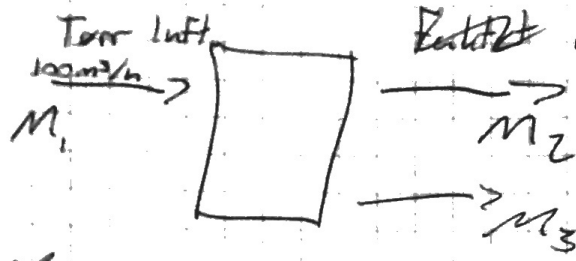
Prosess øving 2

1)



~~Massebalanse~~ UT = INN + tilsatt

a)

Generell: $n_2 = n_1 + n_{H_2O(g)}$

Luft: $n_2 = n_1$

Vanndamp: $n_2 = 0 + n_{H_2O(g)}$

b) $pV = nRT$

Luft: $4358\ mol/h$

For gasser gjelder:

$$\frac{n_{H_2O(g)}}{n_T} = \frac{p_{H_2O(g)}}{p_T}$$

* anntar 1 bar i utstrømmen

$n_T = n_{H_2O(g)} + n_{luft}$

$n_{H_2O(g)} = 143\ mol/h$

$pV_{ut} = n_T RT$, $n_T = 4358\ mol/h + 143\ mol/h$

$V_{ut} = 111{,}5\ m^3/h$

1c) $n_{H_2O} = 143\ mol/h$

$m_{H_2O} = 143\ mol/h \cdot 18 \cdot 10^{-3}\ kg/mol$

$\underline{\underline{m_{H_2O} = 2{,}574\ kg/h}}$

1d) dersom p øker ved konstant Volum og Stoffmengde må temperaturen øke. Da øker damptrykket til vann og oppløst av vann øker.

2a) $(C_2H_4)_n + 3n\,O_2 \rightarrow 2n\,CO_2 + 2n\,H_2O$

$n_{plast} = m_{plast} \cdot (28 \cdot 10^{-3}\ kg/mol)^{-1}$

$\underline{n_{plast} = 35714\ mol}$

$n_{O_2} = 3 n_{plast} = 107142\ mol$

$n_{luft} = \frac{n_{O_2}}{0{,}21} = 510200\ mol$

$V_{luft} = \frac{nRT}{p}$

$V_{luft} = \frac{510200\ mol \cdot 8{,}314\ J/mol\cdot K \cdot 298\ K}{10^5\ Pa}$

$\underline{\underline{V_{luft} = 12641\ m^3}}$

2B)

$$n_{Argass} = 4 n_{Methan} = 142856\,mol$$

$$V_{CO_2} + V_{H_2O} \text{ ~~} V_{Argass} = \frac{142856\,mol \cdot 8{,}314 \frac{J}{mol \cdot K} \cdot (900 + 273)\,K}{0{,}9 \cdot 10^5\,Pa}$$

$$V_{CO_2} + V_{H_2O} \text{ ~~} V_{Argass} = 15480\,m^3 = V_{CO_2} + V_{H_2O}$$

$$V_{Argass} = V_{CO_2} + V_{H_2O} + V_{N_2} = 15480\,m^3 + 0{,}79 \cdot V_{Luft}$$

~~$V_{Argass} = 15480\,m^3 + 0{,}79 \cdot 17641\,m^3$~~

~~$V_{Argass} = 25466\,m^3$~~

$$n_{N_2} = \frac{0{,}79}{0{,}21} n_{O_2} = 403058\,mol$$

$$V_{N_2} = \frac{403058\,mol \cdot 8{,}314 \frac{J}{mol \cdot K} \cdot 1073\,K}{0{,}9 \cdot 10^5\,Pa}$$

$$V_{N_2} = 39914\,m^3$$

$$V_{Argass} = 15480\,m^3 + 39914\,m^3$$

$$V_{Argass} = 55394\,m^3$$