New ideas in mixing: plug flow mixers

Ali Soltanzadeh[a], Chad P.J. Bennington (posthumous)[b], Boris Stoeber[a,c], Guy A. Dumont[a,*]

[a] *Department of Electrical and Computer Engineering, University of British Columbia, Vancouver, Canada V6T1Z4*
[b] *Department of Chemical and Biological Engineering, University of British Columbia, Vancouver, Canada V6T1Z4*
[c] *Department of Mechanical Engineering, University of British Columbia, Vancouver, Canada V6T1Z4*

Abstract

This paper presents a new method to design continuous mixers for reducing fluctuations in the flow. The mixer is based on separation and reconnection of flow through separate channels. The main contribution of this work which differentiates it from previous ones is that it establishes a mathematical framework to calculate optimal mixer parameters for efficient mixing. In addition, it uses a back flow loop that permits true low-pass mixing behavior. The method is demonstrated through the design of parameters and simulation of the mixing performance of a mixer at the micro scale. The simulations show that the plug flow mixer has similar performance as a conventional stirred tank mixer.

Keywords: Mixer design, Stirred tank, Laminar flow, Plug flow, Optimization, Micro fluid