LAMPIRAN

Lampiran 1 Data hasil percobaan pada pipa 1/2 inch

No	Q air (LPM)	ΔP (N/m^2)										ΔP rata-rata (N/m^2)
		Exp. 1	Exp. 2	Exp. 3	Exp. 4	Exp. 5	Exp. 6	Exp. 7	Exp. 8	Exp. 9	Exp. 10	
1	1.5	1867.824	1467.576	1600.992	1600.992	1734.408	1467.576	2001.24	1600.992	1600.992	1734.408	1667.7
2	2	2534.904	2534.904	2668.32	2668.32	2935.152	2801.736	3201.984	2801.736	2534.904	2534.904	2721.6864
3	2.5	4002.48	4802.976	4669.56	4135.896	4669.56	4402.728	5736.888	4669.56	4536.144	4402.728	4602.852
4	3	7071.048	7071.048	7204.464	6937.632	7071.048	6937.632	7337.88	7471.296	7337.88	7071.048	7151.0976
5	3.5	9205.704	9872.784	9605.952	9472.536	10006.2	9339.12	9072.288	10006.2	9472.536	9339.12	9539.244
6	4	11206.944	12674.52	12407.688	12140.856	12007.44	12674.52	12674.52	12541.104	12807.936	12674.52	12381.0048
7	4.5	15342.84	16410.168	15609.672	16009.92	15876.504	16276.752	16009.92	16143.336	16410.168	17744.328	16183.3608
8	5	19612.152	20012.4	19878.984	20546.064	20412.648	21213.144	19478.736	19612.152	20012.4	20412.648	20119.1328
9	5.5	22013.64	23347.8	23748.048	23881.464	23347.8	24148.296	23881.464	23614.632	23748.048	23748.048	23547.924
10	6	26282.952	28017.36	27617.112	27216.864	27750.528	27883.944	28551.024	28150.776	28150.776	28284.192	27790.5528
11	6.5	31753.008	32820.336	30685.68	31352.76	32286.672	32286.672	33087.168	33354	32553.504	32820.336	32300.0136
12	7	36022.32	38156.976	37356.48	36689.4	37890.144	38824.056	37223.064	36422.568	38557.224	37223.064	37436.5296
13	7.5	41892.624	43093.368	42559.704	42026.04	42559.704	42959.952	42959.952	42959.952	43893.864	43893.864	42879.9024
14	8	48029.76	49363.92	48430.008	48430.008	48163.176	48830.256	48830.256	49497.336	48830.256	48696.84	48710.1816
15	8.5	54700.56	55367.64	54433.728	54300.312	54833.976	54967.392	55634.472	55234.224	55901.304	55767.888	55114.1496
16	9	61371.36	63506.016	62705.52	61905.024	61771.608	62305.272	61905.024	64173.096	63639.432	62972.352	62625.4704

