Utilisation of Jute Caddy Bleached Pulp As Long Fibre with Agro Bleached Pulp for Writing & Printing Paper

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ABSTRACT:-- Due to high cost of bleached soft wood pulp and cotton linter pulp, jute caddy bleached pulp has completely replaced bleached cotton linter and soft wood pulps as long fibres. To reduce the quantam of chlorinated compounds in the effluent, laboratory experiments were conducted to cook jute caddy to low Kappa number to reduce Chlorine consumption and achieve bleached pulp of above 70% brightness even by using Calcium hypo Chlorite only as well as having bleaching sequence of Chlorination, Alkali extraction and hypo. By increasing percentage of Caustic soda as cooking chemical for jute caddy from 7.5 to 12.5%, the quantity of bleach liquor was drastically brought down from 36 to 23.5% as total bleached liquor demand to obtain bleached pulp of brightness around 72%. By increasing percentage of cooking chemicals more than 12.5% the degradation of jute caddy fibres takes place.

INTRODUCTION

Shreyans papers is poineer in the Northern India to go in for raw jute and caddy usage as complete replacement of cotton linter and soft wood bleached pulp and to bleach unbleached pulp from jute caddy to brightness around 72% by installation of separate Chlorination tower for jute caddy unbleached pulp.

There had been steep rise in the price of liquid chlorine and the paper market has been very competitive. Therefore, special emphasis has been laid down on improving the quality of jute caddy bleached pulp by improving the quality of jute caddy bleached pulp by improving its brightness and cleaniness and to bring down Chlorine consumption. Keeping this in view, laboratory experiments were conducted. Shreyanspapers is already in the process of installation Chemical recovery plant, therefore, spent liquor obtained from pulping of jute caddy is to be processed alongwith weak black liquor from agro pulping in Soda recovery plant taking advantage of high percentage of residual active alkali in jute caddy black liquor. It would also reduce load of toxic compounds in the effluent by having low Kappa number of jute caddy unbleached pulp and using less quantity of chlorine in bleaching.

EXPERIMENTS

After opening jute caddy bales, the material was passed through duster drum. Then it was sorted out manually to remove foreign matters like plastic pieces, nails, bobbing etc. Laboratory experiments of cooking jute caddy were done in rotary digester with direct steam heating arrangement.

In plant scale trials the cooked jute caddy pulp

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was dumped on the floor and after taking out spent liquor of high twaddle, the unbleached jute caddy pulp was diluted and pumped to beater cum washer. The unbleached pulp was washed and beaten to 20°SR before it was dumped into the chest for further treatment by Chlorine in Chlorination tower The unbleached pulp from the beater cum washer was collected at 20°SR. Both unbleached pulps cooked in laboratory as well as in the plant were washed completely. The unbleached pulps were bleached with single stage Calcium hypo chlorite and also with bleaching sequence Chlorination, Alkali extraction and hypo chlorite. In laboratory jute caddy pulp was beaten in Valley beater to determine physical strength properties of unbleached and bleached pulps at various degrees of freeness. Standard hand sheets (60 +- 2 gsm) were made from beaten pulp to determine physical strength properties.

TABLE-1.

Laboratory cooking conditions for jute caddy

S.No.	Particulars	Cook no.				
		no.1	no.2	no.3	no.4	no.5
1.	NaOH taken on O.D raw material (%)	7.5	8.5	10.0	12.5	14.0
2.	Bath ratio	1:3	1:3	1:3	1:3	1:3
3.	Steam time to rise the temp. 160-165°C (Including degassing) Min.	45	45	45	45	45
4.	Cooking time at max. temp. and pressure Minute	2.5	2.5	2.5	2.5	2.5
5.	pH of spent liquor	8.0	9.5	10.1	10.4	10.7
6.	Residual active alkali as NaOH (mg/l)	nil	nil	0.64	0.80	0.96
7.	Unbleached pulp yield %	78	74.5	71.7	67.7	64.5
8.	Kappa number	88	85.6	65	35	26

RESULTS & DISCUSSIONS

Laboratory experiments as well as plant scale trials were conducted on cooking of jute caddy, show that the Kappa Number of jute caddy pulp can be brought down from 88 to around 26 by increasing percentage of alkali (from 7.5% to 12.5%) taken for cooking the raw material, without any adverse affect on the physical strength properties of bleached pulp.

