Solution proposal

Classroom exercise 3

**Task 1**

1. **Rate to prevent sand accumulation**

Gas velocity > Sinking velocity for sand grains (jfr.: Turner’s criterium,)

Friction factor: fs=0.44 as starting point, corresponds to Reynolds number: 500<Re<2.105

Estimated velocity



Reynolds number: 

1. Iteration

Estimate of friction factor: 

Synkefart: 



1. Iteration

 



1. Iteration

 

 



Convergence within 2 significant digits

To prevent sand accumulation

Gas velocity: vg>vs

 gir: 

1. **Rate to prevent water accumulation**

Turners criterium: Gas velocity> Water droplet velocity

Sinking droplets in stagnant gas:

*Kd* *= 2.75 - 3.1*, here used: *Kd=3.1*





1. **Droplet** **size**

For : fd=0.44 , turbulent boundary layer: 

 

 🡪 Friction factor from figure 7.6: fd=0.6

 fd=0.44 initially assumed. If we repeat calculations for fd=0.6 :🡪 

**Task 3 Droplets in flowing gas**

1. **Flow and droplet size**

Energy dissipation by flow turbulence : 

Droplet size: 

**b) Maximum droplet size**

Flow turbulence is predicted to limited droplet size to: 13mm, while turbulence in the boundary layer was predicted to limit it to 9mm. In total, maximum droplet size may be expected somewhat less than estimated from the boundary layer turbulence alone, ie: d <9mm.