

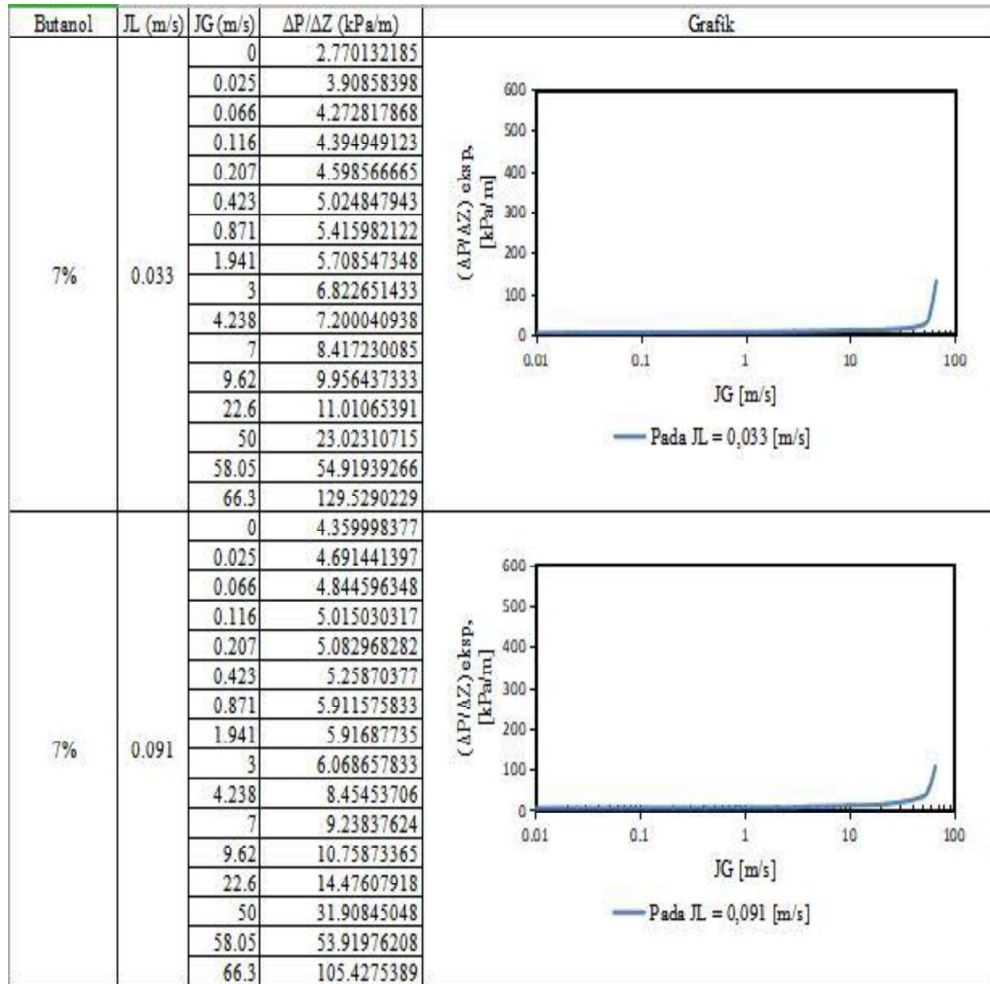
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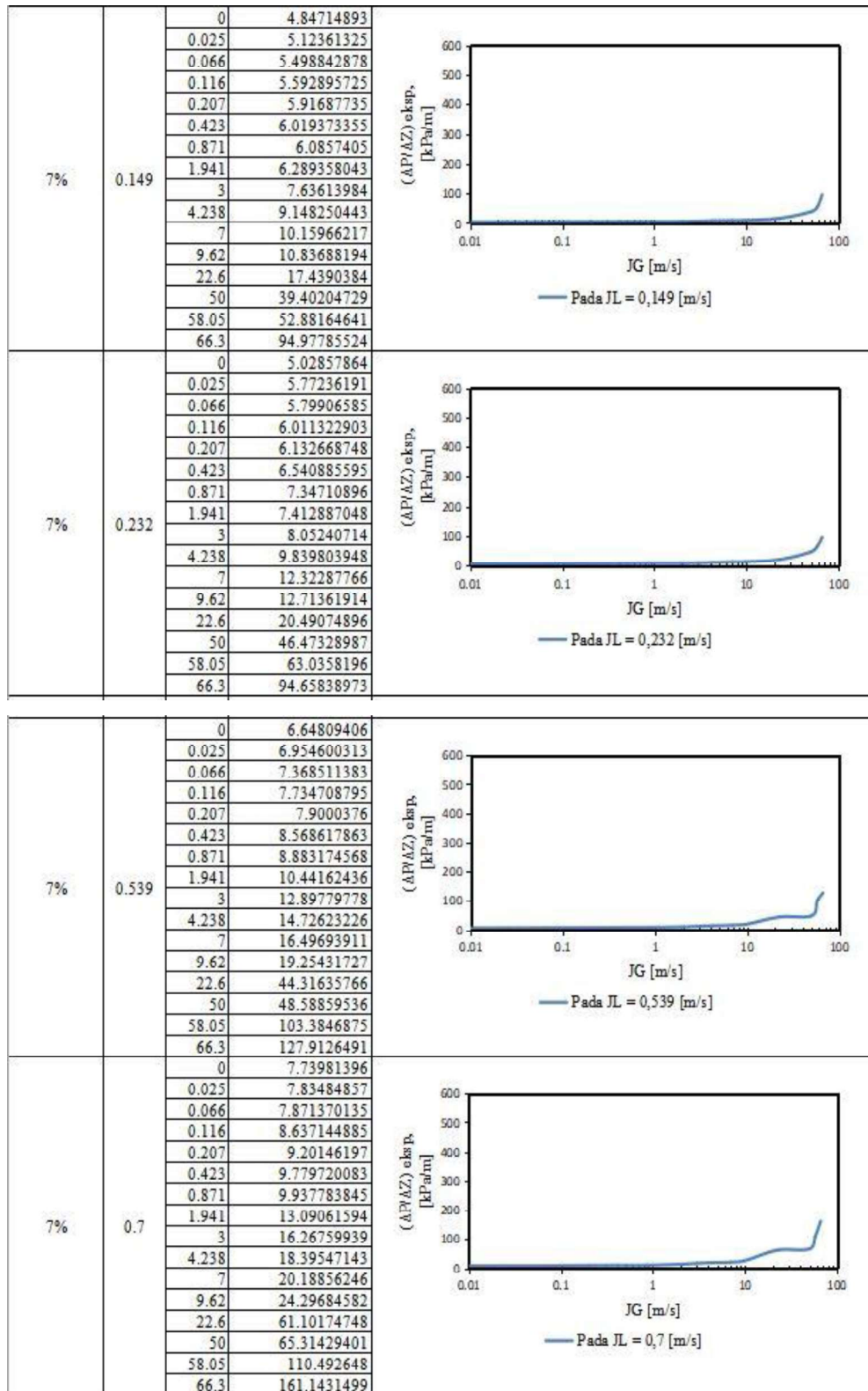
