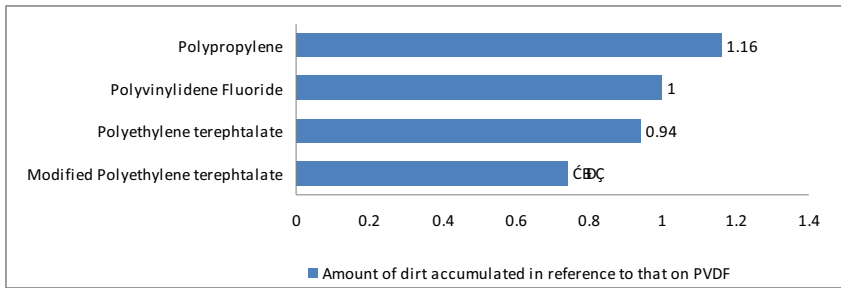
The images explicitly depict the wearing of conventional Polypropylene cloth after 3 months of installation. Fabric cloth has been completely blinded by stickies, ink, filler, etc which

reduce the operating capacity of the filter and deteriorate filtration results. As a result of this, the life of cloth decreases substantially, and the mills need to incur high costs on maintenance.

To provide a cost effective solution, Metso has developed a new kind of fabric from modified Polyethylene Terephthalate. PET modified with PTFE exhibiting excellent dirt repellence properties forms the basis for the development of Easy Clean. Below is the comparison of dirt repellence properties of available raw material in reference to PVDF whose value is fixed at 1. Material with a value less than 1 implies higher repellence for dirt, meaning less amount of dirt (stickies, ink, impurities etc) accumulates on filter fabric. Modified PVDF has the lowest value amongst available raw materials and thus makes it suitable for application in demanding recycling conditions.

Based on the results, wash ability of Easy clean has been found better and its tendency to repel impurities after washing is better than polypropylene fabric, due to the more slippery surface. The running life of Easy Clean fabric is

### Comparison of dirt repellence properties of available raw materials



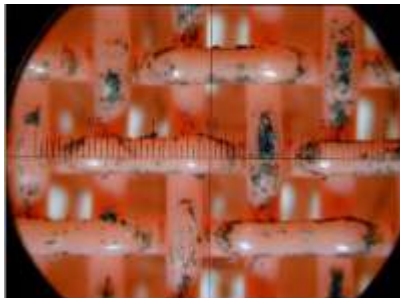
in the range of 2-4 years.

#### Conventional Polypropylene Vs Easy Clean

Based on the mill trial results and experiences from DIP/OCC process, it has been found that after 4 months in operation, Easy Clean seems to be better than conventional PP. Thus Easy Clean promises to be an excellent solution to the frequent blinding problems and fall in operating capacities in disc filters in DIP/OCC. The benefits are also reflected in excellent pulp quality as higher brightness and cleanliness are possible to be achieved with Easy Clean.



Conventional polypropylene filter bag after Washing



Easy Clean filter bag after washing  
 Samples were washed with water shower scrubber:

- pressure 100 bar
- nozzle's distance from the fabric 10 cm
- water jet's width 5 cm (flat spray nozzle)

**Technical Description**  
 PET modified with PTFE;  
 1,2 Twill, yarn 0.3 mm monofilament;  
 13.5/14.5 ends/cm (warp/weft);  
 shrinkage 11%;  
 CFM 1359, 32 % open area



#### The advantages are

- Life time 2-4 years
- No need for extra washing
- Filter cleaning showers keep the bag clean with 8-10 bar pressure
- High shrinkage makes the installation easy
- High shrinkage force gives more lifetime by minimizing wearing
- Keep the maximum capacity throughout the life time

**WavStar™:** *Corrugated Filter Fabric for enhancing disc filter capacity*

#### Results and Discussion:

The ever increasing pressure to achieve higher production rates from existing equipment, often results in capacity



Corrugated fabric structure increases the sector surface area by 29%, enhancing capacity by 10-25%.

load deviating from the optimal range. Equipment running at high loading rates eventually lead to detrimental effect on process parameters, desired results, and maintenance and runnability. Opting for a new equipment of higher capacity or even a retrofit is not only cost intensive, but also a time consuming solution.

WavStar™ is a smart choice to deal with an enhancement in capacity. Through our continuous strive for developing technological and cost effective solutions, we have developed WavStar, a completely new filter bag, which is suitable for all kinds of disc filter sectors. The secret of WavStar lies in its unique fabric corrugation. This solution increases the sector surface area by 29%, enhancing capacity by 10 to 25%. The corrugation also facilitates filter cake removal.

**Technical Description**  
 PET/Kynar (PVDF), stainless steel or Kynar zipper, PP sewing yarn; 1,2 Twill; Warp 0.3 mm, 14.7 ends/cm; Weft 0.4 mm, 14.5 ends/cm, shrinkage 10%/32% (warp/weft); CFM 956, 25% open area

#### Applications

- Deckers in pulp dewatering filters
- Saveall systems for fiber recovery from paper machine white water

#### The advantages are

- High capacity
- High pulp discharge consistency
- Improved filtrate quality
- Cost-effective retrofit
- Easy maintenance and service

#### Selection of raw material

The WavStar fabrics are made of heat-resistant materials, which feature excellent breaking strength and chemical resistance properties. They ensure high runnability and

performance even in tough conditions, such as in TMP/CTMP and groundwood processes. The bags are fitted with acid-proof or Kynar (PVDF) zippers and sewn with Teflon yarn. For conditions where bags do not need to be resistant to high temperature and strong chemicals, such as in savealls and DIP processes, WavStar is made of mixed polyester. It ensures the same high capacity and performance properties as the heat-resistant bags.