Laboratory experiments show that when percentage of alkali for cooking jute caddy is higher than 12.5%, the degradation of pulp also takes place, thereby the physical strength properties of unbleached and bleached pulp cooked with 14.5% Caustic soda reduced. Jute caddy bleached pulp of brightness around 76% is easily obtained by adopting bleaching sequence of Chlorination, alkali extraction and hypo. There is also deterioration of the fibres on bleaching by Calcium hypo chlorite alone as compared to that of bleaching jute caddy pulp

Table-2.

Bleaching conditions in multistage bleaching of Jute caddy pulp in sequence of Chlorination, Alkali extraction and hypo.

S.No.	Particulars	Cook no.				
		1	2	3	4	5
1.	**Chlorination**					
	a. Chlorine/water as available Cl_2 (%)	17.5	15.8	15.0	11.5	10.2
	b. Reaction time (hrs.)	1.0	1.0	1.0	1.0	1.0
	c. Residual chlorine after 1 hr (%)	0.20	0.20	0.15	0.38	0.35
2.	**Alkali extraction**					
	a. pH maintained	9.3	9.0	9.0	9.1	9.1
	b. NaOH consumed to maint. pH (%)	3.6	2.2	2.6	0.5	1.0
	c. Retention time (minute)	30	30	30	30	30
3.	**Hypo stage**					
	a. Calcium hypo chlorite as available chlorine (%)	11.4	10.3	10.0	7.5	6.5
	b. Reaction time (hrs.)	2.0	2.0	2.0	2.0	2.0
	c. Residual chlorine after 2 hrs (%)	0.50	0.65	0.70	2.7	1.7
4.	Total chlorine consumption (%)	28.2	25.2	24.1	15.9	14.6
5.	Shrinkage (%)	15.5	15.0	14.7	14.0	16.0
6.	Bleached pulp yield (%)	65.9	63.3	61.2	58.2	54.2
7.	Brightness achieved (%)	72	74	74	76	74.2

Table-3 (a).

Physical strength properties of unbleached Jute caddy pulp

Cook No.	Breaking Length (Mtr)	Tear factor	Burst factor	Freeness °SR
1	1919	99	15.8	20
	2725	108.7	22.9	30
	2902	99.8	23.7	35
	3374	97.6	25.8	40
	3507	97.0	26.1	45
2	2305	99.5	15.9	20
	3346	102.1	19.6	30
	4317	103.4	28	35
	4434	102.7	30	40
	4487	101.2	31.7	45
3.	1838	92.9	14.1	20
	3567	95.4	23.2	30
	3779	100	24.4	35
	4260	104	29.2	40
	4274	101.1	31.2	45
4	2088	97.7	17.3	20
	2753	99.7	29.8	30
	4344	109.5	30.6	35
	4603	106.1	36.8	40
	4780	104.8	36.9	45
5	2006	86.7	15.2	20
	3027	106	20.7	30
	3627	116	25	35
	4006	120	27.9	40
	4035	118	28.3	45

Table-3 (b).

Physical strength properties of single stage bleached Jute caddy pulp by Calcium Hypo Chlorite

Cook No.	Breaking Length (Mtr)	Tear factor	Burst factor	Freeness °SR
1	1829	77.9	15.9	20
	2650	80.2	20.4	30
	2706	78.7	21.9	35
	2729	74.1	23.1	40
	2857	72.6	23.7	45
2	1867	78.2	16.6	20
	2691	81.6	21.6	30
	2971	79.5	22.7	35
	3194	75.3	24.4	40
	3512	74.0	26.0	45
3	2029	79.3	16.8	20
	2649	82.4	21.9	30
	3445	81.2	23.6	35
	3524	76.2	25.0	40
	3634	74.6	26.9	45
4	2437	80.6	16.2	20
	2921	83.2	22.0	30
	3606	82.5	24.0	35
	3819	77.4	28.4	40
	4052	75.2	33.0	45
5	1890	85.5	14.8	20
	2457	87.0	19.6	30
	2762	85.0	23.4	35
	2963	79.0	25.6	40
	3255	76.7	27.2	45

Table-3 (c).

