Kaplan Chemical Engineering Problems & Solutions, 4th Edition Errata

Page 1:

Example 1.2, Line 1: Change 50 to 10

Page 6 and 7:

Replace present solutions of problems 2.1 to 2.4 on pages 6 and 7 by the following revised solutions:

2.1 Carbon/Hydrogen mass ratio:

CO_2 in the flue gas is 10 mol%, therefore
CO_2 in the flue gas = 0.1(100) = 10 kg mol
Mol fraction of water vapor in flue gas = 12.35/116 = 0.1065
All water vapor in the flue gas is from combustion because air used is moisture free and fuel is also moisture free.

Then moles of water vapor in flue gas = $\frac{0.1065}{0.10} \times 10 = 10.65$ kg mol H_2O

Amount of carbon in 10 kg mol of CO_2 = 10(12) = 120 kg
Amount of H_2 in 10.65 kg mol of H_2O = 10.65(2) = 21.2 kg
Hence carbon/hydrogen mass ratio = 120/21.3 = **5.634**

2.2 Percent excess air:

O_2 used up for formation of CO_2 = 10 kg mol of O_2
O_2 consumed for formation of H_2O = 0.5(10.65) = 5.325 kg mol of O_2
O_2 remaining unused (not known). Assume x kg mol
Therefore total oxygen used for combustion = 10 + 5.325 + x kg mol
= (15.325 + x) kg mol
Hence N_2 in air fed to combustion chamber = [3.76(15.325 + x)] kg mol
N_2 is a key component and assumed inert. Therefore
N_2 + O_2 in flue gas = 3.76(15.325 + x) + x kg mol
= 57.622 + 4.76x kg mol
In 100 kg mol of flue gas, N_2 + O_2 = 100 − 10 − 10.65 = 79.35 kg mol
Thus, equating the two 57.622 + 4.76x = 79.35
From which x = (79.35−57.622)/4.76 = 4.56 kg mol
% excess air used = (4.56/15.325)(100) = **29.8 %**

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2.3 Mol% of N_2 in flue gas:

N_2 in air = 3.76(15.325 + 4.565) = 74.79 kg mol
On the basis of 100 kg mol, the flue gas composition is

Component	kg mol	mol %
CO_2	10.00	10.00
H_2O	10.65	10.65
O_2	4.56	4.56
N_2	74.79	74.79
Total	100.00	100.00

Mol % of N_2 in flue gas ≅ **74.8**%

2.4 Average molecular weight of the flue gas:

Average molecular of flue gas =10×44 + 10.65×18 + 4.56×32 + 74.79 ×28 = **28.72**

Page 7:

Exhibit 2.5: Add F as shown below

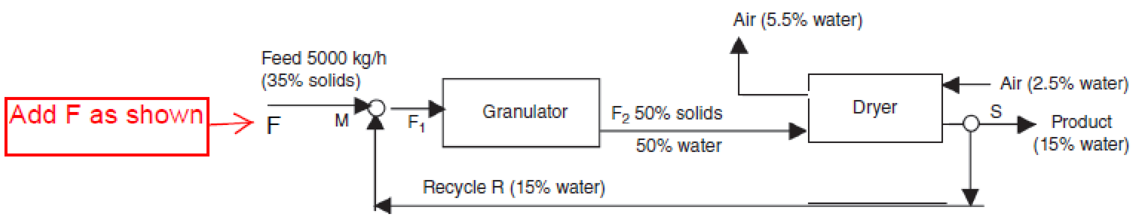

Exhibit 2.5 Process sketch for Problems 2.5 to 2.8

Page 7:

Example 2.8 solution:

Line 1: Add " wet" between " Total" and "air" to make "Total wet air"
Change 1505.52 to 1544.1
Line 6: Change 1505.52 to 1544.1
Change 52.7 to 54.05
Line 8: Change 52.7 to 54.05
Line 9: Change 1181.2 to 1211.5

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Page 8:

Problem 2.11 solution, 5th line: Change 557.2 to 357.2

Page 13:

Example 3.12:

