

CHAPTER 5

RESULTS OF EXPERIMENTS

The experiment has been mainly separated into two parts as follows:

5.1 Drying samples of veneer by electrical oven to find initial moisture content of parawood which is normally used in furniture making. The samples are dried until their weight is no more decreased. The result of this part are shown in Table 5-1.

5.2 Drying samples of veneer by continuous dryer to study relations between moisture content and time and furthermore to study the effects of temperature, hot air velocity and thickness of veneer with drying rate, samples are dried in several conditions by changing those parameters. Their results, for example, are shown in Table 5-2 to 5-13 and total results in Appendix A.

Besides, this experiment is also to study the physical properties of veneer after drying such as wavy and crack. Fig. 5.1 and 5.2 shown the appearance of veneer before and after pass continuous dryer respectively.

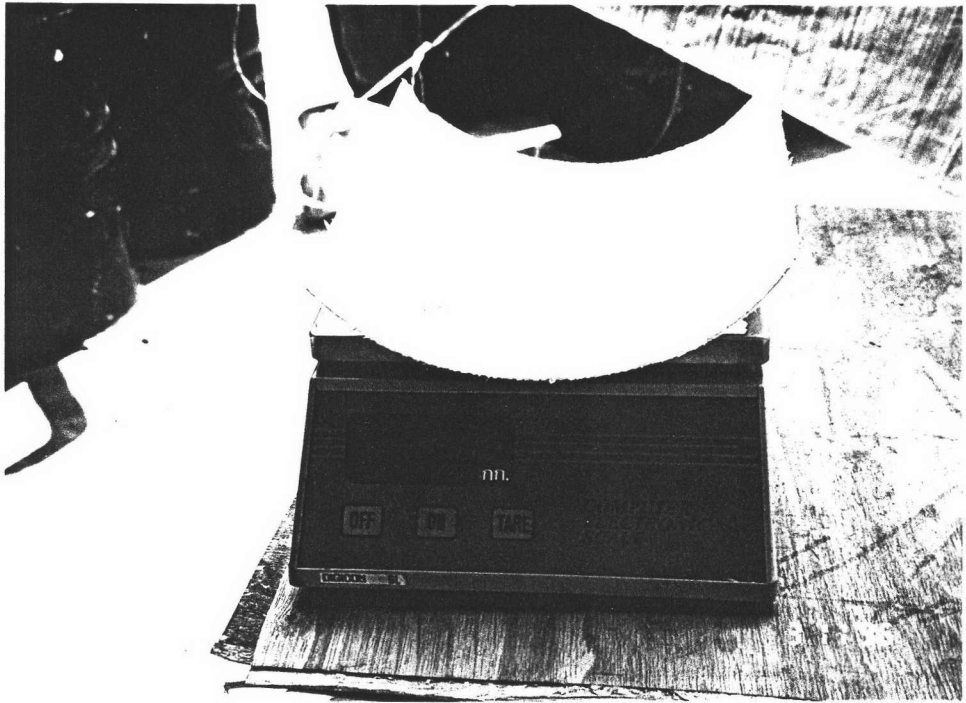


Fig. 5.1 Veneer sheet before drying

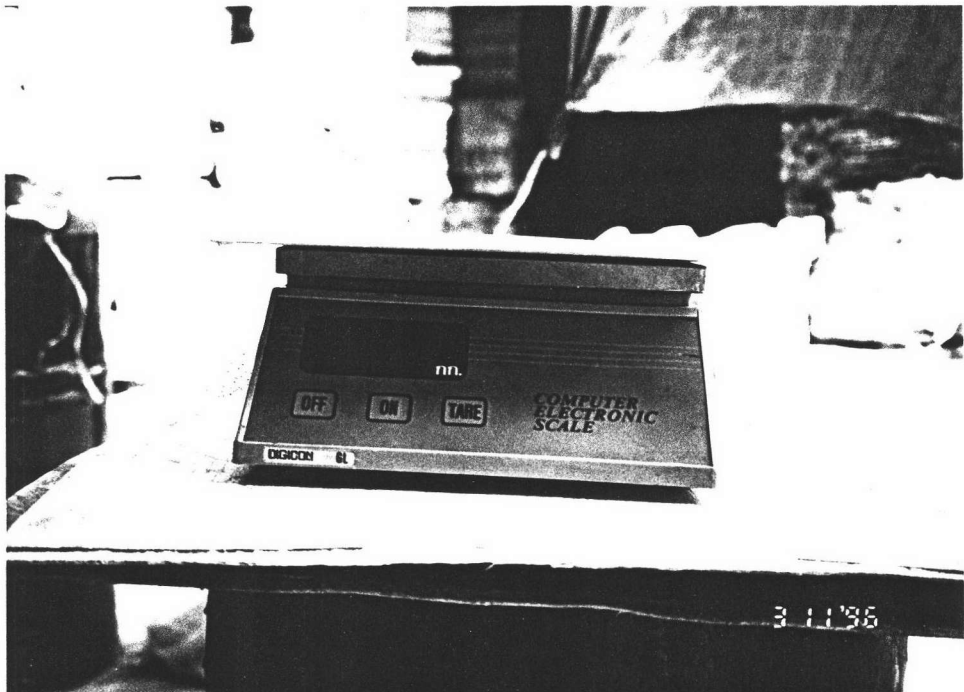


Fig. 5.2 Veneer after drying (smooth, no cracks)

TABLE 5-1

The drying of sample veneers to determine the average initial moisture content.

Thickness of sample veneer 1.5 mm.			
Sample No.	Initial weight	Final weight	Initial Moisture content
	(g.)	(g.)	(%)
1	87.882	47.504	84.999
2	89.016	47.834	86.094
3	88.732	48.214	84.038
4	89.016	48.090	85.103
5	88.449	47.792	85.071
Thickness of sample veneer 2.0 mm.			
1	107.726	58.212	85.058