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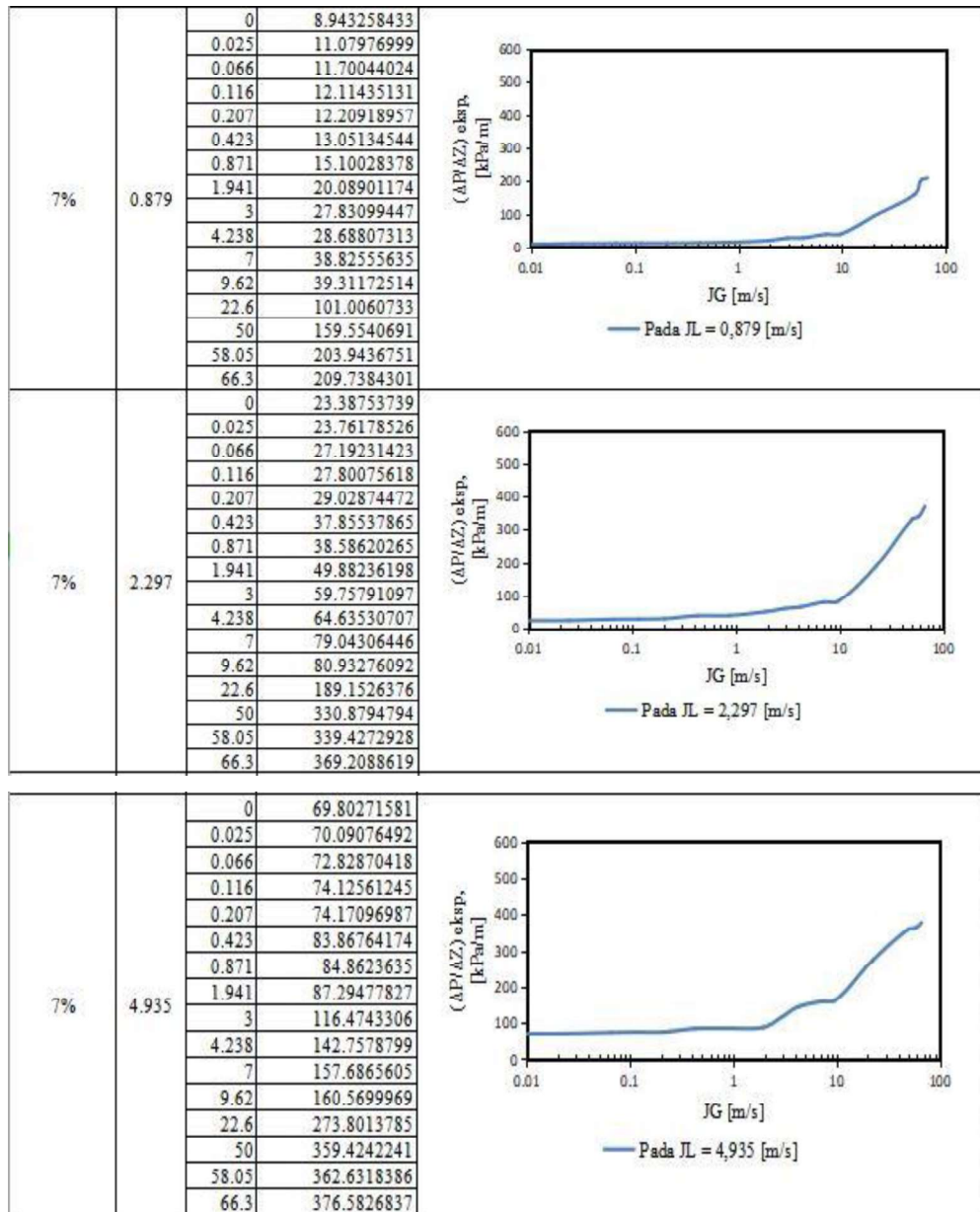
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## LAMPIRAN

