

הכנת המסמך

ภาคผนวก

ตารางที่ 1 ข้อมูลจากการทดลอง

$L_D = 44 \text{ d} , D_2 = 0.8 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.28 \text{ d} , L_1 = 16 \text{ d} , q_c = 0.363 \text{ l/min}$										
TIME min.	T1 (C)	T2 (C)	T3 (C)	T4 (C)	S_d (Cm)	S_t (Cm)	h (Cm)	Q (l)	P_{dis} mm.H ₂ O	P_{suc} mm.H ₂ O
15	402.4	29.2	27.2	39.7	5.5	77	28.5	7.0	660	-590
30	395.5	37.5	30.3	53.2	5.0	77	30.5	13.0	650	-600
45	352.2	46.9	35.5	52.1	5.0	79	30.3	19.0	650	-630
60	407.6	51.3	39.0	60.6	5.0	76	30.0	25.0	660	-630
75	427.3	61.3	41.7	59.1	5.5	77	30.0	31.3	660	-620
90	454.6	70.8	48.3	61.6	5.5	77	29.5	38.0	675	-610
$L_D = 42 \text{ d} , D_2 = 0.8 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.28 \text{ d} , L_1 = 16 \text{ d} , q_c = 0.368 \text{ l/min}$										
TIME	T1	T2	T3	T4	S_d	S_t	h	Q	P_{dis}	P_{suc}
15	379.4	26.9	27.1	41.5	6.0	71	27.8	7.3	670	-590
30	337.6	32.1	28.2	47.1	5.2	78	29.0	15.0	650	-570
45	360.6	38.8	33.9	56.8	5.0	79	30.5	22.0	640	-630
60	348.9	48.8	36.1	60.9	5.2	78	31.0	26.6	630	-580
75	356.7	52.2	42.0	66.0	5.0	78	31.2	31.0	625	-570
90	346.2	54.8	42.7	65.5	5.0	77	30.5	35.0	610	-570

ข้อมูลการทดลอง (ต่อ)

$L_D = 48 \text{ d}$, $D_2 = 0.8 \text{ d}$, $D_4 = 0.3 \text{ d}$, $H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d}$, $D_3 = 0.28 \text{ d}$, $L_1 = 16 \text{ d}$, $q_c = 0.363 \text{ l/min}$										
TIME min.	T1 (C)	T2 (C)	T3 (C)	T4 (C)	S_d (Cm)	S_t (Cm)	h (Cm)	Q (l)	P_{dis} mm.H ₂ O	P_{suc} mm.H ₂ O
15	200.7	79.8	33.8	77.7	0.3	8	40.0	0	280	60
30	286.8	68.6	36.5	72.2	0.2	7	36.0	0	380	-50
45	291.7	72.5	43.7	75.5	0.8	12	35.0	0	180	-30
60	296.7	82.4	51.8	81.5	0.2	7	34.5	0	220	80
75	302.7	87.2	54.8	84.8	0.3	8	34.0	0	430	50
90	324.6	90.4	53.9	86.1	0.2	6	33.5	0	340	40
$L_D = 46 \text{ d}$, $D_2 = 0.8 \text{ d}$, $D_4 = 0.3 \text{ d}$, $H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d}$, $D_3 = 0.28 \text{ d}$, $L_1 = 16 \text{ d}$, $q_c = 0.368 \text{ l/min}$										
TIME	T1	T2	T3	T4	S_d	S_t	h	Q	P_{dis}	P_{suc}
15	350.0	52.6	31.7	56.6	5.0	77	32.5	2.2	660	-610
30	357.3	49.7	34.5	58.9	5.0	77	30.5	7.5	630	-600
45	353.2	54.1	41.8	58.3	5.5	78	30.0	14.2	640	-600
60	371.2	62.9	43.2	63.0	5.0	78	30.3	19.8	640	-610
75	360.3	63.9	47.5	65.6	5.5	77	29.0	26.0	690	-600
90	385.8	70.2	49.0	66.8	5.5	76	28.5	33.0	660	-570

ข้อมูลการทดลอง (ต่อ)

$L_D = 48 \text{ d}$, $D_2 = 0.5 \text{ d}$, $D_4 = 0.3 \text{ d}$, $H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d}$, $D_3 = 0.28 \text{ d}$, $L_1 = 16 \text{ d}$, $q_c = 0.363 \text{ l/min}$										
TIME min.	T1 (C)	T2 (C)	T3 (C)	T4 (C)	S_d (Cm)	S_u (Cm)	h (Cm)	Q (l)	P_{dis} mm.H ₂ O	P_{suc} mm.H ₂ O
15	241.0	73.2	35.7	67.8	0.3	10	37.5	0	210	-110
30	250.4	81.2	39.5	71.7	0.5	15	37.0	0	240	-170
45	208.5	89.9	44.7	76.4	0.4	14	37.0	0	250	-120
60	211.7	94.8	51.1	81.4	0.3	12	37.3	0	250	102
75	287.6	115	54.5	88.1	0.3	10	35.5	0	100	220
90	282.1	113	57.5	89.4	0.3	8	35.8	0	300	100
$L_D = 46 \text{ d}$, $D_2 = 0.5 \text{ d}$, $D_4 = 0.3 \text{ d}$, $H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d}$, $D_3 = 0.28 \text{ d}$, $L_1 = 16 \text{ d}$, $q_c = 0.368 \text{ l/min}$										
TIME	T1	T2	T3	T4	S_d	S_u	h	Q	P_{dis}	P_{suc}
15	366.3	52.8	32.2	56.5	4.5	82	34.0	3.5	450	-640
30	366.6	53.6	37.6	58.9	4.6	78	31.6	7.0	580	-590
45	388.2	64.4	41.1	62.8	5.0	77	29.8	13.0	590	-530
60	400.6	63.7	45.6	65.7	5.0	75	29.0	19.5	570	-550
75	413.0	66.1	49.1	69.7	5.2	74	28.7	25.8	610	-530
90	420.2	63.6	50.7	67.4	5.0	73	27.8	32.0	610	-530

ข้อมูลการทดลอง (ต่อ)

$L_D = 44 \text{ d} , D_2 = 0.7 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.28 \text{ d} , L_1 = 16 \text{ d} , q_c = 0.363 \text{ l/min}$										
TIME min.	T1 (C)	T2 (C)	T3 (C)	T4 (C)	S_d (Cm)	S_u (Cm)	h (Cm)	Q (l)	P_{dis} mm.H ₂ O	P_{suc} mm.H ₂ O
15	350.3	54.8	33.6	56.9	5.4	66	30.8	4.5	650	-675
30	388.5	68.2	35.0	60.4	6.0	63	30.3	8.0	660	-620
45	408.3	76.5	42.7	63.2	6.0	67	29.8	14.5	670	-640
60	405.5	80.4	43.3	66.0	5.6	68	29.5	21.1	650	-680
75	408.4	78.2	48.8	67.3	5.3	65	29.0	25.5	630	-675
90	381.9	88.6	49.5	71.6	6.2	70	29.0	32.6	690	-680
$L_D = 42 \text{ d} , D_2 = 0.7 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.28 \text{ d} , L_1 = 16 \text{ d} , q_c = 0.368 \text{ l/min}$										
TIME	T1	T2	T3	T4	S_d	S_u	h	Q	P_{dis}	P_{suc}
15	365.5	28.7	26.2	40.1	5.5	70	27.5	6	820	-640
30	335.9	38.9	27.6	54.0	5.0	77	30.5	11.5	820	-665
45	342.4	47.5	36.6	59.5	5.0	74	32.0	14.5	760	-680
60	342.0	48.8	40.4	60.7	5.0	75	32.0	16.3	720	-660
75	336.8	59.2	42.0	66.6	5.3	73	32.5	18.2	690	-650
90	355.3	72.5	48.8	68.2	5.0	74	31.0	21.0	680	-640

ข้อมูลการทดลอง (ต่อ)

$L_D = 48 \text{ d} , D_2 = 0.7 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.28 \text{ d} , L_1 = 16 \text{ d} , q_c = 0.363 \text{ l/min}$										
TIME min.	T1 (C)	T2 (C)	T3 (C)	T4 (C)	S_d (Cm)	S_c (Cm)	h (Cm)	Q (l)	P_{dis} mm.H ₂ O	P_{suc} mm.H ₂ O
15	403.4	34.1	29.1	48.6	5.5	73	29.0	6.8	770	-630
30	401.9	39.0	32.6	55.0	5.5	72	29.0	13.6	770	-630
45	387.3	43.2	34.6	54.4	5.5	72	29.0	20.5	770	-630
60	414.4	44.5	35.5	58.7	5.5	72	29.0	27.0	770	-630
75	414.1	49.1	35.6	50.8	5.5	72	28.6	34.0	770	-630
90	414.8	51.3	43.4	65.7	5.5	72	28.5	41.0	770	-630
$L_D = 46 \text{ d} , D_2 = 0.7 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.28 \text{ d} , L_1 = 16 \text{ d} , q_c = 0.368 \text{ l/min}$										
TIME	T1	T2	T3	T4	S_d	S_c	h	Q	P_{dis}	P_{suc}
15	269.3	81.2	34.5	72.2	0.8	9	37.8	0	250	100
30	302.4	99.9	41.5	79.6	0.7	13	37.4	0	340	180
45	292.1	107	47.1	86.0	0.5	10	37.5	0	360	180
60	298.9	113	54.8	89.6	0.3	8	37.5	0	300	170
75	304.3	116	60.1	97.6	0.3	6	37.0	0	270	170
90	308.5	117	60.9	97.8	0.3	6	37.2	0	280	170

ข้อมูลการทดลอง (ต่อ)