2	109.143	59.161	84.485
3	108.860	58.792	85.161
4	108.577	58.688	85.007
5	108.293	58.435	85.322
Summation			850.338
Average initial moisture content of veneer			85.034

TABLE 5-2 TEST DATA RECORD

Sample Properties			Ambient Condition			LPG Consumption	Electrical Power Consumption
t	Wi	Ui	Tad	Taw	R.H.a		
(mm.)	(g.)	(%)	(Deg. C)	(Deg. C)	(%)	(kg./hr.)	(Watt)
1.5	90.72	85.034	36.0	29.0	59.81	0.8	2432.0

Test Condition				Hot Air Inlet			Hot Air Outlet		
T	Va	Vc	dt	Tdi	Twi	R.H.i	Tdo	Two	R.H.o
(Deg. C)	(m/s)	(m/s)	(min.)	(Deg. C)	(Deg. C)	(%)	(Deg. C)	(Deg. C)	(%)
90.0	1.5	27.17	1.0	94.0	42.0	6.07	89.0	42.0	7.79

Time	Weight	Moisture content	Time	Weight	Moisture content
(min.)	(g.)	(%)	(min.)	(g.)	(%)
0	90.72	85.034	16	56.39	15.021
1	88.37	80.247	17	55.18	12.545
2	87.05	77.553	18	54.89	11.953
3	84.35	72.040	19	53.95	10.033
4	82.04	67.335	20	53.58	9.279
5	78.65	60.414			
6	75.57	54.147			
7	73.04	48.974			
8	69.62	42.001			
9	66.68	36.009			
10	64.26	31.067			
11	62.50	27.483			
12	60.79	23.984			
13	59.22	20.795			
14	58.21	18.736			
15	56.72	15.693			

TABLE 5-3 TEST DATA RECORD

Sample Properties			Ambient Condition			LPG	Electrical Power
t	Wi	Ui	Tad	Taw	R.H.a	Consumption	Consumption
(mm.)	(g.)	(%)	(Deg. C)	(Deg. C)	(%)	(kg./hr.)	(Watt)
1.5	90.72	85.034	36.0	28.0	54.91	0.9	2508.0

Test Condition				Hot Air Inlet			Hot Air Outlet		
T	Va	Vc	dt	Tdi	Twi	R.H.i	Tdo	Two	R.H.o
(Deg. C)	(m/s)	(m/s)	(min.)	(Deg. C)	(Deg. C)	(%)	(Deg. C)	(Deg. C)	(%)
90.0	2.0	27.17	1.0	94.5	41.5	5.62	89.0	42.5	8.17

