King Abdulaziz University
Faculty of Engineering
Mechanical Engineering

MEP 460
Heat Exchanger Design
Spring 2021
HW. # 07 Answers

From Kakac 3ed edition book

Problem	Modifications	Answers
6.2	Change the overall heat transfer coefficient from 300 $W/m^2.K$ to 350 $W/m^2.K$, and total fouling of 0.00070 $m^2.K/W$. Get the outlet temperatures for fouled HX	% reduction in heat transfer 8.55
6.3	Change the inlet gas temperature from 150º C to 170 ºC, Let h_o=120 $W/m^2.K$, h_i=1200 $W/m^2.K$	U_c=107.1 $W/m^2.K$, U_f=105.1 $W/m^2.K$, OS=1.88 %, Tube length per tube pass 5.2 m
6.4	Change the outlet cold temperature after 3 months from 46 ºC to 45º C.	V=1.6 m/s, U_c=592.3 W/m^2K, R_{fi}=3.554E-4 $m^2.K/W$
6.5	Let the thickness of calcium carbonate be 1.2 mm and the thickness of magnesium phosphate to be 1.0 mm.	$R_{ft}=9.714*10^{-4}$ $m^2.K/W$
6.6	Change the outlet temperature from 80 ºC to 75 ºC. Change U value from 2100 to 2000 W/m^2K	U_f=1119 W/m^2K, OS=78.78 % R_{ft}=3.3939E-4 m^2. K/W
6.10	Change the outlet temperature after 6 months to 85 ºC instead of 95 ºC. 6.10b Calculate the outlet water temperature if the heat exchanger fouling factor reached 0.00015 $m^2.K/W$	q_{new}=1.0E6 W, q_{6m}=836894 W, U_f=2796 $W/m^2.K$ R_{ft}=0.000072 $m^2.K/W$
A	List five types of fouling found in heat exchangers	
B	What is the difference between on-line and periodic fouling cleaning? Give example for each	
C	Draw a sketch to show the difference between linear and asymptotic fouling build up.	
D	What are the effects of fouling on heat exchangers?	
F	What is the difference between crystallization and biological fouling.	