Week 6 Exercise:

- Considering the same example you solved in the previous assignment (radiative heat transfer between two parallel plates), how many shields with epsilon = 0.1 should you add in order to have the new heat transfer rate to be 1% of the case without shields?

If the values are not equal

$Qfrom\ previous\ example$ = 3625.4

1 % of $\dot{Q}$ = 36.254

ε=0.1

36.253=(σ(T_1^4-T_2^4))/((1/ε_1 +1/ε_2 -1)-)

$\dot{Q}$_(N shields= Aσ(T_1^4-T_2^4)/(N+1)(1/ε+1/ε-1) = 1/(N+1) $\dot{Q}$_(no shields))

1% of previous case $\dot{Q}$= 1/100×3625.3 W/m^2 =36.253 W/m^2

36.253 W/m^2 =(5.67×10^(-8)×(800^4-500^4))/((N+1)(1/0.1+1/0.1-1))

36.253 W/m^2 =19680.57/((N+1)(19))

N+1= 28.57

N=27.57~28

If the values are equal

∈1 = ∈2 = ∈3.1 =∈3.2 =0.1

T1 = 800 K

T2=500K

(Q)/A= σ(T_1^4-T_2^4)/((1/ε+1/ε-1)) (Q)/A= (5.67×10^(-8)×(800^4-500^4))/((1/0.1+1/0.1-1)) = 1035.81 w/ m2

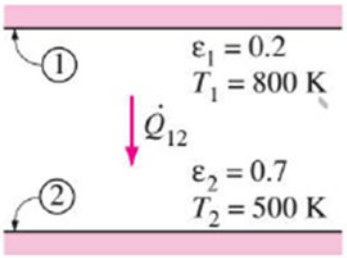
1035.81 X 1% = 10.35

〖(σ(T_1^4-T_2^4)/(N+1)(1/ε+1/ε-1) = 1/(N+1))〗

〖_(1/((N+1)) Q= 1/(100) Q)〗

99 SURFACES TO LOWER THE RADIATION 1 %

-Find the radiative heat exchange between two parallel plates considering the two emissivities to be 0.1. What can you conclude from the result?



if ε1= 0.2; ε2= 0.7

RTotal= = 1/0.2 + 1/0.7- 1= 5.43

Q˙12= Aσ (T14 – T24) / (1/ϵ1) + (1/ϵ2)-1 = (A*(5.67*10^(-8))*(800^4-500^4))/(1/0.2+1/0.7-1) = 3625.4*A W

if ε1 = ε2= 0.1;

RTotal= 1/0.1 + 1/0.1 - 1= 19

Q˙ 12= (A*(5.67*10^(-8))*(800^4-500^4))/(1/0.1+1/0.1-1)= 1035.8*A W