Time	Weight	Moisture content	Time	Weight	Moisture content
(min.)	(g.)	(%)	(min.)	(g.)	(%)
0	90.72	85.034	16	54.369	10.896
1	88.45	80.409	17	54.219	10.589
2	86.47	76.375	18	53.838	9.813
3	83.66	70.634	19	53.150	8.410
4	81.27	65.755	20	52.964	8.029
5	77.50	58.069			
6	74.73	52.431			
7	71.17	45.166			
8	68.03	38.752			
9	65.32	33.238			
10	62.65	27.776			
11	60.86	24.133			
12	59.19	20.734			
13	57.98	18.260			
14	56.39	15.012			
15	55.47	13.134			

TABLE 5-4 TEST DATA RECORD

Sample Properties			Ambient Condition			LPG	Electrical Power
t	Wi	Ui	Tad	Taw	R.H.a	Consumption	Consumption
(mm.)	(g.)	(%)	(Deg. C)	(Deg. C)	(%)	(kg./hr.)	(Watt)
1.5	90.72	85.034	36.0	28.0	54.91	1.0	2584.0

Test Condition				Hot Air Inlet			Hot Air Outlet		
T	Va	Vc	dt	Tdi	TwI	R.H.i	Tdo	Two	R.H.o
(Deg. C)	(m/s)	(m/s)	(min.)	(Deg. C)	(Deg. C)	(%)	(Deg. C)	(Deg. C)	(%)
90.0	2.5	27.17	1.0	95.0	41.5	5.48	88.5	42.5	8.37

Time	Weight	Moisture content	Time	Weight	Moisture content
(min.)	(g.)	(%)	(min.)	(g.)	(%)
0	90.72	85.034	16	52.511	7.106
1	88.49	80.501	17	52.370	6.819
2	86.27	75.966	18	52.183	6.437
3	83.31	69.933	19	52.078	6.222
4	80.19	63.572	20	51.979	6.021
5	76.55	56.135			
6	73.16	49.217			
7	69.10	40.948			
8	66.03	34.685			
9	62.91	28.309			
10	60.08	22.539			
11	58.75	19.831			
12	55.96	14.148			
13	55.44	13.075			
14	54.07	10.282			
15	53.69	9.505			

TABLE 5-5 TEST DATA RECORD

Sample Properties			Ambient Condition			LPG	Electrical Power
t	Wi	Ui	Tad	Taw	R.H.a	Consumption	Consumption
(mm.)	(g.)	(%)	(Deg. C)	(Deg. C)	(%)	(kg./hr.)	(Watt)
1.5	93.55	85.034	34.0	29.0	69.23	0.8	2432.0

Test Condition				Hot Air Inlet			Hot Air Outlet		
T	Va	Vc	dt	Tdi	Twi	R.H.i	Tdo	Two	R.H.o
(Deg. C)	(m/s)	(m/s)	(min.)	(Deg. C)	(Deg. C)	(%)	(Deg. C)	(Deg. C)	(%)
70.0	1.5	27.17	1.0	74.0	35.0	8.48	68.0	35.5	12.98

Time	Weight	Moisture content	Time	Weight	Moisture content
(min.)	(g.)	(%)	(min.)	(g.)	(%)
0	93.55	85.034	16	74.93	48.194
1	93.41	84.747	17	73.80	45.959
2	92.95	83.840	18	71.06	40.553
3	92.27	82.495	19	68.96	36.392
4	91.13	80.251	20	66.87	32.253
5	90.88	79.754	21	64.49	27.544
6	89.51	77.034	22	63.03	24.663
7	88.84	75.715	23	60.76	20.171
8	87.03	72.139	24	59.25	17.192
9	85.84	69.788	25	58.37	15.455
10	84.71	67.543	26	57.12	12.981
11	84.43	66.993	27	56.03	10.813
12	81.11	60.418	28	55.79	10.345
13	79.47	57.190	29	55.59	9.955
14	78.65	55.561	30	55.58	9.923
15	77.33	52.946			

TABLE 5-6 TEST DATA RECORD

Sample Properties			Ambient Condition			LPG Consumption	Electrical Power Consumption
t	Wi	Ui	Tad	Taw	R.H.a		
(mm.)	(g.)	(%)	(Deg. C)	(Deg. C)	(%)	(kg./hr.)	(Watt)
1.5	85.05	85.034	34.0	29.0	69.23	0.9	2508.0

