Optimization of a 2D Particle Separator – 2009

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Abstract

Background: Often after a spray has been produced as a method to increase the surface area upon which a reaction can take place the byproducts of the reaction in the liquid form need to be removed from the gas phase. This project utilizes automated optimization computational design tools developed at the University of Denver to design a highly efficient spray separator with minimal pressure drop. Methods: Our approach is to use commercially available CFD with a Matlab®-based optimization routine and interface them together with custom coding. The optimization routine manages the CFD code by importing any number of variables within ranges and/or distributions set by the user. Results: We evaluated a gas-liquid separator with streamlined airfoils to maximize particle trapping, while maintaining a low pressure drop. The optimum spacing, chord length, airfoil thickness and placement were evaluated as design parameters. Conclusions: Our optimization routine increased the number of particles trapped while maintaining a low pressure drop for 2.5 micrometer particles.

Key words: Optimization, particle separator, computational fluid dynamics

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