

LAMPIRAN

Lampiran 1. Hasil data pengujian dan sensor *nozzle* bintang delapan dengan variasi diameter hidrolis 6mm pada tekanan *motive flow* 170, 27Kpa

1. Hasil pengujian pada tekanan *motive flow* 170, 27Kpa

NO	Pm	Ps		Qm	Qs	Pd		ϕ_s	η
	KPa	cmHg	KPa	lpm	slpm	mmHg	KPa		%
1	170, 27	11	86,65	28	13,44	764,49	101,92	0,48	9,87%
2		15	81,32	30	13,62	763,13	101,74	0,454	12,07%
3		20	74,66	33	2,8	76,53	101,66	0,084	2,85%

2. Hasil data sensor pada tekanan *motive flow* 170,27Kpa

a. Tekanan *suction* 11 cmHg

Sensor	Tegangan rata – rata (Volt)	<i>Gauge pressure</i> (mmHg)	<i>Absolute pressure</i> (cmHg)
1	0,900489237	113,9248405	646,0751595
2	0,899178082	110,7957041	649,2042959
3	0,858258317	106,1333548	653,8666452
4	0,868767123	108,7131945	651,2868055
5	0,884324853	115,4428689	644,5571311
6	0,848727984	106,4107984	653,5892016
7	0,723209393	89,29801605	670,701984
8	0,27254902	18,91282353	741,0871765
9	0,174588235	-4,199491765	764,1994918
10	0,120862745	-13,15258745	773,1525875
11	0,152078431	-4,49283216	764,4928322

b. Tekanan *suction* 15 cmHg

Sensor	Tegangan rata – rata (Volt)	<i>Gauge pressure</i> (mmHg)	<i>Absolute pressure</i> (mmHg)
1	1,187755906	160,2178642	599,7821358
2	1,18435039	156,697039	603,302961

3	1,123740616	148,82018	611,17982
4	1,06435897	140,205438	619,794562
5	0,62362919	733,4969369	686503063
6	0,38497041	31,5974272	728,402573
7	0,371005917	32,60382249	727,3961775
8	0,21248521	9,0815787	750,918421
9	0,189723866	-1,75539014	761,7553901
10	0,138086785	-10,37331637	770,3733164
11	0,160493097	-3,135883235	763,1358832

c. Tekanan *suction* 20 cmHg

sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmHg)	<i>Absolute pressure</i> (mmHg)
1	1,464484127	204,8126171	555,187389
2	0,896699801	110,3968	649,603
3	0,4166998	35,13516103	724,864839
4	0,376918489	29,52064592	730,4793541
5	0,370934394	32,83834394	727,1616561
6	0,379184891	30,66410656	729,3358934
7	0,381510934	34, 29481511	725,7051849
8	0, 23345945	12,51440915	747,4853909
9	0,198250497	0,378509742	760,3785097
10	0,139085487	-10, 21216581	770,2121658
11	0,164194831	-2,538941551	762,5389416

Lampiran 2. Hasil data pengujian dan sensor *nozzle* bintang delapan dengan variasi diameter hidrolis 6mm pada tekanan *motive flow* 201,32 Kpa

1. Hasil pengujian pada tekanan *motive flow* 201,32 KPa

No	Pm	Ps		Qm	Qs	Pd		ϕ_s	η
	KPa	cmHg	KPa	lpm	slpm	mmHg	Kpa		%
1	201,32	10	87,99	34	18,93	760,83	101,44	0,56	6,97%
2		15	81,33	35	17,18	761,44	101,52	0,49	8,87%
3		20	74,66	37	14,82	761,56	101,53	0,40	9,21%
4		25	67,99	39	7	76595	102,12	0,19	5,42%

2. Hasil data sensor pada tekanan *motive flow* 201,32 Kpa

a. Tekanan *suction* 10 cmHg

Sensor	Tegangan rata – rata (Volt)	<i>Gauge pressure</i> (mmHg)	<i>Absolute pressure</i> (mmHg)
1	0,882727273	111,0625	648,9375
2	0,88719697	108,8672242	651,1327758
3	0,839393939	103,1001515	656,8998485
4	0,855974684	106,6534838	653,3465162
5	0,870531646	113,2235418	646,7764582
6	0,861974684	108,5477559	651,4522441
7	0,810227848	103,3053767	656,6946233
8	0,428278481	44,40262177	715,5973782
9	0,280506329	12,90416203	747,095838
10	0,170455696	5,150268861	765,1502689
11	0,174810127	0,827118987	760,827119

b. Tekanan *suction* 15 cmHg

Sensor	Tegangan rata – rata (Volt)	<i>Gauge pressure</i> (mmHg)	<i>Absolute pressure</i> (mmHg)
1	1,20566787	163,1043773	596,8956227
2	1,203375451	159,7593126	600,2406874
3	1,160072202	154,6620094	605,3379906

4	1,170649819	157,3193274	602,6806726
5	1,161353791	160,0168249	599,9831751
6	1,027093863	135,1847819	624,8152181
7	0,835985533	107,4515913	652,5484087
8	0,304575045	24,1548434	735,8451566
9	0,19761302	-0,481449548	760,4814495
10	0,134050633	-11,02458987	771,0245899
11	0,170994575	-1,442414828	761,4424148

c. Tekanan *suction* 20 cmHg

Sensor	Tegangan rata – rata (Volt)	<i>Gauge pressure</i> (mmHg)	<i>Absolute pressure</i> (mmHg)
1	1,501171875	210,7248477	549,2751523
2	1,495996094	206,8595313	553,1404688
3	1,438144531	199,3732592	560,6267408
4	1,374765625	190,1840133	569,8159867
5	0,888867188	116,1737305	643,8262695
6	0,458727984	43,49599843	716,5040016
7	0,413091977	39,37841546	720,6215845
8	0,249412916	15,12590607	744,8740939
9	0,200998043	0,065163992	759,934836
10	0,143757339	-9,458315851	769,4583159
11	0,170273973	-1,558619178	761,5586192

d. Tekanan *suction* 25 cmHg

Sensor	Tegangan rata – rata (Volt)	<i>Gauge pressure</i> (mmHg)	<i>Absolute pressure</i> (mmHg)
1	1,797159763	258,4232959	501,5767041
2	1,445364892	198,7099329	561,2900671
3	0,66504931	75,0672785	684,9327215
4	0,433806706	38,68021775	721,3197822
5	0,406252465	38,5210217	721,4789783

6	0,419250493	37,12748955	722,8725105
7	0,426660079	41,56247292	718,4375271
8	0,267687747	18,11713043	741,8828696
9	0,215810277	2,457043478	757,5429565
10	0,15444664	-7,733490119	767,7334901
11	0,143023715	-5,952995652	765,9529957

Lampiran 3. Hasil data pengujian dan sensor *nozzle* bintang delapan dengan variasi diameter hidrolik 6mm pada tekanan *motive flow* 218,53 Kpa

1. Hasil pengujian pada tekanan *motive flow* 218,53 KPa

NO	Pm	F		Qm	Qs	Pd		ϕ_s	η %
	KPa	cmHg	KPa	lpm	slpm	mmHg	KPa		
1	218,53	10	87,99	34	23,08	761,00	101,46	0,68	7,26%
2		15	81,33	35	20,41	762,67	101,68	0,58	9,06%
3		20	74,66	36	17,2	761,30	101,50	0,48	9,36%
4		25	67,99	38	13,36	761,47	101,52	0,35	8,19%
5		30	61,33	40	8,75	763,93	101,85	0,22	5,83%

2. Hasil data sensor pada tekanan *motive flow* 218,53 Kpa

a. Tekanan *suction* 10 cmhg

Sensor	Tegangan rata – rata (Volt)	Gauge pressure (mmHg)	Absolute pressure (mmHg)
1	0,864015748	108,0471378	651,9528622
2	0,865255906	105,3355906	654,6644094
3	0,829468504	101,5042407	658,4957593
4	0,832913386	102,9403843	657,0596157
5	0,852047244	110,2494016	649,7505984
6	0,84476378	105,7712929	654,2287071
7	0,81242126	103,6584502	656,3415498
8	0,482027559	53,20027087	706,7997291
9	0,33484252	21,67837008	738,3216299

10	0,173799213	-4,610759055	764,6107591
11	0,173767258	-0,995291913	760,9952919

b. Tekanan *suction* 15 cmhg

Sensor	Tegangan rata – rata (Volt)	<i>Gauge pressure</i> (mmHg)	<i>Absolute pressure</i> (mmHg)
1	1,178023715	158,6495217	601,3504783
2	1,177252964	155,5546372	604,4453628
3	1,137865613	151,0914119	608,9085881
4	1,145623762	153,289882	606,710118
5	1,154059406	158,8431584	601,1568416
6	1,098633663	146,7255826	613,2744174
7	0,953821782	126,4196923	633,5803077
8	0,38790099	37,79363406	722,2063659
9	0,215643564	2,430122772	757,5698772
10	0,131108911	-11,49926614	771,4992661
11	0,163405941	-2,66615802	762,666158

c. Tekanan *suction* 20 cmhg

Sensor	Tegangan rata – rata (Volt)	<i>Gauge pressure</i> (mmHg)	<i>Absolute pressure</i> (mmHg)
1	1,437821782	200,5159802	559,4840198
2	1,439386139	197,7475929	562,2524071
3	1,398732673	193,0362265	566,9637735
4	1,393544554	193,2076087	566,7923913
5	1,400415842	198,4819089	561,5180911
6	1,200118812	163,0971667	596,9028333
7	0,909920635	119,3529246	640,6470754
8	0,909920635	27,18622857	732,8137714
9	0,209146825	1,381029365	758,6189706
10	0,140694444	-9,952544444	769,9525444
11	0,171904762	-1,295638095	761,2956381

d. Tekanan *suction* 25 cmhg

Sensor	Tegangan rata –rata (Volt)	<i>Gauge pressure</i> (mmHg)	<i>Absolute pressure</i> (mmHg)
1	1,825915033	263,0572075	496,9427925
2	1,824019608	259,6581961	500,3418039
3	1,73248366	246,7000477	513,2999523
4	1,509379085	211,8581265	548,1418735
5	0,629346405	74,4168366	685,5831634
6	0,47130719	45,52527582	714,4747242
7	0,478169935	49,85401438	710,1459856
8	0,299836601	21,14769771	738,8523023
9	0,247836066	7,628567869	752,3714321
10	0,188983607	-2,160605246	762,1606052
11	0,170819672	-1,470619672	761,4706197

e. Tekanan *suction* 30 cmhg

Sensor	Tegangan rata –rata (Volt)	<i>Gauge pressure</i> (mmHg)	<i>Absolute pressure</i> (mmHg)
1	2,04201581	297,8818478	462,1181522
2	1,801462451	256,027396	503,972604
3	1,020533597	132,225597	627,774403
4	0,563952569	59,63500316	700,3649968
5	0,473023715	49,26451581	710,7354842
6	0,489130435	48,40052174	711,5994783
7	0,501343874	53,58432332	706,4156767
8	0,334604743	29,07010435	730,9298957
9	0,273063241	11,70225217	748,2977478
10	0,209980198	1,227404752	758,7725952
11	0,155544554	-3,933885149	763,9338851

Lampiran 4. Hasil data pengujian dan sensor *nozzle* bintang delapan dengan variasi diameter hidrolik 8mm pada tekanan *motive flow* 170,27 Kpa

1. Hasil pengujian pada tekanan *motive flow* 170, 27Kpa

NO	Pm	Ps		Qm	Qs	Pd		ϕ_s	η
	KPa	cmHg	KPa	lpm	slpm	mmHg	KPa		%
1	170,27	10	87,99	55	34,5	767,92	102,38	0,62	12,31%
2		15	81,32	56	30,28	767,82	102,36	0,54	14,90%
3		20	74,66	58	24,62	766,27	102,16	0,42	14,59%
4		25	67,99	60	18,66	764,79	101,96	0,31	12,54%
5		30	61,32	61	11,41	762,36	101,64	0,18	8,44%
6		35	54,66	63	9,6	761,38	101,50	0,15	7,50%
7		40	47,99	64	4,8	760,49	101,39	0,07	3,91%
8		42	45,32	66	2,81	759,70	101,28	0,04	2,25%