Lampiran 2 Data hasil percobaan pada pipa 1 inch

No	Q air (LPM)	ΔP (N/m^2)										ΔP rata-rata (N/m^2)
		Exp. 1	Exp. 2	Exp. 3	Exp. 4	Exp. 5	Exp. 6	Exp. 7	Exp. 8	Exp. 9	Exp. 10	
1	1.5	400.248	400.248	533.664	533.664	667.08	533.664	533.664	533.664	400.248	400.248	493.6392
2	2	667.08	667.08	800.496	800.496	933.912	933.912	800.496	667.08	800.496	800.496	787.1544
3	2.5	1067.328	1067.328	1067.328	1200.744	1067.328	1200.744	1200.744	933.912	1067.328	1200.744	1107.3528
4	3	1467.576	1734.408	266.832	1867.824	1867.824	1734.408	1600.992	1600.992	1734.408	1734.408	1560.9672
5	3.5	2268.072	2001.24	2134.656	2401.488	2668.32	2268.072	2401.488	2401.488	2401.488	2401.488	2334.78
6	4	3335.4	2668.32	2801.736	3735.648	3468.816	3068.568	3468.816	3335.4	3201.984	2935.152	3201.984
7	4.5	4135.896	3735.648	3602.232	4269.312	4002.48	4135.896	4002.48	4269.312	4002.48	3869.064	4002.48
8	5	4402.728	4669.56	4936.392	4802.976	4802.976	5470.056	4802.976	4802.976	5203.224	5203.224	4909.7088
9	5.5	6270.552	5870.304	6137.136	6137.136	6537.384	6403.968	6403.968	6137.136	4802.976	5736.888	6043.7448
10	6	7337.88	6937.632	6937.632	6937.632	6804.216	6937.632	6670.8	7204.464	6804.216	6670.8	6924.2904
11	6.5	8805.456	8004.96	8138.376	8271.792	7738.128	7871.544	7738.128	7738.128	8004.96	8004.96	8031.6432
12	7	9872.784	9205.704	9072.288	9472.536	9205.704	9339.12	9472.536	9339.12	9072.288	9472.536	9352.4616
13	7.5	10806.7	10940.11	10406.45	10806.7	11206.94	10673.28	10673.28	10673.28	10406.45	10806.7	10739.988
14	8	12541.1	12407.69	12140.86	12274.27	12541.1	12407.69	11874.02	11874.02	11607.19	12140.86	12180.881
15	8.5	14275.51	14275.51	13341.6	14008.68	13875.26	13741.85	13608.43	13741.85	13475.02	14008.68	13835.239
16	9	15876.5	15743.09	15743.09	16143.34	15876.5	15876.5	16543.58	15876.5	15476.26	15876.5	15903.187
17	9.5	17877.74	18544.82	17210.66	17744.33	18011.16	17610.91	17744.33	17610.91	17477.5	18144.58	17797.694
18	10	20812.9	19878.98	19478.74	20012.4	20145.82	20279.23	19478.74	19345.32	19478.74	19612.15	19852.301
19	10.5	22147.06	21880.22	21613.39	22547.3	21746.81	21746.81	21880.22	21613.39	21479.98	22013.64	21866.882
20	11	24948.79	24948.79	24281.71	24681.96	24548.54	24948.79	24014.88	24281.71	25082.21	24681.96	24641.935

Lampiran 3 Hasil perhitungan Cd pada pipa ½ inch

No	Debit	ΔP rata-rata (N/m^2)	v (m/s)	Re	Q_{ideal} (m^3/s)	Cd
1	1.5	1667.7	0.09104	1702.532	0.00002894	0.8640
2	2	2721.6864	0.12139	2270.043	0.00003697	0.9018
3	2.5	4602.852	0.15174	2837.554	0.00004808	0.8668
4	3	7151.0976	0.18209	3405.065	0.00005993	0.8345
5	3.5	9539.244	0.21244	3972.575	0.00006921	0.8430
6	4	12381.0048	0.24279	4540.086	0.00007885	0.8456
7	4.5	16183.3608	0.27313	5107.597	0.00009015	0.8321
8	5	20119.1328	0.30348	5675.108	0.00010052	0.8292
9	5.5	23547.924	0.33383	6242.619	0.00010874	0.8431
10	6	27790.5528	0.36418	6810.129	0.00011814	0.8467
11	6.5	32300.0136	0.39453	7377.640	0.00012736	0.8508
12	7	37436.5296	0.42487	7945.151	0.00013711	0.8510
13	7.5	42879.9024	0.45522	8512.662	0.00014674	0.8520
14	8	48710.1816	0.48557	9080.172	0.00015640	0.8527
15	8.5	55114.1496	0.51592	9647.683	0.00016637	0.8517
16	9	62625.4704	0.54627	10215.194	0.00017734	0.8460

