CYCLONES- Exercitation

Data

Design a conventional cyclone to function as a precleaner on a gas stream that flows at **120 Nm^3/min**. The cyclone must achieve a minimum overall efficiency of 70% for the following particulate distribution, with a maximum allowable ΔP of 3000 Pa (30 cm H_20).

The particulate density is 1500 kg/m^3, the gas density is 1.0 kg/m^3 and the gas viscosity is 0.07 kg/m-hr.

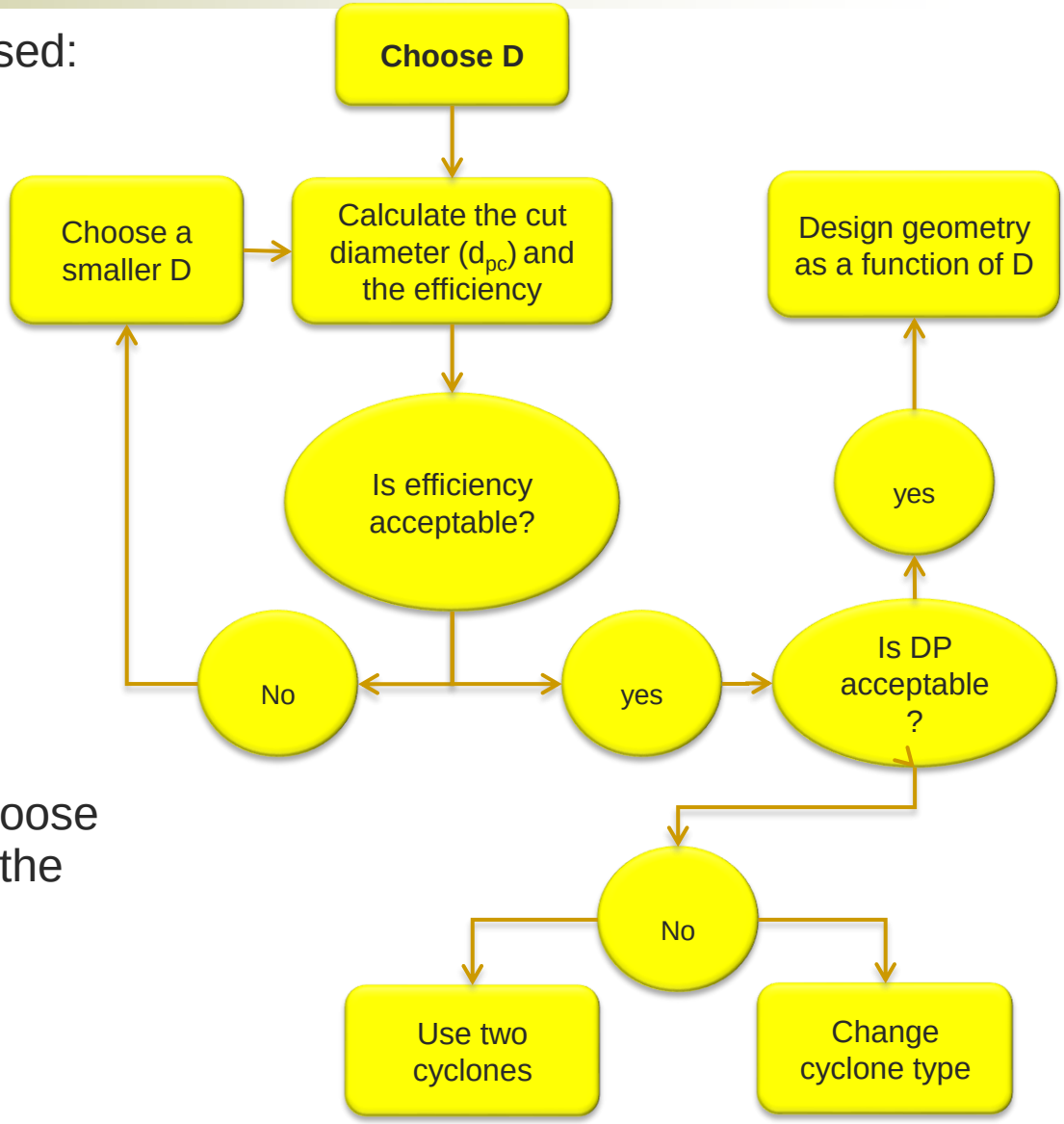
Specify your final choice of body diameter, overall cyclone efficiency, inlet gas velocity and pressure drop (assume K=14)

Size range (µm)	mass percent in size range (%)
0-2	2
2-4	18
4-10	30
10-20	30
20-40	15
40-100	4
>100	1

Procedure

A **trial-and-error** procedure can be used:

- First choose a body diameter.
- Calculate the corresponding d_{pc} and efficiency.
- If efficiency is too low, a smaller body diameter must be chosen and the procedure iterate.
- If the efficiency is acceptable, the pressure drop must be checked.
- If DP is too high, we can either choose a different type of cyclone or split the flow gas between two cyclones in parallel.



Effects of design and process parameters on cyclone efficiency

NAME:…… SURNAME:……...

PARAMETER	IF PARAMETER INCREASES, CYCLONE EFFICIENCY WILL INCREASE OR DECREASE?
Particle size (d_p)	
Particle density (ρ_p)	
Dust loading	
Inlet gas velocity	
Cyclone body diameter	
Ratio of cyclone body lenght to diameter	
Smoothness of cyclone inner wall	
Gas viscosity	
Gas density	
Gas inlet duct area	
Gas exit pipe diameter	