

HIGH BRIGHTNESS PULPS AS FILLER FOR THE PRODUCTION OF UREA FORMALDEHYDE & MELAMINE FORMALDEHYDE MOULDING POWDER

By

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Introduction

Plastic Industry in India is a developing Industry and Urea formaldehyde and Melamine formaldehyde powders are essential materials for the same. For producing these moulding materials high brightness pulps are used as fillers. The requirement of high brightness pulp for this Industry is estimated as 15 to 20 tonnes per day. One alternative is to purify further the available market pulps. At the suggestion of M/s. Nuchem Plastics Ltd. Faridabad, a sponsored project was undertaken to purify the market pulp namely unbleached and bleached bamboo sulphate pulp from Central Pulp Mill Fort Sondgarh. It was also investigated to find out the suitability of *Eucalyptus hybrid* growing in Haryana State for the production of such pulps.

Specifications of the pulp

The main specifications of the pulp to be used as filler in the manufacture of moulding powders as given by M/s. Nuchem Plastics Ltd. is as under :

Brightness	—	92.96 G.E.C. Scale
Alpha Cellulose	—	90.0%
Pentosans	—	3.5%
Ash	—	0.15%

Experimental results & discussion

Bleaching of bamboo sulphate pulps from Fort Sondgarh

The unbleached as well as bleached bamboo sulphate pulp from Central Pulp Mill was analysed and converted into laminates in the Nuchem Plastics Laboratory. The reports of the two pulps are given in Table I. It is observed from Table I that the laminates from unbleached pulps are blackish, have very high ash content and the pH is also high. The bleached pulps yield yellowish laminates, have higher ash content and have higher pH. With the aim to remove these defects and reduce the ash content both the unbleached and bleached pulps were further purified by multi stage bleaching. The conditions of multi stage bleaching of unbleached bamboo sulphate pulp are recorded in Table II and those of bleaching bleached sulphate pulp are recorded in Table III. The brightness of these purified pulps as well as the chemical analysis of these pulps was also carried out according to TAPPI standard. On comparing the specifications with the analysis of the pulps it is observed that brightness, alpha cellulose, & pentosans of the pulps meet the specifications, though the ash content is a little on the higher side. The results are recorded in Table II & III. Laminates from these purified pulps were made at Nuchem Plastics Laboratories and

their report is given in Table IV. It is observed that though the ash content is reduced considerably, yet it is on a little higher side. By using demineralised water during the bleaching for washing purposes, this can further be reduced, to meet the specifications. According to Nuchem Plastics, bleaching of the pulps seems to be interesting and promising process for the production of such grades of pulps.

Preparation of high Brightness Pulps from *Eucalyptus hybrid* and the analysis of this pulp.

Eucalyptus hybrid wood was obtained from Haryana State & converted into chips after debarking. These chips were screened. The screened chips were pulped by the prehydrolysis sulphate process followed by multi stage bleaching as detailed in Table V. This pulp was converted into laminates at the Nuchem Plastics Laboratory and their report is given in Table VI. It is observed that the ash content and acidity are on a little higher side which can be reduced by using demineralised water.

Conclusions

It can be concluded that by bleaching under suitable conditions both unbleached and bleached bamboo sulphate pulp from Fort Sondgarh can be used as fillers for making moulding powders. It is also observed that high brightness pulps suitable for moulding powders can be obtained from *Eucalyptus hybrid*.

Table 1
Evaluation of the unbleached and bleached bamboo sulphate pulp from Central Pulp Mill

Test	Specification	Unbleached bamboo pulp*		Bleached bamboo sulphate pulp†	
		Observation	Variation	Observation	Variation
Moisture Content	6%	3.26%	Less	2.86%	Less
Ash	0.1%	2.53%	Higher	1.31%	Higher
Acidity	Nil	Nil	Suitable	Nil	Suitable
Alkalinity	Nil	0.08%	Slightly higher	0.096%	Slightly higher
Dirt peaks	1-7	To many	Higher	To many	Higher
Apparent density	0.03"	—	—	—	—
Preparation of laminate	—	Blackish	Objectionable	Yellowish	Objectionable
Final pH.	—	8.3	(Initial pH. 7.0)	8.6	(Initial pH. 6.9)

Remarks :—*Having blackish laminate, and higher ash content

†Having yellowish laminate, higher pH and higher ash content.