Lampiran 1 Tabel Variasi Kecepatan Superfisial Gas ( $J_G$ ) Terhadap Gradien Tekanan pada Butanol 7%







Lampiran 2 Tabel Kecepatan Variasi Kecepatan Superfisial *Liquid* ( $J_L$ ) Terhadap Gradien Tekanan pada Butanol 7%

Butanol	JG (m/s)	$J_L$ (m/s)	$\Delta P/\Delta Z$ (kPa/m)	Grafik
7%	0	0.033	2.770132185	<p>(<math>\Delta P/\Delta Z</math>) eksp, [kPa/m]</p> <p>— Pada <math>JG = 0</math> [m/s]</p>
		0.091	4.359998377	
		0.149	4.84714893	
		0.232	5.02857864	
		0.539	6.64809406	
		0.7	7.73981396	
		0.879	8.943258433	
		2.297	23.38753739	
		4.935	69.80271581	
7%	0.025	0.033	3.90858398	<p>(<math>\Delta P/\Delta Z</math>) eksp, [kPa/m]</p> <p>— Pada <math>JG = 0,025</math> [m/s]</p>
		0.091	4.691441397	
		0.149	5.12361325	
		0.232	5.77236191	
		0.539	6.954600313	
		0.7	7.83484857	
		0.879	11.07976999	
		2.297	23.76178526	
		4.935	70.09076492	
7%	0.066	0.033	4.272817868	<p>(<math>\Delta P/\Delta Z</math>) eksp, [kPa/m]</p> <p>— Pada <math>JG = 0,066</math> [m/s]</p>
		0.091	4.844596348	
		0.149	5.498842878	
		0.232	5.79906585	
		0.539	7.368511383	
		0.7	7.871370135	
		0.879	11.70044024	
		2.297	27.19231423	
		4.935	72.82870418	
7%	0.116	0.033	4.394949123	<p>(<math>\Delta P/\Delta Z</math>) eksp, [kPa/m]</p> <p>— Pada <math>JG = 0,116</math> [m/s]</p>
		0.091	5.015030317	
		0.149	5.592895725	
		0.232	6.011322903	
		0.539	7.734708795	
		0.7	8.637144885	
		0.879	12.11435131	
		2.297	27.80075618	
		4.935	74.12561245	

