

Dept. of Chemical Engineering [TECHZITE-2K14]

REACTOR DESIGN

Problem Statement:

Two Configurations of stirred tank reactors are to be considered for carrying out the reversible hydrolysis of methyl acetate (A) to produce methanol (B) and acetic acid (C) at a particular temperature. Determine which of the following configurations result in greater steady state rate of production of methanol.

- (a) A single 15-L CSTR
- (b) Three 5-L CSTRs in series with 75% of the product species B and C selectively removed between 1 and 2 and between 2 and 3, with appropriate adjustment in flow rate.

The forward reaction is pseudo-first order with respect to A

($K_f = 1.82 \times 10^{-4} \text{ sec}^{-1}$), and the reverse reaction is second order ($K_r = 4.49 \times 10^{-4} \text{ L.mol}^{-1}.\text{s}^{-1}$). The feed is a dilute aqueous solution of methyl acetate ($C_{ao} = 0.25 \text{ mol L}^{-1}$) at a rate of 0.25 L.h^{-1} (q_o). Assume necessary notations.