THE COORDINATED COMBINATION OF A METAL FIBER FLEECE WITH A WOVEN WIRE MESH

Martin Müller[1]

[1]G. Bopp + Co. AG

Woven wire meshes, produced in a high precision weaving process, have a narrow pore size distribution and guarantee an excellent separation und classifying accuracy. Depending on the combination of the warp wires and the weft wires, the production of different types of weave with different aperture sizes and filtration behaviors is possible. The filtration performance can be assessed based on the initial pressure loss, absolute pore size, dirt holding capacity, load-depending separation efficiency and cleaning behavior. In the paper, these parameters are determined experimentally using a flow rate test-rig, an air-solid test-rig and a cleaning test-rig based on DIN ISO 11057.

The performed experimental investigations are explained in detail within the paper. They show, that the blocking of the wire mesh and the associated steep increase of the pressure loss as function of the loading is more shaped in a Dutch Twilled Weave compared to a Single Plain Dutch Weave. Even in the further developed weaving type, the so-called Betamesh fabrics with their high porosity and slot-shaped pores, the blocking cannot be prevented completely.

In contrast, a metal fiber nonwoven is a highly porous depth filter medium with a high dirt holding capacity. Due to the large number of deposition positions in the interior of the nonwoven, the pressure loss increases during the loading of the filter medium only moderately until the pores are filled completely by dust. A disadvantage of this type of filter medium is its wide pore size distribution. Consequently, no absolute purity of the filtrate can be guaranteed.

By the coordinated combination of these two types of filter media, the advantages of each medium can be enhanced, and the appearance of the disadvantages can be reduced. The fiber fleece, arranged in the first layer, ensures a high dirt holding capacity and at the same time prevents the blocking of the woven wire mesh, which is arranged in the second layer. Due to its narrow pore size distribution the wire cloth acts as so-called control filter and guarantees a defined purity of the filtrate in each loading state. With this new composite cloth, it is possible to convert the filtration process into the cake filtration at a lower pressure loss and thus reduced power consumption compared to the single-layered wire cloth. Due to the lower increase of the pressure loss as function of the loading, the lifetime of the filter is significantly increased. At the same time, the initial grade efficiency of the composite cloth is higher compared to the single-layered filter media. By sintering the individual filter layers together, the discharge of nonwoven fibers to the clean gas side is prevented. Supporting layers, which can be arranged in the third or further following layers, enable the use of the filter medium under high mechanical stress. By combining fiber materials with different fiber diameters and porosities with metal wire cloths of different type of weave and filter fineness, filter media with defined desired properties can be produced, as it is shown in detail within the paper.