$L_D = 51 \text{ d} , D_2 = 0.7 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.3 \text{ d} , L_1 = 19 \text{ d} , q_c = 0.363 \text{ l/min}$										
TIME min.	T1 (C)	T2 (C)	T3 (C)	T4 (C)	S_d (Cm)	S_b (Cm)	h (Cm)	Q (l)	P_{dis} mm.H ₂ O	P_{suc} mm.H ₂ O
15	244.0	73.1	31.0	59.1	0.6	15	37.5	0	260	-170
30	265.0	76.1	38.7	62.4	0.3	7	36.1	0	320	240
45	316.1	99.1	46.1	72.2	0.5	12	34.0	0	490	290
60	346.3	98.2	50.8	76.8	0.5	14	32.5	0	480	120
75	362.8	96.0	53.6	76.5	5	60	32.3	0.2	620	-460
90	363.7	98.5	56.1	77.2	5.0	58	31.0	0.3	605	-460
$L_D = 49 \text{ d} , D_2 = 0.7 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.3 \text{ d} , L_1 = 19 \text{ d} , q_c = 0.368 \text{ l/min}$										
TIME	T1	T2	T3	T4	S_d	S_b	h	Q	P_{dis}	P_{suc}
15	390.6	35.4	30.2	54.6	7.0	75	29.0	5.5	780	-600
30	388.6	42.3	31.5	64.8	6.5	75	28.6	13.0	780	-590
45	381.5	47.6	31.9	65.4	5.5	73	28.5	20.0	775	-585
60	384.4	54.2	37.6	68.0	5.4	75	27.5	28.0	770	-585
75	387.6	61.8	41.0	67.6	5.8	76	27.5	36.0	810	-600
90	377.9	67.6	38.3	67.4	6.2	75	27.0	44.5	760	-590

ข้อมูลการทดลอง (ต่อ)

$L_D = 47 \text{ d}$, $D_2 = 0.7 \text{ d}$, $D_4 = 0.3 \text{ d}$, $H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d}$, $D_3 = 0.3 \text{ d}$, $L_1 = 19 \text{ d}$, $q_c = 0.363 \text{ l/min}$										
TIME min.	T1 (C)	T2 (C)	T3 (C)	T4 (C)	S_d (Cm)	S_u (Cm)	h (Cm)	Q (l)	P_{dis} mm.H ₂ O	P_{suc} mm.H ₂ O
15	371.5	36.8	27.4	53.9	5.8	72	27.3	6.8	800	-570
30	396.1	38.7	31.4	55.4	7.0	71	26.5	15.0	800	-580
45	391.6	40.6	34.6	59.0	7.0	71	26.5	23.0	800	-585
60	388.2	43.5	38.0	60.0	7.0	70	26.7	30.5	770	-590
75	374.9	55.7	39.8	68.0	5.8	71	27.4	37.5	770	-600
90	378.2	63.1	41.8	69.7	6.0	72	27.3	43.8	770	-595
$L_D = 45 \text{ d}$, $D_2 = 0.7 \text{ d}$, $D_4 = 0.3 \text{ d}$, $H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d}$, $D_3 = 0.3 \text{ d}$, $L_1 = 19 \text{ d}$, $q_c = 0.368 \text{ l/min}$										
TIME	T1	T2	T3	T4	S_d	S_u	h	Q	P_{dis}	P_{suc}
15	324.6	57.3	29.9	69.4	1.0	15	32.0	0	460	100
30	335.1	68.7	31.4	75.3	1.0	13	32.5	0	370	50
45	341.1	76.0	42.7	80.4	1.2	30	32.0	0	500	-80
60	359.5	75.3	46.3	81.1	5.0	60	32.0	0	660	-300
75	346.7	75.6	49.3	82.3	5.0	62	32.0	0	650	-480
90	361.2	80.5	51.6	83.0	5.5	64	32.0	0.5	640	-490

ข้อมูลการทดลอง (ต่อ)

$L_D = 48 \text{ d}$, $D_2 = 0.8 \text{ d}$, $D_4 = 0.3 \text{ d}$, $H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d}$, $D_3 = 0.4 \text{ d}$, $L_1 = 16 \text{ d}$, $q_c = 0.363 \text{ l/min}$										
TIME min.	T1 (C)	T2 (C)	T3 (C)	T4 (C)	S_d (Cm)	S_e (Cm)	h (Cm)	Q (l)	P_{dis} mm.H ₂ O	P_{suc} mm.H ₂ O
15	294.1	65.4	27.2	42.0	4.2	67	36.0	1.0	580	-560
30	297.3	50.8	30.6	46.2	4.1	66	34.5	2.3	575	-540
45	272.9	60.2	35.2	50.1	4.2	63	34.0	3.8	590	-500
60	310.5	70.4	36.0	52.6	3.8	61	33.5	5.0	580	-500
75	323.6	77.0	39.7	55.4	4.0	64	33.5	8.0	570	-520
90	328.5	78.2	41.2	56.3	3.5	56	31.0	11.0	580	-580
$L_D = 46 \text{ d}$, $D_2 = 0.8 \text{ d}$, $D_4 = 0.3 \text{ d}$, $H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d}$, $D_3 = 0.4 \text{ d}$, $L_1 = 16 \text{ d}$, $q_c = 0.368 \text{ l/min}$										
TIME	T1	T2	T3	T4	S_d	S_e	h	Q	P_{dis}	P_{suc}
15	295.3	37.1	30.4	39.2	5.2	70	31.0	6.2	720	-580
30	371.7	52.3	31.7	46.8	5.6	71	29.0	12.5	670	-570
45	375.2	49.0	35.6	48.0	6.9	69	27.0	21.0	730	-590
60	416.1	52.4	35.9	48.9	7.5	72	27.5	31.1	720	-590
75	382.6	48.3	40.9	52.5	7.0	70	27.2	42.0	730	-570
90	384.2	51.6	41.2	51.2	6.8	68	27.5	54.0	740	-560

ข้อมูลการทดลอง (ต่อ)

$L_D = 44 \text{ d} , D_2 = 0.8 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.4 \text{ d} , L_1 = 16 \text{ d} , q_c = 0.363 \text{ l/min}$										
TIME min.	T1 (C)	T2 (C)	T3 (C)	T4 (C)	S_d (Cm)	S_t (Cm)	h (Cm)	Q (l)	P_{dis} mm.H ₂ O	P_{suc} mm.H ₂ O
15	389.9	36.2	33.4	42.9	5.6	72	28.5	6.5	700	-590
30	374.1	40.8	33.1	44.6	5.6	72	29.1	14.5	680	-620
45	352.9	55.1	35.7	48.8	5.6	72	29.6	20.5	670	-610
60	354.4	60.4	36.8	44.1	5.5	70	30.0	25.5	640	-605
75	309.4	62.1	39.9	50.1	5.6	71	30.3	29.9	620	-620
90	353.7	52.4	25.8	39.8	5.1	68	30.5	29.9	610	-610
$L_D = 42 \text{ d} , D_2 = 0.8 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.4 \text{ d} , L_1 = 16 \text{ d} , q_c = 0.368 \text{ l/min}$										
TIME	T1	T2	T3	T4	S_d	S_t	h	Q	P_{dis}	P_{suc}
15	423.1	33.8	28.8	34.8	6.5	75	27.0	6.0	680	-610
30	386.9	47.3	29.1	42.5	6.0	71	29.0	15.0	700	-610
45	380.1	65.8	34.4	49.2	5.3	70	30.0	21.7	670	-610
60	388.8	66.3	34.9	50.3	5.0	69	29.5	27.5	660	-605
75	384.5	68.7	38.2	53.1	4.8	67	29.0	31.4	610	-570
90	396.4	70.9	38.5	54.9	4.6	65	29.0	35.8	615	-575

ข้อมูลการทดลอง (ต่อ)

$L_D = 46 \text{ d}$, $D_2 = 0.7 \text{ d}$, $D_4 = 0.3 \text{ d}$, $H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d}$, $D_3 = 0.4 \text{ d}$, $L_1 = 16 \text{ d}$, $q_c = 0.363 \text{ l/min}$										
TIME min.	T1 (C)	T2 (C)	T3 (C)	T4 (C)	S_d (Cm)	S_t (Cm)	h (Cm)	Q (l)	P_{dis} mm.H ₂ O	P_{suc} mm.H ₂ O
15	117.0	98.5	36.5	86.7	0.5	12	41.0	0	300	200
30	209.9	107	41.2	97.3	1.0	14	39.5	0	350	270
45	246.5	110	47.6	103	1.0	12	36.5	0	450	280
60	266.8	115	50.3	103	1.3	15	37.2	0	400	300
75	273.8	113	56.5	97.2	1.2	13	36.8	0	340	270
90	283.5	114	57.4	98.8	1.0	12	36.4	0	320	260
$L_D = 44 \text{ d}$, $D_2 = 0.7 \text{ d}$, $D_4 = 0.3 \text{ d}$, $H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d}$, $D_3 = 0.4 \text{ d}$, $L_1 = 16 \text{ d}$, $q_c = 0.368 \text{ l/min}$										
TIME	T1	T2	T3	T4	S_d	S_t	h	Q	P_{dis}	P_{suc}
15	392.5	41.6	29.2	44.7	5.0	61	28.0	7.5	770	-600
30	391.3	44.7	30.1	47.8	5.7	61	27.7	16.2	800	-590
45	394.4	49.7	35.1	53.0	5.8	61	27.3	25.0	800	-600
60	386.4	57.6	35.2	52.3	6.0	60	27.0	33.5	790	-600
75	378.1	64.8	40.6	60.0	6.1	59	27.3	38.5	750	-590
90	359.6	71.5	39.7	59.3	6.0	57	28.2	42.3	740	-570

ข้อมูลการทดลอง (ต่อ)