7%	0.207	0.033	4.598566665	<p>— Pada JG = 0,207 [m/s]</p>
		0.091	5.082968282	
		0.149	5.91687735	
		0.232	6.132668748	
		0.539	7.9000376	
		0.7	9.20146197	
		0.879	12.20918957	
		2.297	29.02874472	
		4.935	74.17096987	
7%	0.423	0.033	5.024847943	<p>— Pada JG = 0,423 [m/s]</p>
		0.091	5.25870377	
		0.149	6.019373355	
		0.232	6.540885595	
		0.539	8.568617863	
		0.7	9.779720083	
		0.879	13.05134544	
		2.297	37.85537865	
		4.935	83.86764174	
7%	0.871	0.033	5.415982122	<p>— Pada JG = 0,871 [m/s]</p>
		0.091	5.911575833	
		0.149	6.0857405	
		0.232	7.34710896	
		0.539	8.883174568	
		0.7	9.937783845	
		0.879	15.10028378	
		2.297	38.58620265	
		4.935	84.8623635	
7%	1.941	0.033	5.708547348	<p>— Pada JG = 1,941 [m/s]</p>
		0.091	5.91687735	
		0.149	6.289358043	
		0.232	7.412887048	
		0.539	10.44162436	
		0.7	13.09061594	
		0.879	20.08901174	
		2.297	49.88236198	
		4.935	87.29477827	

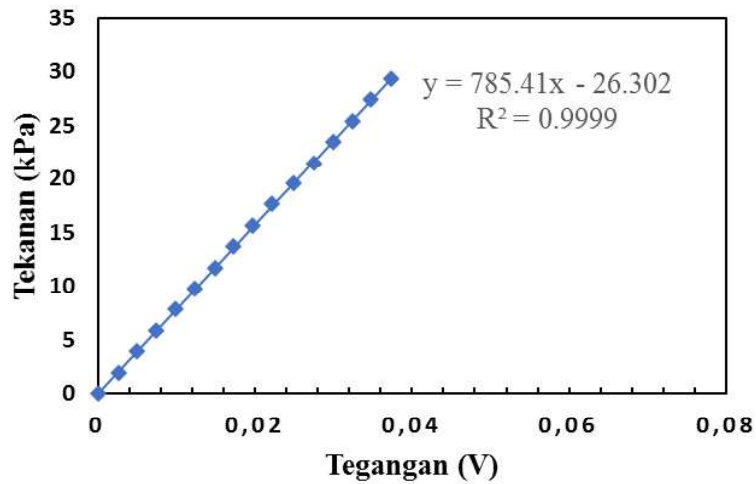
7%	3	0.033	6.822651433	<p>— Pada <math>JG = 3</math> [m/s]</p>
		0.091	6.068657833	
		0.149	7.63613984	
		0.232	8.05240714	
		0.539	12.89779778	
		0.7	16.26759939	
		0.879	27.83099447	
		2.297	59.75791097	
		4.935	116.4743306	
7%	4.238	0.033	7.200040938	<p>— Pada <math>JG = 4,238</math> [m/s]</p>
		0.091	8.45453706	
		0.149	9.148250443	
		0.232	9.839803948	
		0.539	14.72623226	
		0.7	18.39547143	
		0.879	28.68807313	
		2.297	64.63530707	
		4.935	142.7578799	
7%	7	0.033	8.417230085	<p>— Pada <math>JG = 7</math> [m/s]</p>
		0.091	9.23837624	
		0.149	10.15966217	
		0.232	12.32287766	
		0.539	16.49693911	
		0.7	20.18856246	
		0.879	38.82555635	
		2.297	79.04306446	
		4.935	157.6865605	
7%	9.62	0.033	9.956437333	<p>— Pada <math>JG = 9,62</math> [m/s]</p>
		0.091	10.75873365	
		0.149	10.83688194	
		0.232	12.71361914	
		0.539	19.25431727	
		0.7	24.29684582	
		0.879	39.31172514	
		2.297	80.93276092	
		4.935	160.5699969	



