

1. Batch Filtration: Cell Culture.

A Buchner funnel 8 cm in diameter is available for testing the filtration of a cell culture suspension, which has a viscosity of 3.0 cp. The following data were obtained at a vacuum pressure of 600 mm Hg applied to the funnel.

t (min)	26	96	197	342	537	692	989 (end)
V (ml)	100	200	300	400	500	600	692

The cell solids on the filter at the end of filtration were dried and found to weigh 14.0 g. Determine the specific cake resistance α and the medium Resistance r_m . Then estimate how long it would take to obtain 10,000 liters of filtrate from this cell culture on a filter with a surface area of 10 m² and vacuum pressure of 500 mm Hg.

2. Continuous Centrifugation using a Tubular Centrifuge.

Yeast cells are recovered from a fermentation broth by using a tubular centrifuge. At a flow rate of 12 l/min, the centrifuge must be operated at a rotation rate of 4000 rpm to collect the cells. You are asked to predict operation under different conditions.

- What rotation rate must you operate at if the flow rate is increased to 20 l/min?
- If the length of the tubular portion of the centrifuge can be replaced, how much longer must the length be if the flow rate is increased to 20 l/min?
- What rotation rate must the unit in part a) operate at if the particle diameter is doubled?

Due Fri. 2 Nov., 2007