S2.2.4 EFFECTIVE REDESIGN STRATEGIES FOR BETTER AIR FILTER MEDIA - CONTRIBUTION OF SUPPORT LAYERS

Arek Kotlewski, Robin Winters, Luuk van der Molen, Martin Koerntjes, Jan Westerdijk
Low & Bonar

The design of air filter media in most product development efforts starts with a choice of the right support layer. Until recently these layers have been almost exclusively providing open structure limiting potential increases of pressure drop, giving mechanical support and protecting fragile layers of filter either during conversion or end use. In addition many exiting nonwoven solutions are borrowed from other applications and not always optimized to contribute to filtration efficiency, low pressure drop and high dust holding capacity.

One of the most practical ways to increase value of filter media is to rely on electret forming techniques such as corona discharging. This relatively simple procedure relies on charge carrier generation and following complex series of electron-ion-molecule collisions which contribute to deposition of charge at the surface and in depth of dielectric material. Although charging and charge stability of PP meltblowns is well documented, the effects in thermally bonded sheath-core based nonwovens are not yet fully utilized, giving couple of interesting filter design opportunities.

Pleating is a well-known process to increase surface area of filter media. In synthetic filter media composites the support allows pleating and stabilizing of the ‘active’ filtration layer - often a melt blown nonwoven - and provides dimensional stability of the filter cartridge. It strongly relates to pleat stability which is very important from end user perspective. At this moment the industry often uses Gurley stiffness as an approximation of end user experience. The study presented here puts more light on alternative characterization techniques coupled to several different raw material combinations.

This study summarizes several redesign strategies originating from unique thermally bonded sheath-core based nonwovens and tailoring these support layers for specific applications in filtration. Presentation will focus on two main subjects: electret forming and mechanical properties attempting to link effects of crystallinity and polymer combination choice.