$L_D = 48 \text{ d} , D_2 = 0.7 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.4 \text{ d} , L_1 = 16 \text{ d} , q_c = 0.363 \text{ l/min}$										
TIME min.	T1 (C)	T2 (C)	T3 (C)	T4 (C)	S_d (Cm)	S_b (Cm)	h (Cm)	Q (l)	P_{dis} mm.H ₂ O	P_{suc} mm.H ₂ O
15	339.9	65.6	25.6	44.0	5.0	69	32.0	2.1	600	-600
30	349.4	71.4	28.7	44.5	4.6	68	30.3	6.0	635	-615
45	338.5	68.9	29.5	45.3	5.5	69	31.5	10.8	660	-650
60	321.5	51.3	32.8	45.7	5.5	69	30.5	15.5	660	-640
75	315.4	44.7	35.1	46.0	5.5	71	29.6	21.5	670	-630
90	326.8	47.7	36.2	47.6	5.6	70	28.6	28.0	670	-630
$L_D = 46 \text{ d} , D_2 = 0.7 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.4 \text{ d} , L_1 = 16 \text{ d} , q_c = 0.368 \text{ l/min}$										
TIME	T1	T2	T3	T4	S_d	S_b	h	Q	P_{dis}	P_{suc}
15	341.8	68.6	30.4	47.3	6.0	75	30.0	2.5	690	-690
30	330.6	77.2	36.1	51.7	5.0	73	30.0	6.2	640	-690
45	344.2	86.7	40.4	65.3	4.5	70	31.5	9.0	630	-650
60	326.8	88.8	41.8	65.5	6.5	75	29.5	13.5	690	-670
75	366.0	86.5	47.3	70.7	6.0	74	29.0	16.0	660	-650
90	375.1	98.4	45.9	71.3	4.5	68	29.0	18.5	600	-610

ข้อมูลการทดลอง (ต่อ)

$L_D = 48 \text{ d} , D_2 = 0.7 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.4 \text{ d} , L_1 = 16 \text{ d} , q_c = 0.363 \text{ l/min}$										
TIME min.	T1 (C)	T2 (C)	T3 (C)	T4 (C)	S_d (Cm)	S_t (Cm)	h (Cm)	Q (l)	P_{dis} mm.H ₂ O	P_{suc} mm.H ₂ O
15	339.9	65.6	25.6	44.0	5.0	69	32.0	2.1	600	-600
30	349.4	71.4	28.7	44.5	4.6	68	30.3	6.0	635	-615
45	338.5	68.9	29.5	45.3	5.5	69	31.5	10.8	660	-650
60	321.5	51.3	32.8	45.7	5.5	69	30.5	15.5	660	-640
75	315.4	44.7	35.1	46.0	5.5	71	29.6	21.5	670	-630
90	326.8	47.7	36.2	47.6	5.6	70	28.6	28.0	670	-630
$L_D = 46 \text{ d} , D_2 = 0.7 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.4 \text{ d} , L_1 = 16 \text{ d} , q_c = 0.368 \text{ l/min}$										
TIME	T1	T2	T3	T4	S_d	S_t	h	Q	P_{dis}	P_{suc}
15	341.8	68.6	30.4	47.3	6.0	75	30.0	2.5	690	-690
30	330.6	77.2	36.1	51.7	5.0	73	30.0	6.2	640	-690
45	344.2	86.7	40.4	65.3	4.5	70	31.5	9.0	630	-650
60	326.8	88.8	41.8	65.5	6.5	75	29.5	13.5	690	-670
75	366.0	86.5	47.3	70.7	6.0	74	29.0	16.0	660	-650
90	375.1	98.4	45.9	71.3	4.5	68	29.0	18.5	600	-610

ข้อมูลการทดลอง (ต่อ)

$L_D = 44 \text{ d} , D_2 = 0.5 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.4 \text{ d} , L_1 = 16 \text{ d} , q_c = 0.363 \text{ l/min}$										
TIME min.	T1 (C)	T2 (C)	T3 (C)	T4 (C)	S_d (Cm)	S_b (Cm)	h (Cm)	Q (l)	P_{dis} mm.H ₂ O	P_{suc} mm.H ₂ O
15	345.2	60.3	26.2	48.1	5.0	67	30.5	5.5	700	-690
30	332.8	64.6	28.8	50.6	5.0	70	32.0	10.5	700	-700
45	308.1	61.7	32.5	53.4	5.0	70	31.5	15.5	700	-650
60	331.2	67.6	35.1	56.4	5.0	66	30.0	20.6	730	-670
75	314.5	60.3	39.6	57.6	5.0	65	30.0	25.8	680	-660
90	356.7	71.0	39.7	59.5	4.8	62	29.0	31.2	670	-640
$L_D = 42 \text{ d} , D_2 = 0.5 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.4 \text{ d} , L_1 = 16 \text{ d} , q_c = 0.368 \text{ l/min}$										
TIME	T1	T2	T3	T4	S_d	S_b	h	Q	P_{dis}	P_{suc}
15	378.4	38.8	28.4	30.6	3.0	45	23.8	4.6	580	-430
30	384.5	41.0	27.3	31.8	5.0	58	23.0	9.0	620	-450
45	393.2	40.4	29.8	34.4	4.8	52	22.7	12.2	610	-430
60	399.4	41.3	28.8	33.2	4.0	48	22.0	15.0	560	-430
75	406.4	41.2	31.8	37.2	-	46	21.4	16.2	510	-410
90	414.7	43.3	30.4	35.4	-	42	21.0	18.5	490	-400

ข้อมูลการทดลอง (ต่อ)

$L_D = 48 \text{ d} , D_2 = 0.5 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.4 \text{ d} , L_1 = 16 \text{ d} , q_c = 0.363 \text{ l/min}$										
TIME min.	T1 (C)	T2 (C)	T3 (C)	T4 (C)	S_d (Cm)	S_t (Cm)	h (Cm)	Q (l)	P_{dis} mm.H ₂ O	P_{suc} mm.H ₂ O
15	292.7	65.4	29.2	45.9	5.5	41	32.5	1.8	440	-400
30	290.9	44.5	31.5	45.7	5.6	65	31.5	3.5	580	-440
45	255.5	37.9	36.1	43.9	5.0	65	30.0	6.0	550	-460
60	246.7	39.4	35.6	37.6	4.2	62	28.2	9.0	540	-450
75	331.2	43.3	35.6	34.5	5.5	53	24.5	12.5	560	-440
90	309.5	43.3	35.6	34.5	5.5	53	24.5	14.3	560	-410
$L_D = 46 \text{ d} , D_2 = 0.5 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.4 \text{ d} , L_1 = 16 \text{ d} , q_c = 0.368 \text{ l/min}$										
TIME	T1	T2	T3	T4	S_d	S_t	h	Q	P_{dis}	P_{suc}
15	271.1	41.7	28.7	46.1	5.5	67	31.5	2.3	500	-490
30	209.9	48.3	32.1	47.8	5.5	66	34.0	4.0	520	-410
45	260.7	62.4	33.5	54.4	5.8	68	33.0	6.0	500	-410
60	273.6	72.3	35.7	60.3	4.8	65	31.0	7.5	480	-390
75	551.3	75.1	36.1	63.2	4.5	64	30.0	8.2	470	-390
90	549.2	78.2	39.7	68.1	5.2	65	29.0	9.5	460	-380

ข้อมูลการทดลอง (ต่อ)

$L_D = 48 \text{ d} , D_2 = 0.5 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.7 \text{ d} , L_1 = 16 \text{ d} , q_c = 0.363 \text{ l/min}$										
TIME min.	T1 (C)	T2 (C)	T3 (C)	T4 (C)	S_d (Cm)	S_t (Cm)	h (Cm)	Q (l)	P_{dis} mm.H ₂ O	P_{suc} mm.H ₂ O
15	322.8	66.4	27.6	52.6	3.5	23	31.5	0	590	-370
30	301.6	66.2	30.1	51.9	3.0	20	31.0	0	450	-270
45	267.7	50.8	35.6	52.3	1.8	19	31.8	0	300	-250
60	286.2	58.2	35.8	53.1	2.0	20	31.0	0	460	-360
75	300.8	49.2	38.4	51.0	3.0	22	29.0	0	410	-330
90	343.1	62.9	39.6	58.3	2.5	23	27.5	0	420	-300
$L_D = 46 \text{ d} , D_2 = 0.5 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.7 \text{ d} , L_1 = 16 \text{ d} , q_c = 0.368 \text{ l/min}$										
TIME	T1	T2	T3	T4	S_d	S_t	h	Q	P_{dis}	P_{suc}
15	325.5	41.4	27.0	45.5	3.0	32	29.0	0.3	570	-430
30	338.9	49.1	29.4	48.2	2.2	30	28.5	0.3	520	-440
45	361.1	56.6	33.7	52.3	3.2	32	27.0	0.3	500	-420
60	364.5	55.6	34.3	52.8	4.0	32	27.5	0.5	510	-410
75	351.2	50.6	38.4	55.4	3.8	33	27.0	0.6	480	-420
90	359.9	59.2	38.8	50.1	4.0	35	27.0	0.9	520	-450

ข้อมูลการทดลอง (ต่อ)

$L_D = 44 \text{ d} , D_2 = 0.5 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.7 \text{ d} , L_1 = 16 \text{ d} , q_c = 0.363 \text{ l/min}$										
TIME min.	T1 (C)	T2 (C)	T3 (C)	T4 (C)	S_d (Cm)	S_t (Cm)	h (Cm)	Q (l)	P_{dis} mm.H ₂ O	P_{suc} mm.H ₂ O
15	370.9	41.2	29.7	30.9	3.0	22	25.0	2.5	600	-400
30	325.5	43.6	30.8	36.7	4.5	33	27.5	3.5	650	-450
45	349.8	59.8	36.1	46.1	4.8	32	27.0	4.0	650	-440
60	362.5	77.3	36.1	47.7	4.5	34	26.6	4.0	530	-400
75	350.0	75.6	41.5	51.0	4.0	32	26.5	4.0	510	-380
90	336.2	65.4	41.2	48.4	3.0	26	28.0	4.1	440	-370
$L_D = 42 \text{ d} , D_2 = 0.5 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.7 \text{ d} , L_1 = 16 \text{ d} , q_c = 0.368 \text{ l/min}$										
TIME	T1	T2	T3	T4	S_d	S_t	h	Q	P_{dis}	P_{suc}
15	358.3	74.5	26.5	56.1	4.0	35	30.0	0.8	510	-480
30	341.2	73.9	30.9	56.4	4.5	33	30.0	1.2	520	-400
45	309.4	75.1	34.9	59.6	3.8	28	31.3	1.2	450	-380
60	301.1	77.2	36.8	62.5	4.0	29	31.5	1.2	450	-390
75	329.6	84.1	40.7	65.1	3.9	28	31.3	1.2	440	-340
90	343.1	89.8	41.1	68.4	4.2	25	32.2	1.2	450	-360

