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A NUMERICAL INSIGHT OF THE RESIDENCE TIME DISTRIBUTION IN MULTIORIFICE BAFFLED TUBES

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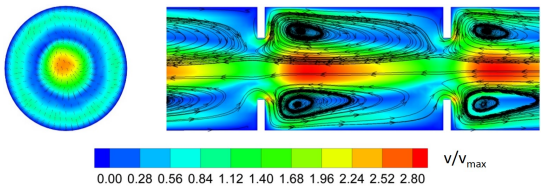
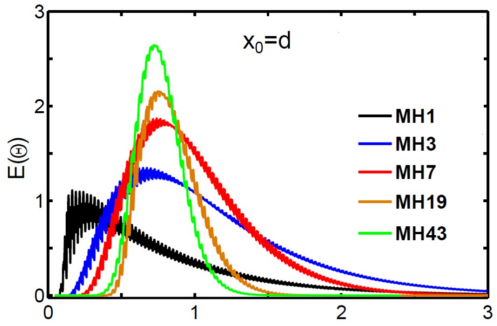
In the present work, the fluid flow and the transport of species in an intensified topology of oscillatory baffled reactors is analyzed here by means of Computational Fluid Dynamics. The classic configuration with equidistant single orifice plate baffles has been replaced by multiple-hole disk, of the same total cross-sectional area. The flow through these disks generates an array of parallel jets downstream and upstream (depending upon the phase of the oscillatory flow), exhibiting various swirl structures that increase the radial mixing.

Time-dependent flow patterns are presented here for configurations of disk with 1, 3, 7, 19 and 43 orifices in a 25 mm diameter tube. The evaluation of their mixing performance has been accomplished by injecting a pulse of tracer which is conveyed to the end of the tube by the compound effect of the net flow rate and the oscillations. The influence of the oscillation amplitude was analyzed a constant frequency of f=0.35 Hz. The concentration-time profile of the tracer throughout the reactor was analyzed. Results show an important enhancement of plug flow behavior and mixing performance by increasing number of orifices.



Dimensionless velocity contours. Geometry MH1. t=T



Residence Time Distribution comparing the influence of number of holes.