

# IMPROVED PERFORMANCE WITH LAYER ORIENTATION INCORPORATED PLEATED MEDIA ON COALESCENCE FILTRATION

*R. Bharadwaj and G.G. Chase\**

Microscale Physiochemical Engineering Center  
Department of Chemical and Biomolecular Engineering  
The University of Akron, OH 44325-3906

\*Corresponding Author

Tel: 330-972-7943

Fax: 330-972-5856

[gchase@uakron.edu](mailto:gchase@uakron.edu)

<http://www.engineering.uakron.edu/%7Echem/fclty/chase/chase.html>

Experimental observations have shown layer orientation is more important than individual fiber orientation. Layered orientation in filter media affects the permeability and the separation efficiency of coalescing filters. A filter media performs differently with respect to different axis which depends on the orientation of fibers with respect to the direction of the flow. During Coalescence oil droplets get bigger and tend to move on fibers, these fibers can aid in the drainage of oil if they are placed appropriately with respect to the flow and gravity. The main objective of this work is to study the effects of Layer orientation and test its performance for different angles with respect to the flow. It incorporates stacking micro fiber sheets at different angles (0, 30, 45, 60 and 90). For capture of liquid droplets the decrease in pressure drop obtained is offset by the decrease in capture efficiency, resulting in nearly constant quality factor regardless of fiber orientation. However, in coalescing filter media the improvement in liquid drainage from the filter can improve the quality factor from 20 to 60%. Stacking media at different angles to the flow changes the average fiber angle of the media, which can be measured by the fiber mapping method. In coalescing filter media the Layered orientation can have an added benefit of reducing the liquid saturation in the filter media, which leads to an improved quality factor for the filter media. The stacking sheets can be extended to a pleating structure, which would be relatively easier to construct from an industrial point of view. Introducing angles (0, 30, 45, 60, and 90) in pleated structures can vary the performance on coalescence filtration. A regular pleated media performs much better than a layered media and this performance can be further improved by incorporating angles in the pleated structure.

**Name:** Rahul Bharadwaj

**Company:** The University of Akron

**Address:** 2746 Mull Ave Apt A, Akron Ohio 44321

**Phone:** 330-289-4241

**Email:** [rb47@ziips.uakron.edu](mailto:rb47@ziips.uakron.edu)

**Education:** PhD, The University of Akron (fall 2006 – Present), Expected Graduation Summer 2010, Studying the effects of Fiber and Layer orientation in coalescence filtration.

B.S. Chemical Engineering, V.T. University, Bangalore, India

**Publications and proceedings:**

- R.Bharadwaj and G.G. Chase “Porous media of fibers and spheres” AFS 2007 Diesel and Gas Emissions solutions and filter testing, Procedures and equipment conference, Ann Arbor, MI Oct 2007.
- R. Bharadwaj, A. Patel, S. Chokdepanich, Ph.D., and G.G. Chase, Oriented fiber filter media, Journal of engineered fibers and fabrics, Special Issue 2008, 29-34
- R.Bharadwaj and G.G. Chase “Effects of fiber and layered orientation on Coalescence filtration” AFS 2009 Annual Conference and exposition, Bloomington, MN
- R.Bharadwaj and G.G Chase “ Effects of Fiber and layered orientation on Coalescence filtration” AFS 2009 Emission Solutions in Transportation, Ann Arbor, MI Oct 2009