ข้อมูลการทดลอง (ต่อ)

$L_D = 48 \text{ d} , D_2 = 0.7 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.7 \text{ d} , L_1 = 16 \text{ d} , q_c = 0.363 \text{ l/min}$										
TIME min.	T1 (C)	T2 (C)	T3 (C)	T4 (C)	S_d (Cm)	S_t (Cm)	h (Cm)	Q (l)	P_{dis} mm.H ₂ O	P_{suc} mm.H ₂ O
15	282.5	97.3	32.4	69.8	0.4	7	36.5	0	160	-80
30	280.8	100	35.5	71.1	0.8	5	36.8	0	150	-60
45	309.6	106	41.6	82.1	1.0	6	35.5	0	250	-70
60	310.7	108	44.7	80.4	1.2	7	35.5	0	260	-80
75	323.6	110	49.7	84.7	2.0	9	35.0	0	340	-90
90	323.4	109	51.4	83.9	3.0	11	35.0	0	330	-100
$L_D = 46 \text{ d} , D_2 = 0.7 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.7 \text{ d} , L_1 = 16 \text{ d} , q_c = 0.368 \text{ l/min}$										
TIME	T1	T2	T3	T4	S_d	S_t	h	Q	P_{dis}	P_{suc}
15	350.7	39.2	31.1	35.7	3.0	26	26.0	2.7	730	-400
30	372.7	52.1	30.5	37.2	6.0	35	25.0	4.5	740	-450
45	345.2	40.3	34.9	39.2	5.5	33	24.5	7.0	760	-410
60	383.2	45.2	33.1	40.1	5.0	30	23.5	9.0	740	-420
75	367.3	44.1	36.3	42.9	5.5	31	23.5	12.0	720	-420
90	383.6	48.6	35.2	43.6	5.0	33	23.0	13.6	740	-440

ข้อมูลการทดลอง (ต่อ)

$L_D = 44 \text{ d}$, $D_2 = 0.7 \text{ d}$, $D_4 = 0.3 \text{ d}$, $H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d}$, $D_3 = 0.7 \text{ d}$, $L_1 = 16 \text{ d}$, $q_c = 0.363 \text{ l/min}$										
TIME min.	T1 (C)	T2 (C)	T3 (C)	T4 (C)	S_d (Cm)	S_t (Cm)	h (Cm)	Q (l)	P_{dis} mm.H ₂ O	P_{suc} mm.H ₂ O
15	354.7	40.2	30.3	44.5	3	30	29.0	0.1	640	-330
30	352.8	41.9	32.5	46.8	4	32	28.5	0.1	610	-410
45	363.2	42.4	35.8	48.2	4	33	27.0	1.0	610	-420
60	378.8	41.4	36.5	44.5	4.6	32	25.6	2.0	650	-440
75	385.6	41.9	38.6	45.8	5.5	34	24.7	3.5	660	-460
90	392.1	44.8	38.1	43.4	5	32	24.0	5	620	-410
$L_D = 42 \text{ d}$, $D_2 = 0.7 \text{ d}$, $D_4 = 0.3 \text{ d}$, $H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d}$, $D_3 = 0.7 \text{ d}$, $L_1 = 16 \text{ d}$, $q_c = 0.368 \text{ l/min}$										
TIME	T1	T2	T3	T4	S_d	S_t	h	Q	P_{dis}	P_{suc}
15	392.7	40.3	35.3	36.9	3	30	24.0	2.5	670	-300
30	381.1	39.6	35.9	38.3	5	27	25.0	4.3	840	-390
45	367.8	45.6	33.3	39.9	5	28	23.5	7.3	330	-440
60	372.1	48.4	36.1	42.6	5.4	25	24.5	9.5	780	-400
75	366.4	46.7	37.2	46.5	5	32	24.5	11.8	820	-430
90	364.7	47.1	36.5	40.1	5	30	24.5	13.2	750	-440

ข้อมูลการทดลอง (ต่อ)

$L_D = 44 \text{ d} , D_2 = 0.8 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.7 \text{ d} , L_1 = 16 \text{ d} , q_c = 0.363 \text{ l/min}$										
TIME min.	T1 (C)	T2 (C)	T3 (C)	T4 (C)	S_d (Cm)	S_u (Cm)	h (Cm)	Q (l)	P_{dis} mm.H ₂ O	P_{suc} mm.H ₂ O
15	361.8	45.9	26.8	44.4	3.5	35	29.5	1.5	360	-200
30	352.2	69.2	31.1	53.9	4.0	42	29.5	2.2	310	-230
45	344.8	69.2	31.1	53.9	4.2	37	29.5	2.8	340	-220
60	345.8	77.5	37.8	58.4	4.5	46	29.8	3.3	320	-200
75	362.2	78.1	41.9	64.1	3.8	40	30.0	3.8	340	-220
90	341.2	76.2	41.8	63.7	3.5	39	29.3	4.4	330	-230
$L_D = 42 \text{ d} , D_2 = 0.8 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.7 \text{ d} , L_1 = 16 \text{ d} , q_c = 0.368 \text{ l/min}$										
TIME	T1	T2	T3	T4	S_d	S_u	h	Q	P_{dis}	P_{suc}
15	299.6	58.9	23.7	46.7	1.5	21	31.5	0	280	-230
30	271.1	38.2	23.0	46.8	2.5	38	32.0	0	100	-130
45	261.5	42.7	25.7	50.4	0.7	15	32.5	0	60	-100
60	285.2	57.4	26.8	53.2	3	24	32.0	0	220	-150
75	273.7	66.4	30.8	57.7	2.5	30	32.5	0	160	-210
90	250.4	52.5	29.5	55.1	1	23	33.0	0	90	-130

ข้อมูลการทดลอง (ต่อ)

$L_D = 48 \text{ d} , D_2 = 0.8 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.7 \text{ d} , L_1 = 16 \text{ d} , q_c = 0.363 \text{ l/min}$										
TIME min.	T1 (C)	T2 (C)	T3 (C)	T4 (C)	S_d (Cm)	S_u (Cm)	h (Cm)	Q (l)	P_{dis} mm.H ₂ O	P_{suc} mm.H ₂ O
15	349.8	62.5	29.8	47.2	4	33	29.0	0.8	400	-230
30	340.4	74.0	32.4	53.4	4	40	29.0	1.6	410	-240
45	334.4	74.7	37.5	55.4	2	41	29.5	2.4	390	-230
60	362.3	80.1	39.2	58.3	3.8	38	28.0	4.0	360	-220
75	346.2	76.9	43.3	60.4	4.5	40	27.2	5.5	350	-220
90	353.8	79.1	44.1	59.6	4.2	43	27.0	7.2	370	-250
$L_D = 46 \text{ d} , D_2 = 0.8 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.7 \text{ d} , L_1 = 16 \text{ d} , q_c = 0.368 \text{ l/min}$										
TIME	T1	T2	T3	T4	S_d	S_u	h	Q	P_{dis}	P_{suc}
15	333.9	66.1	30.0	55.3	3	30	26.5	1.6	370	-180
30	335.6	36.7	31.6	42.3	3.5	35	27.5	3.6	380	-190
45	350.9	39.4	31.1	44.6	4	36	26.6	5.5	410	-200
60	361.2	42.8	34.1	44.4	3	32	25.8	8.0	370	-180
75	352.1	42.1	35.5	45.8	4.5	35	25.6	12.0	420	-200
90	347.2	44.4	36.1	46.5	4.5	39	25.5	15.0	390	-200

ข้อมูลการทดลอง (ต่อ)

$L_D = 47 \text{ d} , D_2 = 0.5 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.3 \text{ d} , L_1 = 19 \text{ d} , q_c = 0.363 \text{ l/min}$										
TIME min.	T1 (C)	T2 (C)	T3 (C)	T4 (C)	S_d (Cm)	S_c (Cm)	h (Cm)	Q (l)	P_{dis} mm.H ₂ O	P_{suc} mm.H ₂ O
15	344.1	27.0	27.7	45.3	0.5	8	27.5	0	360	200
30	369.8	30.8	32.2	44.6	5.5	75	27.5	6.5	720	-590
45	366.2	33.8	34.3	50.7	5.5	75	27.5	14.5	720	-590
60	367.5	35.0	38.6	51.6	5.5	75	27.5	22.5	720	-595
75	364.6	36.9	39.4	55.2	5.3	75	27.8	30.5	720	-580
90	363.8	39.7	43.0	55.9	5.5	76	28.0	38.0	710	-590
$L_D = 45 \text{ d} , D_2 = 0.5 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.3 \text{ d} , L_1 = 19 \text{ d} , q_c = 0.368 \text{ l/min}$										
TIME	T1	T2	T3	T4	S_d	S_c	h	Q	P_{dis}	P_{suc}
15	378.6	33.2	25.6	48.4	6.5	78	26.5	8.5	760	-640
30	386.2	45.5	32.9	57.3	5.7	77	29.2	16.0	700	-640
45	386.6	55.8	37.6	61.5	5.7	77	29.0	22.5	680	-635
60	378.4	54.5	41.4	62.8	5.5	75	28.5	28.0	690	-610
75	385.2	55.3	45.1	67.1	5.5	73	28.0	34.0	695	-595
90	391.1	57.8	46.2	66.5	5.7	73	22.7	40.0	695	-610