Lampiran 4 Hasil perhitungan Cd pada pipa 1 inch

No	Debit	ΔP rata-rata (N/m^2)	v (m/s)	Re	Q_{ideal} (m^3/s)	Cd
1	1.5	493.6392	0.04120	1145.229	0.00003480	0.7186
2	2	787.1544	0.05493	1526.971	0.00004394	0.7587
3	2.5	1107.3528	0.06866	1908.714	0.00005212	0.7996
4	3	1560.9672	0.08239	2290.457	0.00006188	0.8082
5	3.5	2334.78	0.09612	2672.200	0.00007568	0.7710
6	4	3201.984	0.10985	3053.943	0.00008862	0.7524
7	4.5	4002.48	0.12359	3435.686	0.00009908	0.7571
8	5	4909.7088	0.13732	3817.429	0.00010974	0.7595
9	5.5	6043.7448	0.15105	4199.171	0.00012176	0.7530
10	6	6924.2904	0.16478	4580.914	0.00013032	0.7675
11	6.5	8031.6432	0.17851	4962.657	0.00014036	0.7720
12	7	9352.4616	0.19224	5344.400	0.00015146	0.7704
13	7.5	10739.988	0.20598	5726.143	0.00016231	0.7703
14	8	12180.8808	0.21971	6107.886	0.00017285	0.7715
15	8.5	13835.2392	0.23344	6489.629	0.00018422	0.7692
16	9	15903.1872	0.24717	6871.372	0.00019751	0.7596
17	9.5	17797.6944	0.26090	7253.114	0.00020894	0.7579
18	10	19852.3008	0.27464	7634.857	0.00022067	0.7554
19	10.5	21866.8824	0.28837	8016.600	0.00023160	0.7558
20	11	24641.9352	0.30210	8398.343	0.00024585	0.7459

Lampiran 5 Hasil perhitungan debit *orifice* pada pipa ½ Inch

No	Debit (LPM)	ΔP rata-rata (N/m^2)	Q ideal (m^3/s)	Debit (m^3/s)	Re Regresi	Cd Regresi	Q *orifice* (m^3/s)	Q *orifice* (LPM)	ΔQ
1	1.5	1667.7	0.00002894	0.000025005	1712.882931	0.874376309	0.00002530	1.517937753	0.017937753
2	2	2721.6864	0.00003697	0.00003334	2119.622792	0.867800345	0.00003208	1.924577819	0.075422181
3	2.5	4602.852	0.00004808	0.000041675	2709.467755	0.85885186	0.00004129	2.47701355	0.02298645
4	3	7151.0976	0.00005993	0.00005001	3357.545211	0.849822206	0.00005093	3.054998798	0.054998798
5	3.5	9539.244	0.00006921	0.000058345	3873.308771	0.843236345	0.00005836	3.501087076	0.001087076
6	4	12381.0048	0.00007885	0.00006668	4413.187919	0.836912469	0.00006599	3.958718317	0.041281683
7	4.5	16183.3608	0.00009015	0.000075015	5050.12135	0.830201299	0.00007484	4.489669609	0.010330391
8	5	20119.1328	0.00010052	0.00008335	5637.183495	0.824734168	0.00008290	4.972963047	0.027036953
9	5.5	23547.924	0.00010874	0.000091685	6104.523467	0.820874737	0.00008927	5.35488094	0.14511906
10	6	27790.5528	0.00011814	0.00010002	6639	0.816996321	0.00009652	5.789823302	0.210176698
11	6.5	32300.0136	0.00012736	0.000108355	7164.936061	0.813737588	0.00010364	6.217021164	0.282978836
12	7	37436.5296	0.00013711	0.00011669	7721.809543	0.810890152	0.00011118	6.669702047	0.330297953
13	7.5	42879.9024	0.00014674	0.000125025	8272.297738	0.808684955	0.00011867	7.118735777	0.381264223
14	8	48710.1816	0.00015640	0.00013336	8824.923873	0.807080804	0.00012623	7.572224971	0.427775029
15	8.5	55114.1496	0.00016637	0.000141695	9395.481891	0.806065442	0.00013410	8.044489217	0.455510783
16	9	62625.4704	0.00017734	0.00015003	10024.3751	0.805700594	0.00014288	8.571282329	0.428717671

