Example 4.2

A filtration experiment is carried out on a single cloth of area 0.02 m^2 to which a slurry is fed at a constant rate, yielding 4×10^{-5} m^3/s of filtrate. Readings taken during the test show that after 100 s the pressure is 4×10^4 N/m^2 and after 500 s the pressure is 1.2×10^5 N/m^2.

The same filter cloth material is to be used in a plate and frame filter press, each frame having dimensions 0.5 m $\times$ 0.5 m $\times$ 0.08 m, to filter the same slurry. The flow rate of slurry per unit area of cloth during the initial constant rate period is to be the same as that used in the preliminary experiment and the constant rate period is to be followed by constant pressure operation once the pressure reaches 8×10^4 N/m^2. If the volume of cake formed per unit volume of filtrate, γ is 0.02, calculate the time required to fill the frame.