Table II*Bleaching of unbleached bamboo sulphate pulp from Central Pulp Mill*

<i>1st Stage (Chlorination)</i>			
(a)	Available Chlorine applied on o.d. pulp%	—	4
(b)	Consistency of pulp%	—	3
(c)	Period of treatment, hrs	—	$\frac{1}{2}$
(d)	Temperature of treatment, °C	—	30
<i>2nd Stage (Caustic extraction)</i>			
(a)	Caustic soda on o.d. pulp, %	—	2
(b)	Consistency of the pulp, %	—	5
(c)	Period of treatment, hrs	—	1
(d)	Temperature of treatment, °C	—	50
<i>3rd Stage (Chlorination)</i>			
(a)	Available chlorine applied on o.d. pulp, %	—	2
(b)	Consistency of the pulp, %	—	3
(c)	Period of treatment, hrs	—	$\frac{1}{2}$
(d)	Temperature of treatment, °C	—	30
<i>4th Stage (Caustic extraction)</i>			
(a)	Caustic soda applied on o.d. pulp, %	—	2
(b)	Consistency of the pulp, %	—	5
(c)	Period of treatment, hrs,	—	1
(d)	Temperature of treatment, °C	—	50
<i>5th Stage (Sodium hypochlorite)</i>			
(a)	Available chlorine applied on o.d. pulp, %	—	3
(b)	Consistency of the pulp, %	—	5
(c)	Period of treatment, hrs	—	$2\frac{1}{2}$
(d)	Temperature of treatment, °C	—	35
<i>6th Stage (Caustic extraction)</i>			
(a)	Caustic soda applied on o.d. pulp, %	—	2
(b)	Consistency of the pulp, %	—	5
(c)	Period of treatment, hrs	—	1
(d)	Temperature of treatment, °C	—	50
<i>7th Stage (Sodium hypochlorite)</i>			
(a)	Available chlorine applied on o.d. pulp, %	—	2
(b)	Consistency of the pulp, %	—	5
(c)	Period of treatment, hrs	—	$2\frac{1}{2}$
(d)	Temperature of treatment °C	—	35
<i>8th Stage (Sodium hypochlorite)</i>			
(a)	Available chlorine applied on o.d. pulp, %	—	1
(b)	Consistency of the pulp, %	—	5
(c)	Period of treatment, hrs	—	$2\frac{1}{2}$
(d)	Temperature of treatment, °C	—	35

(Contd.)

<i>9th Stage (Sulphur dioxide wash)</i>		
(a) Chemical applied on o.d. pulp, %	—	$\frac{1}{2}$
(b) Consistency of the pulp, %	—	8
(c) Period of treatment, hrs	—	$\frac{1}{4}$
(d) Temperature of treatment, °C	—	room temperature
1. Yield of the bleached pulp	—	75.4% on the basis of unbleached bamboo pulp from C.P.M.
2. Brightness of the pulp (MgO=100)	—	92
3. Alpha Cellulose, %	—	92.4
4. Pentosans, %	—	3.2
5. Ash%	—	0.27

Table III

Bleaching of the bleached bamboo sulphate pulp from Central Pulp Mill

<i>1st stage (alkali extraction)</i>		
(a) Caustic soda on o.d. pulp, %	—	5
(b) Consistency of the pulp, %	—	5
(c) Period of treatment, hrs	—	1
(d) Temperature of treatment, °C	—	60
<i>2nd stage (Sodium hypochlorite)</i>		
(a) Available chlorine applied on o.d. pulp, %	—	2
(b) Consistency of the pulp, %	—	5
(c) Period of treatment, hrs	—	$2\frac{1}{2}$
(d) Temperature of treatment, °C	—	35
<i>3rd stage (Sodium hypochlorite)</i>		
(a) Available chlorine applied on o.d. pulp, %	—	1
(b) Consistency of the pulp, %	—	5
(c) Period of treatment, hrs	—	$2\frac{1}{2}$
(d) Temperature of treatment, °C	—	35
<i>4th stage (Sulphur dioxide wash)</i>		
(a) Chemical applied on o.d. pulp, %	—	$\frac{1}{2}$
(b) Consistency of the pulp, %	—	8
(c) Period of treatment, hrs	—	$\frac{1}{4}$
(d) Temperature of treatment °C	—	room temperature
1. Yield of the pulp	—	83.2% on the basis of o.d. bleached pulp from C.P.M.
2. Brightness of the pulp (MgO=100)	—	91
3. Alpha Cellulose, %	—	91.4
4. Pentosans, %	—	2.8
5. Ash, %	—	0.298