2. Hasil data sensor pada tekanan *motive flow* 170,27 Kpa

a. Tekanan *suction* 10 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	0,845346154	105,0385327	654,9614673
2	0,866480769	105,5327446	654,4672554
3	0,811403846	98,59962442	661,4003756
4	0,778807692	94,22882654	665,7711735
5	0,757288462	95,00271346	664,9972865
6	0,676820809	78,67873295	681,3212671
7	0,643815029	76,5179052	683,4820948
8	0,455761079	48,90097341	711,0990266
9	0,378458574	28,72149056	731,2785094
10	0,196743738	-0,908430443	760,9084304
11	0,130770713	-7,928914836	767,9289148

b. Tekanan *suction* 15 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	1,172470588	157,7546353	602,2453647
2	1,185137255	156,8236925	603,1763075
3	1,144705882	152,1912588	607,8087412
4	1,109588235	147,4878018	612,5121982
5	1,060314342	143,7595776	616,2404224
6	0,931964637	119,8385352	640,1614648
7	0,845284872	108,9485059	651,0514941
8	0,512082515	58,11966601	701,880334
9	0,354361493	24,83029391	735,1697061
10	0,187013752	-2,478460904	762,4784609
11	0,131414538	-7,825091552	767,8250916

c. Tekanan *suction* 20 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	1,480078125	207,3255898	552,6744102
2	1,488203125	205,605175	554,394825
3	1,450859375	201,4176789	558,5823211
4	1,42078125	197,5929891	562,4070109
5	1,351409002	190,5967084	569,4032916
6	1,183268102	160,3788102	599,6211898
7	1,004970646	134,6531249	625,3468751
8	0,464481409	50,32831703	709,671683
9	0,312446184	18,06180978	741,9381902
10	0,192074364	-1,661880626	761,6618806
11	0,140998043	-9,903555773	769,9035558

d. Tekanan *suction* 25 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	1,74515748	250,043128	509,956872
2	1,744940945	246,9296945	513,0703055
3	1,706515748	242,5246671	517,4753329
4	1,672893701	238,1856148	521,8143852
5	1,577559055	226,984252	533,015748
6	1,310688976	180,9343457	579,0656543
7	0,914389764	120,0723203	639,9276797
8	0,426417323	44,0979874	715,9020126
9	0,305452756	16,93251102	743,067489
10	0,206535433	0,67155748	759,3284425
11	0,150197239	-4,796193294	764,7961933

e. Tekanan *suction* 30 cmhg

Sensor	Tegangan rata – rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	2,103156863	307,7347284	452,2652716
2	2,084302554	301,5533391	458,4466609
3	2,058941176	299,1911518	460,8088482
4	2,009529412	292,3873306	467,6126694
5	1,675098039	242,6782745	517,3217255
6	0,882	111,77824	648,22176
7	0,765127701	96,04560609	663,9543939
8	0,463045187	50,09323615	709,9067639
9	0,364675835	26,49585383	733,5041462
10	0,269646365	10,85513752	749,1448625
11	0,16524558	-2,369497839	762,3694978

f. Tekanan *suction* 35 cmhg

Sensor	Tegangan rata – rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	2,440916179	362,1646423	397,8353577
2	2,37668616	348,6154043	411,3845957
3	1,987504873	285,9727844	474,0272156
4	1,045234375	137,1261867	622,8738133
5	0,698242188	85,50216797	674,497832
6	0,718339844	85,37658359	674,6234164
7	0,749433594	93,51932559	666,4806744
8	0,474472656	51,96368437	708,0363156
9	0,377421875	28,55408437	731,4459156
10	0,280859375	12,66446875	747,3355313
11	0,171367188	-1,382327344	761,3823273

g. Tekanan *suction* 40 cmhg

Sensor	Tegangan rata–rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	2,689173228	402,1712657	357,8287343
2	2,005137795	288,8109795	471,1890205
3	0,886003937	110,594573	649,405427
4	0,679389764	78,22154587	681,7784541
5	0,703503937	86,34878346	673,6512165
6	0,733681102	87,85143543	672,1485646
7	0,764043393	95,87106489	664,1289351
8	0,490887574	54,65047811	705,3495219
9	0,395285996	31,43878264	728,5612174
10	0,295936884	15,09737554	744,9026245
11	0,176844181	-0,499107298	760,4991073

h. Tekanan *suction* 42 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	2,782558594	417,2203174	342,7796826
2	1,749824219	247,7157063	512,2842938
3	0,804707031	97,52284355	662,4771564
4	0,678398438	78,06193242	681,9380676
5	0,713183594	87,90624023	672,0937598
6	0,744042969	89,52301172	670,4769883
7	0,770449219	96,90221074	663,0977893
8	0,500625	56,2443	703,7557
9	0,40484375	32,98216875	727,0178313
10	0,305225049	16,59611389	743,4038861
11	0,181741683	0,290663796	759,7093362

Lampiran 5. Hasil data pengujian dan sensor *nozzle* bintang delapan dengan variasi diameter hidrolisk 8mm pada tekanan *motive flow* 201,32 Kpa

1. Hasil pengujian pada tekanan *motive flow* 201,32 KPa

NO	Pm	Ps		Qm	Qs	Pd		ϕ_s	η %
	KPa	cmHg	KPa	lpm	slpm	mmHg	KPa		
1	201,32	10	87,99	58	36,15	766,38	102,17	0,62	8,27%
2		15	81,32	60	28,3	765,23	102,02	0,47	8,76%
3		20	74,66	62	23,38	762,83	101,70	0,37	8,74%
4		25	67,99	63	20,05	762,67	101,68	0,31	8,74%
5		30	61,32	64	16,28	761,22	101,48	0,25	7,87%
6		35	54,66	65	13,49	761,10	101,47	0,20	7,03%
7		40	47,99	66	11,6	759,85	101,30	0,17	6,30%
8		45	41,32	68	8,92	759,53	101,26	0,13	4,86%
9		50	34,66	70	7,22	75737	100,97	0,10	3,81%
10		55	27,99	72	0,71	756,40	100,84	0,00	0,35%

2. Hasil data sensor pada tekanan *motive flow* 201,32 Kpa

a. Tekanan *suction* 10 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	0,924510557	117,7958762	642,2041238
2	0,949942418	118,9667317	641,0332683
3	0,884241843	110,3112459	649,6887541
4	0,873474088	109,471063	650,528937
5	0,894153846	117,0243538	642,9756462
6	0,915096154	117,1173115	642,8826885
7	0,934230769	123,2661269	636,7338731
8	0,806173077	106,2564092	653,7435908
9	0,695384615	79,89870769	680,1012923
10	0,239557692	6,000029231	753,9999708
11	0,140326923	-6,387880385	766,3878804

b. Tekanan *suction* 15 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	1,208624754	163,5808792	596,4191208
2	1,233084479	164,5412778	595,4587222
3	1,172102161	156,5963065	603,4036935
4	1,160451866	155,677355	604,322645
5	1,177524558	162,6187014	597,3812986
6	1,2	163,078	596,922
7	1,210846457	167,7929541	592,2070459
8	0,99226378	136,7157354	623,2842646
9	0,651633858	72,83383543	687,1661646
10	0,21261811	1,653058268	758,3469417
11	0,1475	-5,23115	765,23115

c. Tekanan suction 20 cmhg

Sensor	Tegangan rata-rata (Volt)	Gauge pressure (mmhg)	Absolute pressure (mmhg)
1	1,48785575	208,5789542	551,4210458
2	1,520760234	210,8455673	549,1544327
3	1,461793372	203,1757563	556,8242437
4	1,449356725	202,1939263	557,8060737
5	1,462475634	208,4673294	551,5326706
6	1,477641326	207,8670986	552,1329014
7	1,475546875	210,4017805	549,5982195
8	1,104433594	155,0756906	604,9243094
9	0,618574219	67,49536484	692,5046352
10	0,2590625	9,147325	750,852675
11	0,162363281	-2,834297266	762,8342973

d. Tekanan suction 25 cmhg

Sensor	Tegangan rata-rata (Volt)	Gauge pressure (mmhg)	Absolute pressure (mmhg)
1	1,786372549	256,6849363	503,3150637
2	1,817235294	258,5661929	501,4338071
3	1,765960784	252,0828345	507,9171655
4	1,751392157	250,8246512	509,1753488
5	1,758411765	256,0834529	503,9165471
6	1,769352941	254,9260165	505,0739835
7	1,752921569	255,0507849	504,9492151
8	1,122294118	157,9991012	602,0008988
9	0,527647059	52,81244706	707,1875529
10	0,261137255	9,482107451	750,5178925
11	0,163379175	-2,670474263	762,6704743

e. Tekanan *suction* 30 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	2,094911937	306,4060587	453,5939413
2	2,123209393	307,815784	452,184216
3	2,085420744	303,4488014	456,5511986
4	2,071389432	302,3474125	457,6525875
5	2,071980392	306,5366451	453,4633549
6	2,078176471	304,7454282	455,2545718
7	2,043490196	301,8236169	458,1763831
8	1,052392157	146,5575482	613,4424518
9	0,452705882	40,71094588	719,2890541
10	0,265588235	10,20031765	749,7996824
11	0,172372549	-1,220202745	761,2202027

f. Tekanan *suction* 35 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	2,438949416	361,8476984	398,1523016
2	2,465155642	362,8554521	397,1445479
3	2,439961089	360,4553436	399,5446564
4	2,424163424	359,1475529	400,8524471
5	2,41122807	361,1215965	398,8784035
6	2,42245614	360,2846246	399,7153754
7	2,349844055	351,1373975	408,8626025
8	0,894288499	120,6791415	639,3208585
9	0,410253411	33,85572086	726,1442791
10	0,272768031	11,35884951	748,6411505
11	0,173060429	-1,109275244	761,1092752

g. Tekanan *suction* 40 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	2,705185185	404,7515926	355,2484074
2	2,721793372	404,1638612	355,8361388
3	2,717095517	405,0157881	354,9842119
4	2,698576998	403,3308825	356,6691175
5	2,686003899	405,3330273	354,6669727
6	2,688479532	403,1995181	356,8004819
7	2,56748538	386,1711216	373,8288784
8	0,780292398	102,0202596	657,9797404
9	0,403723197	32,80122183	727,1987782
10	0,280371094	12,58567969	747,4143203
11	0,180839844	0,145233203	759,8547668

h. Tekanan *suction* 45 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	3,054921875	461,1116602	298,8883398
2	3,053307241	457,5243335	302,4756665
3	3,080626223	463,4678904	296,5321096
4	3,0562818	460,9249327	299,0750673
5	3,037201566	461,8407319	298,1592681
6	3,010763209	455,1903209	304,8096791
7	2,709921722	409,0990996	350,9009004
8	0,640567515	79,1500908	680,8499092
9	0,405812133	33,13854325	726,8614568
10	0,289706458	14,09203405	745,9079659
11	0,182798434	745,9079659	759,5389245

i. Tekanan *suction* 50 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	3,345096899	507,8733653	252,1266347
2	3,318178295	500,1579783	259,8420217
3	3,369748062	509,9557909	250,0442091
4	3,346860465	507,7110035	252,2889965
5	3,328682171	508,7399612	251,2600388
6	3,233436893	491,1120396	268,8879604
7	2,464485437	369,5912208	390,4087792
8	0,588951456	70,70157437	689,2984256
9	0,412485437	34,21614835	725,7838517
10	0,297281553	15,31435146	744,6856485
11	0,19623301	2,627535146	757,3724649

j. Tekanan *suction* 55 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	3,660331384	558,6734025	201,3265975
2	2,840467836	423,2657029	336,7342971
3	1,147446394	152,6319057	607,3680943
4	0,803547758	98,21222456	661,7877754
5	0,811695906	103,7568713	656,2431287
6	0,848945313	106,4458578	653,5541422
7	0,886308594	115,5520943	644,4479057
8	0,564667969	66,72685313	693,2731469
9	0,438925781	38,48573516	721,5142648
10	0,32359375	19,5600875	740,4399125
11	0,202246094	3,597205078	756,4027949

Lampiran 6. Hasil data pengujian dan sensor *nozzle* bintang delapan dengan variasi diameter hidrolik 8mm pada tekanan *motive flow* 218,53 Kpa

1. Hasil data pengujian pada tekanan *motive flow* 218,53 kPa

NO	Pm	F		Qm	Qs	Pd		ϕ_s	η
	KPa	cmHg	KPa	lpm	slpm	mmHg	KPa		%
1	218,53	11	86,65	62	47,08	762,81	101,70	0,75	9,01%
2		15	81,32	64	38,85	763,88	101,84	0,60	9,52%
3		20	74,66	65	32,16	759,63	101,27	0,49	9,61%
4		25	67,99	65	25,82	758,00	101,05	0,39	9,11%
5		30	61,32	66	21,85	757,54	100,99	0,33	8,62%
6		35	54,66	668	18,34	757,92	101,04	0,02	0,78%
7		40	47,99	69	13,8	757,52	100,99	0,2	6,08%
8		45	41,32	69	11,09	757,55	100,99	0,16	5,05%
9		50	34,66	70	8,49	757,48	100,99	0,12	3,82%
10		55	27,99	73	5,90	756,54	100,86	0,08	2,46%
11		60	21,33	75	1,27	756,29	100,83	0,01	0,48%

