Baghouse filtration

Baghouses are typically classified according to the method used to remove the filter cake from the bags. As the filter cake builds up, the resistance to air flow increases, so that a higher-pressure differential is required to maintain flow through the bags. To keep the resistance within reasonable levels, the filter cake must be periodically removed from the filter. In milk powder plants, the filter cake is also a valuable product, which will degrade in the baghouse if it is not removed regularly, so it is even more important to have an effective cake removal method in place.

Cake Filtration

The above mechanisms relate mainly to filtration on a clean filter, where collection relies on the particles colliding with the filter fibres. As filtration progresses, however, a layer of particles builds up on the surface of the filter, known as the filter cake. Incoming particles are then mostly retained in the filter cake, with very few particles reaching the filter fabric. This is known as cake filtration, and is responsible for the very high collection efficiencies (>99.9%) that baghouses attain. It is thought that the primary mechanism of collection in the filter cake is sieving, whereby many of the incoming particles are simply too large to fit through the pores in the filter cake.

Heat Setting

Heat setting involves exposing the fabric to temperatures higher than those experienced during service. This stabilizes the fabric and reduces shrinkage during service. Singeing Fabrics produced from short fibres often have fibres protruding from the surface, which can impede cake dislodgement. Fabrics may be passed over a flame or a hot roller to burn away these fibres, resulting in a smoother fabric surface. Calendaring is a common treatment for synthetic fabrics and involves passing the fabric between heated rollers, with the speed and pressure tailored to give the desired effect. This smoothes the surface, improving cleanability, and reduces pore size, improving the collection efficiency, although it also reduces the filter permeability.

Calendaring fuses the fibres together, reducing friability, although excessive calendaring can weaken the fabric. Membrane Laminates During the initial stages of filtration, prior to the formation of a filter cake, fine particles can penetrate the filter. These particles are difficult to remove with pulsing, and result in blinding of the filter medium. In addition, some of these particles can pass right through the filter, adding to emissions in the cleaned air stream.

The bags used in the dairy industry are simple tubular bags, up to 7 m in length and made from polyester needlefelts. Needlefelts are non-woven, synthetic fabrics, although a woven support structure called scrim is included in all pulse cleaned bags to increase the fabric strength. The fabric surface is singed to remove protruding fibres, but other treatments are not commonly used, due the increased cost of the treated bags. The choice of fabric is somewhat restricted by the operational demands of dairy baghouses; for example, PTFE membranes can become delaminated from the fabric during CIP wash cycles and are therefore unsuitable in modern washable baghouses.

