Cold Soda Semichemical Pulping Plant at Andhra Pradesh Paper Mills

P. S. Hangal, K. S. R. Murthy, and K. Kalyanasundaram.

Introduction

The main raw material used for Paper making in India has been Bamboo for the last several decades. The process employed for pulping generally is the Sulphate cooking. It is quite known that the Bamboo resources are more or less fully utilised by the Paper Mills in India and there is hardly any Bamboo forest left for the future expansion of this industry. The tendency, therefore, is to look for other avenues of fibrous raw materials such as Bagasse Agricultural Residues and Hardwoods. While one or two Mills were established in the last decade for utilising Bagasse, the problems confronted by such Mills, both technical and economical, have been enormous. Some attempts have been made by the Paper Mills to utilise Hardwoods to augment the fibrous raw materials supply in view of their need to expand the production. However, most of the Mills who have used Hardwoods or are using Hardwoods have tried to subjet Hardwood chips for conventional Sulphate cooking, sometimes admixed with Bamboo chips. The results are none too encouraging.

In Andhra we have an expansion programme envisaging an increase in production from the present 100 tonnes to 150 tonnes of Paper per day in the very near future. We are also going to face the shortage of Bamboo raw material like other Paper Mills for all our future expansion programmes. In order to augment fibrous raw material supply, we also turned to Hardwoods which are available in plenty in the Andhra Region forests. However, it was our considered view that we should not subject Hardwood chips for chemical pulping process because we are likely to dissolve the hemicelluloses and degrade the short fibres of the wood thereby weakening the pulp. The basic strength in Hardwood pulps could be retained provided we do not degrade the fibres and retain more hemicellulose. The only course left for achieving this objective is to look forward a milder treatment for hardwood chips and the result was, we decided to go for a semichemical pulping process with Cold Soda treatment.

This paper gives in brief, description of the Cold Soda High Yield Pulping Plant we are installing for Hardwoods as a part of our expansion programme. This unit is expected to go into production by July/August 1969 and it is designed to produce 35 tonnes of High Yield Hardwood pulp per day. The basic equipment for this plant are being supplied by the Sprout Waldron & Co., Incorporated, U.S.A. The entire Engineering is done by the Mill's Technical Department, under the guidance of Sprout Waldron & Co.

The process employed would be the impregnation of fractionated wood chips by the Caustic Soda solution followed by two stage refining of impregnated chips in Disc Refiners. The Refined pulp is washed in vacuum filters and screened. We have no programme to bleach this pulp at the present but some kind of bleaching will be arranged after we have sufficient experience of the Hardwoods available in the proximate forests.

Description of the Process

The debarked wood is primarily chipped in a conventional disc chipper and screened 15 mm. to 25 mm. wood chips thus obtained are stored in the Silo having 25 tonnes storage capacity. The Silo is a cylindrical vessel with conical bottom constructed of mild steel plates. The chips run down the Silo through the conical bottom and metered by Rotary Table Feeder with variable speed drive and then passed through a Magnetic Chute for removing any metal. A pneumatic conveyor feeds the chips to a Sprout Walron Fractionator driven by 100 HP Motor. There is an arrangement to administer about 20% of the total Caustic Soda required for impregnation at the Chip Fractionator. The Fractionator disintegrates the chips to match stick size before conveying to a Sprout Waldron Soaking Bin.

The soaking bin is fabricated at the Mills on the design given by Sprout Waldron. The bottom of the soaking bin is being imported. It consists of a discharge section with heavy duty set of screws driven at variable speeds. The Soaking Bin works as a continuous impregnation vessel and the impregnated chips are discharged at any desired rate which could be adjusted by controlling the feed, the level in the impregnation vessel and the speed of the discharge screws.

The balance quantity of Caustic lye required for impregnation is added to the Soaking Bin along with the chips. The Caustic lye requirement is approximately 4% to 6% of NaOH on O.D. chips. The Caustic Soda feed is controlled by Conductivity cell. The liquor to wood ratio will be approximately 5:1 and the retention time for the chips could be anywhere between 1 hr. to 2 hrs. at room temperature, depending upon the type of pulp, yield and the species of wood.

The impregnated chips at 4% to 5% consistency are discharged on to a cross collecting Screw Conveyor which feeds to a specially designed Allis Chalmers Pump. The Allis Chalmers Pump transports the impregnated chips to a Rotary Drainer which is fabricated at the Mills out of Stainless Steel construction. The spent liquor drains into a sump.

The spent liquor is utilised partly at the Soaking Bin for maintaining the liquor ratio and partly at the discharge section of the Soaking Bin for reducing the consistency of the impregnated chips.

The impregnated chips are discharged from the Drainer at 15% to 16% consistency and are lead continuously to a 36" Single Disc Refiner driven by 1000 HP Motor.

The feed of the impregnated chips is regulated by Uniflow Feeder and the excess chips are returned to the Soaking Bin. The Disc Refiner defiberises the impregnated chips and discharges the stock by the gravity into a chest. The stock is further diluted to a consistency of 5% to 5.5% and the same is regulated by Instrument before it is fed

P. S. Hangal, Works Manager, K. S. R. Murthy. Incharge Planning and Development, K. Kalyanamundaram. Incharge Pulp Mill, Andhra Pradesh Paper Mills Ltd., Rajahmundry A.P.

