# Thermo-mechanical pulps for newsprint manufacture from tropical pines

## SHARMA Y, K.\*

۵

To meet the expanding demand of newsprint, it will be essential to identify the suitability of pulps from alternative raw materials. Tropical pines in this regard cannot be overlooked. Considerable work done on plantations of tropical pines have revealed that these could be grown in several parts of the country. Pande<sup>1</sup> has indicated that vast potential exists in the various states like Andhra Pradesh, Madhya Pradesh, Orissa, Tamilnadu, Uttar Pradesh, West Bengal for growing tropical pines. Table I gives the area estimated under tropical pine plantations in India<sup>1</sup>.

	TABLE-1	ESTIMATED	AREAS UNDER	TROPICAL	PINE	PLANTATION	IN INDIA
--	---------	-----------	-------------	----------	------	------------	----------

State	Area of plantation in hectares	Extent of estimated potential areas and details of localities	Species showing pro- mise of good growth
Andhra Pradesh	270	10,000 hectares in Srikakulam, Vishakhapatnam and East Godavari districts.	Pinus caribaea Pinus Kesiya Pinus oocarpa
Madhya Pradesh	700	1,00,000 hectares in Bastar, Amarkanatak, Supkar and Joshipur areas.	Pinus caribaea Pinus oocarpa Pinus kesiya
Orissa	120	50,000 hectares in Koraput & Phulbani areas.	Pinns kesiya Pinus caribaea Pinus oocarpa
Tamilnadu	2000	10,000 hectares in Gudalur, Perumalmalai, Nilgiri and Madurai districts.	Pinus patula Pinus caribaea Pinus oocarpa
Uttar Pradesh	50	24,000 hectares in Dehra Dun and other hill districts.	Pinus caribaea Pinus kesiya Pinus patula
West Bengal	50	20, 000 hectares in Darjeeling Kalimpong and Buxa districts.	Pinus patula Pinus kesiya Pinus carib <b>a</b> ea

Besides above, some plantations have also been raised in the states like Kerala, Karnataka and Bihar, but the details and potential are not yet available.

\*Cellulose and Paper Branch, Forest Research Institute & Colleges. DEHRA DUN

IPPTA Vol. 20, No. 1, March 1983

Conventionally newsprint is made from a blend of mechanical pulp and chemical pulp. High yield pulping processes like cold soda process is of particular interest for production of newsprint grade pulps from hardwood and cold soda pulps. The two new mills being set up viz. Mysore Paper Mills and Kerala Newsprint will utilise eucalyptus, bamboo and eta reed.

Thermo-mechanical pulping process (TMP) is the most recent mechanical process yielding a strong pulp having all the essential requirement for newsprint production. The key feature of this process is reduction or complete elemination of chemical pulp in the furnish, thus not only eliminating one pulping street but also pollution arising out of chemical pulp mill.

The reported study was undertaken to evaluate pulping characteristics of *P. patula* and *P. caribaea* by the momechanical pulping process. The results reported are very encouraging. On pilot plant, newsprint grade paper was also made from 100% Thermo-mechanical pulp from *P. patula*. The runnability on experimental pilot plant was good.

# **Raw Materials**

*P. patula* logs were supplied from 1972-73 plantation of Kanasar-6 plantations by Silviculturist, Sal region U.P. The logs were 10-15cm in diameter and 2-2.5 m. in length. The specific gravity (Weight O. D. Green volume) of wood as received was 0.343.

*Pinus caribaea* logs were supplied from experimental plantation of Forest Research Institute by Director, Forestry Research, Forest Research Institute Dehra Dun. The plantations were raised in 1963. The specific gravity of wood as received was 0.400. The chip density of *P. patula* and *P. caribaea* was 170 and 165 (o.d. kg./m<sup>3</sup>) respectively.

## Experimental

The detailed description of the Thermo-mechanical pulp pilot plant was reported in an earlier publication<sup>2</sup>.

# Preparation of Thermomechanical Pulps

The conditions for Thermo-mechanical pulp preparations are given in Table-2. The plat pattern in pressurised refiner was 5821, and in atmospheric refiner 5811.

The pulps produced were subjected to latency removal. In all the cases the pulps were kept at about 80°C for a period of one hour. The properties of 100 g.s.m. standard handsheets of Thermo-mechanical pulp as received from second stage atmospheric refiner are reported in Table-3

<u>()</u>	First	t Stage Refi	age Refining (Pressurised)						
SI. Species No.	Pressure in preheater	Temp. in preheater	Plate clear-	Power consu-	Produc- tion rate	Plate	Power	Produc-	Atmospheric) Total energy
1	kg/cm <sup>2</sup>	Ċ	ance mm	mption KWH	Kg/H	ance mm	mption KWH	Kg/H	KWH
2. P. Carbaea	1.2	120 120	0.4 0.4	1000 1150	100 85	0.2 0.2	800 800	100	1800