2. Hasil data sensor pada tekanan *motive flow* 218,53 Kpa

a. Tekanan *suction* 10 cmhg

Sensor	Tegangan rata-rata (Volt)	Gauge pressure (mmhg)	Absolute pressure (mmhg)
1	0,963333333	124,0521667	635,9478333
2	0,999688109	126,9737981	633,0262019
3	0,949805068	120,8531569	639,1468431
4	0,924814815	117,7374333	642,2625667
5	0,9534375	126,5630938	633,4369063
6	0,969140625	125,8357656	634,1642344
7	0,989335938	132,1364059	627,8635941
8	0,864453125	115,7956875	644,2043125
9	0,804257812	97,47955156	662,5204484
10	0,312246094	17,72902969	742,2709703
11	0,162480469	-2,815399609	762,8153996

b. Tekanan *suction* 15 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	1,18423301	159,6501495	600,3498505
2	1,223980583	163,0759146	596,9240854
3	1,173864078	156,879605	603,120395
4	1,173864078	154,2008429	605,7991571
5	1,174368932	162,1109612	597,8890388
6	1,191011673	161,6280031	598,3719969
7	1,210291829	167,7036757	592,2963243
8	1,038949416	144,3572405	615,6427595
9	0,81311284	98,90946148	661,0905385
10	0,244085603	6,730652918	753,2693471
11	0,155817121	-3,889931128	763,8899311

c. Tekanan *suction* 20 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	1,529241245	215,2482267	544,7517733
2	1,565894942	218,1104498	541,8895502
3	1,520466926	212,609877	547,390123
4	1,495622568	209,6431897	550,3568103
5	1,514027237	216,7619825	543,2380175
6	1,531734893	216,5934729	543,4065271
7	1,542300195	221,1470624	538,8529376
8	1,241832359	177,5651205	582,4348795
9	0,760506823	90,41464172	669,5853583
10	0,262768031	9,745249513	750,2547505
11	0,182183236	0,361868616	759,6381314

d. Tekanan suction 25 cmhg

Sensor	Tegangan rata-rata (Volt)	Gauge pressure (mmhg)	Absolute pressure (mmhg)
1	1,831673228	263,9851407	496,0148593
2	1,863090551	265,9470551	494,0529449
3	1,825472441	261,6517138	498,3482862
4	1,798051181	258,3372207	501,6627793
5	1,813858268	265,0047953	494,9952047
6	1,830767717	264,833448	495,166552
7	1,826252465	266,8548594	493,1451406
8	1,304812623	187,8737302	572,1262698
9	0,637771203	70,59529389	689,4047061
10	0,263333333	9,836466667	750,1635333
11	0,192307692	1,994538462	758,0054615

e. Tekanan suction 30 cmhg

Sensor	Tegangan rata-rata (Volt)	Gauge pressure (mmhg)	Absolute pressure (mmhg)
1	2,086434109	305,0398566	454,9601434
2	2,115825243	306,6272311	453,3727689
3	2,081106796	302,7551617	457,2448383
4	2,054524272	299,631953	460,368047
5	2,067087379	305,7493592	454,2506408
6	2,079708738	304,9926136	455,0073864
7	2,064135922	305,1469594	454,8530406
8	1,291631068	185,7161732	574,2838268
9	0,549747573	56,38123806	703,6187619
10	0,265747573	10,22602835	749,7739717
11	0,195145631	2,452184466	757,5478155

f. Tekanan suction 35 cmhg

Sensor	Tegangan rata-rata (Volt)	Gauge pressure (mmhg)	Absolute pressure (mmhg)
1	2,383912281	352,978464	407,021536
2	2,420140351	355,6097909	404,3902091
3	2,383859649	351,434793	408,565207
4	2,353807018	347,8194679	412,1805321
5	2,315807018	353,3532926	406,6467074
6	2,363421053	353,4294474	406,5705526
7	2,374059754	352,4773195	407,5226805
8	2,347047452	350,6872283	409,3127717
9	1,254920914	179,7074552	580,2925448
10	0,479349736	45,01339543	714,9866046
11	0,272759227	11,35742882	748,6425712
12	0,192811951	2,075855185	757,9241448

g. Tekanan suction 40 cmhg

Sensor	Tegangan rata-rata (Volt)	Gauge pressure (mmhg)	Absolute pressure (mmhg)
1	2,770317195	415,247616	344,752384
2	2,802053422	417,0825189	342,9174811
3	2,774557596	414,2551159	345,7448841
4	2,744958264	410,7987301	349,2012699
5	2,747078464	415,1599249	344,8400751
6	2,750918197	413,2721235	346,7278765
7	2,702671119	407,9319699	352,0680301
8	1,05672788	147,2672194	612,7327806
9	0,434691152	37,80192721	722,1980728
10	0,281669449	12,7951823	747,2048177
11	0,195258765	2,470428381	757,5295716

h. Tekanan *suction* 45 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	3,066843137	463,0327716	296,9672284
2	3,099783465	465,0051465	294,9948535
3	3,073858268	462,3796709	297,6203291
4	3,046220472	459,3049583	300,6950417
5	3,040216535	462,3258406	297,6741594
6	3,040649606	460,0115945	299,9884055
7	2,9625	449,756625	310,243375
8	0,90507874	122,4452882	637,5547118
9	0,424035433	36,08124173	723,9187583
10	0,29011811	14,15845827	745,8415417
11	0,19511811	2,447746457	757,5522535

i. Tekanan *suction* 50 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	3,364218456	510,9548041	249,0451959
2	3,391054614	511,8881507	248,1118493
3	3,379811676	511,5739194	248,4260806
4	3,356440678	509,2535136	250,7464864
5	3,342391714	510,9458267	249,0541733
6	3,335800377	507,6253168	252,3746832
7	3,191431262	486,6076902	273,3923098
8	0,764500942	99,43551412	660,5644859
9	0,425178908	36,26589002	723,73411
10	0,29819209	15,46127571	744,5387243
11	0,195517891	2,512215066	757,4877849

j. Tekanan *suction* 55 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	3,671602671	560,4897705	199,5102295
2	3,686427379	559,4313509	200,5686491
3	3,682721202	560,2787421	199,7212579
4	3,683222037	561,8685801	198,1314199
5	3,640400668	558,8954674	201,1045326
6	3,632404007	555,4734144	204,5265856
7	3,268898164	499,0775374	260,9224626
8	0,661652755	82,60132287	677,3986771
9	0,428313856	36,77212154	723,2278785
10	0,305108514	16,57730985	743,4226902
11	0,201335559	3,450372287	756,5496277

k. Tekanan *suction* 60 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	3,9975	613,008125	146,991875
2	3,983582677	607,2614677	152,7385323
3	3,648385827	554,7579571	205,2420429
4	1,42988189	199,0582831	560,9417169
5	0,858700787	111,3199567	648,6800433
6	0,903543307	115,2536063	644,7463937
7	0,944330709	124,8919142	635,1080858
8	0,586141732	70,24167874	689,7583213
9	0,445708661	39,58103465	720,4189654
10	0,324635108	19,7281211	740,2718789
11	0,202899408	3,70255858	756,2974414

Lampiran 7. Hasil data pengujian dan sensor *nozzle* bintang delapan dengan variasi diameter hidrolik 10mm pada tekanan *motive flow* 170,27 Kpa

1. Hasil pengujian pada tekanan *motive flow* 170, 27Kpa

NO	Pm	Ps		Qm	Qs	Pd		ϕ_s	η %
	KPa	cmHg	KPa	lpm	slpm	mmHg	KPa		
1	170,27	10	87,99	79	47,7	766,08	102,13	0,60	11,61%
2		15	81,32	80	37,59	766,11	102,14	0,4	12,78%
3		20	74,66	82	31,6	756,74	100,89	0,38	12,49%
4		25	67,99	85	25,05	756,33	100,83	0,29	11,37%
5		30	61,32	88	19,34	755,01	100,66	0,21	9,59%
6		35	54,66	89	16,08	754,67	100,61	0,18	8,65%
7		40	47,99	90	12,62	753,41	100,44	0,14	7,12%
8		45	41,32	91	9,51	752,16	100,28	0,10	5,37%
9		50	34,66	94	7,39	751,79	100,23	0,07	4,13%
10		55	27,99	97	5,24	751,65	100,21	0,05	2,75%
11		60	21,33	99	3,76	751,36	100,17	0,03	1,79%
12		65	14,66	102	1,55	751,27	100,16	0,01	0,61%
13		68	10,66	105	0,14	751,54	100,19	0,00	0,05%

2. Hasil data sensor pada tekanan *motive flow* 170,27 Kpa

a. Tekanan *suction* 10 cmhg

Sensor	Tegangan rata-rata (Volt)	Gauge pressure (mmhg)	Absolute pressure (mmhg)
1	0,904505929	114,5721304	645,4278696
2	0,92416996	114,8183968	645,1816032
3	0,906758893	113,9317625	646,0682375
4	0,903023715	114,2288484	645,7711516
5	0,887312253	115,9235415	644,0764585
6	0,967213439	125,5248719	634,4751281
7	0,894130435	116,8111761	643,1888239
8	0,844229249	112,4854435	647,5145565
9	0,743557312	87,67763478	672,3223652

10	0,29	14,1394	745,8606
11	0,142435644	-6,047828119	766,0478281

b. Tekanan *suction* 15 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	1,172044674	157,6859991	602,3140009
2	1,190515464	157,6893691	602,3106309
3	1,175189003	157,0926399	602,9073601
4	1,170378007	157,2755629	602,7244371
5	1,147920962	157,8554828	602,1445172
6	1,231116838	168,0977684	591,9022316
7	1,157285223	159,1712024	600,8287976
8	1,034776632	143,6742392	616,3257608
9	0,792010309	95,50182474	664,4981753
10	0,239226804	5,946637113	754,0533629
11	0,142027491	-6,113646735	766,1136467

c. Tekanan *suction* 20 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	1,452587549	202,8954835	557,1045165
2	1,46885214	202,4904405	557,5095595
3	1,455894942	202,2273477	557,7726523
4	1,450175097	202,3256924	557,6743076
5	1,422315175	202,0055117	557,9944883
6	1,504182879	212,1487821	547,8512179
7	1,435019455	203,8780817	556,1219183
8	1,236128405	176,6314973	583,3685027
9	0,833735409	102,2395938	657,7604062
10	0,290506823	14,2211809	745,7788191
11	0,200136452	3,257004288	756,7429957

d. Tekanan *suction* 25 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	1,742640777	249,6375612	510,3624388
2	1,763359223	249,8943006	510,1056994
3	1,749398058	249,4197138	510,5802862
4	1,741281553	249,1967429	510,8032571
5	1,698990291	246,5225379	513,4774621
6	1,797223301	259,4220629	500,5779371
7	1,72215534	250,098345	509,901655
8	1,357805825	196,5476575	563,4523425
9	0,708504854	82,01736388	677,9826361
10	0,293035019	14,62913074	745,3708693
11	0,202684825	3,667954864	756,3320451

e. Tekanan *suction* 30 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	2,085344828	304,864319	455,135681
2	2,10462572	304,8245559	455,1754441
3	2,093704415	304,7807328	455,2192672
4	2,086449136	304,7721754	455,2278246
5	2,0343762	300,4861305	459,5138695
6	2,135278311	313,9570971	446,0429029
7	2,06537428	305,3462979	454,6537021
8	1,4356238	209,2849036	550,7150964
9	0,607504798	65,70787486	694,2921251
10	0,296276392	15,15215854	744,8478415
11	0,21084453	4,983788868	755,0162111

f. Tekanan *suction* 35 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	2,383653846	352,9368173	407,0631827
2	2,404384615	353,0737477	406,9262523
3	2,394788462	353,1920367	406,8079633
4	2,383326923	352,5724679	407,4275321
5	2,331192308	348,2438423	411,7561577
6	2,432384615	361,8862862	398,1137138
7	2,353865385	351,784711	408,215289
8	1,397307692	203,0133231	556,9866769
9	0,549711538	56,37541923	703,6245808
10	0,306961538	16,87631385	743,1236862
11	0,212980769	5,328278846	754,6717212

g. Tekanan *suction* 40 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	2,728837209	408,5631163	351,4368837
2	2,747790698	408,3483907	351,6516093
3	2,743914729	409,3280492	350,6719508
4	2,729360465	408,2873285	351,7126715
5	2,696841085	407,0767306	352,9232694
6	2,777829457	417,6134481	342,3865519
7	2,679573643	404,2139694	355,7860306
8	1,262810078	180,9987535	579,0012465
9	0,516395349	50,99552093	709,0044791
10	0,313585271	17,94511938	742,0548806
11	0,220796117	6,588581748	753,4114183

h. Tekanan *suction* 45 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	3,05744186	461,5177558	298,4822442
2	3,076085271	461,1906853	298,8093147
3	3,07629845	462,7720277	297,2279723
4	3,059631783	461,4643134	298,5356866
5	3,016065891	458,4400019	301,5599981
6	3,105717054	470,5082752	289,4917248
7	2,972926357	451,4349556	308,5650444
8	1,113972868	156,6370791	603,3629209
9	0,504135922	49,01586874	710,9841313
10	0,322834951	19,43764777	740,5623522
11	0,228543689	7,83795534	752,1620447

i. Tekanan *suction* 50 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	3,393918919	515,7410338	244,2589662
2	3,416003861	515,9039815	244,0960185
3	3,41530888	517,2815149	242,7184851
4	3,397683398	515,8940039	244,1059961
5	3,372471042	515,7855907	244,2144093
6	3,440038685	524,4410406	235,5589594
7	3,303887814	504,7098215	255,2901785
8	1,08868472	152,4979149	607,5020851
9	0,510077369	49,97529362	710,0247064
10	0,331160542	20,78106499	739,218935
11	0,230812379	8,203804255	751,7961957

j. Tekanan *suction* 55 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	3,718263773	568,009207	191,990793
2	3,739916528	568,0409643	191,9590357
3	3,744808013	570,2616805	189,7383195
4	3,723639399	568,3761796	191,6238204
5	3,692988314	567,3568197	192,6431803
6	3,754023372	575,0930504	184,9069496
7	3,609833055	553,9578269	206,0421731
8	1,024741235	142,0316454	617,9683546
9	0,518414023	51,32149649	708,6785035
10	0,336010017	21,56357629	738,4364237
11	0,231686144	8,344707513	751,6552925

k. Tekanan *suction* 60 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	3,961825243	607,2591379	152,7408621
2	3,980776699	606,8098175	153,1901825
3	3,990368932	609,7454206	150,2545794
4	3,965592233	607,3330054	152,6669946
5	3,926291262	604,8952641	155,1047359
6	3,98811284	612,8563634	147,1436366
7	3,839571984	590,9389023	169,0610977
8	0,962976654	131,9220187	628,0779813
9	0,522898833	52,0457035	707,9542965
10	0,340583658	22,30157899	737,698421
11	0,23348249	8,634386381	751,3656136

l. Tekanan *suction* 65 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	4,31503861	664,179472	95,82052799
2	4,339498069	664,5496093	95,45039073
3	4,349498069	667,4897946	92,51020541
4	4,326795367	665,490322	94,50967799
5	4,304401544	665,7332085	94,26679151
6	4,310888031	664,9264571	95,07354286
7	4,189305019	647,235429	112,764571
8	0,893745174	120,59021	639,40979
9	0,531702128	53,46725957	706,5327404
10	0,34762089	23,43710677	736,5628932
11	0,234061896	8,727821277	751,2721787

m. Tekanan *suction* 68 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	4,486266925	691,7729149	68,22708511
2	4,507833656	691,6449052	68,35509478
3	4,520290135	694,9514509	65,04854913
4	4,492417795	692,1571892	67,84281083
5	4,474758221	693,1435977	66,85640232
6	4,445620155	686,6614434	73,33855659
7	4,341860465	671,7922791	88,20772093
8	0,880542636	118,4292186	641,5707814
9	0,541589147	55,0638155	704,9361845
10	0,351899225	24,12745891	735,8725411
11	0,232383721	8,457198837	751,5428012

