

1)

ANTAG 100 MOL 1 PASANG

A)

	1	2	3	4	5
A	70	70	52,5	52,5	
B	-	-	17,5	17,5	
C	10	10	27,5	27,5	
I	20	20	20	20	

B)

	1	2	3	4	5
A	70	70+x	$(70+x) \cdot 0,75$	42	$0,5 \cdot 0,75(70+x)$
B	-	-	28	28	0,5
C	10	10	8	38	
I	20	20	20	20	

ANTAG X MOL A REKURULONAT

$$0,5 \cdot 0,75 (70+x) = x \Rightarrow x = 42$$

$$B^3 = 0,25 \cdot (70+42) = 28$$

C)

	1	2	3	4	5
A	70	35	26,25	61,25	35
B	-	-	8,75	8,75	-
C	10	5	13,75	18,75	5
I	20	10	10	20	10

$X_{sust} = 12,5\%$

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VPPGIFT 2:

$$q_x = 0,2 \frac{s}{(0,1+s)} \cdot X$$

$$s^0 = 12$$

$$Y_{X/s} = 0,159/9$$

$$D(s^0 - s) - q_x Y_{s/x} = 0$$

$$D(x^0 - x) + q_x = 0$$

$$x^0 = 0$$

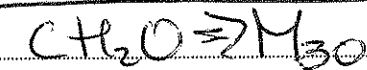
$$-0,08 \cdot X + 0,2 \frac{s}{(0,1+s)} \cdot X = 0$$

$$\Rightarrow s = \frac{0,4 \cdot 0,1}{(1-0,4)} = 0,067$$

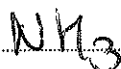
$$X = x^0 + Y_{s/x} (s^0 - s) = 0 + \frac{1}{0,15} \cdot (12 - 0,067)$$

$$= 1,79$$

Y



$$\Rightarrow \text{IDMAM}_1 X_1 = 12 + 1,8 + 0,5 \cdot 16 + 0,2 \cdot 14 =$$



24,6

$$Y_{X/S} = 0,15 \cdot \frac{30}{24,6} = 0,183$$

$$Y_{CO_2/S} = 1 - 0,183 = 0,817$$

$$r_x = 4 + 1,8 - 0,5 \cdot 2 - 3 \cdot 0,2 = 4,2$$

$$r_s = 4$$

$$r_{O_2} = -4$$

$$Y_{O_2/S} = -\frac{1}{4} [r_s Y_{CO_2/S} + r_x Y_{X/S}] = -\frac{1}{4} [-4 \cdot 1 + 4,2 \cdot 0,183]$$
$$= 0,8078$$

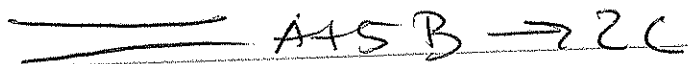
c) $RQ = \frac{0,817}{0,808} = 1,0113$

b) D für WASHOUT

$$D = 0,2 \sum_{0,1175} S_{max} = 12 \Rightarrow$$

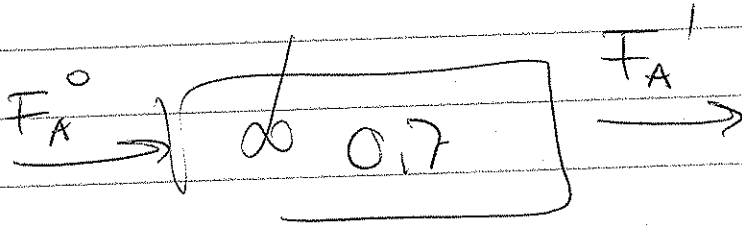
$$\max D = 0,19835$$

Uppgift 3



$$r = k \cdot C_A \cdot C_B$$

$$X_A = 0,7$$



$$F_A' = F_A^0 (1 - 0,7) = 0,3 F_A^0 = 6$$

$$F_B' = F_B^0 - 5 \cdot 0,7 F_A^0 = 120 - 5 \cdot 0,7 \cdot 20 = 47,5$$

$$F_C' = 2 F_A^0 \cdot 0,7 = 28$$

$$F_{TOT} = 6 + 47,5 + 28 = 81,5$$

$$\begin{aligned} F_{TOT} &= F_A^0 (1 - X) + F_B^0 - 5 F_A^0 X + 2 F_A^0 X \\ &= F_A^0 + F_B^0 + 6 F_A^0 X \end{aligned}$$

