LAMPIRAN

Data Hasil Simulasi disetiap Variasi Campuran:

Variasi konsentrasi 0.1%

Reynolds Number		Re kalkulasi	Nasselt Number	h
1	9350	9442.21	773.688	5591.69
2	13800	13936.1	107.122	7742.03
3	18500	18621.9	137.242	9918.87
4	23000	23151.5	165.234	11942

Variasi konsentrasi 0.5%

Reynolds Number		Re kalkulasi	Nasselt Number	h
1	9350	9536.4	788.354	5697.69
2	13800	14075.1	109.285	7898.35
3	18500	18566.8	138.042	9976.74
4	23000	23083.1	165.96	11994.5

Variasi konsentrasi 1%

Reynolds Number		Re kalkulasi	Nusselt number	h
1	9350	9654.13	805.116	5818.82
2	13800	14248.9	111.419	8052.57
3	18500	18500	138.774	10029.6
4	23000	23000	166.779	12053.7

Variasi konsentrasi 1.5 %

Reynolds Number		Re kalkulasi	Nusselt number	h
1	9350	9771.87	815.331	5892.66
2	13800	14422.6	113.161	8178.52
3	18500	18435.2	139.098	10053.1
4	23000	22919.5	167.211	12084.8

Tabel Perhitungan hasil Keseluruhan Pengaruh Variasi Konsentrasi Terhadap Nusselt number

Pengaruh Variasi Konsentrasi Terhadap Nusselt number									
NO	Re	0,1%	Peningkatan	0,5%	Peningkatan	1%	Peningkatan	1,5%	Peningkatan
1	9350	77	8.970141	79	11.03577	81	13.39662	82	14.83535
2	13800	107	8.20404	109	10.38889	111	12.54444	113	14.30404
3	18500	137	9.7936	138	10.4336	139	11.0192	139	11.2784
4	23000	165	10.156	166	10.66667	167	11.186	167	11.474
Rata-rata			9.280945		10.63123		12.03657		12.97295

Tabel Hasil perhitungan Koefsien Perpindahan Panas Rata-rata dan Nusselt number

Koefsien Perpindahan Panas Rata-rata dan Nusselt number									
NO	Re	0.1%	Peningkatan	0,5%	Peningkatan	1%	Peningkatan	1,5%	Peningkatan
1	9350	5591.69	4.791006	5697.69	6.777498	5818.82	9.047533	5892.66	10.43133
2	13800	7742.03	4.584292	7898.35	6.695962	8052.57	8.779265	8178.52	10.48068
3	18500	9,919	5.400365	9,977	6.015306	10029.6	6.577009	10,053	6.826726
4	23000	11942	6.065316	11994.5	6.531606	12053.7	7.057402	12084.8	7.333623
Rata-rata			5.210245		6.505093		7.865303		8.76809

Tabel Hasil Validasi Persamaan Dittus-Boelter

Validasi Dengan Persamaan Dittus-bolter					
NO	Re	0% (dari perhitungan h)	Dittus-bolter	Nu 0%	Peningkatan
1	9350	5336.04	75.51184	71	6.354704
02	13800	7402.67	103.1025	99	4.1439
3	18500	9410.66	130.3476	125	4.278105
4	23000	11259.1	155.1487	150	3.432441
Rata rata					4.552287

Tabel Termovisik Dari TiO_2/Air

NO.	THERMOPHYSICAL PROPERTIES TiO2/Water			
1	**Referensi nilai properti pada suhu 300K**			
2	**Thermal conductivity TiO2**	**Kp**	8.7	W/m.K
3	**Thermal conductivity Water**	**Kbf**	0.6	W/m.K
4	**Density of TiO2**	**pp**	4240	Kg/m^3
5	**Density of Water**	**pbf**	997	Kg/m^3
6	**Dynamic viscosity of water**	**nbf**	0.001003	Kg/m.s
7	**Specific heat of water**	**Cpbf**	4170	J/Kg.K
8	**Specific heat of nanoparticle**	**Cpnf**	689	J/Kg.K

LAMPIRAN PERHITUNGAN

1. Viskositas

$\mu_{nf} = (1 + 2{,}5\emptyset_p)\,\mu_{bf}$

μ_{nf} = (1 + 2,5 × 0,001 Kg/m.s) 0,001 Kg/m.s

=0, 001 Ns/m²

2. Densitas

$\rho_{nf} = \emptyset\rho_p + (1-\emptyset)\,\rho_{bf}$

ρ_{nf} = 0,001 Kg/m.s × 4240 Kg/m^3 + (1-0,001 Kg/m.s) × 997 Kg/m^3

= 1,003 Kg/m^3

3. Panas spesifik

$$Cp_{nf} = \frac{(1-\emptyset)(\rho Cp)_{bf} + \emptyset\,(\rho Cp)_P}{(1-\emptyset)\rho_{bf} + \emptyset\rho_P}$$

Cp_{nf} = (1-0,001 Kg/m.s) × (997 Kg/m^3 × 4170 J/ Kg.K) + 0,001 Kg/m.s × (4240 Kg/m^3 × 689 J/Kg.K)

(1- 0,001 Kg/m.s) × 997 Kg/m^3 + 0,001 Kg/m.s × 4240 Kg/m^3

= 4154,5 .J/Kg.K

4. Konduktivitas Termal

$$K_{nf} = \frac{K_p + K_{bf} + 2(K_p - K_{bf})\emptyset}{K_p + 2K_{bf} - (K_p - K_{bf})\emptyset} K_{bf}$$

K_{nf} = 8,7 W/m.K + 0,6W/m.K + 2 (8,7 W/m.K – 0,6 W/m.K) 0,001 0,6Wm/K

8,7 W/m.K + 2 × 0,6 W/m.K – (8,7 W/m.K – 0,6W/m.K) 0,001

= 0,56508 W/m.K

5. Reynolds Number

$$Re = \frac{\rho u D}{\mu}$$

9350 = 4240 Kg/m.s × v× 0,08 m

0,001 Ns/m^2

V = 4240 Kg/m.s × 0,08 m =339,2

= 9350 × 0,001 Ns/m^2 = 9,35

= 36,278

6. Perhitungan Nusselt Number

$Nu = 0{,}023Re^{0.8}Pr^{0.3}$

$= 0{,}023\times9350^{0.8}\times Pr^{0.3}$

$Pr = \frac{Cp.\ \mu}{k}$

$= \frac{4170J/Kg.K\times0.001Kg/m.s}{0.6W/m.K}$

$= 6{,}95$

$Nu = 0{,}023\times9350^{0.8}\times6{,}95^{0.3}$

$= 358{,}7$

Kegiatan Pengambilan Data Simulasi Di lab.