Liner Grade Pulp from Eucalyptus hybrid

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SUMMARY

Eucalyptus hybrid (mainly *E. tereticornis*) was cooked by NSSC process for the production of liner grade pulp. The cooking was carried out by varying the concentration of sodium sulphite (15–20 percent) and sodium carbonate (3.5-4.6 percent). The cooking temperature was kept 170°C in all experiments, but the cooking period at maximum temperature was varied from 1–3 hours. After refining, the yield of unbleached pulp was determined. Standard sheets were made & tested for coventional physical strength properties and ring crush resistance, a property important in liner grade pulp. From the results it was concluded that the pulp in satisfactory yield and physical strength properties required for liner could be obtained by NSSC process from Eucalyptus hybrid.

INTRODUCTION

The growth of packaging industry is linked with the industrialisation and its standard of living in The introduction and growth of the country. semi-chemical process for the last few decade is to large extent a result of its adaptability of low cost abundent hardwoods to produce high yield pulps for corrugating media and other products where high physical properties are required. The Neutral Sulphite Semi-Chemical (NSSC) pulping of hardwoods has been well established. NSSC pulps have high crush resistance which is the primary requirement for corrugating media, liner and other paper boards used in the manufacture of packaging cases. Fibre board products are subjected to crushing forces in during storage and chipment. An investigation on corrugating medium from Eucalyptus hybrid have been made earlier (¹). For making corrugated containers, liner paper or board is also required, therefore an investigation for the production of liner grade pulp from Eucalyptus hybrid has been undertaken and the results are reported.

PRODUCTION OF PULP

For each experiment 200 g. (on oven-dry basis) of chips were taken. The digestions were carried out in a verticle stationary stainless steel three litre autoclave by varying the concentration of sodium sulphite 15 to 20 percent and of sodium carbonate 3.5-4.6

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percent on o.d. chips. The cooking temperature was kept 170°C. The time of cooking was varied from 1-4 hours excluding 1.5 hours required to reach the maximum temperature of the contents from room temperature. The material to liquor ratio was kept 1:3.5 in all experiments. After the digestion, the cooking material was washed, then passed through a laboratory sprout waldron refiner twice, keeping the clearance 5 and zero mils successively. The pulp was washed and screened on a laboratory screen having slots of 0.35 mm size. The unbleached pulp yield was found. The unbleached pulp was beaten in lampen mill to about 300 ml (CSF) freeness and standard sheets of 60 gsm and 170 gsm were prepared for determining the strength properties and ring crush resistance respectively which is important for liner board.

The ring crush resistance of paper and paper board is the maximum compressive force that a test piece will sustain without being crushed. The test piece being in the form of cylinder, standing on one end and the force being applied to other and under specified conditions. The test was carried out on L & W Alwetron universal strength tester according to SCAN Standard 34:71 and the results are reported as ring crush resistance in Newtons (N). [1 Newton (N)= Kg × f × 9.807]. This method applied to paper and paper board with thickness of not less than 0.15 mm and not more than 0.49 mm.

Conditions of pulping, yield and strength properties are recorded in Table-I. For comparison the

194

specification of South Africa Bureau of Standards are also given in Table-I. Ring crush value of Philipines hardwood kraft pulp is also recorded in Table—I for comparison.

DISCUSSION

From Table-I, it is evident that by increasing the concentration of chemicals as well as by increasing the cooking time, the pulp yield decreases and the strength properties improve. At fixed chemical concentration (15% Na₂SO₃ and 3.5% Na₂CO₃), when the cooking period is varied from 1 hr. to 3 hrs., the pulp yield decreases and strength properties including ring crush improves. The important property of liner board is ring crush resistance, as it is useful in controlling the manufacturing process and in providing an indication of the compression resistance to be expected in the finished product. The conventionally determined strength properties like the breaking length, bursting strength and tearing resistance are of little importance. Under the conditions studied, the optimum condition for the production of liner grade pulp is considered as given in Table-I,

at Sl. No. 6. In this case the ring crush resistance value is 268 N which is sufficient for good quality and product. By comparing the results with standard prescribed in South Africa, it is evident that Eucalyptus hybrid is a suitable raw material for production of liner grade pulp. The average ring crush value of Philipines hardwood kraft pulp sheets of 212 gms. is 350 N. In this case high value of ring crush is due to high grammage of sheet and because kraft pulp has been used.

For corrugated containers, generally corrugating medium is of NSSC pulp and liner of kraft pulp. The yield of Eucalyptus kraft pulp lies in the range of 45-48 percent, whereas in the case of NSSC process it is in the range of 62.7 to 68.4% and strength properties are satisfactory to meet the requirement of liner board. This is one of the advantage that kraft pulp may be replaced by NSSC pulp in liner. Eucalyptus hybrid have been cooked by NSSC process for the production of corrugated medium. Pulp could be prepared in satisfactory yield and with adequate property for corrugating medium (¹).

TABLE-I

PULPING CONDITIONS AND PROPERTIES OF LINER GRADE PULPS FROM EUCALYPTUS HYBRID

Sl. No.	Chemicals Na ₂ SO ₃ (%)	applied Na ₂ CO ₃ (%)	Cooking Time (hr.)	Pulp yield (%)	Burst factor	Tear factor	Breaking length (metre)	Ring crush (Newton)
1.	15	3.5	1.0	68.4	27.9	87	4650	240.5
2.	15	3.5	1.5	66.2	32.0	91	4760	232.0
3.	15	3.5	2.0	64.0	34.1	88	4590	250.0
4.	15	3.5	3.0	63.4	37.2	95	4970	259.0
:5.	18	4.2	1.0	65.8	34.7	97	4880	267.5
6.	18	4.2	1.5	64.3	40.2	102	5490	268.0
7.	20	4.6	1.0	63.2	36.2	98	5630	270.0
'8.	20	4.6	- 1.5	62.7	41.5	108	5780	272.5
9.	South Africa Standard				29.8	108	4220	•• .
10.	Philipines hardwood kraft pulp				. 	د ب	· ·	350.0

REFERENCES

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Ippta, Vol. XVI, No. 4, Dec., 1979

195