Physical strength properties of Jute caddy bleached pulp with multi-stage bleaching sequence CEH.

Cook No.	Breaking Length (Mtr)	Tear factor	Burst factor	Freeness °SR
1	1989	81.2	16	20
	3010	86.4	22.6	30
	3310	82.5	23.8	35
	3465	78	25.2	40
	3563	76	26.3	45
2	2182	82.6	17.8	20
	3104	87.5	22.3	30
	3282	84.1	23.8	35
	3574	82.0	26.1	40
	3821	78	28	45
3	2231	84.4	18.1	20
	3215	88.4	23.4	30
	3542	86.2	24.4	35
	3752	84	26.8	40
	3985	79.7	30.1	45
4	2520	86.4	19.2	20
	3352	89.4	24.8	30
	3707	88.2	27.2	35
	3916	86.4	29.3	40
	4100	82.4	33.6	45
5	1910	86.8	15.2	20
	2518	89	21.2	30
	2810	87	24.1	35
	3200	84	26.1	40
	3412	82	27.8	45

with the sequence of Chlorination, Alkali extraction and hypo.

With increased amount of alkali in cooking there is loss in the yield of unbleached and bleached jute caddy pulps, but the bleached pulp is found to be much more cleaner, and there is slight improvement of bleached pulp strength properties. The runnability of the agro-bleached pulp blended with jute caddy bleached pulp cooked at Lower Kappa number on the paper machine improved and a cleaner paper was obtained. The speed of paper machine has been increased from 350 to 380 Metres per minute.

CONCLUSION

The major findings of these laboratory experiments were that a substantial reduction in total bleach liquor and chlorine demand for bleaching jute caddy unbleached pulp to the brightness above 70% was obtained by reducing Kappa number of the unbleached pulp with increased dosage of alkali during cooking. The main objective of getting

Table-4.

Cooking conditions and physical strength properties of unbleached and bleached jute caddy pulp (Bleaching sequence C & H) at plant scale.

Sr. No.	Particulars		Cook no. No.1			No.2		
1.	Caustic soda taken O.D. raw material (%)		8			11.5		
2.	Anthraquinone (%)		Nil			0.05		
3.	Steaming time to raise to max. temp including degassing (Hrs.)		1.0			1.0		
4.	a. cooking temp °C		155-160			155-160		
	b. cooking time at max. temp. (Hr.)		4.0			5.0		
5.	Bath ratio		1 : 25			1 : 3		
6.	Residual active alkali in black liquor collected after dumping (g/l)		0.62			0.88		
7.	Kappa number of unbleached pulp.		85			22-30		
8.	Bleach liquor demand as available chlorine to bleach the pulp to brightness around 70%		32-33			18-20		
9.	Physical strength properties of pulp.							
	Unbleached:	Freeness °SR	20	30	35	20	30	35
		Burst factor	14	26	27	20	27	28
		Tear factor	112	125	126	102	105	120
		Breaking length	1455	3300	3450	2700	3600	4130
	Bleached:	Freeness °SR	35		Kappa number 85			
		Burst factor	24					
		Tear factor	102					
		Breaking length	3443					
		Brightness	70					

strength and cleaner pulp from jute caddy was also achieved by increasing the quantity of Sodium hydroxide for cooking upto a certain limit (i.e 12.5%). The excessive quantity of alkli (i.e beyond 12.5%) if used for cooking jute caddy weaken both unbleached and bleached pulps.

The bleached jute caddy pulp of brightness more than 72% is easily obtainable by bleaching sequence: Chlorination, Alkali extraction, and hypo rather than using only Calcium hypo Chlorite as bleaching agent.

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