Line 1: Replace 1000 by 900

Data table, row 2, column 3: Change 100 to 900

Data table, row 5, last column: Change 1.6102 to 1.6002

Data table, row 6, last column: Change 1.6211 to 1.6210

Page 13:

Examples 3.13 and 3.14:

Data on SO_2: Insert decimal point in −755 to give −75.5

Add data above statement of example 3.13 as follows:

Entropy of SO_2 at 25^0C = 59.4 g cal/g mol·K

Example 3-13:

Line 1: Change 538 to 537
Line 2: Change -101 to -100

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Page 14:

Example 3.1 solution: Exhibit 3.1

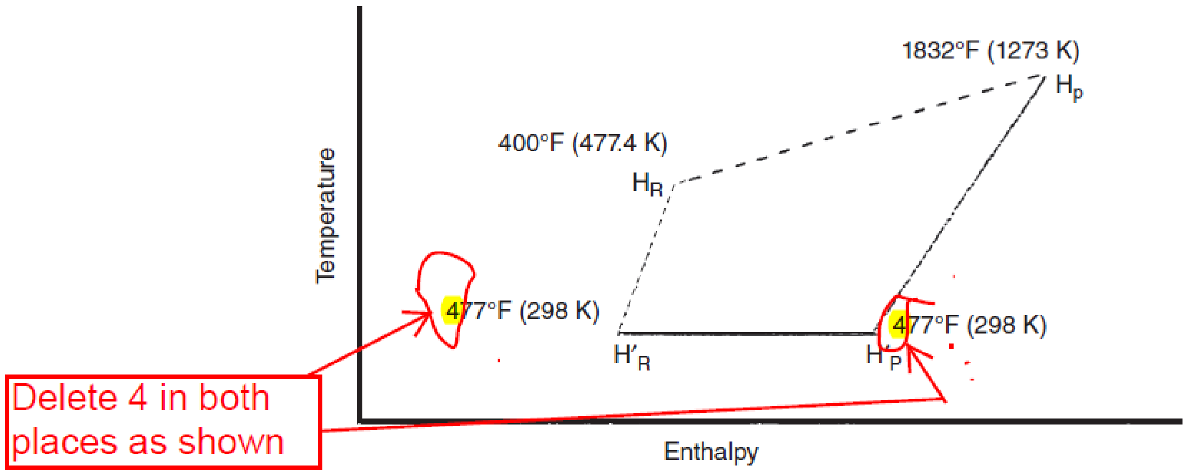

Exhibit 3.1 Path for calculation of final enthalpy

Page 15:

Line 18, equation for Q: Make Add R as subscript to H in $\sum H$
Problem 3.2, last line on page: Change 106 to 10^6 (i.e. make 6 exponent of 10)

Page 22:

Item Gas Cooling:

Insert symbol Δ before S to give ΔS

Item Gas Condensation:

Insert = between $\frac{-5960}{268}$ and −22.2389

Item Liquid Cooling:

2nd line: Insert = sign before 64

Item Phase Change from liquid to solid:

Insert = − 8.957 between $\frac{-1769}{197.5}$ and gcal/gmol·K

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Page 23:

Item cooling of solid:

2nd line of solution: Insert 14.656 between = and $\ln \frac{173}{197.5}$

Insert $-$ sign before 1.9411 to give -1.9411

3rd line of solution: change 22.34 to 22.24

4th line of solution: Replace 29.778 by -51.5741

5th line: Change 29.778 to 51.5741 (Retain $-$ sign)

Change 454 to 454.6

6th line of solution: change 0.4653 to -0.8076

Page 23:

Example 3.14:

4th line up from bottom of solution:

Change 22.34 to 22.24

Change 38.2851 to 38.2862

3rd line up from bottom of solution:

Change 38.2851 to 38.2862

2nd line up from bottom of solution:

Change 20.8549 to 21.1138

Last line: Change 0.3258 to 0.3306

Page 33:

Problem 4.13, Equation for A: Change 78.45 to 78.54

Page 35:

After equation for t, insert the missing lines as follows

= 17334.975 s

= 4.8 h

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Page 36:

2nd line up from bottom: Change 8.398 to 8.338

Bottom line: Change 58.32 to 57.9

Page 46:

Calculation of B: Insert brackets after division sign as shown below:

G_s= 50,000/(0.016667*B*) = 246,968

Page 59:

After equation for $\frac{dV_D}{dV}$, in the equation, $\frac{1.4V^2}{900\times 50} - 50 = 0$, Change -50 to -15

Page 60:

After Exhibit 7.4 title, 5th line equation for $\frac{2C_V^{'}}{A^2}$, insert = sign between $\frac{2C_V^{'}}{A^2}$ and $e^{0.88(1-s)}$

In 6th line,

Change 4.41 to 4.416

Delete 2 before $C_V^{'}$ to give $C_V^{'}$ = 4.416

Line 15, Calculation of θ: After = sign, insert 2 before $C_V^{'}$ in $\frac{C_V^{'}}{A^2}$

Line 19, calculation of $\frac{dV}{d\theta}$: After = sign insert 2 before $C_V^{'}$ in the denominator.

Page 61:

Problem 7.5, line 6: After 1.8, insert = sign
Problem 7.7, line 2: Change 4873 to 4874

Page 62:

Problem 7.10, line 2: Change 7363.6 to 3233
Problem 7.12, line 2: Insert = sign before 2.02

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Page 86:

Problem 10.17, Equation for *B*: After = sign, Replace 0.471 by 0.529

Page 87:

From top, 4th line: Make *i in yi* subscript to y.

Page 103:

Problem 12.13: In the line beginning with "If x_1 kg …. " move $Y_1 =$ to next line behind

$x_1/60$ to make $Y_1 = x_1/60$

Also insert 'and' behind $Y_1 = x_1/60$ to give 'and $Y_1 = x_1/60$'

Page 122:

Problem 14.1:

Line 3, Schmidt number: On RHS delete 1010 and delete 2 from 0.652
Reset calculation of Schmidt's number as follows:

$$\text{Schmidt number, Sc} = \frac{\mu}{\rho D_{AB}} = \frac{0.02\ \text{cP} \times \dfrac{0.01\text{P}}{\text{cP}} \dfrac{1\text{g}}{\text{cm}\cdot\text{s}\dfrac{0.01\text{m}}{\text{cm}}} \dfrac{10^{-3}\text{kg}}{\text{g}} /\text{P}}{1.185\dfrac{\text{kg}}{\text{m}^3} \times 2.6 \times 10^{-5}\dfrac{\text{m}^2}{\text{s}}}$$

$$= \frac{0.02 \times 10^{-3}}{1.185 \times 2.6 \times 10^{-5}} = 0.65$$

In expression for $\dfrac{h_G}{k_Y}$, on RHS, delete 2 from 0.652

In expression for $\dfrac{h_G}{k_Y}$, Change 954 to 955

Equation following the sentence "Therefore, by substituting in the wet bulb equation":
Change 954 to 955

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Page 134:

Problem 15.1, line 9, Equation for I_H : Insert = sign before 29.903

Problem 15.1, first expression for ΔG_T^0 , 2nd line: Insert = sign before 16.28

Problem 15.1, equation for ln K: Insert $-$ sign before ΔG^0 *in* $\frac{\Delta G^0}{RT}$

Page 141:

Problem 15.15, line 9: Change subscript *r* in ΔH_r to R *to give* ΔH_R

Problem 15.15, line 9: Insert 1 between – sign and 66000 to give -166000 and change 1.66 to 1.6658, also delete 1 from 5.291

Page 145:

Problem 16.1, Equation for $\rho c V \frac{dT}{dt}$: Insert = sign after $\rho c V \frac{dT}{dt}$

In the sentence starting with "For steady state energy balance, insert = 0 after $\frac{dT}{dt}$

Equation for $\rho c V \frac{d(T - T_s)}{dt}$: Insert = sign after $\rho c V \frac{d(T - T_s)}{dt}$

Page 147:

Problem 16.3, second line: Insert before = sign the following:

$$\times \frac{1}{2}\sqrt{\frac{1+3}{1\times 0.25}}$$