TANK $r = k \cdot C_A \cdot C_B$

$$C_A = \frac{N_A}{N_{TOT}} \frac{P}{RT} = \frac{0,3 F_A^0}{F_A^0 + 6 F_A^0 + 6 F_A^0 X} \frac{P}{RT}$$

$$C_B = \frac{N_B}{N_{TOT}} \frac{P}{RT} = 47,5$$

$$C_A = \frac{6}{81,5} \frac{P}{RT} = 1,79$$

$$C_B = \frac{50}{81,5} \frac{P}{RT} = 14,92$$

$$q_{CA} - q_{CB} - k \cdot C_A \cdot C_B \cdot V = 0$$

$$14 = k \cdot 1,79 \cdot 14,92 \cdot 1 \Rightarrow$$

$$k = 0,52 \frac{\text{mol}^2}{\text{mol} \cdot \text{s}}$$

VÄRMEBÄLVANS

$$\left(\frac{20 \cdot 30 + 120 \cdot 25}{3600} \right) (T_N - 298) - \left(\frac{6 \cdot 30 + 50 \cdot 25 + 28 \cdot 80}{3670} \right)$$

$$(500 - 298) + 20 \cdot 10^3 \cdot 14$$

$$\Rightarrow T_N = \frac{741,340 \cdot 10^3 - 4200 \cdot 10^3}{3600} = 89,7 + 29$$

$$\Rightarrow = \underline{\underline{387 \text{ K}}}$$

$$q_G^0 - q_G - k C_A C_B V = 0$$

$$20 - 6 - k \cdot 1,79 \cdot 1492 \cdot 1 = 0$$

$$\Rightarrow k = \frac{\text{mol}^3}{\text{mol s}} \quad \underline{\underline{0,52}}$$

C

$$\sum \dot{F}_A^0 C_P^A (20 \cdot 30 + 120 \cdot 25) (T^{IN} - 298) - \left(6 \cdot 30 + 595 \cdot 25 + 28 \cdot 40 \right) (500 - 298) + 5,151 \cdot 10^5 (-\Delta H) R = 0$$

$$R = \dot{F}_A^0 X$$

$$\begin{aligned} (-\Delta H R) &= 40 \cdot 10^3 \cdot 14 = 560 \cdot 10^3 \text{ J} \\ (30 \cdot 10^3 \cdot 14 &= 420 \cdot 10^3 \Rightarrow T = \underline{\underline{318 \text{ K}}}) \end{aligned}$$

$$T^{IN} - 298 = 294 \Rightarrow T^{IN} = 592,44$$

RIMLIGT ?

A) PLOTDA $C^*(t)$ (INDIKERAR

TUB/TANK ALI TANK TUB.

$\langle t \rangle$ G_c^2 + N BERJALAN

t	$C^*(t)$	E(t)
0	0	0
2	0	0
4	0	0
6	0,3	1
8	0,25	
10	0,13	
12	0,11	
14	0,07	
16	0,04	
18	0,01	
20	0	

t	C^*	E(t)	$t \cdot E(t)$	$t^2 \cdot E(t)$
0	0	0	0	0
2	0	0	0	0
4	0	0	0	5,9341
6	0,3	0,1648	0,989	8,7912
8	0,25	0,1374	1,0989	7,1429
10	0,13	0,0714	0,7143	8,7033
12	0,11	0,0604	0,7253	7,5385
14	0,07	0,0385	0,5385	5,6264
16	0,04	0,022	0,3516	1,7802
18	0,01	0,0055	0,0989	0
20	0	0	0	0
	0,91	0,5	4,5165	45,516
	1,82			

