# Abrasive Kraft Base Paper From Sun Hemp (Crotolaria Jauncia)

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# SUMMARY

The article gives the details of laboratory work done on the production of Abrasive Kraft base paper from Sun hemp The results show that a furnish containing 50% Sun hemp soda bleached pulp and 50% bleached hard wood pulp, (bleached with 4% hypo) gives a fairly good furnish for the production of Abrasive Kraft base paper. This furnish should be mixed with sizing chemicals wet strength resin.

## INTRODUCTION

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For manufacturing of abrasive kraft base paper, long fibre pulp is used. In India long-fibre pulp from Spruce and Pine is not generally available. Sunhemp is the potential source of such long-fibre pulp. To study the possibility of using sunhemp pulp for such paper, trials were taken up in these laboratories.

Emery powder is bound to Kraft base paper with an Adhesive. The major physical characteristic requirements for above grade of Kraft base paper are uniform substance, caliper, high tensile strength and high wet strength, low porosity and absorbancy and shade matching to the current market products.

### **EXPERIMENTAL**

Chopped sun hemp was cooked in laboratory rotary digester of 200 litre capacity heated with open s cam with alkali, 10% NaOH varying cooking cycle 4 and 3 hours. The cooking condition and characteristics of unbleached sun hemp pulp are given in Table I. The standard sheets were made with both 3 hours and 4 hrs. cooked pulp. The strength properties are given in Table III. Columns No. 6 & 7.

The four hours sun hemp cooked pulp (Cook No. 1, Table 1) was treated with 2%, 3% and 5% hypo separately and standard sheets were made. Treatment conditions and total active chlorine consumed during treatment are given in Table 2.

The strength properties of standard sheets made from Sun Hemp pulp with 2%, 3% and 5% hypo treatment are given in Col. Nos. 8, 9 and 10 of Table III. The unbleached NPS plant pulp was also treated with 4% hypo, 4% and 8% chlorine separate-

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ly. The standard sheets were made of all the above pulp and strength properties are tabulated in Table III. col. No. 2, 3 and 4.

Standard sheets of the sun hemo pulp cooked in ran plant-some time back, for manufacturing of Abrasive kraft base paper, were also made and strength properties are tabulated in Table III and Col. No. 10.

The 5% hypo treated sun hemp pulp, unbleached NPS plant pulp and 4% chlorinated NPS plant pulp were beaten separately to 40° SR in Labolatory Valley Beater. The 50% sun hemp (5% hypo treated) and 50% unbleached plant (NPS) pulp, beaten to 40 °SR, were mixed and standard sheets were made. Strength propert es were determined. 50% sun hemp pulp (5% hypo treated) and 50% plant (NPS) pulp (4% chlorinated) were beaten to 40 °SR, and mixed. Standard sheets were made and the strength properties of the above two combinations are given in Table IV, columns 1 and 2.

50% the sun hemp cooked in ran plant and pulp treated with, of 25 °SR was mixed with 50% and 60% plant (NPS) pulp (4% hypo treated) separately and beaten to 40 °SR and standard sheets were made with those two combinations and strength properties are given in Col. 3 and 4 in Table 4.

To study the effect of wet tensile strength resin in equal combination of sun hemp pulp and plant (NPS) pulp (both 4% hypo treated) beaten to 40 °SR were sized with 2% Resin and 10% Alum in Valley Beater. The standard sheets were made of (1) unsized pulp stock, (2) sized pulp stock (3) sized + 0.5%polycrylad resin, (4) sized + 0.5% melamine solution resin and (5) sized + 0.5% melamine power

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resin. Strength properties were determined as it is and after heat treatment by passing the sheets 6 times through dryers of M/c. 6. The results are shown in Table V and Col. 2, 3, 4, 5, 6, 7, 8, 9 and 10.

### SHADE :

- 1. Combination of 50% sun hemp pulp (5% hypo treated) with 50% plant (NPS) pulp (4% hypo treated) was tried with different combinations of dyes finally 0.1% crysophene+0.0025% Acid orange combination shade was matching reasoably with specified shade.
- Combination of 50% Sun Hemp(4% hypo treated) rag plant pulp with 50% plant pulp (NPS), 8% chlorinated, was tried with different combination of dyes 0.06%, 0.025% Acid orange combination was okayed.

## **OBSERVATIONS**

1 The strength properties of pulp from 4 hrs. cooking cycle was found to have higher strength properties than that of the pulp from 3 hours cooking cycle (ref. Col. No. 5 and 6 in Table-III).

2. On treating the 4 hrs. cooked sun hemp pulp with 2%, 3% and 5% hypo, the strength properties improved except the tearing strength. 5% hypo treatment give high strength properties burst factor 52.3, tear factor 110.8, breaking length 6.7 KM, double fold 410 and stretch 4.6% ref. Col. Nos. 7, 8 and 9 in Table-III.