ข้อมูลการทดลอง (ต่อ)

$L_D = 51 \text{ d}$, $D_2 = 0.5 \text{ d}$, $D_4 = 0.3 \text{ d}$, $H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d}$, $D_3 = 0.3 \text{ d}$, $L_1 = 19 \text{ d}$, $q_c = 0.363 \text{ l/min}$										
TIME min.	T1 (C)	T2 (C)	T3 (C)	T4 (C)	S_d (Cm)	S_t (Cm)	h (Cm)	Q (l)	P_{dis} mm.H ₂ O	P_{suc} mm.H ₂ O
15	207.9	59.5	24.2	54.8	0.5	6	37.5	0	380	-170
30	269.0	78.6	34.3	67.3	0.8	18	36.0	0	235	-130
45	287.0	86.9	38.5	77.4	0.5	15	34.5	0	370	110
60	313.2	93.6	42.4	84.5	0.5	13	34.0	0	400	200
75	295.1	91.7	53.8	78.6	1.0	15	35.0	0	220	-130
90	317.3	92.8	55.6	83.4	3.0	30	34.5	0	330	-130
$L_D = 49 \text{ d}$, $D_2 = 0.5 \text{ d}$, $D_4 = 0.3 \text{ d}$, $H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d}$, $D_3 = 0.3 \text{ d}$, $L_1 = 19 \text{ d}$, $q_c = 0.368 \text{ l/min}$										
TIME	T1	T2	T3	T4	S_d	S_t	h	Q	P_{dis}	P_{suc}
15	349.5	29.4	27.3	44.7	5.0	75	29.5	5.0	680	-550
30	354.5	38.1	31.3	52.2	5.0	74	29.5	12.0	710	-605
45	354.8	45.4	34.8	58.8	5.0	74	30.0	17.2	680	-610
60	353.4	50.5	40.7	60.7	5.0	74	30.0	21.5	660	-600
75	360.6	54.7	40.9	65.7	5.1	74	29.5	25.5	635	-615
90	356.7	57.5	46.9	65.3	5.0	75	29.0	30.5	665	-620

ข้อมูลการทดลอง (ต่อ)

$L_D = 51 \text{ d}$, $D_2 = 0.5 \text{ d}$, $D_4 = 0.3 \text{ d}$, $H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d}$, $D_3 = 0.7 \text{ d}$, $L_1 = 19 \text{ d}$, $q_c = 0.363 \text{ l/min}$										
TIME min.	T1 (C)	T2 (C)	T3 (C)	T4 (C)	S_d (Cm)	S_t (Cm)	h (Cm)	Q (l)	P_{dis} mm.H ₂ O	P_{suc} mm.H ₂ O
15	270.7	69.6	33.2	64.1	2.5	20	35.5	0	410	-185
30	328.9	81.2	37.2	66.6	4.0	29	33.5	0	340	-290
45	335.0	89.7	39.6	70.7	3.5	25	33.0	0	370	-270
60	341.0	84.5	45.1	67.8	4.0	27	32.0	0	430	-260
75	332.1	89.0	37.1	64.1	4.3	28	31.5	0	350	-250
90	326.8	89.3	49.3	64.6	4.2	27	31.0	0	460	-230
$L_D = 49 \text{ d}$, $D_2 = 0.5 \text{ d}$, $D_4 = 0.3 \text{ d}$, $H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d}$, $D_3 = 0.7 \text{ d}$, $L_1 = 19 \text{ d}$, $q_c = 0.368 \text{ l/min}$										
TIME	T1	T2	T3	T4	S_d	S_t	h	Q	P_{dis}	P_{suc}
15	311.8	28.4	27.5	48.1	2	31	30.0	0	470	-245
30	350.8	32.4	30.6	50.4	3.5	32	28.5	0.3	500	-330
45	357.7	36.8	34.2	38.5	6.0	38	25.5	2.3	630	-350
60	378.6	39.1	34.1	40.9	5.5	39	24.0	5.8	655	-330
75	369.1	39.7	36.2	41.4	4.2	40	24.0	8.2	600	-390
90	357.5	39.3	36.8	38.5	3.5	40	23.0	13.0	660	-340

ข้อมูลการทดลอง (ต่อ)

$L_D = 47 \text{ d} , D_2 = 0.8 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.7 \text{ d} , L_1 = 19 \text{ d} , q_c = 0.363 \text{ l/min}$										
TIME min.	T1 (C)	T2 (C)	T3 (C)	T4 (C)	S_d (Cm)	S_u (Cm)	h (Cm)	Q (l)	P_{dis} mm.H ₂ O	P_{suc} mm.H ₂ O
15	226.2	33.6	34.7	53.0	3.0	30	30.0	0	420	-330
30	239.3	45.0	35.5	58.0	1.5	22	32.0	0	280	-240
45	236.5	54.7	36.0	63.3	1.5	22	32.0	0	210	-240
60	244.4	66.6	34.5	69.6	2.0	24	31.5	0	320	-290
75	243.4	68.1	43.2	70.6	2.0	32	32.0	0	275	-360
90	232.4	54.0	31.1	72.1	3.0	33	32.0	0	360	-380
$L_D = 45 \text{ d} , D_2 = 0.8 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.7 \text{ d} , L_1 = 19 \text{ d} , q_c = 0.368 \text{ l/min}$										
TIME	T1	T2	T3	T4	S_d	S_u	h	Q	P_{dis}	P_{suc}
15	180.5	73.5	26.7	56.1	1.0	5	40.0	0	70	-60
30	216.1	80.6	36.0	64.4	1.5	4	41.0	0	50	-50
45	179.2	83.4	45.8	70.9	1.0	7	41.0	0	90	-20
60	187.2	90.2	50.2	76.3	0.5	3	39.5	0	230	-15
75	247.4	102	51.7	84.2	1.0	6	35.0	0	430	140
90	234.0	99.1	51.4	85.7	3.0	12	35.0	0	450	50

ข้อมูลการทดลอง (ต่อ)

$L_D = 51 \text{ d} , D_2 = 0.8 \text{ d} , D_A = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.4 \text{ d} , L_1 = 19 \text{ d} , q_c = 0.363 \text{ l/min}$										
TIME min.	T1 (C)	T2 (C)	T3 (C)	T4 (C)	S_d (Cm)	S_t (Cm)	h (Cm)	Q (l)	P_{dis} mm.H ₂ O	P_{suc} mm.H ₂ O
15	238.0	86.5	26.0	85.9	6.0	72	32.5	1.5	340	-330
30	320.0	111.9	29.4	89.0	7.5	70	31.0	5.0	680	-650
45	311.3	81.6	35.7	58.3	7.5	68	30.0	11.8	680	-650
60	307.5	88.8	36.9	60.0	6.0	70	29.0	19.5	680	-650
75	329.6	94.5	39.8	68.3	6.0	70	28.0	28.0	680	-650
90	314.5	77.6	42.7	62.8	6.0	69	27.5	37.3	680	-650
$L_D = 49 \text{ d} , D_2 = 0.8 \text{ d} , D_A = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.4 \text{ d} , L_1 = 19 \text{ d} , q_c = 0.368 \text{ l/min}$										
TIME	T1	T2	T3	T4	S_d	S_t	h	Q	P_{dis}	P_{suc}
15	283.0	39.7	29.4	42.9	5.5	70	29.0	6.5	610	-590
30	296.8	43.7	32.9	43.7	5.0	70	27.5	16.0	740	-590
45	310.0	43.9	34.6	42.9	6.5	68	26.0	25.0	740	-590
60	329.9	44.8	36.9	42.0	5.0	58	24.5	32.3	810	-470
75	342.6	50.1	38.0	44.3	5.3	62	24.5	38.0	340	-330
90	346.1	50.0	39.5	47.3	4.5	63	23.5	42.5	740	-400

ข้อมูลการทดลอง (ต่อ)

$L_D = 50 \text{ d} , D_2 = 0.8 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.7 \text{ d} , L_1 = 22 \text{ d} , q_c = 0.363 \text{ l/min}$										
TIME min.	T1 (C)	T2 (C)	T3 (C)	T4 (C)	S_d (Cm)	S_t (Cm)	h (Cm)	Q (l)	P_{dis} mm.H ₂ O	P_{suc} mm.H ₂ O
15	124.8	86.5	31.7	37.2	0.5	4	42.5	0	50	60
30	206.4	87.5	36.5	40.9	0.4	7	41.0	0	230	80
45	187.8	92.5	43.2	47.3	1.5	8	40.0	0	220	160
60	141.3	97.7	46.5	47.7	3.0	15	39.0	0	360	240
75	150.1	92.3	50.3	44.1	0.8	8	40.0	0	350	200
90	176.4	97.8	54.1	55.3	2.5	16	35.5	0	400	150
$L_D = 48 \text{ d} , D_2 = 0.8 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.7 \text{ d} , L_1 = 22 \text{ d} , q_c = 0.368 \text{ l/min}$										
TIME	T1	T2	T3	T4	S_d	S_t	h	Q	P_{dis}	P_{suc}
15	349.4	32.5	29.0	29.2	3	35	24.0	2.5	500	-330
30	314.6	34.0	29.0	30.5	2.5	30	23.5	6.2	470	-130
45	240.5	33.1	30.5	31.3	2	27	23.5	8.3	490	-80
60	277.5	32.4	30.1	31.6	2	25	23.0	10.8	510	-20
75	243.2	33.7	30.9	32.4	2.4	28	22.8	12.5	500	-30
90	288.6	36.8	30.7	32.1	2.7	26	22.5	13.0	480	-50

ข้อมูลการทดลอง (ต่อ)