$$\langle t \rangle = \int_0^{\infty} t E(t) dt = 9,033$$

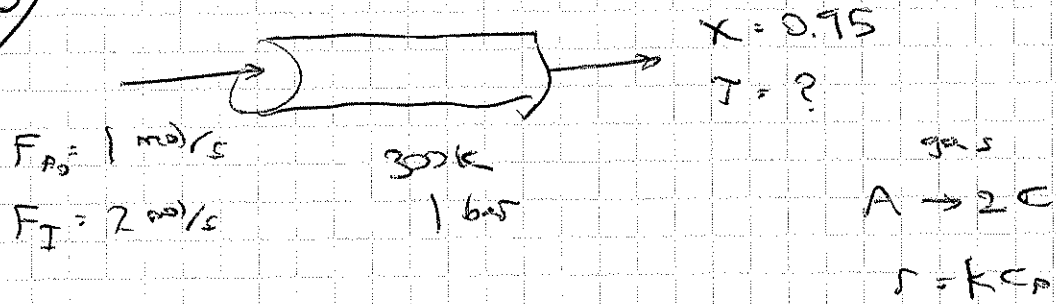
$$G_c^2 = \int_0^{\infty} t^2 E(t) dt - \langle t \rangle^2 = 9,438$$

$$N = 8,64 = \frac{\langle t \rangle^2}{G_c^2}$$

TANK SERI E $C_A = C_A^0 / (1 + k \frac{\tau}{N})^N \Rightarrow X = 0,60$

$$C_A / C_A^0 = 1 - X = 0,40$$

6/



a)

$$F_A = F_{A_0} - x F_{A_0}$$

$$F_C = 2 x F_{A_0}$$

$$F_I = F_I$$

$$F_{T_0} = F_{A_0} + F_I + x F_{A_0}$$

$$C_A = \frac{F_{A_0} - x F_{A_0}}{F_{A_0} + F_I + x F_{A_0}} \frac{P}{RT} = \frac{1-x}{3+x} \frac{P}{RT}$$

$$\frac{dF_A}{dV} = -k C_A$$

$$F_A \cdot \frac{dF_A}{dV} = k \left(\frac{1-x}{3+x} \right) \frac{P}{RT}$$

$$V = \frac{F_{A_0} \left(\frac{RT}{P} \right)}{k} \int_0^{0.95} \frac{3+x}{1-x} dx$$

$$\frac{F_{A_0} RT}{k P} = \frac{1 \text{ mol/s}}{1 \cdot 0.8} \cdot \frac{300 \text{ K}}{1 \cdot 10^5 \text{ Pa}} \cdot \frac{8.314 \text{ Pa m}^3}{\text{mol K}} = 0.0312 \text{ m}^3 = A$$