Test Condtion				Hot Air Inlet			Hot Air Outlet		
T	Va	Vc	dt	Tdi	Twi	R.H.i	Tdo	Two	R.H.o
(Deg. C)	(m/s)	(m/s)	(min.)	(Deg. C)	(Deg. C)	(%)	(Deg. C)	(Deg. C)	(%)
70.0	2.0	27.17	1.0	75.0	35.0	7.97	67.5	35.0	12.70

Time	Weight	Moisture content	Time	Weight	Moisture content
(min.)	(g.)	(%)	(min.)	(g.)	(%)
0	85.05	85.034	16	65.38	42.241
1	84.75	84.378	17	64.28	39.850
2	84.12	83.023	18	62.37	35.703
3	83.19	81.003	19	60.84	32.361
4	82.28	79.014	20	59.08	28.545
5	81.92	78.221	21	57.52	25.154
6	80.67	75.507	22	55.44	20.623
7	79.47	72.895	23	54.55	18.684
8	78.20	70.140	24	53.15	15.645
9	76.95	67.422	25	52.37	13.943
10	74.95	63.059	26	50.93	10.797
11	73.20	59.257	27	50.42	9.691
12	71.64	55.856	28	50.21	9.243
13	70.69	53.789	29	50.01	8.805
14	69.71	51.655	30	49.67	8.068
15	67.75	47.393			

TABLE 5-7 TEST DATA RECORD

Sample Properties			Ambient Condition			LPG Consumption	Electrical Power Consumption
t	Wi	Ui	Tad	Taw	R.H.a		
(mm.)	(g.)	(%)	(Deg. C)	(Deg. C)	(%)	(kg./hr.)	(Watt)
1.5	80.80	85.034	36.5	30.5	65.17	0.9	2584.0

Test Condition				Hot Air Inlet			Hot Air Outlet		
T	Va	Vc	dt	Tdi	Tw	R.H.i	Tdo	Two	R.H.o
(Deg. C)	(m/s)	(m/s)	(min.)	(Deg. C)	(Deg. C)	(%)	(Deg. C)	(Deg. C)	(%)
70.0	2.5	27.17	1.0	75.0	34.5	7.48	6.8	35.5	12.98

Time	Weight	Moisture content	Time	Weight	Moisture content
(min.)	(g.)	(%)	(min.)	(g.)	(%)
0	80.80	85.034	16	60.20	37.860
1	79.98	83.175	17	57.97	32.759
2	79.45	81.959	18	56.15	28.604
3	78.24	79.188	19	54.59	25.016
4	78.06	78.771	20	53.06	21.521
5	75.76	73.506	21	51.88	18.816
6	74.25	70.055	22	50.53	15.711
7	74.05	69.581	23	49.32	12.959
8	72.38	65.771	24	48.17	10.320
9	71.06	62.729	25	47.83	9.531
10	69.26	58.617	26	47.57	8.941
11	67.00	53.442	27	47.31	8.348
12	65.52	50.050	28	47.05	7.749
13	64.78	48.364	29	46.79	7.154
14	62.93	44.116	30	46.41	6.280
15	61.37	40.551			

TABLE 5-8 TEST DATA RECORD

Sample Properties			Ambient Condition			LPG Consumption	Electrical Power Consumption
t	Wi	Ui	Tad	Taw	R.H.a		
(mm.)	(g.)	(%)	(Deg. C)	(Deg. C)	(%)	(kg./hr.)	(Watt)
2.0	107.726	85.034	28	25	78.65	1.1	2432.0

Test Condtion				Hot Air Inlet			Hot Air Outlet		
T	Va	Vc	dt	Tdi	Tw	R.H.i	Tdo	Two	R.H.o
(Deg. C)	(m/s)	(m/s)	(min.)	(Deg. C)	(Deg. C)	(%)	(Deg. C)	(Deg. C)	(%)
90.0	1.5	27.17	1.0	95.0	43.0	6.38	89.0	43.5	8.94

Time	Weight	Moisture content	Time	Weight	Moisture content
(min.)	(g.)	(%)	(min.)	(g.)	(%)
0	107.73	85.034	16	70.21	20.590
1	107.00	83.791	17	68.29	17.292
2	105.24	80.759	18	66.40	14.054
3	104.14	78.881	19	65.47	12.450
4	101.93	75.086	20	64.75	11.217
5	100.57	72.751			
6	98.91	69.897			
7	94.54	62.392			
8	92.79	59.375			
9	90.53	55.499			
10	86.77	49.044			
11	84.93	45.878			
12	80.79	38.776			
13	78.04	34.042			
14	74.14	27.352			
15	71.43	22.699			