$L_D = 54 \text{ d} , D_2 = 0.8 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.7 \text{ d} , L_1 = 22 \text{ d} , q_c = 0.363 \text{ l/min}$										
TIME min.	T1 (C)	T2 (C)	T3 (C)	T4 (C)	S_d (Cm)	S_u (Cm)	h (Cm)	Q (l)	P_{dis} mm.H ₂ O	P_{suc} mm.H ₂ O
15	217.2	71.9	33.3	61.1	3.5	20	37.5	0	320	-20
30	193.5	73.4	36.7	62.3	2	12	37.0	0	200	90
45	242.6	76.6	39.8	66.1	2	15	36.6	0	300	70
60	247.2	76.5	42.8	67.5	1.2	14	36.5	0	350	40
75	256.6	76.1	46.5	68.1	2.8	20	37.0	0	260	-140
90	242.6	79.4	46.9	69.6	3.5	32	36.0	0	330	-180
$L_D = 52 \text{ d} , D_2 = 0.8 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.7 \text{ d} , L_1 = 22 \text{ d} , q_c = 0.368 \text{ l/min}$										
TIME	T1	T2	T3	T4	S_d	S_u	h	Q	P_{dis}	P_{suc}
15	290.8	66.7	32.6	71.8	4	35	32.0	0.8	400	-280
30	294.9	66.7	37.4	71.9	3	40	31.5	1.5	300	-270
45	325.1	79.3	38.1	73.3	3.5	38	30.0	2.2	300	-280
60	311.1	73.6	41.5	73.3	4	43	29.5	3.0	350	-300
75	319.2	72.6	43.3	73.8	4.8	42	29.0	3.5	340	-260
90	297.3	71.9	45.8	72.4	4.5	43	29.0	4.5	360	-250

ข้อมูลการทดลอง (ต่อ)

$L_D = 51 \text{ d} , D_2 = 0.7 \text{ d} , D_A = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.4 \text{ d} , L_1 = 19 \text{ d} , q_c = 0.363 \text{ l/min}$										
TIME min.	T1 (C)	T2 (C)	T3 (C)	T4 (C)	S_d (Cm)	S_t (Cm)	h (Cm)	Q (l)	P_{dis} mm.H ₂ O	P_{suc} mm.H ₂ O
15	289.4	73.2	27.0	57.3	4.6	48	34.5	0	560	-375
30	290.3	74.0	33.0	60.3	4.0	50	33.0	0	500	-430
45	299.7	61.6	38.2	65.4	4.5	63	32.5	0.3	630	-535
60	295.1	70.4	40.7	70.4	5.3	65	31.2	1.0	640	-540
75	302.9	65.4	43.4	73.5	5.0	60	30.0	2.5	630	-565
90	302.9	52.5	45.5	65.8	5.0	64	29.0	4.0	650	-540
$L_D = 49 \text{ d} , D_2 = 0.7 \text{ d} , D_A = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.4 \text{ d} , L_1 = 19 \text{ d} , q_c = 0.368 \text{ l/min}$										
TIME	T1	T2	T3	T4	S_d	S_t	h	Q	P_{dis}	P_{suc}
15	311.9	38.2	21.2	74.0	4.0	64	30.0	2.0	520	-490
30	315.8	41.0	21.7	72.7	4.5	64	28.5	5.2	510	-490
45	341.0	45.6	25.7	59.0	5.0	66	27.0	10.3	560	-480
60	324.4	48.1	27.6	53.2	5.5	60	25.0	15.0	590	-480
75	344.8	49.4	27.7	51.3	5.0	55	24.0	19.0	460	-320
90	346.0	53.1	28.6	48.3	5.0	56	23.5	23.5	480	-300

ข้อมูลการทดลอง (ต่อ)

$L_D = 51 \text{ d} , D_2 = 0.7 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.7 \text{ d} , L_1 = 19 \text{ d} , q_c = 0.363 \text{ l/min}$										
TIME min.	T1 (C)	T2 (C)	T3 (C)	T4 (C)	S_d (Cm)	S_t (Cm)	h (Cm)	Q (l)	P_{dis} mm.H ₂ O	P_{suc} mm.H ₂ O
15	222.5	70.4	27.7	73.2	1.0	10	35.5	0	440	-50
30	226.2	56.0	32.0	71.5	2.5	20	35.3	0	335	-80
45	234.0	70.2	36.7	71.8	2.5	15	34.5	0	520	-190
60	216.1	73.8	30.1	71.1	2.3	26	34.3	0	490	-160
75	321.8	111	42.7	23.1	4.5	18	32.0	0	440	-230
90	322.5	120	45.8	83.2	4.0	27	30.5	0	425	-210
$L_D = 49 \text{ d} , D_2 = 0.7 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.7 \text{ d} , L_1 = 19 \text{ d} , q_c = 0.368 \text{ l/min}$										
TIME	T1	T2	T3	T4	S_d	S_t	h	Q	P_{dis}	P_{suc}
15	235.4	36.3	25.3	61.5	3.0	30	30.5	0	470	-310
30	250.1	54.3	28.5	57.2	3.8	34	29.5	0	495	-345
45	287.5	62.1	29.6	58.6	4.6	34	27.5	0.8	520	-380
60	298.9	50.8	33.5	46.5	5.4	37	26.3	2.0	550	-380
75	311.9	68.6	35.4	48.5	6.5	33	25.5	3.3	580	-380
90	315.0	62.3	36.2	49.4	5.3	34	25.0	6.0	580	-365

ข้อมูลการทดลอง (ต่อ)

$L_D = 50 \text{ d} , D_2 = 0.7 \text{ d} , D_A = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.7 \text{ d} , L_1 = 22 \text{ d} , q_c = 0.363 \text{ l/min}$										
TIME min.	T1 (C)	T2 (C)	T3 (C)	T4 (C)	S_d (Cm)	S_t (Cm)	h (Cm)	Q (l)	P_{dis} mm.H ₂ O	P_{suc} mm.H ₂ O
15	304.2	37.8	29.9	30.9	2	40	26.0	3.0	540	-100
30	331.5	37.8	29.4	34.1	5	45	26.0	6.5	550	-220
45	332.3	40.7	31.3	36.8	4.5	43	25.5	10.5	610	-330
60	324.6	39.1	31.5	36.5	5	42	25.5	15.0	650	-300
75	308.1	41.4	30.9	37.2	4.5	55	25.0	19.0	710	-350
90	321.4	41.8	33.2	38.8	4	48	24.0	22.5	660	-340
$L_D = 48 \text{ d} , D_2 = 0.7 \text{ d} , D_A = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.7 \text{ d} , L_1 = 22 \text{ d} , q_c = 0.368 \text{ l/min}$										
TIME	T1	T2	T3	T4	S_d	S_t	h	Q	P_{dis}	P_{suc}
15	310.4	29.8	25.2	25.7	3	35	24	2.5	480	-100
30	306.5	28.1	25.1	26.8	3	28	23	6.0	500	-160
45	312.5	28.7	25.0	26.2	3	32	23	9.3	460	-80
60	324.9	30.2	25.1	27.3	2	30	22	12.0	490	0
75	326.2	29.7	25.6	28.1	2	23	22	13.0	460	0
90	301.5	29.1	26.6	28.7	1.5	26	22	15.0	510	-20

ข้อมูลการทดลอง (ต่อ)

$L_D = 51 \text{ d} , D_2 = 0.8 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.7 \text{ d} , L_1 = 19 \text{ d} , q_c = 0.363 \text{ l/min}$										
TIME min.	T1 (C)	T2 (C)	T3 (C)	T4 (C)	S_d (Cm)	S_t (Cm)	h (Cm)	Q (l)	P_{dis} mm.H ₂ O	P_{suc} mm.H ₂ O
15	280.0	82.6	24.0	64.0	2.8	22	33.5	0	555	-200
30	284.1	79.8	28.5	74.1	3.0	20	34.0	0	420	-190
45	248.1	72.5	34.5	60.2	2.5	18	34.0	0	435	-250
60	235.5	79.1	36.4	75.0	2.5	16	34.5	0	365	-185
75	220.6	84.3	41.4	75.1	3.0	14	35.0	0	410	-240
90	233.7	95.6	42.6	76.8	3.5	19	35.5	0	430	-190
$L_D = 49 \text{ d} , D_2 = 0.8 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.7 \text{ d} , L_1 = 19 \text{ d} , q_c = 0.368 \text{ l/min}$										
TIME	T1	T2	T3	T4	S_d	S_t	h	Q	P_{dis}	P_{suc}
15	281.2	34.7	20.5	55.6	2.6	29	31.6	0	475	-320
30	281.7	38.9	26.7	57.4	2.0	29	32.0	0.1	335	-250
45	301.7	44.0	31.7	66.8	2.3	35	30.3	0.2	410	-470
60	292.9	57.1	34.9	64.3	2.3	26	30.0	0.2	420	-360
75	284.9	49.7	38.6	64.4	3.5	24	30.0	0.3	415	-370
90	310.4	57.6	40.3	70.3	3.5	34	29.5	0.8	485	-370

ข้อมูลการทดลอง (ต่อ)

