Exercise 13

Based on the conditions used to carry out an exothermic reaction in a pilot single-orifice baffle COBR, propose a design for an industrial reactor capable of processing 25 times the pilot feed rate.

Neglect the baffle volume (low baffles thickness).

Pilot COBR data:

Reactor length	L_R	$3\ m$
Baffle spacing	L	$0.045\ m$
Reactor inner diameter	d	$0.025\ m$
Baffle orifice diameter	d_o	$0.01\ m$
Feed flowrate	F	$1.2 \cdot 10^{-5}\ m^3 \cdot s^{-1}$
Frequency	f	$1.6\ Hz$
Center-to-peak amplitude	x_o	$5 \cdot 10^{-3} m$

Physical properties of reaction mixture

$\rho = 840\ kg\ m^{-3}$

$\mu = 5 \cdot 10^{-3}\ Pa \cdot s$

$\lambda = 0.137\ Wm^{-1}K^{-1}$

$c_p = 2150\ J\ kg^{-1}K^{-1}$