

MODULE DE GENIE DE LA REACTION - I

Série d'exercices sur les réacteurs réels

Exercice N°1

Le réacteur étant parcouru par un débit constant, on introduit très rapidement 4 grammes de colorant dans la canalisation d'entrée. On enregistre la sortie du colorant à l'aide d'un spectrophotomètre. Les résultats sont les suivants :

t _{pass}	0	1	2	3	4	5	6	7	8
c(g/l)	0,0	0,013	0,033	0,084	0,089	0,078	0,064	0,043	0,029
t(min)	9	10	11	12	13	14			
c(g/l)	0,019	0,011	0,007	0,004	0,002	0			

- 1) Déduire de cette expérience le temps de séjour moyen du fluide dans le réacteur, le débit du fluide et le volume accessible au fluide.
- 2) Afin de tenter de modifier la circulation du mélange réactionnel, un opérateur peu averti procède empiriquement à deux changements successifs dans la disposition géométrique de chicanes et de tuyauteries, sans toutefois modifier le volume accessible au fluide. A l'issue de ces deux tentatives, on procède à la même expérience que ci-dessus (même débit, même quantité de colorant). Les résultats sont les suivants :

t _{pass}	0	1	2	3	4	5	6	7
1 ^{ère} modification c(t)	0	0,006	0,025	0,044	0,035	0,057	0,032	0,043
2 ^{ème} modification c(t)	0	0,040	0,075	0,080	0,067	0,050	0,034	0,022

Déterminer le temps de séjour moyen correspondants aux deux modifications. Que peut-on en déduire quant à la circulation du mélange réactionnel.

- 3) On décide de représenter la distribution des temps de séjour du fluide dans le réacteur par le modèle des mélangeurs en cascade. Evaluer le nombre de mélangeurs en cascade équivalent en recherchant la courbe de distribution du modèle de même sommet que la courbe expérimentale (avant les modifications). Vérifier rapidement à l'aide de quelques points que le modèle représente bien le réacteur réel.

Exercice N°2

On désire modéliser le comportement hydrodynamique d'un réacteur de volume 280 litres traversé par un débit de liquide $Q_0 = 11,4 \text{ m}^3/\text{h}$. Pour cela on utilise la méthode des traceurs. On fait circuler de l'eau dans les conditions de débit fixées ci-dessus et à l'instant $t = 0$, on injecte 0,27 moles d'un traceur pendant un temps très court à l'entrée du réacteur. On mesure la concentration du traceur à la sortie du réacteur. Les résultats sont rassemblés dans le tableau ci-dessous :

t(s)	10	20	30	40	50	60	70	80	90	100
c(mole/m ³)	0,02	0,1	0,26	0,48	0,65	0,82	0,89	0,88	0,84	0,70
t(s)	110	120	130	140	150	160	170	180	190	200
c(mole/m ³)	0,64	0,53	0,43	0,34	0,27	0,20	0,13	0,075	0,03	0

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Michael Hoelscher



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