7%	22.6	0.033	11.01065391	<p>— Pada JG = 22,6 [m/s]</p>
		0.091	14.47607918	
		0.149	17.4390384	
		0.232	20.49074896	
		0.539	44.31635766	
		0.7	61.10174748	
		0.879	101.0060733	
		2.297	189.1526376	
		4.935	273.8013785	
7%	50	0.033	23.02310715	<p>— Pada JG = 50 [m/s]</p>
		0.091	31.90845048	
		0.149	39.40204729	
		0.232	46.47328987	
		0.539	48.58859536	
		0.7	65.31429401	
		0.879	159.5540691	
		2.297	330.8794794	
		4.935	359.4242241	
7%	58.05	0.033	54.91939266	<p>— Pada JG = 58,05 [m/s]</p>
		0.091	53.91976208	
		0.149	52.88164641	
		0.232	63.0358196	
		0.539	103.3846875	
		0.7	110.492648	
		0.879	203.9436751	
		2.297	339.4272928	
		4.935	362.6318386	
7%	66.3	0.033	129.5290229	<p>— Pada JG = 66,3 [m/s]</p>
		0.091	105.4275389	
		0.149	94.97785524	
		0.232	94.65838973	
		0.539	127.9126491	
		0.7	161.1431499	
		0.879	209.7384301	
		2.297	369.2088619	
		4.935	376.5826837	

Lampiran 3 Hasil Kalibrasi Alat Ukur

No.	h (m)	Beda Tekanan (Volt)	Tekanan (Pa)	Tekanan (Kpa)	$\rho$ (g/cm <sup>3</sup> )	g (m/s <sup>2</sup> )
1	0	0,033494959	0	0	996	9,81
2	0,2	0,036206748	1954,152	1,954152	996	9,81
3	0,4	0,038415708	3908,304	3,908304	996	9,81
4	0,6	0,04096836	5862,456	5,862456	996	9,81
5	0,8	0,043403393	7816,608	7,816608	996	9,81
6	1	0,045901646	9770,76	9,77076	996	9,81
7	1,2	0,048378447	11724,912	11,724912	996	9,81
8	1,4	0,05076496	13679,064	13,679064	996	9,81
9	1,6	0,053245502	15633,216	15,633216	996	9,81
10	1,8	0,055694268	17587,368	17,587368	996	9,81
11	2	0,058473666	19541,52	19,54152	996	9,81
12	2,2	0,060975207	21495,672	21,495672	996	9,81
13	2,4	0,063400916	23449,824	23,449824	996	9,81
14	2,6	0,065966688	25403,976	25,403976	996	9,81
15	2,8	0,068292817	27358,128	27,358128	996	9,81
16	3	0,070786566	29312,28	29,31228	996	9,81



Lampiran 4 Matriks Pengambilan Data Pola Aliran

JG(ml/menit)	JL(ml/menit)	3,979008	10,97242	17,96582	27,97363	64,99046	84,4032	105,9863	276,9631	595,0426
	JL	0,033	0,091	0,149	0,232	0,539	0,7	0,879	2,297	4,935
	JG									
0	0	1	2	3	4	5	6	7	8	9
3,0144	0,025	10	11	12	13	14	15	16	17	18
7,958016	0,066	19	20	21	22	23	24	25	26	27
13,98682	0,116	28	29	30	31	32	33	34	35	36
24,95923	0,207	37	38	39	40	41	42	43	44	45
51,00465	0,423	46	47	48	49	50	51	52	53	54
105,0217	0,871	55	56	57	58	59	60	61	62	63
234,038	1,941	64	65	66	67	68	69	70	71	72
361,728	3	73	74	75	76	77	78	79	80	81
511,0011	4,238	82	83	84	85	86	87	88	89	90
844,032	7	91	92	93	94	95	96	97	98	99
1159,941	9,620	100	101	102	103	104	105	106	107	108
2725,018	22,6	109	110	111	112	113	114	115	116	117
6028,8	50	118	119	120	121	122	123	124	125	126
6999,437	58,05	127	128	129	130	131	132	133	134	135
7994,189	66,3	136	137	138	139	140	141	142	143	144

