S2.2.5 and PP10 - *Filter Thickness- Aerosols Concentration- Nonwoven Fiber Media*

AbdulAziz AlGhamdi[1], George Chase[1]
[1]The University of Akron

These days, with a high industrial revolution, gas-liquid multiphase takes place for many applications requiring good performance filters to capture the aerosols involved in the gas stream. During the filtration process, the aerosols, which may be solid particles or liquid droplets, will merge on the filter's surface in the shape of woven or non-woven fibers. The particulates penetration through the filter media from the flow will affect the filter media's efficiency and performance. Liquid droplets will capture by a filter, coalescence with other drops, and leave fast in the thin media. Therefore, we expect that the thin media will perform in a way that shows fluctuations in the downstream concentration and fluctuations in pressure drop of the gas flow. In this research, we will evaluate the periodic of the filter media as unsteady-state behavior in the droplet concentrations and the pressure drop. Glass fiber filter media is the testing material due to its high commercial demand and inexpensive. Evaluation of Glass filter media, including two different fiber sizes in the first part of this project. In the second part, we will perform mathematical modeling to understand the aerosols concentration's behavior as the media thickness varies. The

modeling analysis includes discussing the liquid droplet size captured by fibers and growing into a large or less size than the medium thickness. This project's intellectual merit is to get advanced knowledge of the concentration profiles' unsteady-state behavior. Working on a connection between the experimental data and the multiphase transport modeling equation will take place in this project to better understand the gas-liquid phases flow behavior. This research's broader impact is to improve engineered glass filters' performance due to its global use. Filter media thickness is a critical factor in the industry due to the cost of the material and the operation cost. Prediction of the effect of the thickness on the aerosol concentration will impact the filter media capture efficiency. Hence, we expect that this research results may be a helpful tool used to decide on what filter thickness shall use.

AbdulAziz AlGhamdi

AbdulAziz holds a Master's Degree in Chemical Engineering from the University of Dayton in August 2017. He continues to complete his study in a Ph.D. program on Chemical Engineering at The University of Akron and focuses on multiphase research with Dr. George Chase. He starts to do his first steps in Filtration research in January 2018, working on Gas/liquid area to investigate the effect of filter media thickness on aerosols concentration and increase the filter performance to create a good design for the filter. AbdulAziz is expected to graduate in Fall 2021.

Keywords:
Filter Thickness
Aerosols Concentration
Nonwoven fiber media