$$\int_0^{0.95} \frac{3+x}{1-x} dx = 11.03 = I$$

$$V = 0.344 \text{ m}^3$$

b) $P = ?$ for $x = 0.99$

$$I = \int_0^{0.99} \frac{3+x}{1-x} dx = 17.43$$

$$V = A \left(\frac{P_0}{P} \right) I$$

$$\frac{P}{P_0} = \frac{A I}{V} = \frac{(0.0312) 17.43}{0.344} = 1.58$$

b) $P = 1.58 \text{ bar}$

10/4-2009

7

A

$$X(3-5h)$$

$$X_{3h} = 1,0 \text{ g/l} \quad V_{3h} = 5,5 \text{ l}$$

$$X_{5h} = 1,7 \text{ g/l} \quad V_{5h} = 7,5 \text{ l}$$

$$\Rightarrow \text{PROD BIOMASSA} = 7,25 \text{ g}$$

$$Q = \frac{17,5 - 1,5}{12} = 1,33$$

B

$$Q = 1,33 \text{ l/h}$$

$$S^0 = 23 \text{ g/l}$$

INPORT 4h

$$\Rightarrow 1,33 \cdot 23 \cdot 4 = 122,67$$

$$S_{3h} = 15,8 \text{ g/l} \quad V_{3h} = 5,5$$

$$S_{7h} = 8 \text{ g/l} \quad V_{7h} = 10,5$$

$$\begin{array}{l}
 S_{\text{TOTAL}} = 122,67 \text{ g} \\
 (VS)_{3h} = 86,9 \text{ g} \\
 (VS)_{7h} = 84,0
 \end{array}
 \left. \vphantom{\begin{array}{l} S_{\text{TOTAL}} \\ (VS)_{3h} \\ (VS)_{7h} \end{array}} \right\} \begin{array}{l} (B-7h) \\ S_{\text{FORB}} = 125,6 \text{ g} \end{array}$$

C

$$\text{PRODUCER PROD 2-4} \Rightarrow 2 \cdot 5,5 - 1,0 \cdot 3,5$$

$$P_{4h} = 2,0$$

$$= 1,50 \text{ g}$$

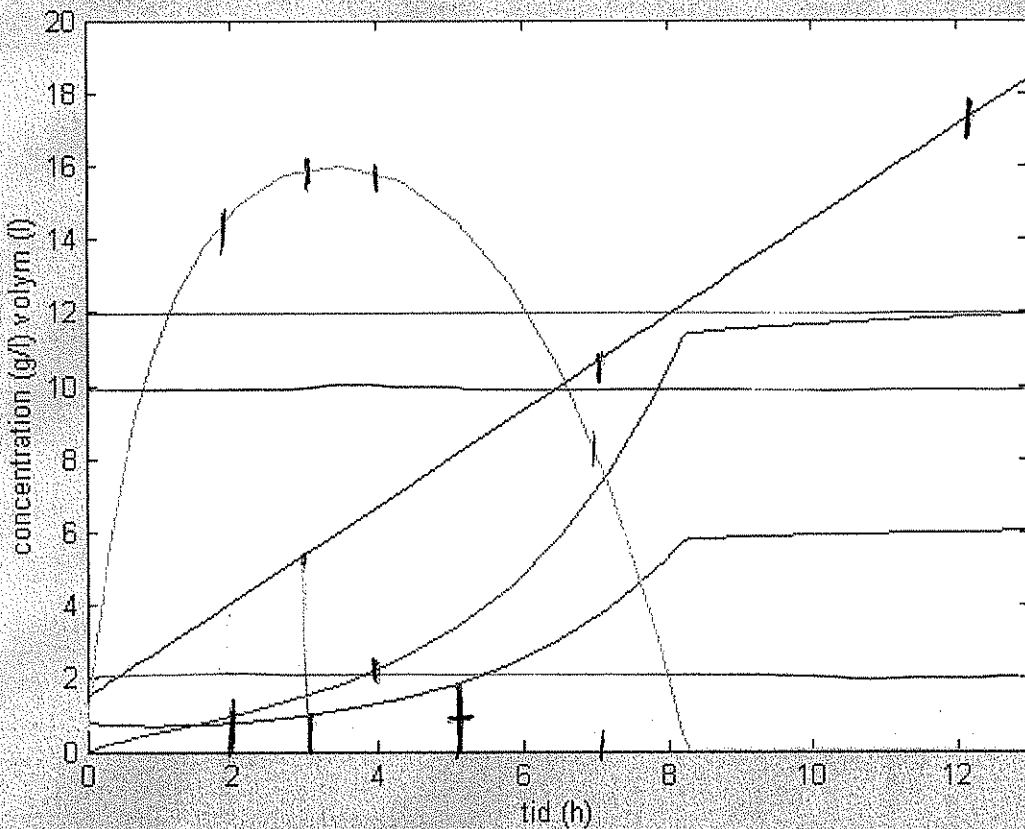
$$P_{2h} = 1,0$$

$$\text{KONSUMER S} = 23 \cdot 2 \cdot 1,33 - 14 \cdot 3,5 - 15,5 \cdot 5,5$$

$$= 24,93$$

$$Y_{P/S} = 0,30$$

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