Lampiran 8. Hasil data pengujian dan sensor *nozzle* bintang delapan dengan variasi diameter hidrolis 10mm pada tekanan motive flow 201,32 Kpa

1. Hasil data pengujian pada tekanan *motive flow* 201,32 Kpa

NO	Pm	Ps		Qm	Qs	Pd		ϕ_s	η
	KPa	cmHg	KPa	lpm	slpm	mmHg	KPa		%
1	201,32	15	81,32	89	55,7	758,57	101,13	0,62	11,07%
2		20	74,66	91	45,88	758,01	101,06	0,50	11,37%
3		25	67,99	94	37,44	756,74	100,89	0,39	10,64%
4		30	61,32	96	29,73	755,59	100,73	0,30	9,37%
5		35	54,66	98	23,78	754,94	100,65	0,24	8,04%
6		40	47,99	100	18,62	754,24	100,55	0,18	6,56%
7		45	41,32	101	14,92	753,26	100,42	0,14	5,37%
8		50	34,66	103	10,54	752,67	100,34	0,10	3,73%
9		55	27,99	105	7,76	752,21	100,28	0,07	2,61%
10		60	21,33	106	4,7	751,72	100,22	0,04	1,45%
11		65	14,66	108	1,96	751,63	100,20	0,01	0,51%
12		68,5	9,99	111	0,12	751,65	100,21	0,00	0,02%

2. Hasil data sensor pada tekanan *motive flow* 201,32 Kpa

a. Tekanan *suction* 15 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	1,203423077	162,7426288	597,2573712
2	1,225788462	163,3669108	596,6330892
3	1,208015414	162,3707985	597,6292015
4	1,203795761	162,6561555	597,3438445
5	1,188381503	164,3655838	595,6344162
6	1,26088632	172,9001811	587,0998189
7	1,205125241	166,87201	593,12799
8	1,114238921	156,6806266	603,3193734
9	0,983583815	126,4371145	633,5628855

10	0,372774566	27,49590405	732,504096
11	0,188805395	1,429757996	758,570242

b. Tekanan *suction* 20 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	1,493474903	209,4844807	550,5155193
2	1,514343629	209,8127506	550,1872494
3	1,497316602	208,8875365	551,1124635
4	1,491121857	208,9185302	551,0814698
5	1,469439072	209,5877466	550,4122534
6	1,550135397	219,5618422	540,4381578
7	1,488510638	212,4885574	547,5114426
8	1,340386847	193,6965191	566,3034809
9	1,081644101	142,2718894	617,7281106
10	0,318046422	18,6649706	741,3350294
11	0,192263056	1,987340426	758,0126596

c. Tekanan *suction* 25 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	1,766870229	253,5421374	506,4578626
2	1,785152672	253,402174	506,597826
3	1,772275335	253,0981511	506,9018489
4	1,763594646	252,789374	507,210626
5	1,732695985	251,9457839	508,0542161
6	1,820057361	263,1056535	496,8943465
7	1,759866157	256,1686553	503,8313447
8	1,518986616	222,9297293	537,0702707
9	1,060095602	138,7922379	621,2077621
10	0,303040153	16,24355908	743,7564409
11	0,200152964	3,259666922	756,7403331

d. Tekanan *suction* 30 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	2,112088975	309,1741383	450,8258617
2	2,131914894	309,2170213	450,7829787
3	2,122112403	309,3484533	450,6515467
4	2,109379845	308,4642488	451,5357512
5	2,066996124	305,7346764	454,2653236
6	2,162112403	318,2859729	441,7140271
7	2,102383721	311,3037076	448,6962924
8	1,711937984	254,5120093	505,4879907
9	0,949031008	120,8575271	639,1424729
10	0,302906977	16,22206977	743,7779302
11	0,207228682	4,400697287	755,5993027

e. Tekanan *suction* 35 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	2,420272374	358,837893	401,162107
2	2,440194553	358,8377152	401,1622848
3	2,433229572	359,3729829	400,6270171
4	2,419708171	358,4302126	401,5697874
5	2,364513619	353,6052412	406,3947588
6	2,468968872	367,7880584	392,2119416
7	2,409455253	360,7330121	399,2669879
8	1,840797665	275,6037619	484,3962381
9	0,804708171	97,55227549	662,4477245
10	0,307738791	17,00173138	742,9982686
11	0,211306043	5,058212476	754,9417875

f. Tekanan *suction* 40 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	2,748014184	411,6534858	348,3465142
2	2,770619469	412,0229097	347,9770903
3	2,761327434	412,1278381	347,8721619
4	2,744389381	410,7071342	349,2928658
5	2,694530973	406,7050336	353,2949664
6	2,79501773	420,3862603	339,6137397
7	2,736170213	413,3243191	346,6756809
8	1,914698582	287,6998638	472,3001362
9	0,69320922	79,54742482	680,4525752
10	0,313143872	17,8738952	742,1261048
11	0,215612789	5,752718295	754,2472817

g. Tekanan *suction* 45 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	3,030658915	457,2016841	302,7983159
2	3,054709302	457,7500093	302,2499907
3	3,045852713	457,8766578	302,1233422
4	3,030988372	456,8524378	303,1475622
5	2,98176699	452,9213087	307,0786913
6	3,074640777	465,4950501	294,5049499
7	3,019961165	459,0061487	300,9938513
8	1,912116505	287,2772295	472,7227705
9	0,634699029	70,09919922	689,9008008
10	0,321592233	19,23712272	740,7628773
11	0,221708738	6,735751068	753,2642489

h. Tekanan *suction* 50 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	3,368766859	511,6877794	248,3122206
2	3,390693642	511,8300486	248,1699514
3	3,389903661	513,1966096	246,8033904
4	3,370192678	511,4677231	248,5322769
5	3,339903661	510,545499	249,454501
6	3,408246628	519,3123461	240,6876539
7	3,358188825	513,4506551	246,5493449
8	1,813969171	271,212474	488,787526
9	0,592755299	63,32612563	696,6738744
10	0,329285714	20,47854286	739,5214571
11	0,225366795	7,325649421	752,6743506

i. Tekanan *suction* 55 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	3,672942207	560,7056366	199,2943634
2	3,695884413	560,9535552	199,0464448
3	3,697110333	562,5923704	197,4076296
4	3,676164623	560,732266	199,267734
5	3,631122807	557,4026596	202,5973404
6	3,707421053	567,5751642	192,4248358
7	3,663315789	562,5669426	197,4330574
8	1,739315789	258,9932084	501,0067916
9	0,577473684	60,85845053	699,1415495
10	0,335385965	21,4628793	738,5371207
11	0,228192982	7,781400351	752,2185996

j. Tekanan *suction* 60 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	3,974846743	609,3575527	150,6424473
2	3,998850575	609,7189885	150,2810115
3	4,003218391	611,8114851	148,1885149
4	3,980823755	609,7854328	150,2145672
5	3,96137931	610,540931	149,459069
6	4,009770115	616,3501149	143,6498851
7	3,954846743	609,4946803	150,5053197
8	1,590613027	234,6535402	525,3464598
9	0,564750958	58,80398467	701,1960153
10	0,342203065	22,56288659	737,4371134
11	0,231247601	8,2739881	751,7260119

k. Tekanan *suction* 65 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	4,326088632	665,960183	94,03981696
2	4,350712909	666,3547499	93,6452501
3	4,358921002	669,0049079	90,9950921
4	4,333957529	666,6435017	93,35649826
5	4,317490347	667,8391969	92,16080309
6	4,326544402	667,4521429	92,54785714
7	4,309054054	666,5114311	93,48856892
8	1,383822394	200,8060494	559,1939506
9	0,561872587	58,33918533	701,6608147
10	0,349324324	23,71197297	736,288027
11	0,231814672	8,365433977	751,634566

1. Tekanan *suction* 68,5 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	4,516038835	696,5706583	63,42934175
2	4,540873786	696,9630447	63,03695534
3	4,552446602	700,1218891	59,87811087
4	4,523346304	697,1369883	62,86301167
5	4,508171206	698,5197471	61,48025292
6	4,502548638	695,8451463	64,1548537
7	4,487101167	695,1716749	64,8283251
8	1,291984436	185,7740125	574,2259875
9	0,568968872	59,48509339	700,5149066
10	0,354533074	24,55245681	735,4475432
11	0,231673152	8,342612451	751,6573875

Lampiran 9. Hasil data pengujian dan sensor *nozzle* bintang delapan dengan variasi diameter hidrolik 10mm pada tekanan *motive flow* 218,53 Kpa

1. Hasil data pengujian pada tekanan *motive flow* 218,53 kPa

NO	Pm	F		Qm	Qs	Pd		ϕ_s	η %
	KPa	cmHg	KPa	lpm	slpm	mmHg	KPa		
1	218,53	20	74,66	98	54,08	759,21	101,22	0,55	10,69%
2		25	67,99	99	44,54	757,62	101,00	0,44	10,30%
3		30	61,32	101	36,55	756,57	100,86	0,36	9,38%
4		35	54,66	102	29,38	756,25	100,82	0,28	8,19%
5		40	47,99	103	23,04	755,02	100,66	0,22	6,75%
6		45	41,32	105	18,38	754,81	100,63	0,17	5,46%
7		50	34,66	106	14,01	754,26	100,55	0,13	4,14%
8		55	27,99	108	10,1	754,39	100,57	0,09	2,84%
9		60	21,33	110	6,09	753,97	100,52	0,05	1,55%
10		65	14,66	111	3,18	752,40	100,31	0,02	0,68%
11		70	7,99	113	0,14	752,29	100,29	0,00	0,02%

2. Hasil data sensor pada tekanan *motive flow* 218,53 Kpa

a. Tekanan *suction* 20 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	1,538626692	216,7606915	543,2393085
2	1,559419729	217,0681996	542,9318004
3	1,546943907	216,8671108	543,1328892
4	1,538897485	216,6108841	543,3891159
5	1,498994197	214,3431663	545,6568337
6	1,599381044	227,5061501	532,4938499
7	1,552823985	222,8410768	537,1589232
8	1,393539652	202,3965702	557,6034298
9	1,207601547	162,6114979	597,3885021
10	0,362533849	25,8434619	734,1565381
11	0,184806202	0,784848062	759,2151519

b. Tekanan *suction* 25 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	1,799005736	258,7207744	501,2792256
2	1,821108987	259,1897025	500,8102975
3	1,808164436	258,8687597	501,1312403
4	1,798852772	258,4662849	501,5337151
5	1,760630975	256,4405239	503,5594761
6	1,857284895	269,1111992	490,8888008
7	1,809330784	264,1309763	495,8690237
8	1,595191571	235,4029563	524,5970437
9	1,251704981	169,7333203	590,2666797
10	0,323831418	19,59843755	740,4015625
11	0,19467433	2,376182375	757,6238176

c. Tekanan *suction* 30 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	2,112634615	309,2620683	450,7379317
2	2,134971098	309,708948	450,291052
3	2,124181118	309,6810819	450,3189181
4	2,11265896	308,9922191	451,0077809
5	2,08433526	308,5245434	451,4754566
6	2,168111753	319,2537881	440,7462119
7	2,119364162	314,0370491	445,9629509
8	1,809865125	270,5407237	489,4592763
9	1,218901734	164,436252	595,563748
10	0,311907514	17,67439653	742,3256035
11	0,201175337	3,424534875	756,5754651

d. Tekanan *suction* 35 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	2,430253411	360,4463372	399,5536628
2	2,45128655	360,623083	399,376917
3	2,445321637	361,3172661	398,6827339
4	2,43109375	360,2634047	399,7365953
5	2,413632813	361,5085195	398,4914805
6	2,4828125	370,0213125	389,9786875
7	2,434082031	364,6971846	395,3028154
8	1,991132813	300,2106188	459,7893812
9	1,079882813	141,9874766	618,0125234
10	0,31125	17,5683	742,4317
11	0,203164063	3,745236719	756,2547633

e. Tekanan *suction* 40 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	2,721119691	407,3194382	352,6805618
2	2,741312741	407,3056988	352,6943012
3	2,736100386	408,0715811	351,9284189
4	2,720733591	406,8983154	353,1016846
5	2,713474903	409,753112	350,246888
6	2,769420849	416,2569714	343,7430286
7	2,725675676	411,6350135	348,3649865
8	2,104603482	318,7834979	441,2165021
9	0,898259188	112,6588936	647,3411064
10	0,314700193	18,12502321	741,8749768
11	0,210773694	4,972365957	755,027634

