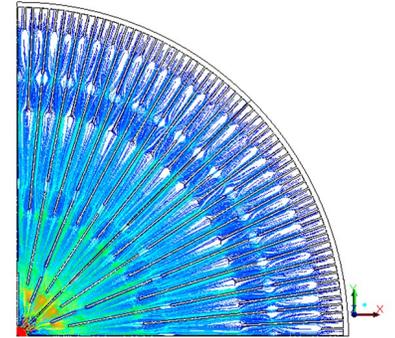
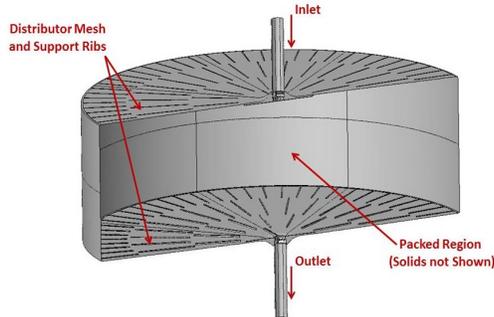


# Chromatography Column Scale-Up



## Project Summary

ALDEN used CFD modeling to determine the source of scale-up problems in a chromatography column and develop a solution that replicated the outstanding performance of the existing smaller unit.

## Client

Confidential

## Year

2016

## Project Overview

Chromatography (the separation of chemical components) is an important aspect of a number of drug production processes. A chromatography column contains the stationary (solid) phase, allowing the mobile phase (in this case, a liquid) to pass through it. One column developer was having challenges scaling up an existing design to a larger version. Columns are designed so that the fluid entering the upper inlet spreads across the entire column and flows downward through the column uniformly, with a narrow band of residence time. Initial experiments with the upscaled unit showed a much broader distribution of residence time relative to the existing unit, indicating that some short-circuiting was occurring, and separation wasn't as efficient as it could be.

## Work Performed

ALDEN worked with the manufacturer using Computational Fluid Dynamics (CFD) to understand the reasons for the reduced performance of the larger column. Alden was able to validate a CFD model and calibrate porous dispersion coefficients for the existing column. Moving to the larger column, however, initial results could not be reproduced with CFD. It was found that for the upscaled column, the synthetic textile mesh that forms the boundary between the distributor and the packed bed had deformed under the packing pressure of the column, such that the distributor was pinched off, and the outer radius of the packed bed was starved of flow. Computing the deformation of this mesh around the radial rib supports, and including this effect in the CFD simulations showed that the upscale experimental results could be reproduced. By adding more supports in the distributor, ALDEN was able to show that the high level of performance typical of the existing column could be reproduced in the upscaled column. The improved design is also able to be packed more consistently, and operates at a lower pressure loss than the original.

## Project Highlights

- ALDEN developed and ran CFD models for the existing and upscaled columns
- ALDEN determined the cause of the reduced performance of upscaled columns
- ALDEN used CFD to show how a redesigned distributor would perform
- The solution was proven in subsequent experiments

## FOR MORE INFORMATION,

Contact our Headquarters, Holden, MA at +1 (508) 829-6000 or by e-mail at : [info@aldenlab.com](mailto:info@aldenlab.com)