$L_D = 54 \text{ d} , D_2 = 0.7 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.7 \text{ d} , L_1 = 22 \text{ d} , q_c = 0.363 \text{ l/min}$										
TIME min.	T1 (C)	T2 (C)	T3 (C)	T4 (C)	S_d (Cm)	S_u (Cm)	h (Cm)	Q (l)	P_{dis} mm.H ₂ O	P_{suc} mm.H ₂ O
15	96.5	81.1	27.7	73.1	0.5	5	50	0	20	-15
30	102.6	81.5	33.6	74.8	0.5	3	49	0	20	-30
45	110.3	91.5	39.2	81.8	0.4	4	48	0	40	-100
60	111.1	80.2	42.4	81.2	0.3	3	47	0	30	-10
75	118.2	85.4	45.6	82.3	0.4	4	48	0	20	-20
90	120.5	91.3	48.4	88.4	0.3	4	48	0	30	-40
$L_D = 52 \text{ d} , D_2 = 0.7 \text{ d} , D_4 = 0.3 \text{ d} , H = 31.25 \text{ d}$ $D_1 = 1.7 \text{ d} , D_3 = 0.7 \text{ d} , L_1 = 22 \text{ d} , q_c = 0.368 \text{ l/min}$										
TIME	T1	T2	T3	T4	S_d	S_u	h	Q	P_{dis}	P_{suc}
15	111.7	87.1	30.8	82.1	0.5	2	48	0	30	20
30	106.3	88.7	35.1	78.8	0.3	4	48	0	80	40
45	108.1	88.3	38.1	87.4	0.4	3	48	0	70	20
60	119.2	92.8	42.9	84.6	0.3	4	47	0	40	100
75	112.2	96.1	48.1	97.9	1.0	5	45	0	160	90
90	148.4	99.5	48.3	100	0.6	8	44	0	200	130

ข้อมูลการทดลอง (ต่อ)

TIME (min)	T _H °C	T _C °C	S _d Cm.	S _t Cm.	h Cm.	Q L	P _{max} mm.H ₂ O	P _{min} mm.H ₂ O
15	835.6	116.4	-	65	25.0	11.5	630	-340
30	816.6	119.5	-	64	23.5	25.0	580	-300
45	822.6	114.2	-	60	22.5	39.0	560	-290
60	838.6	113.2	-	56	22.5	52.0	520	-270
75	774.5	115.7	-	-	22.5	63.0	-	-
90	830.2	118.3	-	-	22.0	73.5	-	-
105	749.1	120.6	-	-	22.0	83.2	-	-
120	713.2	119.7	-	-	23.0	93.0	-	-
135								
150								
165								
180								

ข้อมูลการทดลอง (ต่อ)

TIME (min)	T _H °C	T _C °C	S _d Cm.	S _t Cm.	h Cm.	Q L	P _{max} mm.H ₂ O	P _{min} mm.H ₂ O
15	824.2	33.6	6.0	70	32.0	14.0	620	-390
30	830.3	36.5	7.0	71	32.0	33.0	650	-410
45	849.1	39.1	7.0	72	31.5	55.0	670	-430
60	834.2	41.7	7.5	75	31.0	77.5	700	-430
75	862.3	43.9	8.0	77	30.0	101.0	750	-450
90	835.4	45.8	8.0	77	30.0	125.0	760	-450
105	862.3	46.9	8.0	80	29.0	149.5	770	-470
120	867.2	48.0	8.0	80	29.0	174.0	770	-470
135	823.1	49.0	8.0	80	28.0	198.0	780	-480
150	864.1	50.0	9.0	81	28.0	223.0	790	-470
165	716.5	50.7	9.0	80	28.0	240.0	800	-470
180	786.5	51.6	8.5	79	27.0	272.0	790	-460

ข้อมูลการทดลอง (ต่อ)

TIME (min)	T _H °C	T _C °C	S _d Cm.	S _t Cm.	h Cm.	Q L	P _{max} mm.H ₂ O	P _{min} mm.H ₂ O
15	813.7	31.6	7	73	29.0	17.0	670	-390
30	857.3	34.3	8	75	28.5	39.0	720	-390
45	875.4	35.9	8	77	28.0	61.0	750	-390
60	902.4	37.4	8	79	27.0	85.0	760	-390
75	770.5	39.2	8	78	27.0	108.0	760	-390
90	861.2	40.2	8	77	26.0	130.0	760	-360
105	852.3	40.9	8	77	26.0	152.0	760	-370
120	835.2	42.8	8	75	25.5	174.0	750	-360
135	845.6	43.6	7	74	25.0	195.0	750	-340
150	818.3	44.5	7	73	25.0	215.5	740	-330
165	809.4	45.7	7	70	24.5	236.0	730	-350
180	780.5	46.5	7	72	24.5	256.0	720	-340

ข้อมูลการทดลอง (ต่อ)

TIME (min)	T _H °C	T _C °C	S _d Cm.	S _t Cm.	h Cm.	Q L	P _{max} mm.H ₂ O	P _{min} mm.H ₂ O
15	774.2	58.4	5.5	71	29.5	7.0	660	-550
30	784.3	72.3	6.0	70	29.0	15.2	670	-550
45	798.6	78.5	6.0	71	28.5	25.0	690	-530
60	795.2	78.9	6.0	72	28.0	37.0	700	-560
75	801.1	78.7	7.0	74	27.0	50.5	760	-550
90	793.1	79.3	7.0	76	27.0	65.0	770	-560
105	805.3	79.4	7.0	76	26.5	82.0	820	-590
120	815.9	78.1	7.5	76	26.0	99.5	830	-590
135	782.9	79.1	7.5	76	26.0	118.0	870	-590
150	756.3	76.3	7.0	80	25.0	137.5	860	-620
165	804.8	76.0	7.0	76	25.0	158.0	850	-630
180	792.6	73.3	7.0	76	24.5	178.0	860	-610

ข้อมูลการทดลอง (ต่อ)

TIME (min)	T _H °C	T _C °C	S _d Cm.	S _t Cm.	h Cm.	Q L	P _{max} mm.H ₂ O	P _{min} mm.H ₂ O
15	792.8	77.8	6	76	27.0	12.5	690	-540
30	749.1	76.8	6.5	76	26.5	27.5	690	-540
45	748.3	77.6	6.5	76	26.0	43.2	730	-540
60	759.2	75.1	7.0	77	26.0	60.0	750	-540
75	766.5	72.1	7.0	79	25.0	77.5	770	-570
90	740.7	72.3	7.0	79	25.0	96.0	780	-570
105	642.7	72.9	7.0	79	25.0	115.0	800	-560
120	751.7	72.1	7.0	79	24.5	133.0	800	-570
135	696.3	71.4	7.0	79	24.5	150.5	800	-590
150	690.5	68.1	7.0	78	24.5	168.0	790	-570
165	708.2	69.4	7.0	78	24.5	187.0	820	-570
180	728.5	69.3	7.0	78	24.0	204.0	830	-560

ข้อมูลการทดลอง (ต่อ)

TIME (min)	T _H °C	T _C °C	S _d Cm.	S _t Cm.	h Cm.	Q L	P _{max} mm.H ₂ O	P _{min} mm.H ₂ O
15	618.6	67.5	5.5	70	29.5	8	630	-480
30	601.9	63.1	5.5	73	29.0	21	680	-500
45	741.2	56.8	6.0	75	28.5	35.5	680	-490
60	667.3	59.7	6.5	74	27.0	49.5	700	-470
75	687.4	60.5	6.0	73	37.5	63.5	690	-490
90	673.8	50.9	7.0	76	27.0	77.8	720	-500
105	658.9	48.2	7.0	76	26.0	93.5	740	-490
120	568.2	46.0	8.0	77	26.0	109.5	780	-500
135	662.4	48.7	7.5	76	26.0	126.5	780	-490
150	715.3	48.0	7.0	76	25.0	142.0	690	-420
165	794.2	48.7	6.5	73	24.0	157.3	750	-470
180	716.5	48.7	7.0	72	24.0	172.5	760	-460

ข้อมูลการทดลอง (ต่อ)

TIME (min)	T _H °C	T _C °C	S _d Cm.	S _t Cm.	h Cm.	Q L	P _{max} mm.H ₂ O	P _{min} mm.H ₂ O
15	513.8	36.7	3.5	68	32.0	2.0	540	-460
30	546.6	36.9	4.5	74	30.0	6.5	600	-490
45	514.4	39.8	5.5	76	29.5	15.0	630	-510
60	553.6	41.1	6.0	77	28.5	26.0	630	-530
75	552.8	42.6	6.5	78	27.5	40.0	670	-510
90	680.2	43.5	7.0	80	26.0	54.0	690	-500
105	650.8	43.3	7.0	80	25.0	70.5	700	-500
120	671.1	44.4	6.5	76	24.0	85.5	670	-480
135	752.3	45.6	6.5	76	23.5	101.6	680	-460
150	780.5	46.6	5.5	73	23.0	117.5	640	-430
165	759.8	47.1	5.5	72	22.0	133.2	640	-380
180	758.4	47.1	5.0	70	22.0	150.0	660	-400

ข้อมูลการทดลอง (ต่อ)

TIME (min)	T _H °C	T _C °C	S _d Cm.	S _t Cm.	h Cm.	Q L	P _{max} mm.H ₂ O	P _{min} mm.H ₂ O
15	648.8	32.2	5.0	50	22	6.0	590	-320
30	653.7	32.2	4.5	50	22	16.0	610	-330
45	647.8	32.4	5.0	65	23	27.0	640	-370
60	646.6	32.7	6.0	68	24	39.0	660	-390
75	639.2	34.5	6.0	70	25	52.0	680	-410
90	622.7	36.6	6.0	72	26	65.0	670	-450
105	614.2	38.4	6.0	73	27	78.0	670	-450
120	602.3	40.8	6.0	76	28	90.3	650	-490
135	600.4	43.1	5.5	74	28	101.6	640	-490
150	603.4	45.8	5.0	73	28	112.0	640	-490
165	590.2	49.1	5.0	73	29	122.2	650	-480
180	600.2	52.6	5.0	72	29	131.5	640	-470

ข้อมูลการทดลอง (ต่อ)

TIME (min)	T _H °C	T _C °C	S _d Cm.	S _c Cm.	h Cm.	Q L	P _{max} mm.H ₂ O	P _{min} mm.H ₂ O
15	527.1	30.5	6.0	72	24.0	10.5	620	-410
30	513.2	32.9	6.0	74	26.0	21.7	620	-450
45	497.9	39.2	5.5	77	28.5	31.5	620	-490
60	522.7	52.6	5.5	75	29.0	39.4	610	-490
75	508.9	59.6	5.0	76	30.0	45.5	540	-550
90	595.6	49.4	5.0	74	30.0	52.0	610	-550
105	597.7	57.5	5.0	72	30.0	59.0	520	-460
120	596.7	60.6	5.0	74	32.0	66.0	580	-530