f. Tekanan *suction* 45 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	3,050330097	460,3716951	299,6283049
2	3,069708738	460,1643184	299,8356816
3	3,067281553	461,322201	298,677799
4	3,049650485	459,8572247	300,1427753
5	3,039320388	462,1816505	297,8183495
6	3,093864078	468,596153	291,403847
7	3,057320388	465,0198629	294,9801371
8	2,239475728	340,8593872	419,1406128
9	0,788601942	94,95144155	665,0485584
10	0,321809339	19,27215486	740,7278451
11	0,212062257	5,180159533	754,8198405

g. Tekanan *suction* 50 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	3,336140351	506,4300175	253,5699825
2	3,356452242	506,3185528	253,6814472
3	3,355847953	507,7207924	252,2792076
4	3,336647173	506,0665614	253,9334386
5	3,331734893	509,2311442	250,7688558
6	3,378518519	514,5166074	245,4833926
7	3,347050781	511,6577643	248,3422357
8	2,257578125	343,8223875	416,1776125
9	0,70390625	81,27478125	678,7252188
10	0,327460938	20,18409688	739,8159031
11	0,215527344	5,738939453	754,2610605

h. Tekanan *suction* 55 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	3,648972868	556,8429777	203,1570223
2	3,670116279	556,8059163	203,1940837
3	3,673236434	558,7536862	201,2463138
4	3,65251938	556,9251453	203,0748547
5	3,647945736	560,109469	199,890531
6	3,693662791	565,3556814	194,6443186
7	3,666834951	563,1334221	196,8665779
8	2,195456311	333,6542889	426,3457111
9	0,64623301	71,96170641	688,0382936
10	0,333883495	21,22044078	738,7795592
11	0,214679612	5,602234175	754,3977658

i. Tekanan *suction* 60 cmhg

Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	3,972651072	609,0037203	150,9962797
2	3,993177388	608,8058324	151,1941676
3	4,001890838	611,5980279	148,4019721
4	3,981208577	609,847393	150,152607
5	3,964346979	611,0184288	148,9815712
6	4,013118908	616,8903423	143,1096577
7	3,981384016	613,766385	146,233615
8	2,082183236	315,113752	444,886248
9	0,614463938	66,83163665	693,1683634
10	0,341364522	22,42757934	737,5724207
11	0,217324219	6,028703516	753,9712965

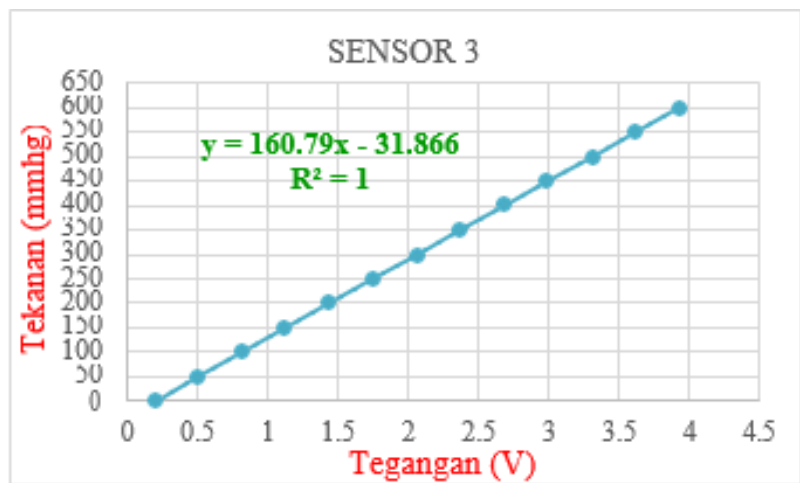
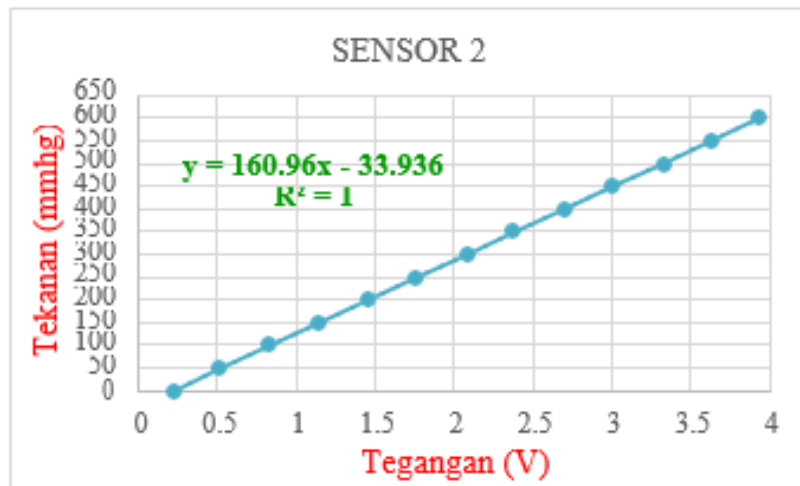
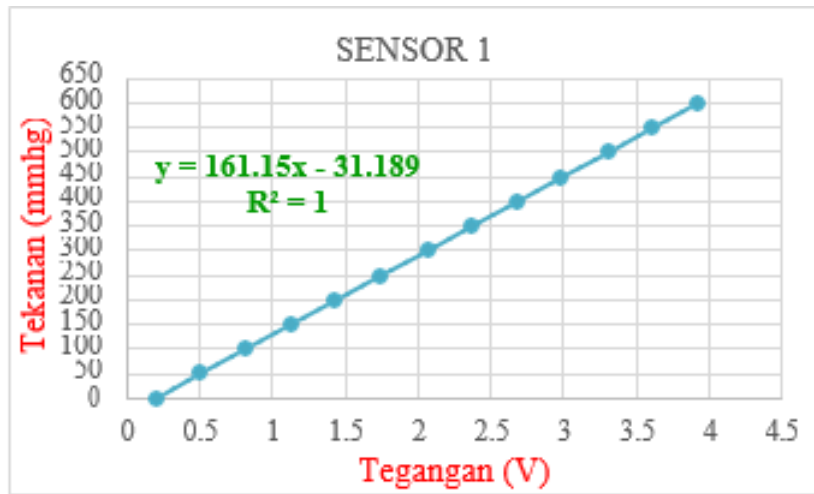
j. Tekanan *suction* 65 cmhg

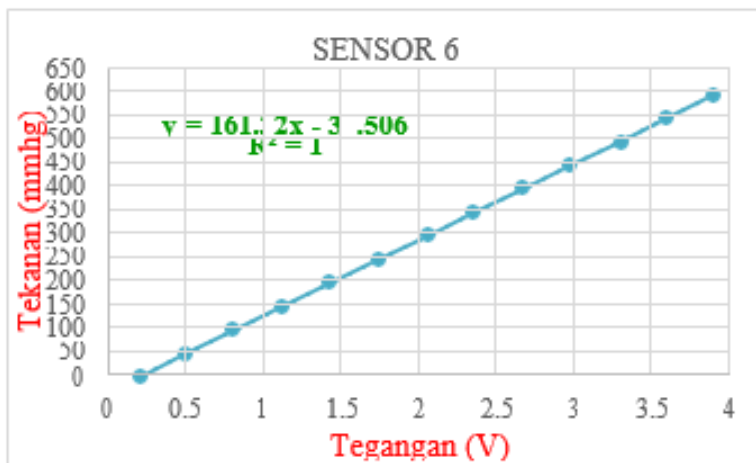
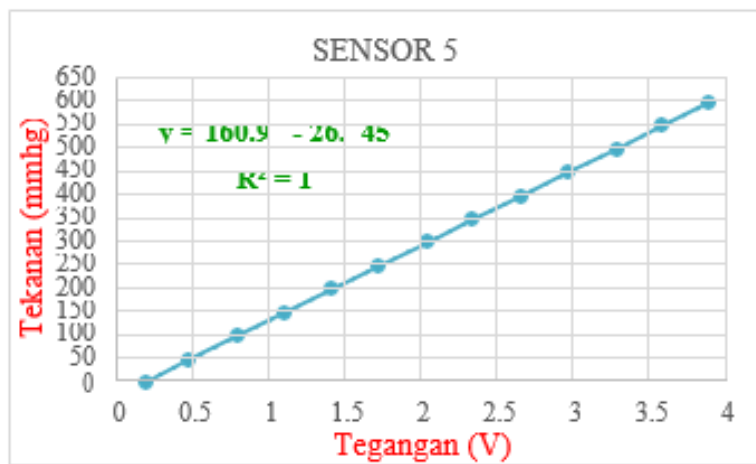
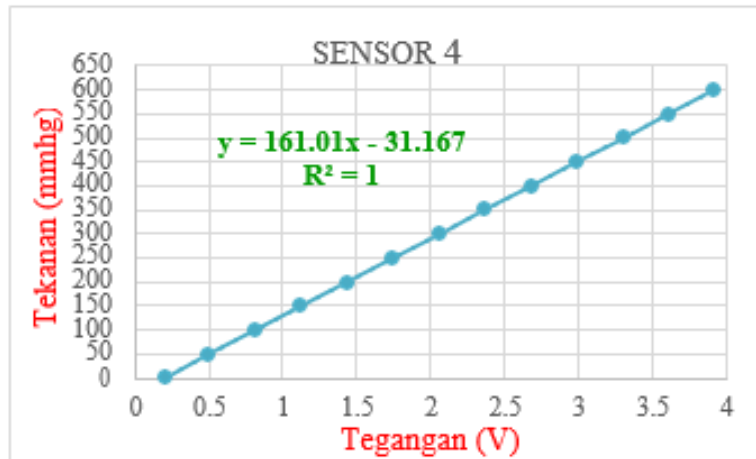
Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	4,280350195	658,5894339	101,4105661
2	4,303715953	658,7901198	101,2098802
3	4,317548638	662,3526455	97,64735447
4	4,287937743	659,233856	100,766144
5	4,283229572	662,3266381	97,67336187
6	4,299377432	663,0695673	96,93043268
7	4,289494163	663,3628755	96,63712451
8	1,920506823	288,6505567	471,3494433
9	0,596354776	63,9073692	696,0926308
10	0,346822612	23,30829669	736,6917033
11	0,227037037	7,594992593	752,4050074

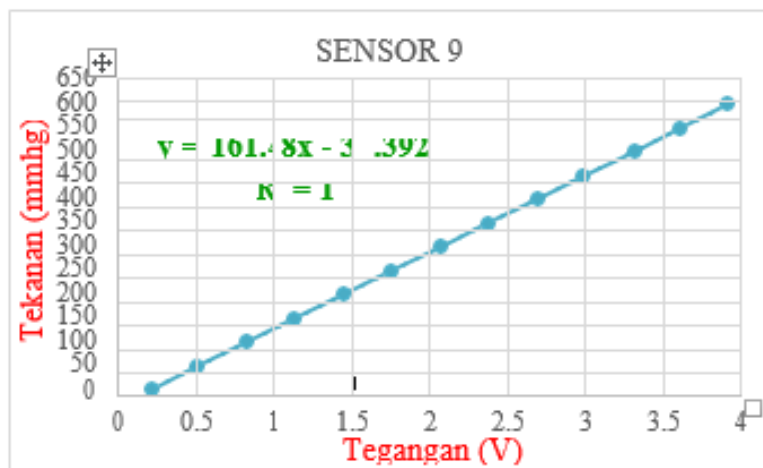
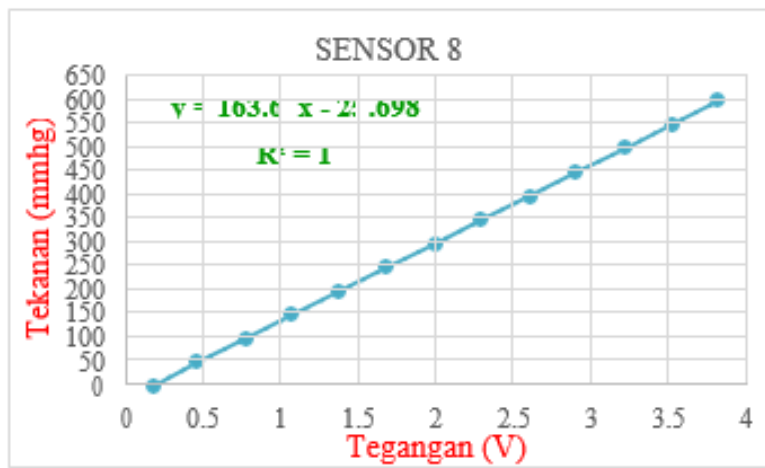
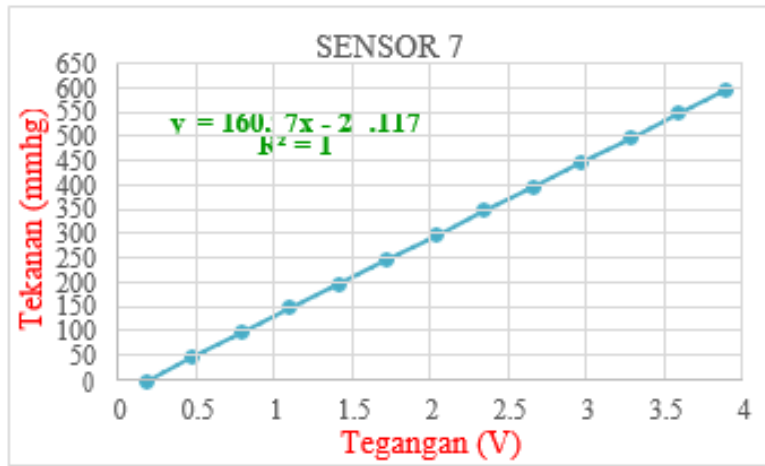
k. Tekanan *suction* 70 cmhg