**Installation**

WavStar is suitable for new filters and upgradations. It suits all filter sectors in the market. Either a single segment or several WavStar segments can be combined with conventional flat surface segments in a disc filter, depending on the desired capacity increase. Retrofitting WavStar segments is a good alternative to installing an entire new filter in a process line.

**Three important steps of fitting**

When fitting a Metso disc filter bag, follow these steps:  
 Pull the bag carefully onto the sector and zip up the bag  
 Always fasten the clamps before shrinking  
 Shrink the bag either by immersing it in hot (>100 ° C) water OR by applying steam onto it

**Always remember**

Whether using hot water or steam, always start shrinking at the lower end of the bag. This is the only way to ensure that the filter bag shrinks tightly around the filter edges  
 Always store the filter bags below the maximum temperature of 30° C  
 Do not store the bags for more than 2 years

**TwinStar:** for demanding dewatering on TWP

TwinStar is Metso's product family of high-quality monofilament wires for pulp drying. Through intensive research and trials Metso has developed a new polyamide edge treatment which has been tested under the most difficult operating conditions.

**Results and Discussion:**

**Raw Material**

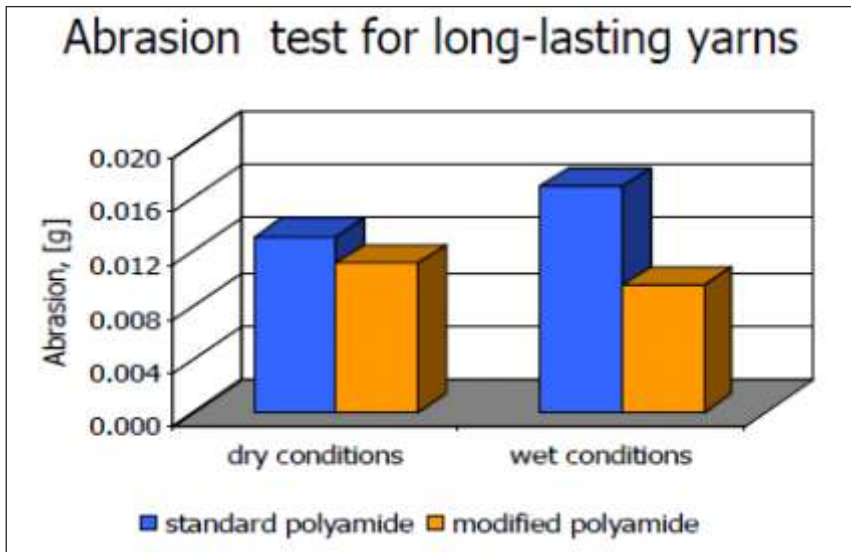
The best possible raw materials extend the operational life of the TwinStar wires to the maximum. The wires are made of either polyamide or polyester.

Polyamide PA is used for applications where

- press load is high
  - alkali resistance must be good
  - operating temperature is high
  - good wear resistance is required
- Polyester PET is used for applications where
- press load is relatively low
  - pH is neutral or an acid side
  - operating temperature is <60 deg C

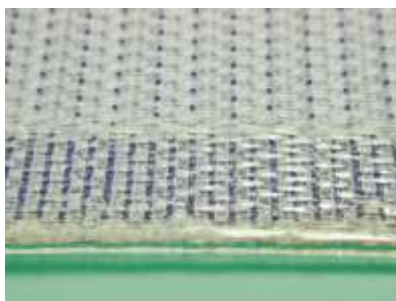
Mixture of PA & PET yarns is used when special rigidity is required.

The following graph shows the abrasion resistance of polyamide and modified polyamide



**Edge Treatment**

Careful edge treatment prevents the wire from fraying. Extremely strong ERF edge treatment has been tested under the most difficult operating conditions with excellent results. Even after several months of operation, the wire still looks new.



**TwinStar fabrics weave patterns**

Major of TwinStar fabrics is made in single layer warp and weft system. Fabrics are made in plain weaving looms.



2/1 twill



3/1 satin



2/1 satin



2/2 x-pick satin

**Operational reliability**

Metso's high-quality heat-setting process ensures that these wires will not shrink or stretch in application. Combining the finest designs the optimum drainage and longest lifetime are ensured giving the lowest cost per ton of pulp produced.



Heat-setting

### **Smooth Surface**

The smooth-surface dewatering wire was developed in cooperation with our customers. The fabric is especially intended for low-freeness positions, where the pulp web has a tendency to attach to conventional coarse surfaced fabrics, thus causing production problems. The contact area of the wire is 50% larger than that of conventional coarse dewatering wires. The pulp web gets sufficient support and does not get pressed inside the wire structure. The void volume is also higher than in conventional wires, improving drainage and increasing the wire's capacity. Thanks to state-of-the-art raw materials, the wire is extremely durable against pressure and wear.

### **Conclusion**

We have over 40 years' experience in making filter fabrics and improving the process productivity of our customers. The filtration problems being faced by the modern pulp and paper industry require economical and user friendly solutions. With state-of the-art materials, advanced production methods and thorough quality control, Metso is committed to helping its customers find those solutions.

### **Acknowledgements**

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