Table I. Process Details on which the Design is Based

		Feed to Fractionator.	Fractionated chips.
1.	**Chip size**		
	Retained on 1 mesh.	5.5%	0%
	Retained on 2 mesh.	51.0%	0%
	Retained on 5 mesh.	43.5%	65.2%
	Retained on 6 mesh.	0	10.0%
	Passed through 6 mesh.	0	24.0%
2.	**Caustic Requirement** 4% to 6% on B.D. chips.		
	Strength of caustic solution, 30—40 gpl.		
	Liquor ratio in the soaking bin, 5:1.		
	Retention time,		1 to 2 hours.
	Temperature,		Room temperature.
3.	Feed to primary Refiner,		14 — 15% cy.
	Feed to secondary Refiner,		4 — 5% cy.
	Freeness after primary refining,		15° SR
4.	Freeness after secondary refining,		30° SR
	Approximate power consumption for refining,		40 HPD/TON

to a Twinflow pressurized Refiner driven by 250 HP Motor. The feed pressure is maintained at 150 to 200 psig. The refined stock will be at 25° to 30° SR.

The refined stock is washed on a Voith Vacuum Filter and screened through a waterous Centrifugal Screen having perforations of 1.2 to 1.4 mm. The rejects are recirculated. The screened pulp is further thickened on another Voith vacuum filter and stored in a 65 M^3 storage chest.

Engineering

The salient features of the Cold Soda Pulping plant at Andhra is that the entire process and plant Engineering was done by the Mill's Technical Department under the guidance of Sprout Waldron & Co. We have imported only the basic capital equipment like the Chip Fractionator, Discharge section of the soaking bin, special duty Allis Chalmers pump, the two Disc Refiners and the Uniflow Feeder. All other equipment and materials like Chipper, Stock pumps, Agitators, Drainers, Screw Conveyors, Instruments, Pipe lines and fittings etc., are arranged indigenously. The two vacuum filters were imported years back by the old Management and the same are re-employed for this plant. The waterous Centrifugal Screen was lying in the Mill's scrap yard for decades and the same was completely renovated in the Mill's work-shop and installed. The Instrumentation was completely designed by the Mill's Technical Department and the specifications were given to indigenous Instrument Manufacturers who readily came forward to tailor make for us. As a matter of fact most of the instrumentation is being supplied on our specification by Taylor Instruments (India) Ltd!

The Hardwoods Availability

The Pre-Investment Survey of Forest Resources have conducted an aerial photo-survey in Dandakaranya forests and Andhra Region forests to assess the availability of pulpable hardwods. From the information available it is reported that the Andhra region forests might yield a sizeable quantity of pulpable Hardwoods proximate to our Mills on a sustained basis. The report of the Pre-Investment Survey of the Forest Resources is yet to be published.

In the meanwhile more than 8 species of Hardwoods which are available in plenty were tested in the laboratories of The West Coast Paper Mills Ltd., and the results for the Cold Soda impregnation were encouraging. Some of the Hardwoods available are the following :—

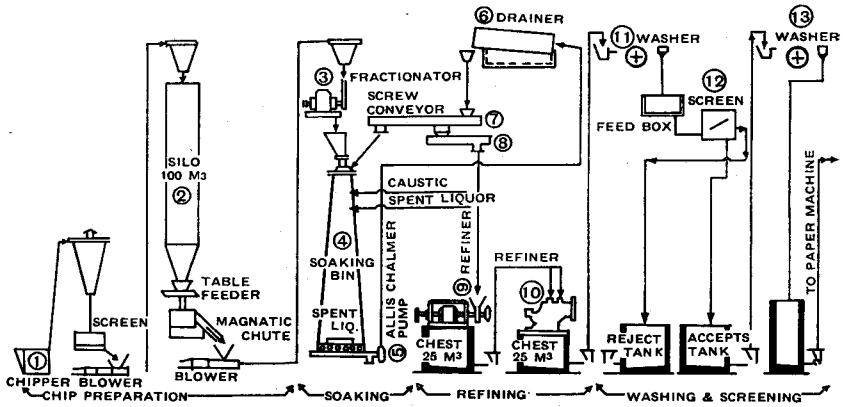
1. Boswellia serrata.
2. Adina cordifolia.
3. Mangifera indica.
4. Bombax malbaricum.
5. Zenea grandis.
6. Casurina.

Table I. gives the details and design data for this Pulping Plant.

Fig. I gives a general flowsheet of the process being employed at the APPM.

The Mills proposed to use the Hardwood Cold Soda Pulp in the manufacture of Liner Board together with bamboo kraft. The Mills are installing a Secondary Head Box on their M.G. machine for the manufacture of Duplex Liner Board for which one of the liner will be Cold Soda Pulp.

The Mills have also plans to bleach this Pulp at a later stage after completing the laboratory bleaching trials. Semibleached or bleached Hardwood pulp will then be used for admixing with Bamboo pulp in the manufacture of many varieties of printing papers. The size press is being installed on one of the machines and also a Supercalender. We understand that the only other Mill that is planning for Cold Caustic Pulp is NEPA and perhaps, ours would be the first to go into production in the country.



1. Chipper, 2. Silo 100 M3. 3. Fractionator(100 HP). 4. Soaking bin (25 M3).
5. Allis chalmer pump. 6. Pulp drainer. 7. Screw conveyor 8. Uniflow feeder.
9. 36-18 Refiner (1000 HP) 10. Twinflow refiner (250 HP).
11. Voith vacuum filter washer (1.6 MO x 1.75O) 12. Waterous centrifugal screen.
13. Voith vacuum filter-thickener (1.6 M.O x 1.75O)

Fig. 1—Flow sheet of cold soda semichemical Pulping Plant

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