BAG FILTER PROBLEMS

Problem 1: Calculate the net air-to-cloth ratio for a reverse air baghouse with 12 compartments containing 276 bags each. The diameter of each bag is 28 cm, and the bag height is 8 m. One of the compartments is always off-line for cleaning, and another is off-line for maintenance. Use a gas flow rate of 10,000 m^3/min.

Problem 2: Calculate the gross and net air-to-cloth ratios for a reverse air baghouse with 20 compartments, 360 bags per compartment, a bag length of 10 m, and a bag diameter of 28 cm. Use an actual gas flow rate of 3.4×10^4 m^3/min. Assume that two compartments are out of service when calculating the net air-to-cloth ratio.

Problem 3: Capacity of an iron scrap furnace is 40 tons/hour. Maximum particle amount of the scrap is 4 kg/ton. Air suction flowrate over the furnace is 2,000 Nm^3/min and temperature of the gas is 700 °C. The waste gas stream is thought to be treated by a series of glass fiber filter:

a. Design the baghouse system (total filtration surface area, surface area of an individual filter and number of bags)
b. Maximum allowable pressure drop is 8 in. H_2O , then calculate the filtration time

Given:

$\Delta P_T = \Delta P_f + R_p C_p V_0^2 t$; $R_p = 72$ in. H_2O /ft/min/lb

For scrap iron particles: $\frac{\Delta P_f}{V_0} = 2.1 \frac{in.H_2O}{ft/\min}$

$C_{p,hava}$ = 1.005 kJ / kg°K ρ_{hava} (25°C) = 1.183 kg/m^3

Çeşitli malzemeler ve uygulama alanları için filtrasyon hızları

Application	Material	Cleaning	A/C (m/min)
Cement	Wool, Glass fiber filter, polyester	T, M	0.46-0.64
Fly ash	Glass fiber filter, teflon	T, M, J	0.58-1.8
Fe_2O_3	Nomex	J	0.64
Fe_2O_3	Glass fiber filter	T	0.58

Material type	Max. Temp. Endurance (°C)
Polyester	150
Glass fiber filter	280
Nomex	180
Wool	70
Teflon	260

Problem 4: A mechanical crushing process generates a dust load of 3000 mg/m^3 with a dust collecting air stream of 20000m^3/hr. Since the process is a heat generating process, this waste gas stream has the temperature of 300°C.

So, 20000 m^3/hr flowrate of wastegas is planned to be treated using a baghouse. The fabric material that is to be used for bag filters is applicaple for temperatures up to 200°C, and its reported air-cloth ratio is 0,6 m/min. The suitable bag sizes can be selected as diameter=0,3m and length=5m.

a)Calculate the total filtration surface area and number bags of baghouse, if the gas is to be cooled by air cooling process

b)Same issue as in (a) if the gas is to be cooled by heat exchanger.