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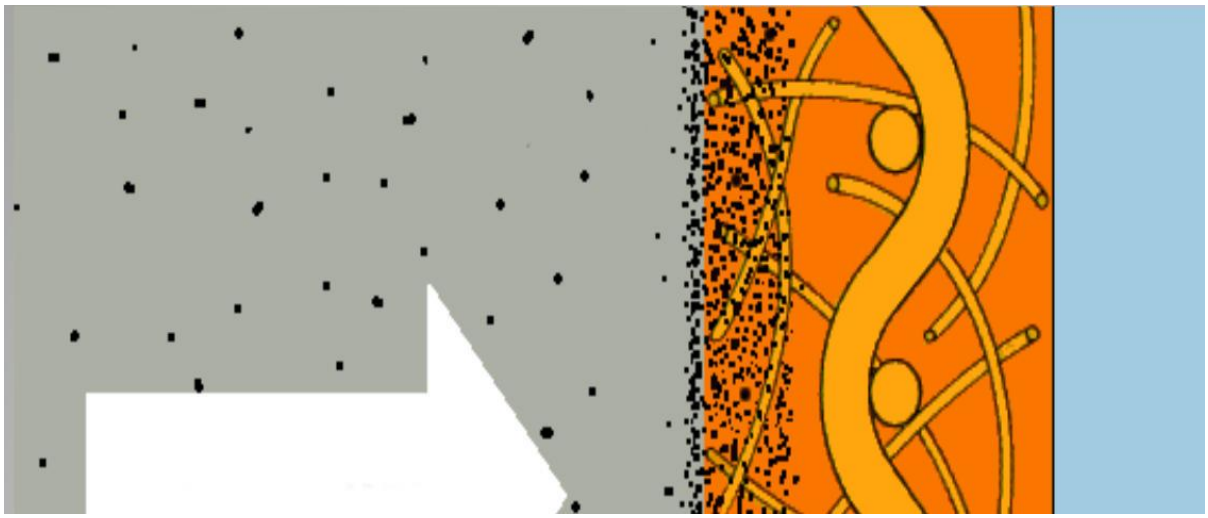
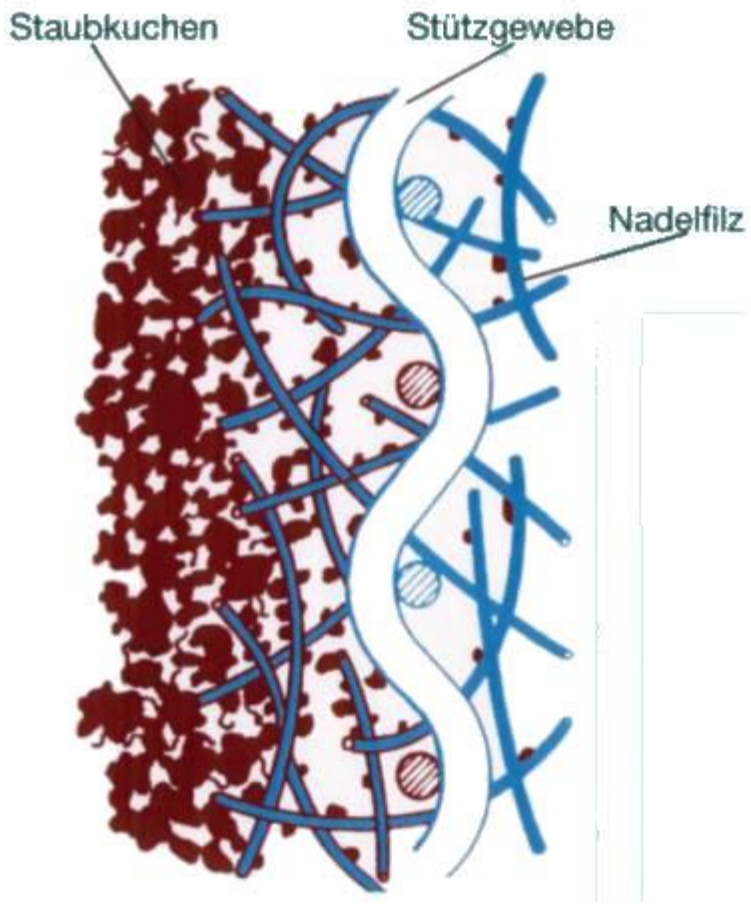
Depth Filtration





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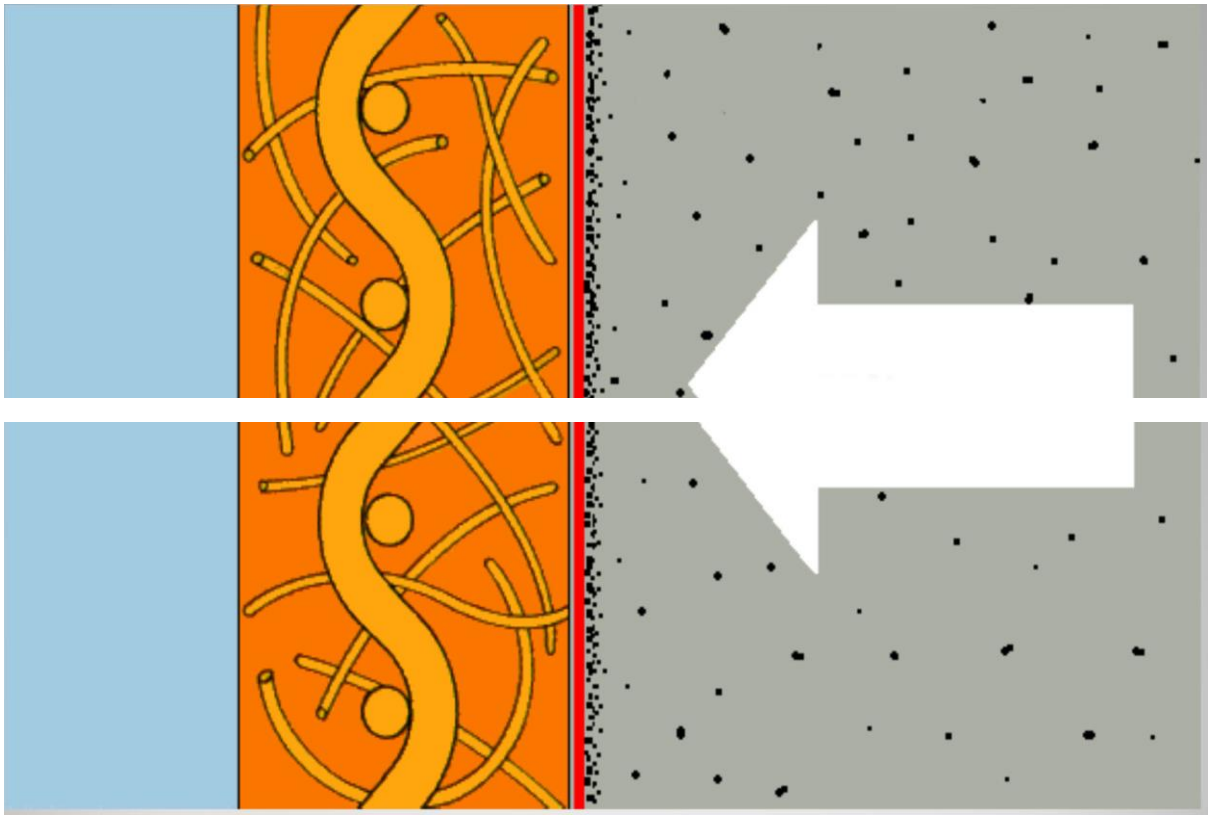
Surface filtration



