NEW DEVELOPMENTS TO INCREASE THE FILTRATION PERFORMANCE OF METAL WOVEN WIRE CLOTHS

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Due to their high chemical, thermal and mechanical resistance, woven wire cloths can be used in demanding operating conditions. With their regular and well defined structure, metal wire meshes have a narrow pore size distribution and guarantee an excellent separation and classifying accuracy. Depending on the combination of the warp wires and the weft wires during the weaving process, 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 show, that the blocking of the filter cloths 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. In contrast, a metal fiber nonwoven is a highly porous depth filter medium with a high dirt holding capacity. A disadvantage of this type of filter medium is its wide pore size distribution.

One method to increase the filtration performance of woven wire cloths is the coordinated combination with a metal fiber nonwoven. The arrangement of the fiber web in the first layer ensures a high dirt holding capacity and prevents the blocking of the woven wire mesh, which is arranged in the second layer. Due to its narrow pore size distribution the metal wire cloth acts as so-called control filter and guarantees a maximum particle size. The filtration process can be converted into the cake filtration at a lower pressure loss and thus reduced power consumption compared to the single-layered wire cloth. At the same time, the initial grade efficiency as well as the lifetime are significantly increased. By sintering the individual filter layers together, the discharge of nonwoven fibers to the clean gas side is prevented. In the paper, the influence of different fiber nonwovens and wire cloths on the filtration performance of the composite cloth is pointed out in detail, based on the quantifying parameters mentioned above.

Another method is the further development of already existing, advantageous types of weave to smaller pore sizes. Betamesh fabrics are wire cloths with a large dirt holding capacity and an excellent cleaning behavior. So far, it was only possible to produce Betamesh fabrics down to a filter fineness of about 10-15µm. By adapting the fabric structure parameters and the weaving technique, which will be explained in detail within the paper, it is now possible to produce Betamesh fabrics with pore sizes down to 5µm. With these media, there are also woven wire cloths for small pore sizes available with an unique permeability, a high dirt holding capacity and an excellent cleanability resulting in higher lifetimes with low energy consumptions. Previously, this pore size range required the use of Dutch Twilled Weaves with high flow resistances.