Lampiran 5 Tabel Kecepatan Superfisial Terbentuknya Pola Aliran

NO	<i>Annular</i>		<i>Bubbly</i>		<i>Slug Annular</i>	
	J <sub>G</sub>	J <sub>L</sub>	J <sub>G</sub>	J <sub>L</sub>	J <sub>G</sub>	J <sub>L</sub>
1	50	0.033	0.025	0.879	1.941	0.033
2	50	0.091	0.025	2.297	1.941	0.091
3	50	0.149	0.025	4.935	1.941	0.149
4	58.05	0.033	0.066	0.879	1.941	0.232
5	58.05	0.091	0.066	2.297	3	0.033
6	58.05	0.149	0.066	4.935	3	0.091
7	66.3	0.033	0.116	0.879	3	0.149
8	66.3	0.091	0.116	2.297	3	0.232
9	66.3	0.149	0.116	4.935	4.238	0.033
10			0.207	0.879	4.238	0.091
11			0.207	2.297	4.238	0.149
12			0.207	4.935	4.238	0.232
13			0.423	0.7	7	0.033
14			0.423	0.879	7	0.091
15			0.423	2.297	7	0.149
16			0.423	4.935	7	0.232
17			0.871	0.539	9.62	0.033
18			0.871	0.7	9.62	0.091
19			0.871	0.879	9.62	0.149
20			0.871	2.297	9.62	0.232
21			0.871	4.935	22.6	0.033
22			1.941	0.539	22.6	0.091
23			1.941	0.7	22.6	0.149
24			1.941	0.879	22.6	0.232
25			1.941	2.297		
26			1.941	4.935		
27			0.423	0.539		

NO	<i>Plug</i>		<i>Churn</i>	
	J <sub>G</sub>	J <sub>L</sub>	J <sub>G</sub>	J <sub>L</sub>
1	0.025	0.033	50	0.232
2	0.025	0.091	3	0.879
3	0.025	0.149	3	2.297
4	0.025	0.232	3	4.935
5	0.025	0.539	4.238	0.539
6	0.025	0.7	4.238	0.7
7	0.066	0.033	4.238	0.879
8	0.066	0.091	4.238	2.297
9	0.066	0.149	4.238	4.935
10	0.066	0.232	7	0.539
11	0.066	0.539	7	0.7
12	0.066	0.7	7	0.879
13	0.116	0.033	7	2.297
14	0.116	0.091	7	4.935
15	0.116	0.149	9.62	0.539
16	0.116	0.232	9.62	0.7
17	0.116	0.539	9.62	0.879
18	0.116	0.7	9.62	2.297
19	0.207	0.033	9.62	4.935
20	0.207	0.091	22.6	0.539
21	0.207	0.149	22.6	0.7
22	0.207	0.232	22.6	0.879
23	0.207	0.539	22.6	2.297
24	0.207	0.7	22.6	4.935
25	0.423	0.033	50	0.539
26	0.423	0.091	50	0.7
27	0.423	0.149	50	0.879
28	0.423	0.232	50	2.297
29	0.871	0.033	50	4.935

30	0.871	0.091	58.05	0.232
31	0.871	0.149	58.05	0.539
32	0.871	0.232	58.05	0.7
33			58.05	0.879
34			58.05	2.297
35			58.05	4.935
36			66.3	0.232
37			66.3	0.539
38			66.3	0.7
39			66.3	0.879
40			66.3	2.297
41			66.3	4.935
42			3	0.539
43			3	0.7

Lampiran Hasil Uji Laboratorium Campuran Aquades dan Butanol

<b>Fluida %</b>	<b>SurfaceTension [mN/m]</b>	<b>Index</b>
Aquades	71.00	A
Aquades + 1% Butanol	55.07	B1
Aquades + 2% Butanol	46.03	B2
Aquades + 3% Butanol	42.9	B3
Aquades + 4% Butanol	36.50	B4
Aquades + 5% Butanol	33.10	B5
Aquades + 6% Butanol	30.85	B6
Aquades + 7% Butanol	30.4	B7
Aquades + 8% Butanol	26.57	B8
Aquades + 10% Butanol	25.03	B10
Aquades + 100% Butanol	24.37	B100