Table IV

Evaluation after multi stage bleaching of the unbleached and bleached bamboo sulphate pulp from Central Pulp Mill

Sl. No.	Test	Specification	Unbleached Bamboo pulp*		Bleached Bamboo sulphate pulp†	
			Observation	Variation	Observation	Variation
1.	Moisture Content	6%	3.81%	Suitable	3.34%	Suitable
2.	Ash	0.1%	0.27%	Higher	0.298%	Suitable
3.	Acidity	Nil	0.05%	Higher	Nil	Suitable
4.	Alkalinity	Nil	Nil	Suitable	Nil	Suitable
5.	Dirt Peaks	1-7	4-5	Suitable	10-11	Higher
6.	Apparent Density	0.03"	0.215"	Suitable	0.235"	Suitable
7.	Preparation of Laminate	—	OK.	Suitable	OK.	Suitable
8.	Final pH.	—	5.6	(Initial pH 6.9) Objectionable	6.8	(Initial pH 6.85) Suitable

Remarks :—*Higher ash Content
+ Higher ash Content

Table V

Preparation of high brightness pulp from Eucalyptus hybrid from Haryana

I. Conditions of Prehydrolysis		
(i) Material : liquor	—	1 : 5
(ii) Temperature, °C	—	162
(iii) Time, hrs	—	2
(iv) pH of the liquor after prehydrolysis	—	3.9
II. Conditions of sulphate digestion (NaOH : Na₂S : : 3 : 1)		
(i) Chemical as Na ₂ O, %	—	20
(ii) Material : liquor	—	1 : 4
(iii) Temperature, °C	—	153
(iv) Time, hrs	—	4 (including 1.5 hrs to raise the temp, to max. cooking temp.)
Yield of the unbleached pulp, %	—	39.1
Permanganate Number of the pulp	—	11.1

Table VI
Bleaching of the Eucalyptus hybrid pulp

<i>1st stage (Chlorination)</i>		
(a) Available chlorine applied on o.d. pulp, %	—	4
(b) Consistency of the pulp, %	—	3
(c) Period of treatment, hrs	—	1
(d) Temperature of treatment, °C	—	30
<i>2nd stage (Caustic extraction)</i>		
(a) Caustic soda applied on o.d. pulp, %	—	2
(b) Consistency of the pulp, %	—	5
(c) Period of treatment, hrs	—	1
(d) Temperature of treatment	—	50
<i>3rd stage (Sodium hypochlorite)</i>		
(a) Available chlorine applied on o.d. pulp, %	—	2
(b) Consistency of the pulp, %	—	5
(c) Period of treatment, hrs	—	2½
(d) Temperature of treatment, °C	—	35
<i>4th stage (Caustic extraction)</i>		
(a) Caustic soda applied on o.d. pulp %	—	2
(b) Consistency of the pulp, %	—	5
(c) Period of treatment, hrs	—	1
(d) Temperature of treatment, °C	—	50
<i>5th stage (Sodium hypochlorite)</i>		
(a) Available chlorine applied on o.d. pulp, %	—	1
(b) Consistency of the pulp, %	—	5
(c) Period of treatment, hrs	—	2½
(d) Temperature of treatment, °C	—	35
<i>6th stage (Sodium hypochlorite)</i>		
(a) Available chlorine applied on o.d. pulp, %	—	1
(b) Consistency of the pulp, %	—	5
(c) Period of treatment, hrs	—	2½
(d) Temperature of treatment °C	—	35
<i>7th stage (Sulphur dioxide wash)</i>		
(a) Chemical applied on o.d. pulp, %	—	½
(b) Consistency of the pulp, %	—	8
(c) Period of treatment, hrs	—	¼
(d) Temperature of treatment, °C	—	room temp.
1. Yield of the bleached pulp	—	35.2% on the basis of o.d. wood.
2. Brightness of the pulp (MgO=100)	—	93
3. Alpha Cellulose	—	93.4
4. Pentosans %	—	3.0
5. Ash %	—	0.205