TABLE-2. PULPING CONDITIONS

TABLE--3 STRENGTH PROPERTIES OF P. PATULA AND P. CARIBAEA TMP PULPS

D DATILLA			
I. FAIULA	P. CARIBAEA	SPRUCE <sup>2</sup>	CUPRESSES
			CASHMERIANA <sup>2</sup>
120	<b>20</b> 0	180	170
15.28	- 8 0	0.32	0.21
<b>g 0</b> .48	0.9	11.0	9.5
g 3.60	2.2	0.35	0.25
41.3	39.0	35.0	2.1
	P. PATULA 120 0.24 15.28 9 0.48 9 3.60 41.3	P. PATULA P. CARIBAEA 120 200 0.24 - 15.28 8.9 0.48 - g 3.60 2.2 41.3 39.0	P. PATULA P. CARIBAEA SPRUCE <sup>2</sup> 120 200 180 0.24 0.32 15.28 8.9 11.0 0.48 0.35 3.60 2.2 2.8 41.3 39.0 35.0

34

IPPTA Vol. 20, No. 1, March 1983

#### Preparation of Newsprint Grade Paper from 100% Thermo-mechanical Pulp from P. patula

Pilot plant scale pulping of P. patula was done on the pilot plant. The pulp was neither screened nor bleached. After latency removal the pulp was directly transferred to papermachine. On papermachine two furnishes viz., 100% Thermo-mechanical pulp and 90% Thermo-mechanical pulp along with 10% soap stone powder as filler was used. Pulp was prepared under following conditions—

# 1. Pulping Conditions :

.

i) Moisture content of Chips, %	:	55
ii) Preheater temperature, °C	:	120
iii) Preheater Pressure, kg/cm <sup>2</sup>	:	1.2
iv) Plate Pattern		
a) Ist stage	:	5821
b) IInd stage	:	5811
v) Power Consumption, Kwh/Tonne	•	2011
a) Ist stage	•	1000
b) IInd stage	:	800
vi) Consistency, %	-	000
Ist stage	:	18
vii) Freeness, ml. C.S.F.	•	
IInd stage		
a) After Ist stage	:	450
b) After IInd stage	:	120
viii) Fibre Classification	-	
(Bauer Mc Nett) of		
IInd stage pulp,		
+ 48		37.77
+ 65		2.00
+ 100		2 51
+ 150		7.47
- 150		55.75
2. Papermaking Conditions :		
i) Machine speed mpm		40
ii) Freeness of pulp before brushing	,	40
refiner, ml. CSF		120
iii) Freeness of pulp after	•	120
brushing refiner, ml CSF		eo
iv) Wet web strength N. m/g	:	0 226
v) Head box consistency, %	:	0.235
vi) Head box pH	•	7.5
vii) Back water consistency, %	:	<b>0.</b> 4
3. Paper Properties :		
i) Furnish $100\%$ TMP of	07 m	

			90% TMP +
iii)	Substance, g.s.m. Apparent Density	, 55	10% Soap Stone 58
iv)	g/cm <sup>3</sup> Tensile Index, Nm	0.42	0.33
	a) Machine direct b) Cross direction	tion :11.20 n : 6.70	9.80 5.9.)

IPPTA, Vol. 20, No. 1, March, 1983

v)	Stretch, %			
	a) Machine direction	:	1.63	1.83
	b) Cross direction	:	3.25	2.32
vi)	Tear Index, mNm <sup>2</sup> /g			
	a) Machine direction	:	1.71	1.48
	b) Cross direction	:	<b>2</b> .0 <b>6</b>	1.66
vii)	Porosity, Secs 100 ml	:	6	5
viii)	Brightness, ISO	:	3 <b>9</b> .6	42.0
ix)	Opacity, %	:	99.2	<b>99.4</b>
X)	Ash. %	•	0.52	5 50

The runnability of pulp on paper-machine in both the trials was good. A sample of paper made is enclosed.

# **Results and Discussions**

The conditions of pulping for *P. patula* and *P. caribaea* are recorded in Table-2. The strength properties of standard sheets of 100 g s m. are recorded in Table-3. For comparison properties of Thermo mechanical pulps of Spruce and *Cupresses cashmeriana* reported earlier<sup>2</sup> are also included. It



Fig. 2. Strengh Properties of MD. and CD of P. Patula (TMP Pulp) Without and With Soap Stone.

35



could be seen that *P. patula* pulps of wood from ten years old plantation are superior to spruce Thermomechanical pulp tested earlier. *P. carbuea* pulps were, however, inferior to *P. patula* and spruce but similar to *Cupressus cashmiriana*.

*P. patula* pulp was run on pilot papermaking machine. The runnability of pulp was good. As the runnability of paper-machine was good an attempt was made to admix, 2% Guar gum. 10% Soap stone powder and 5% alum and ran the pulp on machine. The machine ran smoothly. To check the runnability on paper-machine the machine speed was varied from 30 mpm to 80 mpm. At all the speeds the behaviour of pulps was normal.

Some of the paper made, was subjected to actual printing at the Forest Research Institute Dehra Dun. The printability was satisfactory.

#### Acknowledgement :

Author wishes to acknowledge the help rendered by Dr. R. Pant and Shri G. C. Agarwal of Central Pulp and Paper Research Institute for providing facilities. Further, author is also grateful to Shri P. P. Bhola, Shri S. P. Singh, Shri N. C. Khera, Shri M. K. Bist and other collegues of Cellulose and Paper Branch for valuable help.

#### **References** :

- 1. Pande, G. C., Indian Forester, Vol. 108, No. 1, Page 1, 1982.
- 2. Sharma, Y.K., et al., "Pilot Plant trials on TMP unit with indigenous woods"—presented to IPPTA Seminar 1980.