

Effect and utilisation of bamboo pin chip

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SUMMARY

With the increase cost of bamboo, all efforts are to be made to have maximum utilisation of the same for pulping. A study was conducted on the cooking of Pin Chips (retained on 2mm diameter screen) which are being removed as Bamboo dust during the screening of the chips. Our studies show that the small quantity pulp obtained from separate cooking of Pin Chips can be mixed with normal kraft pulp for the manufacture of the kraft paper without any significant effect on the physical strength properties of the paper. The quality of pulp also does not deteriorate much if a small quantity (5%) of Pin Chips are mixed with the usual chips.

A large quantity of bamboo Pin Chips goes away with bamboo dust, which passes through 4x4 square millimeter screen. If the dust is again screened through 2mm diameter screen, the pin chips are retained on 2 mm diameter screen and fines pass through this screen. Thus above 50% of total dust is recovered as pin Chips. From our past experience, it has been observed that the pin Chips are one of the main causes for Jamming of chips chute of Kamyr Digester. It is also observed that non-uniform chips size, especially high percentage of pin chips and dust causes non-uniform cooking and results in high percentage of rejects in cooked chips.

To-day economic conditions, especially high cost of raw materials are forcing us to consider the maximum utilisation of raw materials. Therefore a study was conducted to determine the effect of small percentage of Pin Chips with the accepted chips and the utilisation of pulp from pin chips.

Experiments :

The bamboo pin chips were cooked with and without accepted bamboo chips to manufacture bleached pulp and also to manufacture kraft grade pulp with mixed hard wood and bamboo chips.

The cooking experiments were conducted in a 5 litre Laboratory electrically heated, stationary autoclave with white liquor having 16 percent sulphidity. Other cooking conditions for the production of Bleached Pulp and Kraft Pulp are given in Table I and II respectively. All the results are reported on oven dry material basis.

Bleached Pulp :

Over 4 mm and under 30 mm size bamboo chips (D. STRICTUS) were used as accepted bamboo chips and 5 percent pin chips were mixed. For comparison a separate cook was made with bamboo chips alone to get bleached grade pulp.

Cooking :

The cooking conditions for bleachable pulp and results are reported in Tabl I.

TABLE—I
COOKING CONDITIONS FOR BLEACHABLE
PULP AND RESULTS

Raw materials used.	Pin chips 100 percent	5 percent pin chips + 95 % Bamboo chips	Accepted bamboo chips 100 %
AA as Na ₂ O	15.0	16.0	16.0
Bath ratio	1:3	1:3	1:3
Time to 165°C	2 Hrs.	2 Hrs.	2 Hrs.
at 165°C	2 Hrs.	2 Hrs.	2 Hrs.
K. No. (25 cc)	16.2	16.2	16.4
Screened yield %	42.2	43.2	43.6
Rejects percent	Nil	0.8	0.6
Total yield percent	42.2	44.0	44.2

Orient Paper Mills, Brajrjnagar Orisa.

Bleaching :

The pulps were bleached in Laboratory as per Bleaching sequence (CEHH) being followed in the plant.

Chlorination :

30% of the total chlorine demand in the form of chlorine water was used in the chlorination stage.

Consistency during reaction was 3% at room temperature (30°C). Reaction time was 60 minutes (not more than 30% chlorine as elemental chlorine of total chlorine demand be used in the plant under existing conditions, therefore the chlorine gas addition was restricted to 30%).

Caustic Extraction :

2% Caustic Lye as NaOH was used. The consistency during reaction was 10% and the reaction time was 60 minutes at 60°C.

1st. Stage Hypo Treatment :

60% of the total chlorine requirement in the form of calcium hypo-chlorite was used in this stage. Consistency during reaction was 8%. Reaction time was 120 minutes at 40°C. NaOH was added as buffer to maintain pH and end pH was (8.5 to 9.0) in all the cases.

2nd. Stage Hypo Treatment :

10% of the total chlorine requirement in the form of calcium hypo-chlorite was used in this stage. Other conditions are as in 1st stage hypo treatment.

Results :

The results obtained after bleaching are reported in Table II.

TABLE—II**TEST RESULTS OF BLEACHED PULP**

Raw materials used	Pin chips 100%	5 % pin chips + 95 % bamboo chips	Bamboo chips 100%
Bleached pulp yield %	31.1	34.4	35.8
Pulp Brightness, % (Elephro)	79.0	79.0	79.5
Pulp Viscosity CPS, 0.5% Cu. (EN) ₂	7.4	8.94	9.63
Total chlorine consumed % on oven dry pulp.	9.8	7.6	6.8

Kraft Pulp :

Kraft cooks were made by mixing 5% pin chips with 45% Hard wood chips and 50% bamboo chips (D.S.). For comparison one cook with 45% Hard Wood chips alongwith 55% bamboo chips (D.S.) and one cook with 100% Bamboo Chips (D.S.) were done. In all the cooks conditions were adjusted to get equal K. No. as reported in Table III.