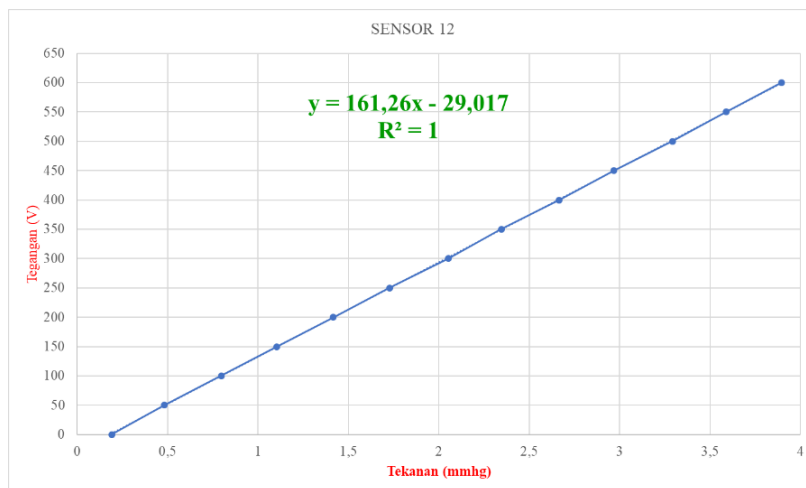
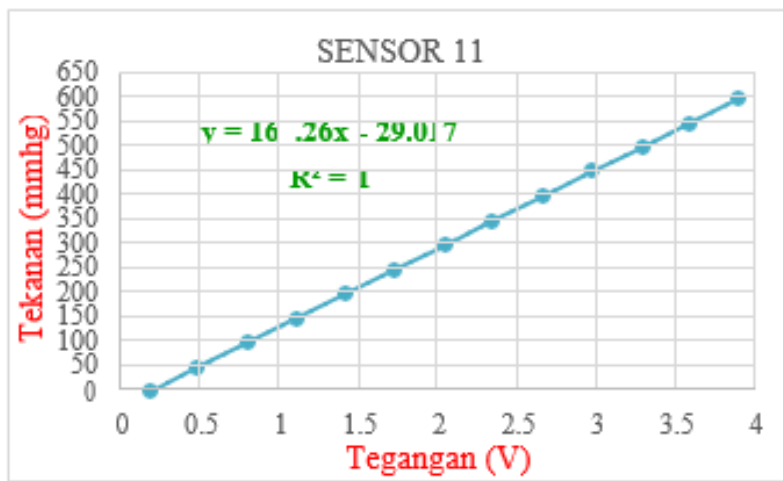
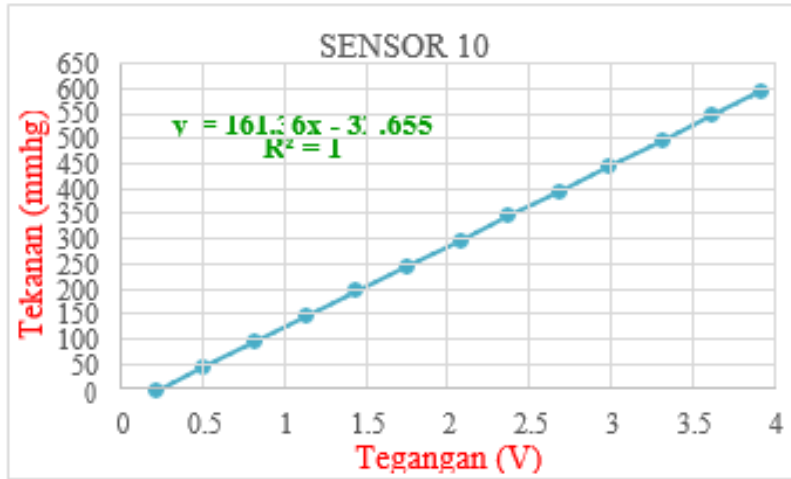
Sensor	Tegangan rata-rata (Volt)	<i>Gauge pressure</i> (mmhg)	<i>Absolute pressure</i> (mmhg)
1	4,534571984	699,5572753	60,44272471
2	4,558677043	699,8286568	60,17134319
3	4,579435798	704,4614819	55,53851809
4	4,536303502	699,2232268	60,77677315
5	4,527451362	701,6219241	58,37807588
6	4,520836576	698,7953564	61,20464358
7	4,513118908	699,3597507	60,64024932
8	1,754736842	261,5173263	498,4826737
9	0,585808967	62,20443197	697,795568
10	0,357446394	25,0225501	734,9774499
11	0,227719298	7,705014035	752,294986

Lampiran 10. Hasil grafik kalibrasi pada sensor tekanan MPX5100DP









Lampiran 11. Program coolTerm untuk alat ukur tekanan

```
// These constants won't change. They're used to give names to the pins used: const
int Sensor1 = A0; // Analog input pin that the potentiometer is attached to

const int Sensor2 = A1;
const int Sensor3 = A2;
const int Sensor4 = A3;
const int Sensor5 = A4;
const int Sensor6 = A5;
const int Sensor7 = A6;
const int Sensor8 = A7;
const int Sensor9 = A8;
const int Sensor10 = A9;
const int Sensor11 = A10;
const int Sensor12 = A11;
int sensor1Value = 0; // value read from the pot
int sensor2Value = 0;
int sensor3Value = 0;
int sensor4Value = 0;
int sensor5Value = 0;
int sensor6Value = 0;
int sensor7Value = 0;
int sensor8Value = 0;
int sensor9Value = 0;
int sensor10Value = 0;
int sensor11Value = 0;
int sensor12Value = 0;
float sensor1Voltage;
float sensor2Voltage;
float sensor3Voltage;
float sensor4Voltage;
float sensor5Voltage;
float sensor6Voltage;
```



```

float sensor7Voltage;
float sensor8Voltage;
float sensor9Voltage;
float sensor10Voltage;
float sensor11Voltage;
float sensor12Voltage;

int output1Value = 0;
int output2Value = 0;
int output3Value = 0;
int output4Value = 0;
int output5Value = 0;
int output6Value = 0;
int output7Value = 0;
int output8Value = 0;
int output9Value = 0;
int output10Value = 0;
int output11Value = 0;
int output12Value = 0;

void setup() { // initialize serial communications at 9600 bPs:
  Serial.begin(9600);
  Serial.print("Sensor 1 \t Sensor 2 \t Sensor 3 \t Sensor 4 \t Sensor 5 \t Sensor 6 \t
  Sensor 7 \t Sensor 8 \t Sensor 9 \t Sensor 10 \t Sensor 11 \t Sensor 12"); }

void loop() {
  // read the analog in value:
  sensor1Value = analogRead(Sensor1);
  sensor1Voltage = sensor1Value/204.8 ;
  // map it to the range of the analog out:
  output1Value = map(sensor1Value, 0, 1023, 0, 100);
  // change the analog out value:

  // read the analog in value:

```

```
sensor2Value = analogRead(Sensor2);
sensor2Voltage = sensor2Value/204.8 ;
// map it to the range of the analog out:
output2Value = map(sensor2Value, 0, 1023, 0, 100);
// change the analog out value:

// read the analog in value:

sensor3Value = analogRead(Sensor3);

sensor3Voltage = sensor3Value/204.8 ;
// map it to the range of the analog out:
output3Value = map(sensor3Value, 0, 1023, 0, 100);
// change the analog out value:

// read the analog in value:

sensor4Value = analogRead(Sensor4);

sensor4Voltage = sensor4Value/204.8 ;
// map it to the range of the analog out:
output4Value = map(sensor4Value, 0, 1023, 0, 100);
// change the analog out value:

// read the analog in value:
sensor5Value = analogRead(Sensor5);
sensor5Voltage = sensor5Value/204.8 ;
// map it to the range of the analog out:
output5Value = map(sensor5Value, 0, 1023, 0, 100);
// change the analog out value:

// read the analog in value:
sensor6Value = analogRead(Sensor6);
sensor6Voltage = sensor6Value/204.8 ;
// map it to the range of the analog out:
output6Value = map(sensor6Value, 0, 1023, 0, 100);
// change the analog out value:

// read the analog in value:
sensor7Value = analogRead(Sensor7);
```

```

sensor7Voltage = sensor7Value/204.8 ;
// map it to the range of the analog out:

output7Value = map(sensor7Value, 0, 1023, 0, 100);
// change the analog out value:
// read the analog in value:
sensor8Value =analogRead(Sensor8);
sensor8Voltage =sensor8Value/204.8;
// map it to the range of the analog out:
output8Value = map(sensor8Value, 0, 1023, 0, 100);
// change the analog out value:
// read the analog in value:
sensor9Value =analogRead(Sensor9);
sensor9Voltage =sensor9Value/204.8 ;
// map it to the range of the analog out:
output9Value = map(sensor9Value, 0, 1023, 0, 100);
// change the analog out value:
// read the analog in value:

sensor10Value = analogRead(Sensor10);
sensor10Voltage = sensor10Value/204.8 ;
// map it to the range of the analog out:
output10Value = map(sensor10Value, 0, 1023, 0, 100);
// change the analog out value:
// read the analog in value:
sensor11Value = analogRead(Sensor11);
sensor11Voltage = sensor11Value/204.8 ;
// map it to the range of the analog out:
output11Value = map(sensor11Value, 0, 1023, 0, 100);
// change the analog out value:
// read the analog in value:
sensor12Value = analogRead(Sensor12);
sensor12Voltage = sensor12Value/204.8 ;
// map it to the range of the analog out:

```

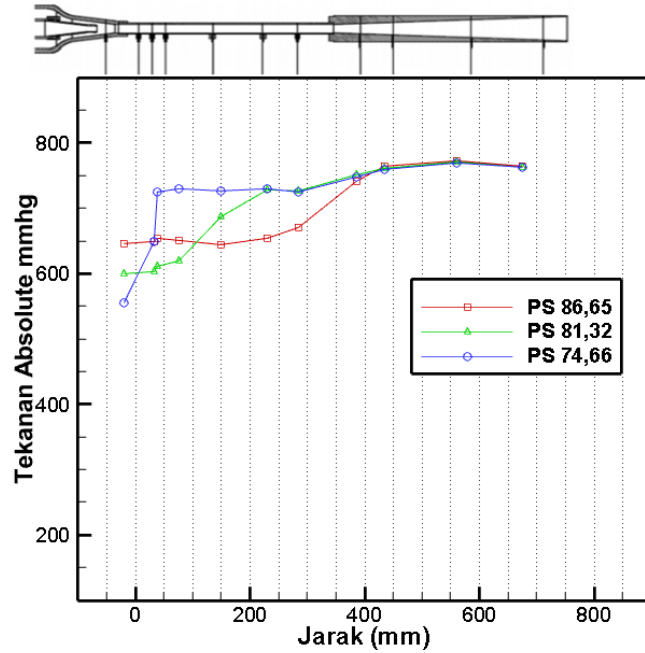
```

output12Value = map(sensor12Value, 0, 1023, 0, 100);
// change the analog out value:
// print the results to the Serial
Monitor: Serial.print("\n");
Serial.print(sensor1Voltage);
Serial.print("\t");
Serial.print(sensor2Voltage);
Serial.print("\t");
Serial.print(sensor3Voltage);
Serial.print("\t");
Serial.print(sensor4Voltage);
Serial.print("\t");
Serial.print(sensor5Voltage);
Serial.print("\t");
Serial.print(sensor6Voltage);
Serial.print("\t");
Serial.print(sensor7Voltage);
Serial.print("\t");
Serial.print(sensor8Voltage);
Serial.print("\t");
Serial.print(sensor9Voltage);
Serial.print("\t");
Serial.print(sensor10Voltage);
Serial.print("\t");
Serial.print(sensor11Voltage);
Serial.print("\t");
Serial.print(sensor12Voltage);
//Mengambil data setiap 1/200
detik delay(5);
}

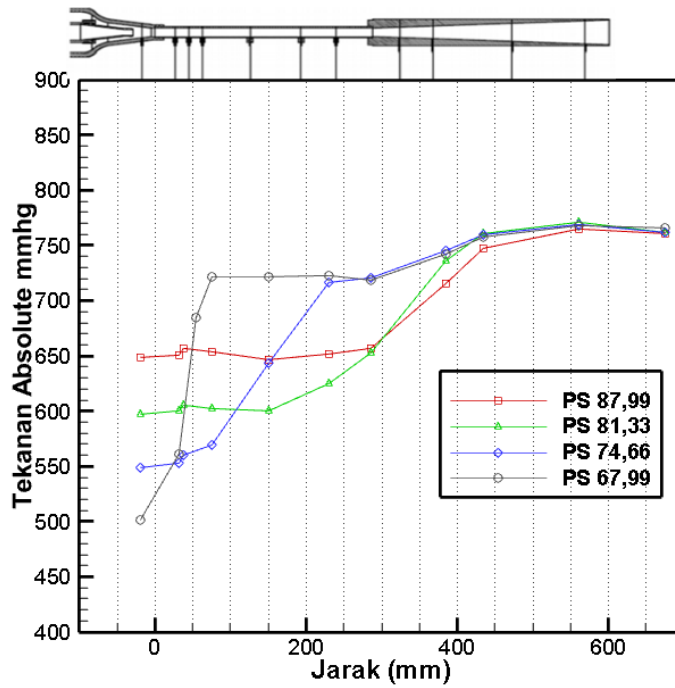
```