3. Strength properties of 5% hypo treated pulp (4 hr. cook, Table-I and Col. 9), are found to be the better compared to those of pulp treated with 2% hypo and 3% hypo Cols. 7 and 8 in Table 3, burst factor of 52, tear factor of 110, breaking length of 6.7 KM and folding endurance of 410 double folds and also stretch of 4.6% of the former proves its suitability for use in furnish of Abrasive Kraft base paper.

4. When the unbleached bamboo and hardwood mixed pulp from NPS was treated with hypo and chlorine separately, it is observed that invariably the strength properties improved as compared to those of parent unbleached pulp (Table-III, Col. Nos. 1, 2, 3 and 4).

TABLEI	COOKING CONDITIONS & UNBLD.	CHARACTERISTICS
	OF SUN HEMP PULP	

					Blow lic	uor cha	racteristics		Unbleache	ed Pulp
SI. No.	Test Cook No.	%NaOH	Dil. ratio	Cooking cycle	Tw	Temp.	Residual alkali as NaOH gpl	%Unb yield	ld characte Kappa No.	eristics P.No.
. 1	Ι	10	1:1.5 Tim Hol	te to raise 60 psig d up time@ 60"	1 Hr. 0 3 Hrs.	100	0.8	78.6	49	28.8
2	II	10	1:1,5 Tim Hol	to raise 60 psig d up time at 60 "	4 Hrs. 1 Hr. 0 2 Hrs. 3 Hrs.	90	0.8	82.5	54.4	30.0

#### TABLE—II HYPO TREATMENT CONDITIONS

SI. No.	Test Cook No.	%Cl <sub>2</sub> consumed	%stock consistency	% yield on b. d. wt. of sun hemp pulp
1	I	5	6	72.7
2	Unbld. bamboo/ wood pulp from NPS suction filter.	<b>4</b>	4	96.0 (on b.d. wt. of unbld. pulp)

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But with 4% chlorine, the strength properties achieved best, giving burst factor 34, breaking length 4.7 KM and stretch of 3.9% folding endurance also improved to nearly more than double of plant pulp, but higher endurance was found with 8% chlorine although other properties have decreased.

5. A comparative study of strength properties was made by mixing laboratory beaten pulp from 5% hypo treated sun hemp pulp and unbleached plant pulp treated with 4% chlorine and 4% hypo separately in 50:50, 40:60 ratio (Table IV-Cols 2, 3 and 4).

<b>IABLE-III</b>	ГАВ	LE-	Ш	
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Sample	PLA	ANT UN	BLEAC	HED PU	LP		SU	IN HEMP	PUMP	
Quality	Unbld. Pulp.	4% Hyp treated pulp 9-8-1	o 4% Chlo. pulp 1978	8% Chlo. pulp 30-8-78	Unblead 3 Hours cooking	thed Pulp 4 Hours cooking	2% Hypo treated (4 Hours cooking)	3% Hypo treated (4 Hour cooking)	5% Hypo treated (4 Hour cooking	Sun Hemp Pulp made in Rag Plant & treated with 4% Hypo in the plant.
1	2,	. 3	4	5	6	7	8	9	10	11
Freeness °SR	40	40	40	40	40	40	40	40	40	40
GSM	64	60	67	64	65	64	65	63	65	63
Caliper (mm)	0.1	0.075	0,095	0.115	0.11	0.11	0.11	0.1	0,105	0.12
Bursting strength Kgs/cm2	1.7	1.7	2.3	2.1	2.6	3.2	3.1	3.2	3.4	3.4
Burst Factor	26.6	28.3	34.3	32.9	40	50	47.7	50.8	52.3	42.6
Tearing Strength Kgs/cm	35	44	40	52	60	76	66	68	72	70
Tear Factor	54.7	72.3	60	81.2	92.3	119	101.5	108	110.8	110
Tensile strength Kg mm	4.0	4.0	4.8	4.5	5.25	5.5	6.0	5.8	6.6	5.2
Breaking length	4166	4444	4776	4688	3386	5730	6154	6138	6770	5500
Stretch %	3.0	3.4	3.7	3.8	3.5	3.8	4.3	4.0	4.6	3.8
Double fold	21	28	46	69	122	512	270	388	410	136
Brightness °GE		30					37	40	47	

