COALESCENCE FILTRATION PERFORMANCE OF LAYERED STEEL FIBER MEDIA – POLYMER FIBER MEDIA

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The aim of this work is to evaluate the performance of two-layer non-woven stainless-steel fiber coalescence filter media fabricated with an intermediate non-woven polymer fiber mat in each filter.

Gas streams containing liquid aerosol impurities are the common problems in industrial processes. Mostly, the droplets of greatest concern are in micron and submicron sizes. These impurities are harmful to the environment and can cause human health problems. It is best to remove those impurities from the gas streams before they are vented in the atmosphere to protect the environment and our health.

Many different filters have been developed for this application. Among them, fibrous filters have a high efficiency in removing droplets in micron-submicron sizes. They act as a coalescing medium where small droplets collected by the fibers merge together to form larger droplets which drain from the filter by gravity and enable cleaned gas to flow to the downstream processes.

In prior works nonwoven stainless steel media were observed to have a reduction in pressure drop compared to glass fiber media, mainly due to a lower surface energy. In another study about drainage channels, space, different materials or different structure layers working as drainage channels can help with lowering the pressure drop across multilayer filter media. So, electrospun polymer fiber mats, which are known to have high capture efficiency but have a higher pressure drop due to the accumulation of liquid in the media, may also work as drainage channels in these multilayered media. Then, layered stainless steel medium with an intermediate electrospun polymer fiber mat has a potential for reduced pressure drop while maintaining high capture efficiency.

In this work, two-layer non-woven stainless-steel fiber coalescence filter media fabricated with an intermediate non-woven polymer fiber mat in each filter are tested and compared. Variations of stainless steel fiber sizes (6.5 μm and 2 μm) and polymer fiber mat basis weights （0, 2, 5, and 10g/m2) are explored and discussed.