Lampiran 12. Grafik *Pressure Profil* pada *throat* dan *diffuser*

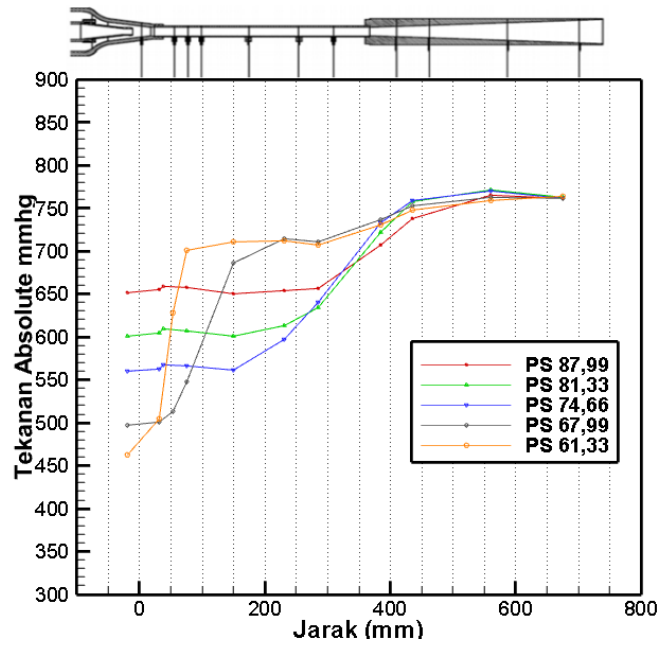
1. Tekanan *motive flow* 170,27 kPa pada *Nozzle* berdiameter hidrolik 6 mm



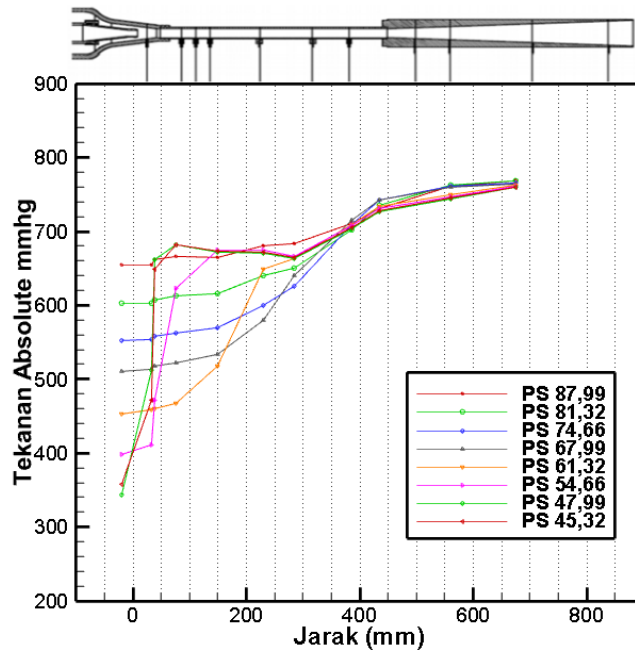
2. Tekanan *motive flow* 201,32 kPa pada *Nozzle* berdiameter 6 mm



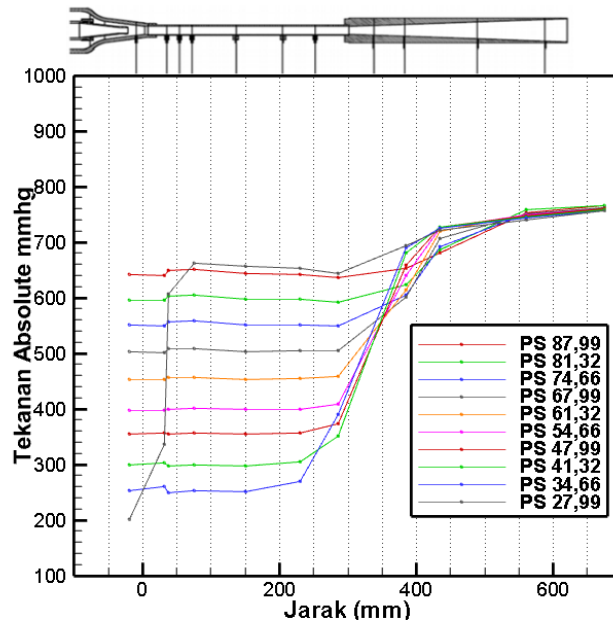
3. Tekanan *motive flow* 218,53 kPa pada *Nozzle* berdiameter 6 mm



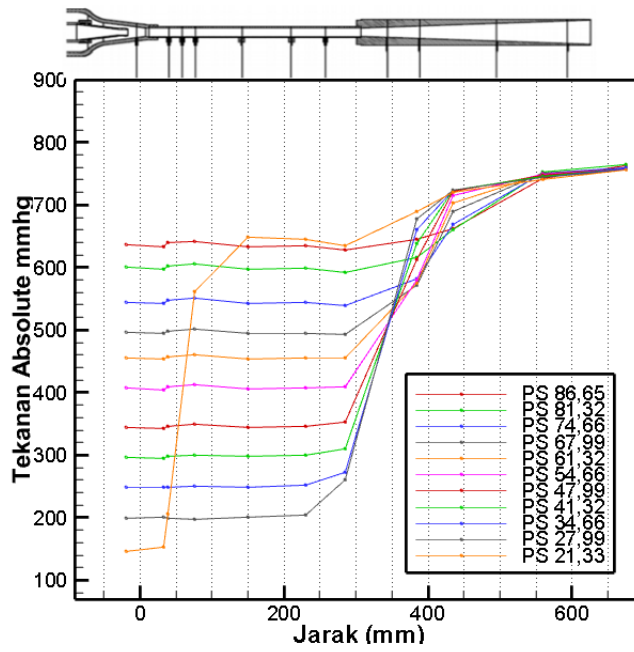
4. Tekanan *motive flow* 170,27 kPa pada *Nozzle* berdiameter hidrolik 8 mm



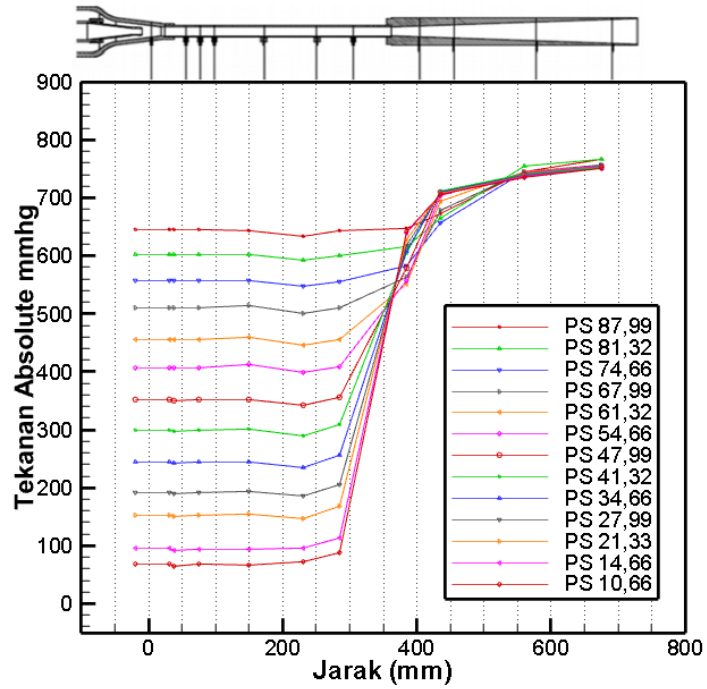
5. Tekanan *motive flow* 201,32 kPa pada *Nozzle* berdiameter hidrolik 8 mm



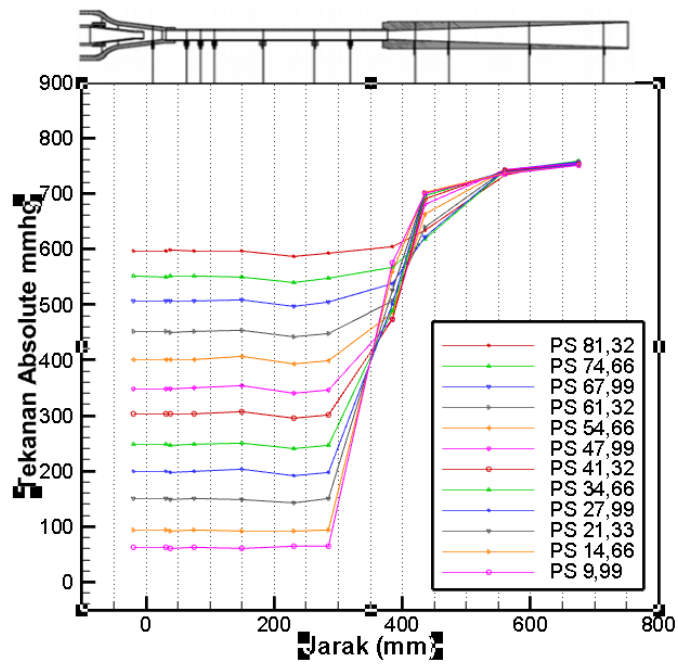
6. Tekanan *motive flow* 218,53 kPa pada *Nozzle* berdiameter hidrolik 8 mm



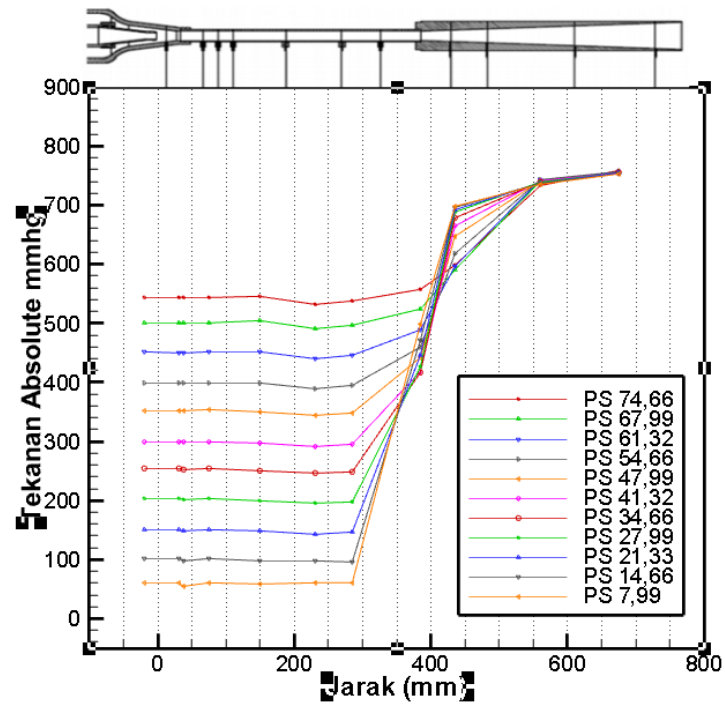
7. Tekanan *motive flow* 170,27 kPa pada *Nozzle* berdiameter hidrolik 10 mm



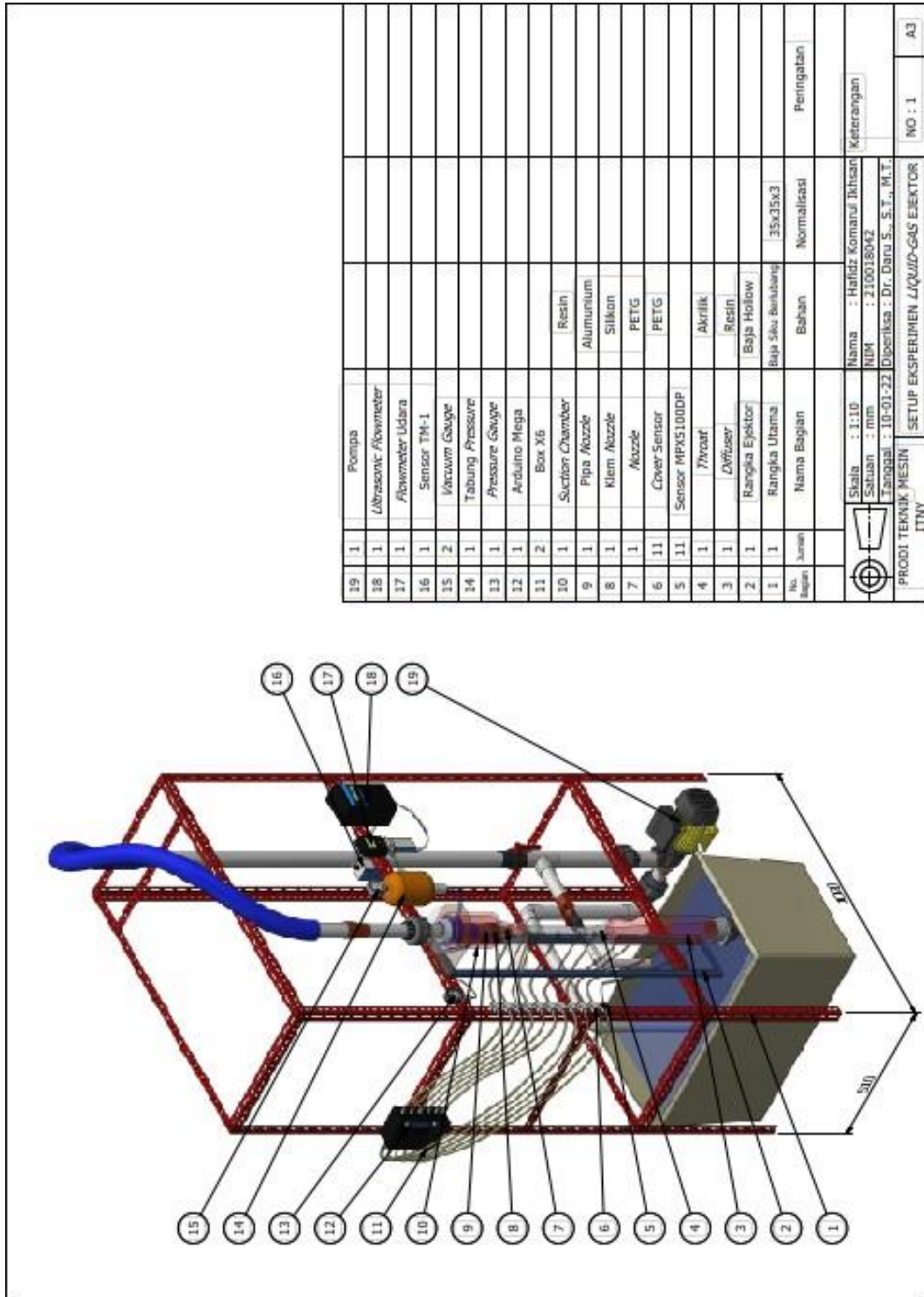
8. Tekanan *motive flow* 201,32 kPa pada *Nozzle* berdiameter hidrolik 10 mm



