

S3.3.1 ANALYSIS OF MEDIA STRUCTURE ON THE PERFORMANCE OF A FILTER

Peter Tsai, The University of Tennessee

There are variations such as fiber diameters, uniformity in basis weight, pore size, and web packing density, as well as defects such as pin holes and overlapping of the web in a filter media. These affect their filtration performance including filtration efficiency (FE), pressure drop (DP), and the filter service life. Meltblown (MB), needle-punched (NP), and glassfiber (GF) media were chosen for the study of this presentation. When two plies of the media are layered up, theoretically, the DP is doubled, and the FE is one-ordered higher. If the media is partially layered up by the same or different types of media in the filtration area, it was found that the DP increased. However, the FE might increase or even decrease.

The combinations of half and 1/3 of the filtration area were layered with the same kind or different kind of media to investigate their effect on FE and DP. For example, a 25 gsm of MB was half layered up by its kind and found that the overall DP was experimentally noticeably increased from 2.4 to 3.5 mmH₂O, and theoretically to 3.2 mmH₂O, while the FE was experimentally slightly decreased from 97.5% to 97.2% and theoretically slightly increased to 97.6%. The same trend was found true for other combinations of the layered up.

It was found that FE and DP were not significantly affected by a small pin hole in a medium or low efficiency, such as NP media. However, a small pin hole had a dramatic effect on the FE of a high efficiency such as HEPA GF media. The variations of fiber diameter and basis weight in a media were also investigated.

This paper will present how the effects of the web variations and defects on the filtration performance were theoretically calculated and the comparison of the theoretical and experimental results.