TABLE—III

Raw material used	Pin chips 100 %	5% pin chips + 45% H.W. chips + 50% Bamboo chips	45% H.W. chips + 55% Bamboo chips	Bamboo chips 100 %
AA as Na ₂ O %	13.0	14.0	14.0	14.0
Bath ratio	1:3	1:3	1:3	1:3
Time to 165°C	2 Hrs.	2 Hrs.	2 Hrs.	2 Hrs.
at 165°C	2 Hrs.	2 Hrs.	2 Hrs.	2 Hrs.
K. No. (40 ml.)	22.6	22.1	22.5	23.0
Screened yield %	43.2	44.4	44.8	46.2
Rejects, %	Nil	2.3	2.3	1.1
Pulp Ash, %	4.8	2.6	2.5	2.9

Strength properties of pulps :

The pulps were beaten in Jokro Mills to evaluate strength properties and standard hand sheets of 60 GSM were made in British sheet making machine. The test results obtained were reported in the following Table IV and V.

TABLE—IV

STRENGTH PROPERTIES OF BLEACHED PULP

Raw materials used.	Pin chips 100%	5% pin chips + 95% bamboo chips.	Bamboo chips 100 %
Initial freeness °SR.	9	8	8
Beating time, minutes.	8	15	15
Freeness, °SR.	36	36	36
Br. length, metres.	4555	5111	5191
Stretch, percent	2.2	3.0	3.4
Burst Factor	25.0	30.2	33.9
Tear factor	52	70	83
Double folds.	22	35	36

TABLE—V

STRENGTH PROPERTIES OF KRAFT PULP

Raw materials used.	Pin chips 100%	5% pin chips + 45% H. Wood chips + 50% bam-boo chips	45% H. W. chips + 55% bamboo chips	Bam-boo chips 100%
Initial freeness, °SR.	9	8	8	8
Beating time, minutes.	10	16	15	16
Freeness, °SR.	37	36	35	36
Br. Length, metres	5161	6505	6666	6777
Stretch, %	2.8	3.6	3.6	3.6
Burst factor.	33.8	40.3	41.2	43.0
Tear Factor.	65	97	103	110
Double folds.	60	125	130	139

TABLE—VI

FIBER CLASSIFICATION OF BLEACHED PULP

Fiber classification	Pin chips 100 %.	5% pin chips + 95% bam-boo chips.	Bamboo chips 100 %.
Retention over 40 mesh %.	40.2	62.0	63.1
Retention over 60 mesh %.	55.2	73.0	76.5

TABLE—VII

FIBER CLASSIFICATION OF KRAFT PULP

Fiber Classifi-cation	Pin chips 100 %	5% Pin chips + 45% H.W. chips + 50% bamboo chips	45% H. Wood chips + 55% bamboo chips.	Bam-boo chips 100%
Retention over 40 mesh, %.	26.00	44.2	51.2	53.0
Retention over 60 mesh, %.	45.2	62.0	63.0	65.0

OBSERVATION

Bleached pulp manufacture :

- The bleached pulp yield is low when pin chips are added to normal bamboo chips.
- The bleached pulp obtained by adding pin chips has low viscosity. The chlorine consumption is also high.
- Strength properties of pulp obtained by adding pin chips goes down and average Fibre length is found to be lower than normal bleached bamboo pulp.
- Bleached pulp contains specks if pin chips were mixed, as such the specks clearly persists over the hand sheet.

Kraft pulp manufacture :

- There is a slight drop in pulp yield if 5% bamboo pin chips are mixed with hard wood chips and bamboo ch ps.

- b) There is a nominal drop in strength properties of pulp when bamboo pin chips were mixed with normal mixed hard wood and bamboo chips.
- c) Fine shieves and dust particles persist over the hand sheet when pin chips were mixed. This may be due to some sand particles remain with pin chips while screening the bamboo dust.

CONCLUSION :

- 1) Pin chips cannot be used in bleached pulp system as specks may come over the paper sheet inspite of screening and cleaning the pulp.
- 2) 5% Bamboo Pin chips retained over 2 mm diameter screen can be used in kraft system without the substantial drop in physical strength properties of the paper sheet.

3) 5% pin chips can be mixed at the time of cooking along with hard wood and bamboo as the K. No. of pulp slightly goes down without any change in reject percentage.

4) 100% pin chips can be cooked separately and the pulp can be used as a bottom filler of unbleached board and small quantity of this pulp can be mixed with normal kraft pulp for the manufacture of kraft paper.

ACKNOWLEDGEMENT :

The authors wish to acknowledge the valuable encouragement and guidance of Shri P. D. Bagri, Vice-President, Orient Paper Mills, Brajrajnagar in carrying out the work and are thankful to the Management to permit us to publish this paper.