Pre-coating

In some applications where the dust collector contains some moisture, oil and/or very small dust particle size, the addition of an inert material or “pre-coat” may be helpful.

Preferably, the pre-coat material is initally applied onto the new, clean surface of the filter media which forms a protective dust cake layer. The benefits are:

- Aids in cake release
- Pre-coat material is porous which helps prevent blinding
- Helps to capture the small particles and limits their ability to penetrate the filter media
- Increases initial dust collection efficiency to 99.99%

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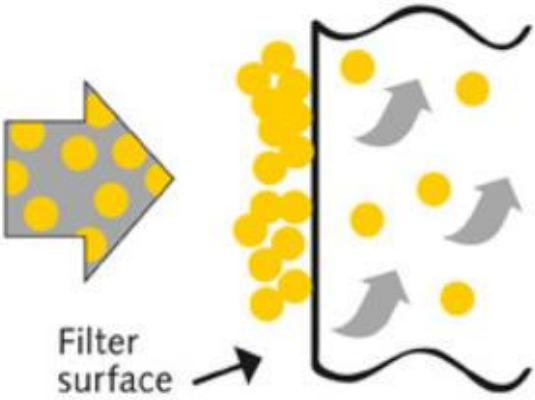
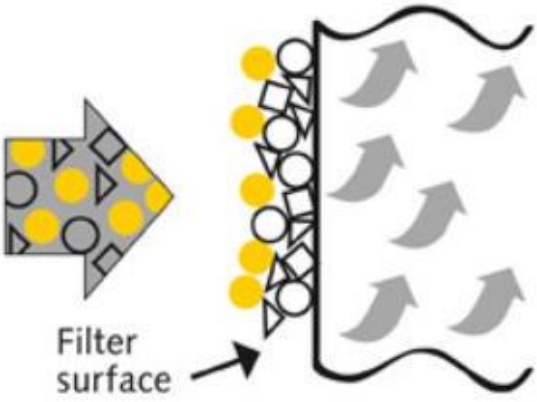
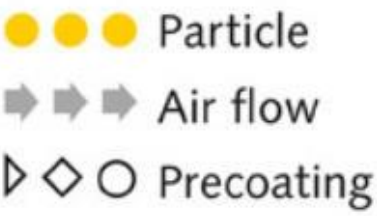
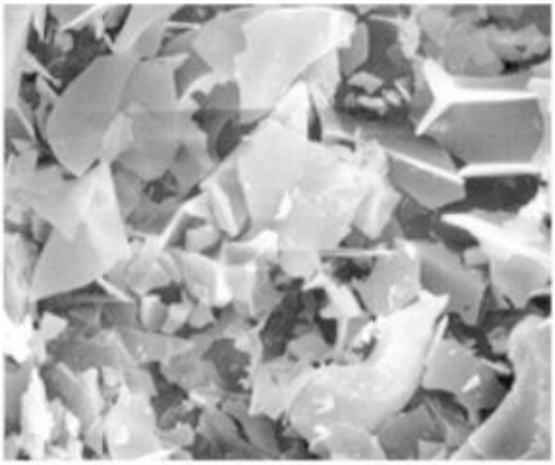
Without precoating



With precoating







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