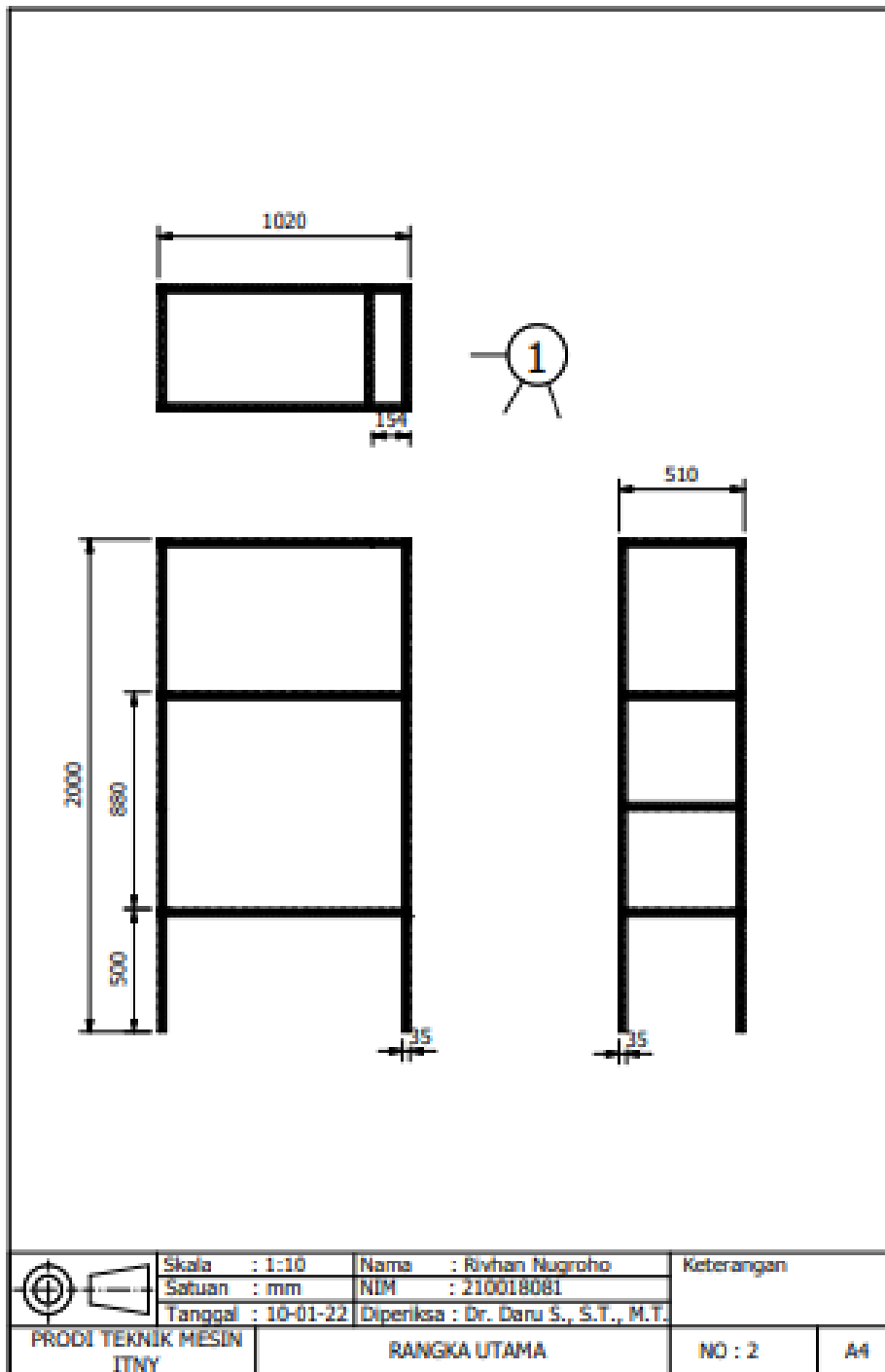
9. Tekanan *motive flow* 218,53 kPa pada *Nozzle* berdiameter hidrolis 10 mm



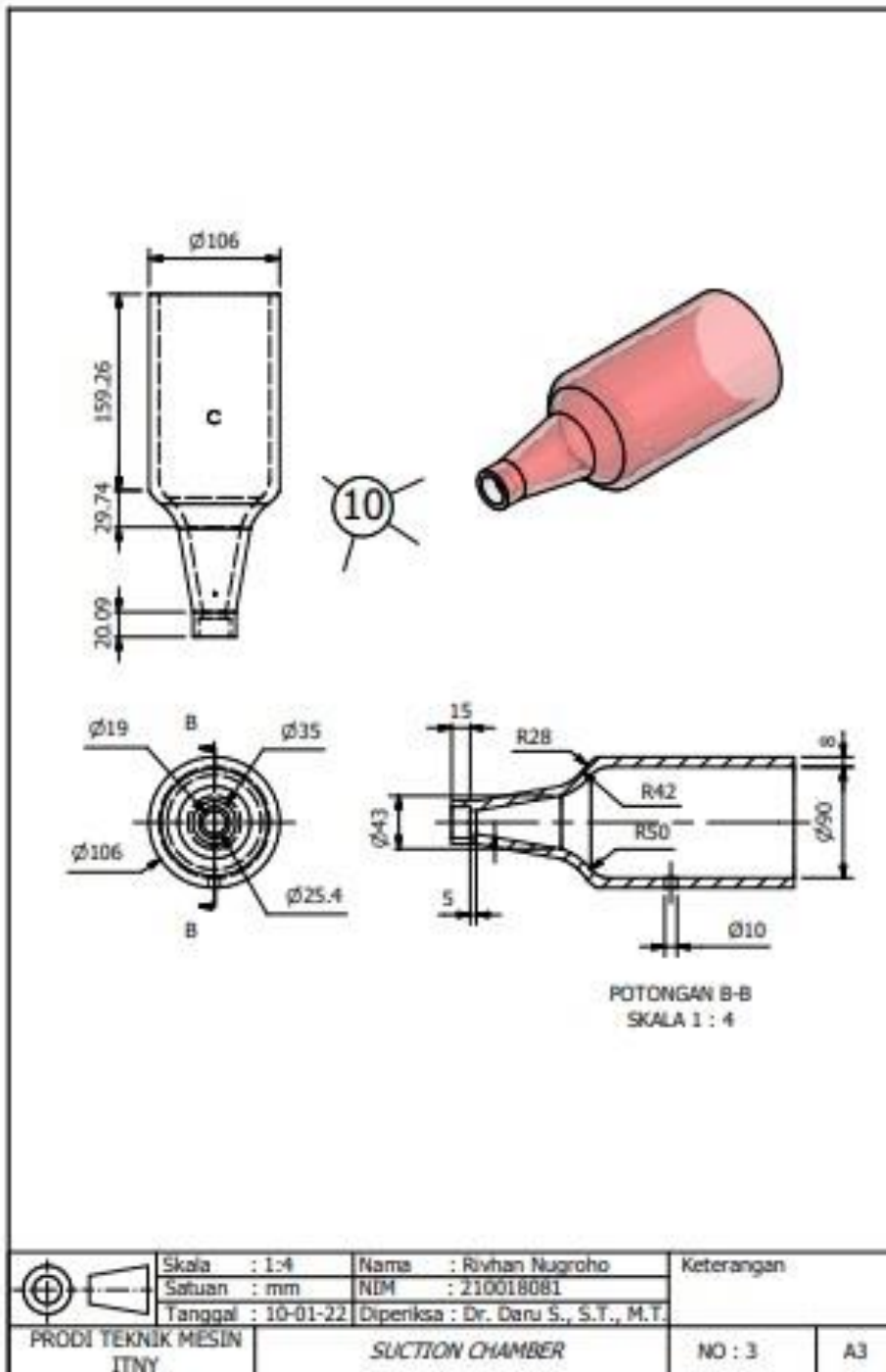
Lampiran 13. Gambar perangkat pengujian



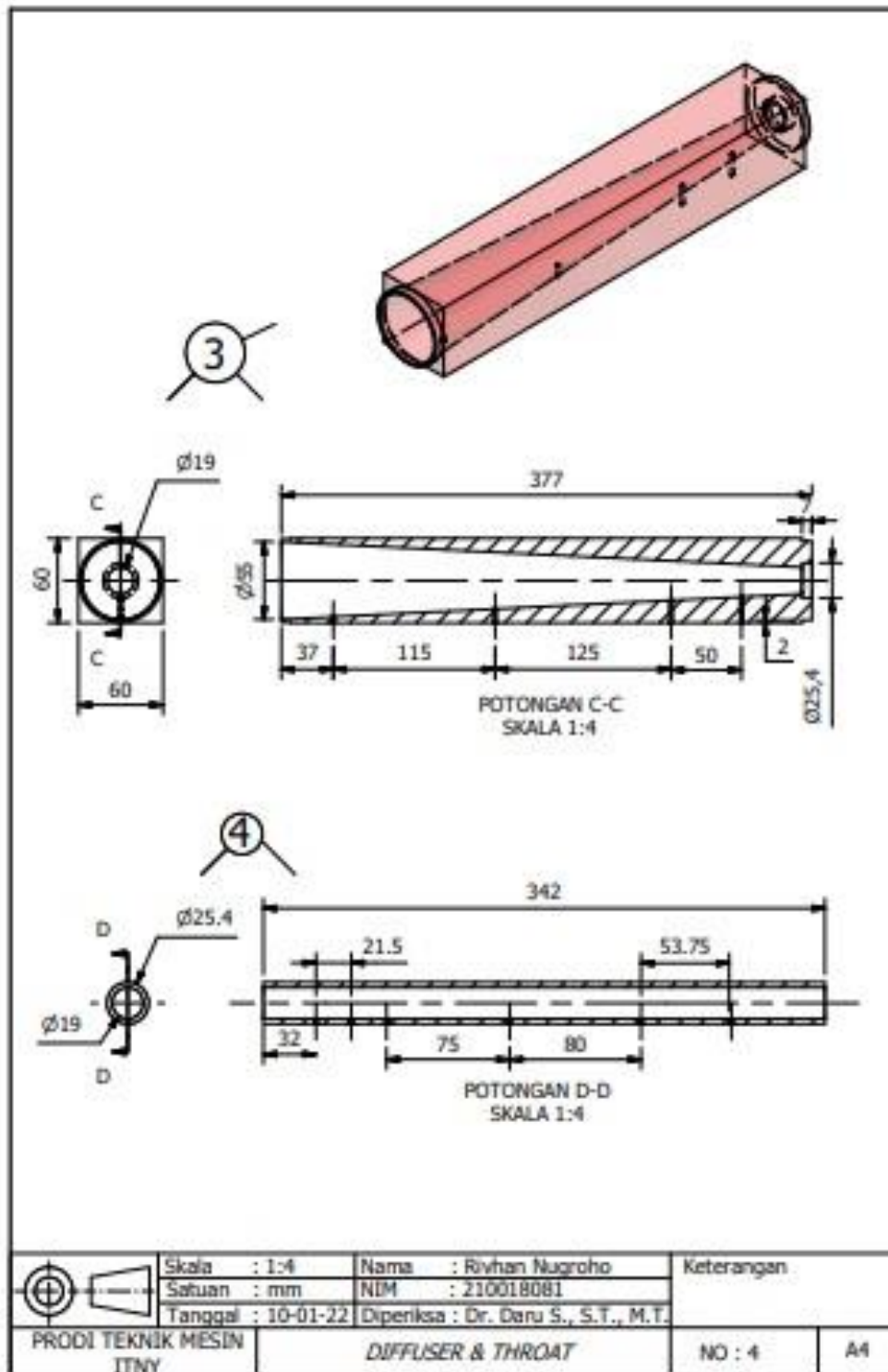
Lampiran 14. Dimensi rangka ejector pump



Lampiran 15. Dimensi *suction chamber*



Lampiran 16. Dimensi *diffuser*



Lampiran 17. Dimensi *Nozzle*, *Klem Nozzle*, dan pipa *Nozzle*