TABLE 5-9 TEST DATA RECORD

Sample Properties			Ambient Condition			LPG Consumption	Electrical Power Consumption
t	Wi	Ui	Tad	Taw	R.H.a		
(mm.)	(g.)	(%)	(Deg. C)	(Deg. C)	(%)	(kg./hr.)	(Watt)
2.0	102.056	85.034	28	26	85.5	1.2	2508.0

Test Condition				Hot Air Inlet			Hot Air Outlet		
T	Va	Vc	dt	Tdi	Twi	R.H.i	Tdo	Two	R.H.o
(Deg. C)	(m/s)	(m/s)	(min.)	(Deg. C)	(Deg. C)	(%)	(Deg. C)	(Deg. C)	(%)
90.0	2.0	27.17	1.0	95.5	43.0	6.23	88.0	43.5	9.38

Time	Weight	Moisture content	Time	Weight	Moisture content
(min.)	(g.)	(%)	(min.)	(g.)	(%)
0	102.06	85.034	16	9.547	17.309
1	100.66	82.511	17	7.348	13.323
2	99.18	79.812	18	6.284	11.393
3	96.53	75.009	19	5.764	10.451
4	95.30	72.789	20	5.252	9.522
5	92.93	68.479			
6	91.17	65.289			
7	89.18	61.685			
8	85.00	54.105			
9	83.81	51.953			
10	79.85	44.767			
11	77.58	40.655			
12	73.49	33.238			
13	70.66	28.118			
14	67.36	22.127			
15	66.02	19.692			

TABLE 5-10 TEST DATA RECORD

Sample Properties			Ambient Condition			LPG	Electrical Power
t	Wi	Ui	Tad	Taw	R.H.a	Consumption	Consumption
(mm.)	(g.)	(%)	(Deg. C)	(Deg. C)	(%)	(kg./hr.)	(Watt)
2.0	96.39	85.034	30	27	79.44	1.2	2584.0

Test Condition				Hot Air Inlet			Hot Air Outlet		
T	Va	Vc	dt	Tdi	Twi	R.H.i	Tdo	Two	R.H.o
(Deg. C)	(m/s)	(m/s)	(min.)	(Deg. C)	(Deg. C)	(%)	(Deg. C)	(Deg. C)	(%)
90.0	2.5	27.17	1.0	95.5	43.5	5.93	88.5	44.0	9.57

Time	Weight	Moisture content	Time	Weight	Moisture content
(min.)	(g.)	(%)	(min.)	(g.)	(%)
0	96.39	85.034	16	58.48	12.262
1	94.42	81.258	17	58.21	11.741
2	92.44	77.451	18	56.97	9.361
3	90.27	73.297	19	56.67	8.793
4	87.54	68.055	20	56.05	7.602
5	85.02	63.220			
6	83.24	59.798			
7	80.72	54.959			
8	77.87	49.491			
9	74.62	43.242			
10	72.10	38.407			
11	68.92	32.308			
12	65.74	26.197			
13	63.21	21.352			
14	61.76	18.558			
15	59.69	14.591			

TABLE 5-11 TEST DATA RECORD

Sample Properties			Ambient Condition			LPG Consumption	Electrical Power Consumption
t	Wi	Ui	Tad	Taw	R.H.a		
(mm.)	(g.)	(%)	(Deg. C)	(Deg. C)	(%)	(kg./hr.)	(Watt)
2.0	104.891	85.034	35	29.5	67.00	0.9	2432.0

Test Condtion				Hot Air Inlet			Hot Air Outlet		
T	Va	Vc	dt	Tdi	Tw	R.H.i	Tdo	Two	R.H.o
(Deg. C)	(m/s)	(m/s)	(min.)	(Deg. C)	(Deg. C)	(%)	(Deg. C)	(Deg. C)	(%)
70.0	1.5	27.2	1.0	73.0	35.0	9.03	68.0	35.0	12.31