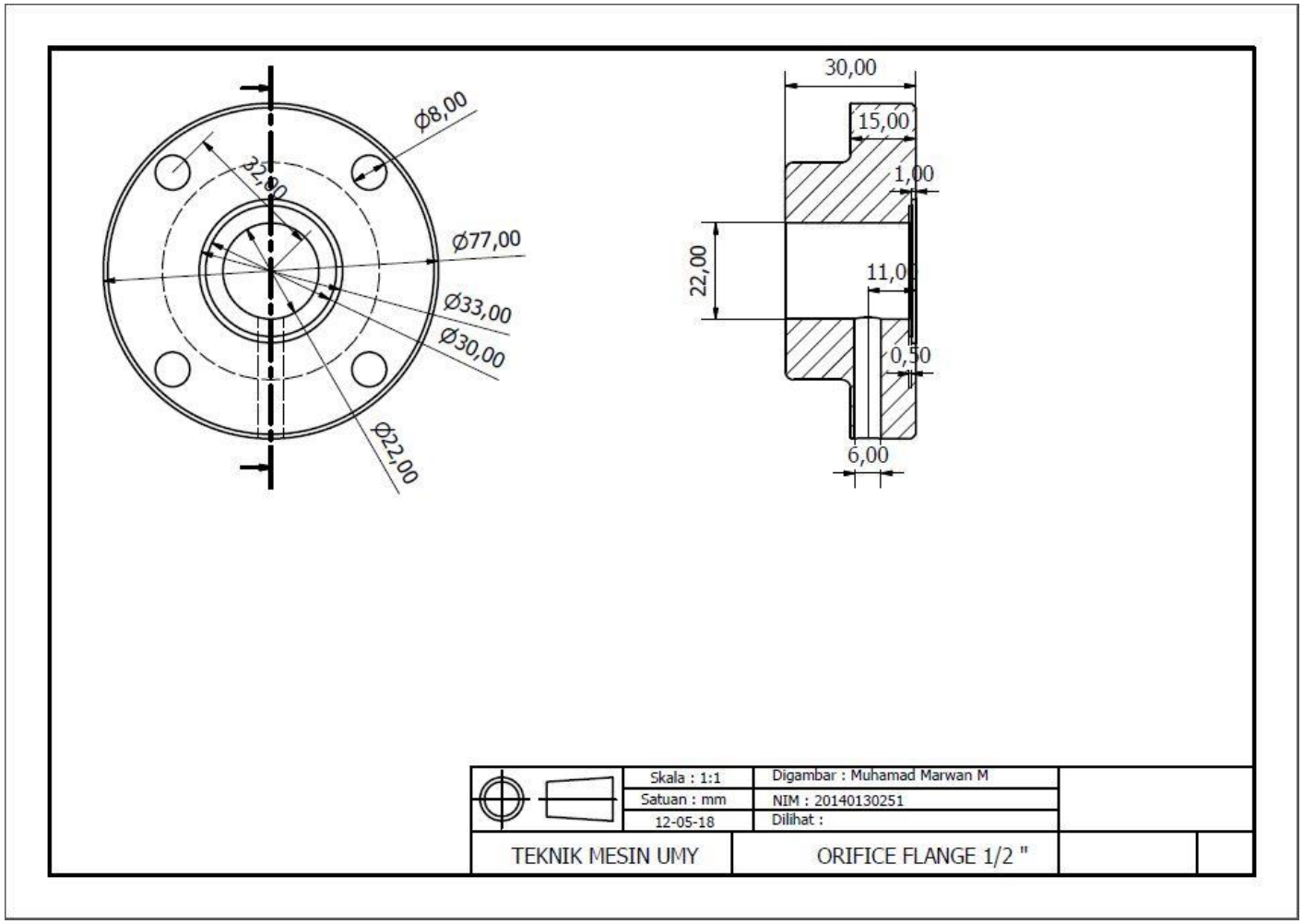
Lampiran 6 Hasil perhitungan debit *orifice* pada pipa 1 inch

