OPTIMIZATION OF CHEMICAL USE FOR HIGHLY PCC FILLED MECHANICAL GRADE PAPERS

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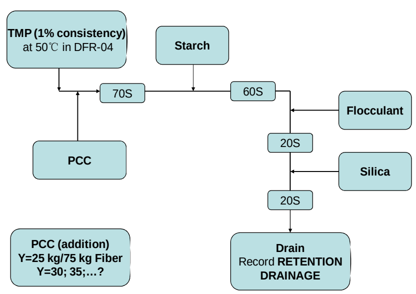
PROJECT OBJECTIVE

♦ To evaluate the ability of three new starches and a new nanoparticle retention system to retain increased amounts of PCC
♦To determine optimal dosages of starch, silica, and flocculant
♦To test the handsheet properties

EXPERIMENTAL DETAILS

1. Peroxide-bleached TMP; PCC
2. Tapioca Starches: S304 (0.22-0.26 N%)
   S858 (0.55-0.60 N%)
   S880 (0.90-1.10 N%)
3. CPAM & Silica

Retention and Drainage Process Flow Diagram

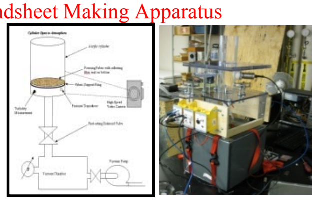


♦ RSM: Use JMP IN 4.0 for experimental design and analysis

Table 1: Levels of Factors

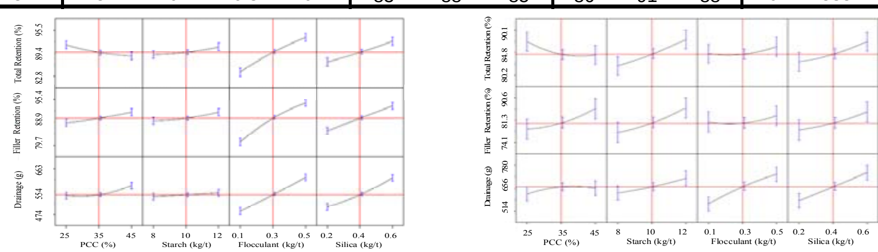
Components	Levels of Factors				
	a(-2)	-1	0	+1	A(2)
PCC (%)	25	30	35	40	45
Starch (kg/t)	8	9	10	11	12
Flocculant (kg/t)	0.1	0.2	0.3	0.4	0.5
Silica (kg/t)	0.2	0.3	0.4	0.5	0.6

Handsheet Making Apparatus

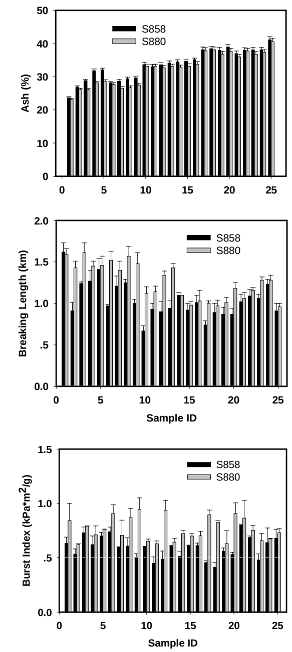


RESULTS AND DISCUSSION

Sample ID	PCC (%)	Starch (kg/t)	CPAM (kg/t)	Silica (kg/t)	Total Retention (%)			Filler Retention (%)			Drainage (g)		
					S304	S858	S880	S304	S858	S880	S304	S858	S880
1	25	10	0.3	0.4	86	91	89	84	87	82	386	555	591
2	30	9	0.2	0.3	82	86	83	73	81	75	325	492	534
3	30	9	0.2	0.5	83	88	85	75	85	78	365	528	628
4	30	9	0.4	0.3	89	91	84	85	89	77	352	554	628
5	30	9	0.4	0.5	90	93	85	88	93	78	380	632	721
6	30	11	0.2	0.3	85	88	87	78	84	81	371	505	615
7	30	11	0.2	0.5	85	90	88	80	89	83	367	547	651
8	30	11	0.4	0.3	89	91	86	86	89	80	377	552	654
9	30	11	0.4	0.5	92	96	88	90	95	84	390	602	780
10	35	8	0.3	0.4	86	89	84	84	88	81	368	540	590
11	35	10	0.1	0.4	78	83	86	70	80	83	344	492	529
12	35	10	0.3	0.2	83	86	83	80	84	80	323	507	559
13-1	35	10	0.3	0.4	87	90	85	85	89	81	386	554	656
13-2	35	10	0.3	0.4	87	90	85	85	89	81	386	554	656
13-3	35	10	0.3	0.4	87	90	85	85	89	81	386	554	656
13-4	35	10	0.3	0.4	86	89	85	85	88	81	387	554	656
13-5	35	10	0.3	0.4	86	89	85	84	89	81	378	554	656
13-6	35	10	0.3	0.4	86	89	85	84	89	81	381	554	656
14	35	10	0.3	0.6	85	92	89	83	93	89	396	619	707
15	35	10	0.5	0.4	91	94	88	92	95	87	396	618	708
16	35	12	0.3	0.4	88	91	89	88	91	88	391	566	689
17	40	9	0.2	0.3	79	85	81	78	85	79	334	501	573
18	40	9	0.2	0.5	82	87	83	80	88	82	359	565	637
19	40	9	0.4	0.3	87	90	84	89	91	84	387	573	673
20	40	9	0.4	0.5	90	92	83	91	94	81	405	638	730
21	40	11	0.2	0.3	81	85	83	80	85	82	358	509	595
22	40	11	0.2	0.5	84	90	89	83	91	89	385	571	710
23	40	11	0.4	0.3	89	90	84	90	91	83	397	576	668
24	40	11	0.4	0.5	92	93	89	93	94	89	419	663	763
25	45	10	0.3	0.4	83	88	85	86	91	88	407	585	624



Prediction Profiler for the retention system OptiPro858 (left); OptiPro 880 (right)



Ash content, breaking length, burst index of S858 and S880 retention system

CONCLUSIONS

1. The retention aid program using medium charge density starch OptiPro858 gave the highest retention and OptiPro880 gave the best drainage results.
2. Significant synergism was found between starch (OptiPro858 and OptiPro880) and silica to improve the retention.
3. The S858 retention system always gave slightly higher ash content than the S880 system.
4. The S880 retention system resulted in the higher breaking length and burst indices, possibly because it has a higher affinity to fibers and fines