Time	Weight	Moisture content	Time	Weight	Moisture content
(min.)	(g.)	(%)	(min.)	(g.)	(%)
0	104.89	85.034	16	87.35	54.085
1	104.67	84.646	17	85.54	50.900
2	104.47	84.296	18	82.94	46.306
3	104.24	83.882	19	80.92	42.751
4	103.26	82.149	20	78.62	38.684
5	102.84	81.417	21	75.99	34.044
6	102.13	80.156	22	73.89	30.353
7	101.20	78.523	23	73.03	28.827
8	100.86	77.920	24	70.38	24.157
9	99.60	75.704	25	69.64	22.842
10	98.92	74.494	26	68.31	20.498
11	96.76	70.695	27	66.73	17.708
12	94.46	66.636	28	65.70	15.898
13	93.85	65.559	29	64.20	13.257
14	92.82	63.734	30	63.62	12.221
15	90.27	59.249			

TABLE 5-12 TEST DATA RECORD

Sample Properties			Ambient Condition			LPG	Electrical Power
t	Wi	Ui	Tad	Taw	R.H.a	Consumption	Consumption
(mm.)	(g.)	(%)	(Deg. C)	(Deg. C)	(%)	(kg./hr.)	(Watt)
2.0	107.726	85.034	34	30	74.91	0.9	2508.0

Test Condition				Hot Air Inlet			Hot Air Outlet		
T	Va	Vc	dt	Tdi	Tw	R.H.i	Tdo	Two	R.H.o
(Deg. C)	(m/s)	(m/s)	(min.)	(Deg. C)	(Deg. C)	(%)	(Deg. C)	(Deg. C)	(%)
70.0	2.0	27.17	1.0	73.0	34.0	7.98	68.0	35.0	12.31

Time	Weight	Moisture content	Time	Weight	Moisture content
(min.)	(g.)	(%)	(min.)	(g.)	(%)
0	107.73	85.034	16	85.93	47.594
1	107.44	84.540	17	83.98	44.254
2	106.87	83.558	18	81.71	40.355
3	106.39	82.742	19	80.66	38.540
4	105.56	81.316	20	78.16	34.253
5	105.08	80.492	21	76.47	31.349
6	104.09	78.783	22	74.75	28.395
7	102.49	76.033	23	72.84	25.105
8	101.65	74.593	24	71.45	22.731
9	100.68	72.938	25	70.24	20.652
10	98.36	68.953	26	69.11	18.700
11	95.50	64.034	27	67.61	16.136
12	93.23	60.140	28	67.17	15.375
13	91.90	57.846	29	65.57	12.624
14	90.19	54.921	30	65.12	11.856
15	87.70	50.639			

TABLE 5-13 TEST DATA RECORD

Sample Properties			Ambient Condition			LPG Consumption	Electrical Power Consumption
t	Wi	Ui	Tad	Taw	R.H.a		
(mm.)	(g.)	(%)	(Deg. C)	(Deg. C)	(%)	(kg./hr.)	(Watt)
2.0	107.726	85.034	34	30	74.91	1.0	2584.0

Test Condition				Hot Air Inlet			Hot Air Outlet		
T	Va	Vc	dt	Tdi	TwI	R.H.i	Tdo	Two	R.H.o
(Deg. C)	(m/s)	(m/s)	(min.)	(Deg. C)	(Deg. C)	(%)	(Deg. C)	(Deg. C)	(%)
70.0	2.5	27.17	1.0	74.0	34.0	7.48	68.5	35.0	11.94

Time	Weight	Moisture content	Time	Weight	Moisture content
(min.)	(g.)	(%)	(min.)	(g.)	(%)
0	107.73	85.034	16	84.416	44.996
1	106.72	83.303	17	81.938	40.740
2	106.53	82.980	18	79.269	36.155
3	105.21	80.719	19	77.325	32.816
4	104.92	80.217	20	74.696	28.300
5	104.16	78.913	21	73.867	26.877
6	102.73	76.448	22	72.086	23.818
7	101.61	74.526	23	70.217	20.608
8	100.72	72.993	24	68.810	18.190
9	98.94	69.940	25	67.861	16.560
10	95.76	64.486	26	66.927	14.957
11	93.63	60.830	27	65.584	12.649
12	91.81	57.700	28	64.924	11.516
13	90.07	54.704	29	64.483	10.759
14	87.48	50.253	30	64.045	10.006
15	85.82	47.400			