CL 206 - Dead-end filtration (DEF) and Rotary vacuum filter – practice problems

Q 1) The table below gives experimental data obtained during a bench scale experiment on filtration of suspensions of rehydrated active dry yeast. The membrane area was **0.0017 m^2**, the applied pressure was **60 kPa**, the wet cell concentration was **32 g/l** and the viscosity of the filtrate can be taken to be **0.001 Ns/m^2**. Determine the specific cake resistance.

t(s)	30	60	120	180	240	270	300	360
V_f(ml)	15.0	21.0	29.6	36.1	41.9	44.2	46.9	51.4

Q 2) An aqueous suspension forms filter cakes with a specific resistance of **4x10^11 m/kg**. What filter area would be required to produce **40 l** of clear filtrate from a **20 g/l** suspension in **10 minutes**, if the operating pressure is **50 kPa** ? Take the viscosity of the filtrate to be **0.001 Ns/m^2** and assume that the membrane resistance is negligible.

Q 3) Filter cakes of E. Coli are found to have a specific cake resistance that is described by Equation **α = a (\delta P)^n** with **a= 8x10^10** and **n=0.79**, with \delta P in **Pa** and **α** in **m/kg**. A **20 g/l** suspension is to be filtered at **30 kPa** in a filter with an area of **0.5 m^2**. How long will it take to produce **10 l** of filtrate ? How long would it take if the pressure were doubled ? Take μ= 0.001 Ns/m^2 and ignore the memrbane resistance.

Q 4) A rotary vacuum filter with an area of 10 m^2 produces a certain filtrate flowrate at a drum speed of 1.2 rpm. An alternative filter is made available that has an area of 15 m^2.

At what speed should this be operated to give the same flowrate ?