สรุปข้อมูลจากการทดลอง

L _D	f ครั้งต่อ นาที.	S _t (ชม.)	S _d (ชม.)	P _d (มม.น้ำ)	P _s (มม.น้ำ)	Q (ลิตร/ ชั่วโมง.)
44d	55	76.8	5.2	637	-565	23.3
45d	50	50.5	3	577	-282	6
46d	55	77.2	5.3	653	-598	22
47d	53	73.5	4.7	632	-568	9.3
48d	20	7.6	0.2	305	51.6	0
49d	35	4.8	0.5	175	115	0
50d	52	40.8	5.4	578	-321	12.3
51d	28	10	0.6	410	80	0
52d	30	16	1.6	540	120	0

ตารางที่ 2 ท่อเอาต์พุต (D₂) = 0.8d , ท่อจูนนิ่ง (D₃) = 0.28d

L_D	f (ครั้งต่อ นาที)	S_t (ชม.)	S_d (ชม.)	P_d (มม.น้ำ)	P_s (มม.น้ำ)	Q (ลิตรต่อ ชั่วโมง)
44d	55	70.8	5.5	653	-609	29.9
45d	59	50.8	4.7	540	-451	10.3
46d	58	71	6.5	730	-576	36
47d	61	61.6	4.6	541	-330	17.8
48d	56	62.8	3.9	579	-533	7.3
49d	55	65	5.3	663	-495	28.3
50d	38	9.6	1.5	268	148	0
51d	57	69	6.5	650	-475	26.3
52d	48	29.8	1.4	280	-100	1

ตารางที่ 3 ท่อเอาต์พุต (D_2) = 0.8d , ท่อจูนนิ่ง (D_3) = 0.4d

L_D	f (ครั้งต่อ นาที)	S_t (ชม.)	S_d (ชม.)	P_d (มม.น้ำ)	P_s (มม.น้ำ)	Q (ลิตรต่อ ชั่วโมง)
44d	50	39.8	3.9	333	-216	2.9
45d	53	6	1.3	220	30	0
46d	54	34.5	3.75	390	-191	10
47d	55	27	2.1	310	-30	0
48d	57	39	3.75	380	-231	4.8
49d	52	29.6	2.7	423	-356	0
50d	49	7	1.5	268	148	0
51d	53	18	2.8	435	-209	0
52d	57	40	3.6	341	-273	3

ตารางที่ 4 ท่อเอาต์พุต (D_2) = 0.8d , ท่อจูนนิ่ง (D_3) = 0.7d

L_D	f (ครั้งต่อ นาที)	S_t (ชม.)	S_d (ชม.)	P_d (มม.น้ำ)	P_s (มม.น้ำ)	Q (ลิตรต่อ ชั่วโมง)
44d	62	66.6	5	691	-668	20.8
45d	45	40	4	520	-333	5
46d	50	66	5.2	656	-681	6.3
47d	63	45.5	4.4	525	-416	3.6
48d	53	63	5.3	645	-621	9.6
49d	56	58	4.9	600	-526	10.5
50d	52	32	3.2	468	-210	2.6
51d	52	60	4.5	584	-510	2.6
52d	50	53	2.4	320	120	0

ตารางที่ 5 ท่อเอาต์พุต (D_2) = 0.5d , ท่อจูนนิ่ง (D_3) = 0.4d

L_D	f (ครั้งต่อ นาที)	S_t (ชม.)	S_d (ชม.)	P_d (มม.น้ำ)	P_s (มม.น้ำ)	Q (ลิตรต่อ ชั่วโมง)
44d	50	13	1	360	263	0
45d	65	44.6	3.3	405	-201	1.7
46d	56	72.4	5.4	651	-660	12.3
47d	62	45.2	4.3	401	-241	4.5
48d	57	69	6.2	650	-627	18.6
49d	54	60.8	4.8	520	-426	15.6
50d	51	48	2.3	520	-116	1
51d	53	58	4.7	601	-497	2.6
52d	52	44	3.2	465	-518	3.2

ตารางที่ 6 ท่อเอาต์พุต (D_2) = 0.7d , ท่อจูนนิ่ง (D_3) = 0.4d

L_D	f (ครั้งต่อ นาที)	S_t (ซม.)	S_d (ซม.)	P_d (มม.น้ำ)	P_s (มม.น้ำ)	Q (ลิตรต่อ ชั่วโมง)
44d	55	70.8	5.5	653	-609	29.9
45d	59	50.8	4.7	540	-451	10.3
46d	58	71	6.5	730	-576	36
47d	61	61.6	4.6	541	-330	17.8
48d	56	62.8	3.9	579	-533	7.3
49d	55	65	5.3	663	-495	28.3
50d	38	9.6	1.5	268	148	0
51d	57	69	6.5	650	-475	26.3
52d	48	29.8	1.4	280	-100	1

ตารางที่ 7 ท่อเอ้าท์พุท (D_2) = 0.8d , ท่อจูนนิ่ง (D_3) = 0.4d

ได้มีการคำนวณหาค่าความถี่การแกว่ง เปรียบเทียบกับค่าความถี่การแกว่งที่ได้จากการทดลองดังนี้

ตัวอย่างการคำนวณหาค่าความถี่การแกว่ง (ω)

$$\text{จากสมการ } \omega = \sqrt{\frac{P_m A_t}{V_m L_t \rho} + \frac{(1 + A_t/2A_d)g}{L_t}}$$

A_t = พื้นที่หน้าตัดของท่อจูนนิ่ง m^2

A_d = พื้นที่หน้าตัดของท่อดิสเพรสเซอร์ m^2

L_t = ความยาวของจูนนิ่งคอลัมน์ m

P_m = ความดันเฉลี่ย N/m^2

V_m = ปริมาตรของจูนนิ่งคอลัมน์ที่กึ่งกลางระยะชัก m^3

$$\begin{aligned}
 A_t &= \frac{\pi(d_t)^2}{4} \\
 &= \frac{\pi(17)^2}{4} \\
 &= 226.98 \text{ mm}^2
 \end{aligned}$$

$$\begin{aligned}
 &= 2.2698 * 10^{-4} \text{ m}^2 \\
 A_d \text{ เฉลี่ย} &= (A_d \text{ แนวนอน} + A_d \text{ แนวตั้ง})/2 \\
 &= \frac{\frac{\pi(32)^2}{4} + \frac{\pi(54.4)^2}{4}}{2} \\
 &= \frac{804.2477 + 2324.2759}{2} \\
 &= 1564.2618 \text{ mm}^2 \\
 2 A_d \text{ เฉลี่ย} &= 3128.525 \text{ mm}^2
 \end{aligned}$$

$$\begin{aligned}
 \frac{1 + (A_t / 2 A_d) g}{L_t} &= \frac{1 + (226.98 / 3128.525) \times 9.81}{1.14} \quad \frac{1}{m} \times \frac{m}{s^2} \\
 &= 9.229 \quad \frac{1}{s^2}
 \end{aligned}$$

$$V_m = \frac{\pi(13)^2}{4} + \frac{750}{2}$$

$$= 49774.6 \text{ mm}^3$$

$$= 49774.6 * 10^{-9} \text{ m}^3$$

$$P_m = (645.83 - 470.83) / 2 \text{ mm.H}_2\text{O}$$

$$= 87.5 \text{ mm.H}_2\text{O}$$

$$= 875 \text{ N/m}^2$$

$$A_t P_m = 226.98 * 10^{-6} * 875 \text{ m}^2 * \text{N/m}^2$$

$$= 0.1986 \text{ N}$$

$$\rho V_m L_t = 1000 \text{ N-s}^2/\text{m}^4 * 49774.6 * 10^{-9} \text{ m}^3 * 1.14 \text{ m}$$

$$= 0.0567 \text{ N-s}^2$$

$$\left(\frac{A_t P_m}{L_t V_m \rho} \right) = \frac{0.1986}{0.0567} \text{ 1/s}^2$$

$$= 3.502 \text{ 1/s}^2$$

เมื่อแทนค่าในสมการที่ 1 จะได้ว่า

$$\begin{aligned}\omega &= \sqrt{3.502 + 9.229} \\ &= 3.57 \quad 1/s \\ &= 214 \quad 1/min\end{aligned}$$

ข้อมูลการคำนวณแสดงไว้ในตารางที่ 8

	ω จากการคำนวณ ครั้ง/นาที	ω จากการทดลอง ครั้ง/นาที	ปริมาณน้ำที่สูบได้ ลิตร/ชั่วโมง
ครั้งที่ 1	214	55	50
ครั้งที่ 2	225	55	57
ครั้งที่ 3	221	56	68
ครั้งที่ 4	234	59	85
ครั้งที่ 5	245	63	90

ตารางที่ 8 ข้อมูลเปรียบเทียบความถี่การแกว่งจากการคำนวณและการทดลอง

สรุปข้อมูลการทดลอง จากการทดลองโดยใช้แบบจำลองเครื่องยนต์ลูกสูบเหลวที่สร้างขึ้นโดย
สุทธิชัยและอดิศักดิ์

L_D ซม.	ช่วงชักเมื่อท่อนึง ขนาด $\varnothing$ 1 นิ้ว	ระยะชักเมื่อท่อนึง ขนาด $\varnothing$ 2 นิ้ว	ระยะชักเมื่อท่อนึง ขนาด $\varnothing$ 3 นิ้ว
198	28	26	15
178	23	28	10
158	-	8.5	15
138	-	9	
128	-	-	

ตารางที่ 9 ข้อมูลการทดลองจากแบบจำลองของ สุทธิชัยและอดิศักดิ์



หอสมุดกลาง
มหาวิทยาลัยขอนแก่น