



GIDA MÜHENDİSLİĞİ BÖLÜMÜ
Department of Food Engineering

Ders Sunumu

Dersin Adı: GM 203 – Enerji ve Kütle Denkliği

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$$\Rightarrow M_A W_{A1} + M_P W_{P1} = M_A W_{A2} + M_P W_{P2}$$

$$\Rightarrow (700)(9009) + M_P(1,5) = (700)(W_{A2}) + M_P(9111)$$

$$\Rightarrow \boxed{W_{A2} = 9002 M_P + 9009}$$

$$\left. \begin{array}{l} 1.60 \text{ NN} \\ 20^\circ\text{C KTS} \end{array} \right\} \Rightarrow W_{A1} = 9009 \text{ kg su/kg kh}$$

$$\Rightarrow M_A H_{A1} + M_P H_{P1} = M_A H_{A2} + M_P H_{P2}$$

$$H_{A1} = C_{S1}(T_{A1} - T_R) + W_{A1} H_{L1}$$

$$C_{S1} = 1,005 + 1,88(9009) \Rightarrow C_{S1} = 1,022 \text{ kJ/kg}^\circ\text{C}$$

$$H_{L1} = H_V - H_C \Rightarrow H_V(T_{A1} = 120^\circ\text{C}) = 2706,3 \text{ kJ/kg}$$

$$H_C(T_{A1} = 120^\circ\text{C}) = 503,71 \text{ kJ/kg}$$

$$H_{L1} = 2706,3 - 503,71 \Rightarrow H_{L1} = 2202,59 \text{ kJ/kg}$$

$$H_{A1} = (1,022)(120 - 0) + (9009)(2202,59) \Rightarrow \boxed{H_{A1} = 142,46 \text{ kJ/kg kh}}$$



$$H_{A2} = C_{S2}(T_{A2} - T_R) + W_{A2} H_{L2}$$

$$C_{S2} = 1,005 + 1,88 W_{A2}$$

$$H_{L2} = H_v - H_c \Rightarrow H_v(T_{A2} = 48^\circ\text{C}) \Rightarrow \begin{matrix} 45^\circ\text{C} & 2583,2 \\ 50^\circ\text{C} & 2592,1 \end{matrix} \left. \begin{matrix} 5^\circ\text{C} & 8,9 \\ 3^\circ\text{C} & x \end{matrix} \right\} x = 5,34$$

$$H_c(T_{A2} = 48^\circ\text{C}) \Rightarrow \begin{matrix} 45^\circ\text{C} & 188,45 \\ 50^\circ\text{C} & 209,33 \end{matrix} \left. \begin{matrix} 5^\circ\text{C} & 20,88 \\ 3^\circ\text{C} & x \end{matrix} \right\} x = 12,53$$

$$H_{L2} = (2583,2 + 5,34) - (188,45 + 12,53) \Rightarrow H_{L2} = 2387,56 \text{ kJ/kg.kh}$$

$$(T_{P2} = \text{Havanın ortalama } T_{P2} \Rightarrow \begin{matrix} 20^\circ\text{C} \\ 60^\circ\text{NN} \end{matrix} \left. \begin{matrix} 120^\circ\text{C ısıt} \\ \Rightarrow T_{P2} = 38^\circ\text{C} \Rightarrow T_{A2} = 48^\circ\text{C} \end{matrix} \right)$$

$$H_{A2} = (1,005 + 1,88 W_{A2})(48 - 0) + W_{A2}(2387,56)$$

$$H_{A2} = 2479,8 W_{A2} + 48,24$$



$$H_{p_1} = (2)(25-0) + (1,5)(4,176)(25-0) \Rightarrow H_{p_1} = 206,6 \text{ kJ/kgkm}$$

$$H_{p_2} = (2)(38-0) + (9,111)(4,176)(38-0) \Rightarrow H_{p_2} = 93,61 \text{ kJ/kgkm}$$

$$\Rightarrow (700)(142,6) + M_p(206,6) = (700)[2477,8 W_{A_2} + 48,24] + M_p(93,61)$$

$$99820 + 112,99 M_p = (700)[2477,8(9,002 M_p + 9,009) + 48,24]$$

$$99820 + 112,99 M_p = 3468,92 M_p + 15610,44 + 33768$$

$$50441,86 = 3355,93 M_p \Rightarrow \boxed{M_p = 15,03 \text{ kJ/kgkm/h}}$$

$$\Rightarrow W_{A_2} = (9,002 \times 15,03) + 9,009 \Rightarrow \boxed{W_{A_2} = 90391 \text{ kJsu/kgkh}}$$