Filtration is the process whereby a slurry or solid liquid mixture is forced through a media, with the solids retained on the media and the liquid phase passing through. This process is generally well understood in the industry. One area of the filtration process, however, that is not usually given much consideration is the type of filter media used. The filter media, or cloth, is an essential part of the filtration process, so it is particularly important to get right.

When reviewing the seemingly simple decision of choosing the right filter cloth, it soon becomes clear that the process is a lot more complex than originally thought! Depending on the application, operating environment and the required performance of the filter media, choosing the optimum filter media could be viewed by some as a bit of a black art.

For one, there are so many criteria to consider. Choosing the optimum filter cloth depends on factors such as application, operating environment and required performance. With regards to the application, for example, a tough filter cloth which remains open for a long time is often important in mining. With a chemical application, on the other hand, the filter cloth generally needs to be tight, with low air permeability in order to provide clear filtrate and prevent loss of product. And then add on all the other necessary considerations – particle size, filtrate clarity, required performance, to mention just a few – and it’s suddenly a much bigger decision.

Filter Cloth selection

Then there are also a multitude of options when it comes to filter cloths – another baffling hurdle.

1. The first step - material

The filter cloth material is probably the easiest step in the decision-making process. The two main options nowadays are polypropylene, and polyester, with other synthetic materials such as peek used for specialized applications. Polypropylene is the most cost efficient material and, providing the optimum fibre, weave and finish is chosen, can still result in excellent performance. Peek, which is high temperature resistant, is the most expensive option and most suited to vacuum belt filters in special chemical industry processes. Many years ago, materials such as cotton and paper were common – in mining, paper is actually still used in some precious metals applications.

2. The second step - fibre

With regards to the fibre itself, there are four main categories - monofilament, multifilament, film and spun yarn.
Monofilament fibres - one single, long continuous strand of synthetic fibre extruded in fairly coarse diameter (range 28 to 1000μm) and are good for cake or surface filtration. Outotec MARO S60, for example, is a monofilament double layer cloth that combines excellent throughput and cake release, still producing clear filtrate. As a monofilament fabric, blinding tendency is minimal and it is easy to keep clean. MARO S60 is mainly used in vacuum belt filters in hydrometallurgical applications.

Multifilament fibres - many long monofilament fibres, twisted together to form one yarn. This type of yarn is widely used in tower press cloths, especially as warp yarns.

Film yarns - strips of plastic with short length cuts twisted to form a yarn.

Spun or staple yarns - made from filaments cut into short lengths and twisted, or spun, together to give a 'woolly' appearance and are used when tight cloth is needed.

3. The third step – weave

Then we come to choosing the right weave pattern – plain weave (simplest form of thread crossing – easy to clean and high elasticity), twill weave (good cake release), satin weave (high flow rate, very smooth filter cake side to ensure excellent cake release), double layer weave (cake filtration, high strength, more expensive).

4. Final step – cloth finish

And last, but not least, the type of finish on the cloth – washing, pre-shrinking, pre-stretching, calendaring, anti-static – to name a few. All Outotec OEM cloths are heat treated to prevent stretching. Additionally, further treatments are available for more exacting duties. With calendaring for example, you can ensure lower permeability and better cake release. And heat treatment with stretching before the cloth is calendared results in a non-stretching cloth. Outotec’s Aino T30, for example, is heat treated to ensure a particularly robust performance in mining applications. Calendaring the same cloth will make it tighter and suitable for applications such as pigment filtration.
Testwork is key

So, armed with this complex matrix of choices, how do you ensure you get the best cloth for your application? An experienced supplier should organise appropriate test filtration on the slurry as a starting point. This is particularly important – without proper slurry preparation or getting the slurry from the right place in the process – the resulting filter cloth will, at best, not deliver the optimum process results and at worst, the product cannot be used at all.

In slurry preparation, the slurry must be truly representative of the actual ‘real life’ process. Factors such as slurry density (% solids) plays a major role – along with pH, other chemistry and actual slurry temperature. During testwork the sample must also be fresh, thereby avoiding issues such as biological oxidisation, agglomeration and any further crystallisation.

Process optimisations

Even for existing filtration operations, it is important to remember that slurry can also change over time, so your supplier is a good port of call for advice or to organise appropriate testwork, if necessary. Some OEM providers such as Outotec also provide process optimisation services. If a site needs to increase capacity or reduce to a lower cake moisture, for example, Outotec Services can optimise the cycle time. Other simple Service checks such as reviewing feed-, pressing- and drying pressures will help extend the lifecycle of pressing diaphrams.

Additionally, if you get your cloths and filtration solutions from the same provider, you can be completely confident the cloth is designed specifically for your own filter technology and delivers truly optimised performance. You also benefit from a single supply chain for spare parts, flexible ordering of filter cloths, short delivery times and agreements with availability guarantees. If the cloth and filters are from the same supplier, filtration issues can be resolved more quickly. Cloths are often blamed for filtration issues but the problem can be from many sources. With one supplier, filtration problems are resolved faster, thereby minimising downtime costs.
### Optimised operation

The life of a filter cloth depends on the application/process and the filter condition, variations in either can significantly affect the life of the cloth as well as the economics of the operation and quality of the product. In mining, in the right circumstances many thousands of cycles can be expected but upstream process variations, poor cloth washing or filter condition can limit the life to hundreds of cycles or a few days of operation. In chemical and pharmaceutical applications it is common for cycle times to be tens of times longer than in mining and cloth life is often counted in months but equally if cloth wash nozzles are worn or blocked and the cloth does not get cleaned properly, the cloth may blind and require to be changed after a relatively short time. In all industries proper cloth installation and machine maintenance is essential for optimum performance.

Filter cloths do not need any extra maintenance; you just need to ensure that the filter uses clean water with high enough pressure (min 6 bar) for cloth washing and that the washing nozzles are open. It is also mandatory to use proper cloth tracking to prevent the cloth edges from fraying. One of the most damaging occurrences is the filter cloth overstretching during operation.

### Economic and environmental benefits of the right filter cloth

Efficient solid-liquid separation technology leads to both economical and environmental benefits. The right filters and filtration solutions are designed in such a way that in most of processes they help to achieve significant savings in energy and/or water consumption. Efficient filtration also leads to better quality waste water, thus reducing the environmental burden.

### Conclusion

Despite the multiple options in filter cloths, choosing the optimum filter media is much more of a science than a black art. It is not shrouded in secrecy but simply an exact and scientific approach once you have all the right steps in place – initial testwork, correct slurry preparation and working with an experienced, professional supplier (ideally one who already supplies your filter technologies). Thereafter, decisions like material, fibre, weave and finish for your filter media are easily and correctly made.

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