TABLE-IV	
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Sample		COMBIN	ATION	Imp. Pulp	Party samp	le Party	
	50%SH	50%SH	50%SH	40%SH	test results	test results	specfi-
Quality	Pulp (5%	Pulp (5%	Pulp (40%	Pulp+	Swedish	M/s. Carbo	- cations
	Hypo)+	Hypo) $+$	Hypo)+	<u>60% PP</u>	Kraftpaper	randun Uni	•
	Unbld.		50% PP	Both		versal,	·
	P.P. 50%		(4%Hypo)	<u>(4%Hyp</u>	)	Madras	
1	2	3	4	5	6	7	8
Freeness	40	40	40	40	120	108	$120\pm5$
GSM	65	62	66	67	0.186M	7.5-8.0	5.5-7.0
·						miles	miles
Caliper mm	0.105	0.11	0.118	0.115			
Bursting strength	2.1	2.2	2.77	2.28			
Burst factor	31.9	35.5	42	34	54.5	29.6	
Tearing strength	60	58	66	62			
Tear factor	91	93.5	100	92.5			
Tensile strength Kg/mi	n 4.6	4.8	5.7	4.9			
Breaking length	4718	5162	5767	4878	5785	5085	M.D. 5222 C.D. 3000
Stretch	50	5.0	4.0	4.1			Avc. 4111
Dcuble fold	85	60	224	130		166	

SH pulp—Sun hemp pulp P.P.—Plant Pulp

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TABLE-V

Sample	· ·	AFTER AL	DITION	OF RESI	IN	AFTER	R HEAT	TREAT	MENT
	5%SR	Col. (1)	Col. (2)	Col. (2)	Col. (2)	Col. (2)	) Col. (3)	) Col. (4	) Col. (5)
Quality	Pulp	+2%	+5%	+.5%	+.5%	Passed	6 times	on mach	ine and
	(4%	Resin	Poly-	Mola-	Mola-	rejected	1.		
	Hypo)	+10%	crylad	mine	mine				
	+50%	Alum.	Resin	sol.	P.W.				
	<b>PP 4%</b>								
	Hypo.								
1	2	3	4	5	6	7	8	9	10
		Mixe	d bea	ting					
Freeness °SR	40	40	40	40	40	40	40	40	40
GSM	130	130	130	130	130	120	120	120	120
Caliper (mm)	0.22	0.22	0.23	0.23	0.285	0.20	0.21	0.205	0.20
BurstingstrengthKgs/cm <sup>2</sup>	4.4	4.2	4.75	4.4	4.5	4.8	5.2	5.1	5.2
Burst factor	33.8	32.3	36.5	33.8	34.6	40.0	43.3	42.5	43.3
Tearing Strength gm/cm	128	120	154	144	150	128	160	140	140
Tear factor	98.4	92.3	118.3	110.4	115	107	133	116	116
Tensile strength kg. 10mm	9.8	9.7	10.1	9.8	9.7	9.0	9.5	9.2	9.2
Breaking length (M)	5027	4976	5181	5027	5078	488 <b>9</b>	5275	5111	5111
Stretch %	4.1	4.2	—	5.2	4.8	4.9	5.1	5.1	5.0
Double fold	212	163	225	186	172	90	205	100	<b>9</b> 5 ·
Brightness° GE									
Cobb No. (1 mnt.)	230	110	82	81	100	20	19.5	78.7	22.5

With 50% sun hemp pulp (4% hypo treated) and 50% of unbleached pulp (4% hypo treated) taken together to furnish and heaten in Laboratory Valley Beater was found to bear fairly good strength properties, viz. Burst factor 42, breaking length 5.7 MM, double fold 224 and stretch of 4%. These strength properties compare very well with the sample of "Abrasive Kraft base paper" received from M/s. Carborandum Universal and also with imported Swedish Kraft paper which are used currently in the market.

6. Further tests were made using plant size supplemented with polycrylad size and melamine size to find out the effect of improvement of strength properties. Samples treated with synthetic resin were dried in Paper Machine No. 6 dryer rolls to make the synthetic resin set by near (ref. Table—V and Col. Nos. 2, 3, 4, 5, 6, 7, 8, 9, 10).

#### CONCLUSIONS

1. 50% Sun hemp pulp treated with 4% Hypo and 50% normal unbleached hard wood mixed from plant preheated with 4% hypo would give a fairly good furnish for manufacturing sack kraft and/or abrasive Kraft base paper.

2. Still better strength properties may be achieved with a furnish of 50% sun hemp pulp

(treated with 4% hypo) and 50% normal unbleached plant pulp pretreated with 4% chlorine. This would give a stronger Abrasive Kraft base paper, but as shade will be matching with that of Punalur Abrasive Kraft base paper and not with the imported Swedish Kraft paper which possess lighter shade.

3. Above furnish should be supplemented with sizing chemicals including a suitable wet strength resin upto 0.5% on b.d.wt. pulp to improve wet strength properties and at the same time, strength properties required for the quality of the paper.

4. Use of wet strength resin should be suitably proportionated with other sizing chemicals to avoid undesirable hard sizing paper.

5. Polycrylad (3005) resin supplied by M/s. Bangalore Polycrylads, Rajajinagar, Bangalore was found to be better as imparting wet strength and other strength properties, as compared to Melamine resins.

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