Table VII
Evaluation of the high brightness pulp from Eucalyptus hybrid

Sl. No.	Test	Specification	High brightness pulp from <i>Eucalyptus hybrid</i>	
			Observation	Variation
1.	Moisture Content	6%	2.71%	Suitable
2.	Ash	0.1%	0.205%	Suitable
3.	Acidity	Nil	0.057%	Suitable
4.	Alkalinity	Nil	Nil	Suitable
5.	Dirt peaks	1-7	19-20	
6.	Apparent Density	0.03"	0.246"	Suitable
7.	Preparation of Laminate	—	Slightly yellowish but better than south India Organisation.	Suitable
8.	pH.	—	5.6 (Initial pH 6.85)	Objectionable

Remarks :—Higher ash content and acidic.

SUMMARY

High brightness pulps suitable for use as Filler for Urea formaldehyde and Melamine formaldehyde moulding powder have been prepared from unbleached and bleached bamboo sulphates pulps of Central Pulp Mill, Fort Sondagarh by suitable bleaching process and from *Eucalyptus hybrid* wood by prehydrolysis sulphate process followed by multi stage bleaching process. These pulps were evaluated by Nuchem Plastics Ltd., Faridabad and found suitable.

युरिया फार्मएलिडहाइड और मेलामिन फार्मएलिडहाइड संचक चूर्णों के उत्पादन में पूरकों के लिए अधिक चमक वाली लुगदियां

लेखक एस० आर० डी० गुह, मनमोहन सिंह व एस० पी० सिंह

सारांश

युरिया फार्मएलिडहाइड और मेलामिन फार्मएलिडहाइड संचक चूर्ण बनाने में स्थान पूरकों की जगह उपयोग करने के लिए उपयुक्त अधिक चमक वाली लुगदियां सेंट्रल पेपर मिल, फोर्ट सोंडगढ़ की बांस की अविरंजित और विरंजित सल्फेट लुगदियों से उपयुक्त विरंजन प्रक्रिया द्वारा तथा युकेलिप्टस हाइब्रिड की लकड़ी से पूर्वजलाशित सल्फेट प्रक्रिया और उसके पश्चात् कई चरणों में विरंजन प्रक्रिया द्वारा बनाई गई है। न्यूकेम प्लास्टिक्स लि०, फरीदाबाद ने इस कार्य के लिए लुगदियों का मूल्यांकन किया और उन्हें उपयुक्त पाया।

Hohe helle Breien als die Füller um Produktion die Urea Formaldehyde
und Melamine Formaldehyde giessformig Puder

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ZUSAMMENFASSUNG

Die hohe helle Breien, nützlich als Füller nach Urea Formaldehyde und Melamine Formaldehyde giessformig Puder, werden von ungebleichter und bleichter bambus Schwefelsaures-salz-Breien der Central Pulp Mill, Fort Sondgarh, beim passende Bleichungsprozeß, und vom *Eucalyptus hybrid* Holz, beim prehydrolyse Schwefelsaures-Salz-Prozeß, mit mehrfachem Bleichungsprozeß gefolgt, gemacht. Die Breien werden bei Nuchem Plastics Ltd., Faridabad, gewertet und passend gefunden.

Pulpes à haute clarté comme des agents d'alourdissement (filler) pour la production
de "moulding powder" l'urée formaldéhyde et mélamine formaldéhyde

par S.R.D. GUHA, MAN MOHAN SINGH ET S.P. SINGH

Résumé

Les pulpes à haute clarté, propre à être utilisées pour la production de "moulding powder" l'urée formaldéhyde et mélamine formaldéhyde ont été fabriquées à partir des pulpes au sulfate blanchies et non-blanchies de bambous, fournies par Central Pulp Mill, Fort Sondgarh. Des pulpes ont également été préparées à partir du bois d'*Eucalyptus hybrid* par les procédés appropriés. Une évaluation en a été faite par Nuchem Plastics Ltd. à Faridabad et on les a trouvés convenables.