No	Debit (LPM)	ΔP rata-rata (N/m^2)	Q_{ideal} (m^3/s)	Q (m^3/s)	Re Regresi	Cd Regresi	$Q_{orifice}$ (m^3/s)	$Q_{orifice}$ (LPM)	ΔQ
1	1.5	493.6392	0.00003480	0.000025005	824.0062519	0.753161076	0.00002621	1.572156162	0.072156162
2	2	787.1544	0.00004394	0.00003334	1369.478381	0.757419313	0.00003328	1.996500086	0.003499914
3	2.5	1107.3528	0.00005212	0.000041675	1725.735163	0.75987919	0.00003960	2.375694269	0.124305731
4	3	1560.9672	0.00006188	0.00005001	2105.857742	0.762223941	0.00004716	2.829322602	0.170677398
5	3.5	2334.78	0.00007568	0.000058345	2606.499169	0.764871154	0.00005788	3.472276167	0.027723833
6	4	3201.984	0.00008862	0.00006668	3056.759995	0.766823818	0.00006796	4.076694502	0.076694502
7	4.5	4002.48	0.00009908	0.000075015	3412.771352	0.768080705	0.00007610	4.565353758	0.065353758
8	5	4909.7088	0.00010974	0.00008335	3770.776911	0.769089011	0.00008440	5.062994644	0.062994644
9	5.5	6043.7448	0.00012176	0.000091685	4170.479096	0.769911895	0.00009374	5.623375485	0.123375485
10	6	6924.2904	0.00013032	0.00010002	4453.583154	0.770301429	0.00010039	6.022146759	0.022146759
11	6.5	8031.6432	0.00014036	0.000108355	4783.587698	0.770553166	0.00010815	6.487954678	0.012045322
12	7	9352.4616	0.00015146	0.00011669	5147.149562	0.770578347	0.00011671	7.001365708	0.001365708
13	7.5	10739.988	0.00016231	0.000125025	5501.110032	0.770348889	0.00012503	7.500536924	0.000536924
14	8	12180.8808	0.00017285	0.00013336	5844.273431	0.769887202	0.00013308	7.983060894	0.016939106
15	8.5	13835.2392	0.00018422	0.000141695	6213.244537	0.769128038	0.00014169	8.499531237	0.000468763
16	9	15903.1872	0.00019751	0.00015003	6643.753206	0.767898075	0.00015166	9.09805713	0.09805713
17	9.5	17797.6944	0.00020894	0.000158365	7013.513668	0.766545763	0.00016016	9.607777896	0.107777896
18	10	19852.3008	0.00022067	0.0001667	7392.378656	0.764876524	0.00016879	10.12511	0.12511
19	10.5	21866.8824	0.00023160	0.000175035	7744.849897	0.763065799	0.00017672	10.60128276	0.10128276
20	11	24641.9352	0.00024585	0.00018337	8204.26928	0.760332658	0.00018693	11.2135738	0.213573797

Lampiran 7 Hasil perhitungan debit prediksi

No	Q aktual (LPM)	Q *orifice* (LPM)	Q ideal Pipa 1" (m3/s)	Cd Pipa 1/2"	Debit Prediksi Pipa 1" (LPM)	ΔQ (LPM)	ΔQ (%)
1	1.5	1.572156162	0.00003480	0.874376309	1.82518208	0.32518208	22%
2	2	1.996500086	0.00004394	0.867800345	2.28745615	0.28745615	14%
3	2.5	2.375694269	0.00005212	0.85885186	2.68512346	0.18512346	7%
4	3	2.829322602	0.00006188	0.849822206	3.15448131	0.15448131	5%
5	3.5	3.472276167	0.00007568	0.843236345	3.82802966	0.32802966	9%
6	4	4.076694502	0.00008862	0.836912469	4.44930945	0.44930945	11%
7	4.5	4.565353758	0.00009908	0.830201299	4.93458903	0.43458903	10%
8	5	5.062994644	0.00010974	0.824734168	5.42931262	0.42931262	9%
9	5.5	5.623375485	0.00012176	0.820874737	5.99560405	0.49560405	9%
10	6	6.022146759	0.00013032	0.816996321	6.38720320	0.38720320	6%
11	6.5	6.487954678	0.00014036	0.813737588	6.85156174	0.35156174	5%
12	7	7.001365708	0.00015146	0.810890152	7.36763306	0.36763306	5%
13	7.5	7.500536924	0.00016231	0.808684955	7.87379777	0.37379777	5%
14	8	7.983060894	0.00017285	0.807080804	8.36872620	0.36872620	5%
15	8.5	8.499531237	0.00018422	0.806065442	8.90772156	0.40772156	5%
16	9	9.09805713	0.00019751	0.805700594	9.54594141	0.54594141	6%

Lampiran 8 *Flange* ½ inch



Lampiran 9 *Flange* 1 inch