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Pulping and Paper Making Process of Lucena Lucocephala (Subabul)

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Abstract: Pulp is a lignocellulose fibrous material the first basic step is pulp and paper prepration is pulping this consist of cooking the raw material, usually wood in suitable chemical in the digester under controlled of temperature, presser, and time. The second basic step is pulp purification. Where pulp is subjected to bleaching and purifying agent to render the pulp more suitable for it's intend use. Pulping process are three principal type (1) mechanical (2) chemical (3) semichemical. Here we are discussing for separation of fibre soda /Kraft pulping process. In this process white liquor (NaoH + Na_2S) used for making pulp. Alkaline pulping process for making pulp and paper is better than other because maximum flexibility, short cooking time, pulp can bleach high brightness labels, no pitch problem, high pulp strength. The recovery of spent liquor is relative easy yield of unbleached pulp 45-45%. 19% subabul with additive brightness 27.81%.

Keyword: Lucena lucocephala, required chemical.

INTRODUCTION

Kraft/Soda pulping is a process which is used for making the paper. Pulping processes provides an important source of raw material for making the paper. The basic raw material for making the paper is cellulose which occurs naturally in the form of fibres in a wide variety of growing plants. However, considering the shortage of conventional raw materials for pulping and the increasing demand of paper products worldwide, systems of agricultural cropping and exotic tree varieties[1] have attracted renewed interest, not only in Mediterranean countries like Spain, Italy and Greece with insufficient forest resources[2] but also in Asian countries. Besides this, in the last decade, a great attention of the European agricultural research was focused on the search of new non-food and high yield short rotations crops with perspective for industrial utilization[3]. Thus, fast growing high yield fibres farms offer enormous potential to provide a productive new resource for the pulp and fibre manufacturing

sector[4]. The Kraft pulping process purpose is to individualize cellulosic fibres and remove lignin by white liquor, which main components are sodium hydroxide and sodium sulfide. This process is known to produce high strength papers, but causes odorous pollution and increases costs of the black liquor recovery system. The soda process is an alternative of pulp production without sulphur compounds.

MATERIAL AND METHOD

Plant materials of *Leucaena leucocephala to* obtain wood chips and wood dust for pulping and paper making. For the study of wood, following information was recorded in the study area Ganjbasoda of district Vidisha for the collection of raw materials as wood chips:

Description of plant	
Botanical name:	Leucaena leucocephala
Local name:	Subabul
Location:	Surrounding areas of Ganjbasoda, district Vidisha (M.P.)
Height of tree:	15 feet
Diameter or girth of tree:	1 feet
Amount of wood:	5 kg hard wood
Color of wood:	Yellowish.

The Kraft process (also known as Kraft pulping or sulfate process) describes a technology for conversion of wood into wood pulp consisting of almost pure cellulose fibers . The process entails treatment of wood chips with a mixture of sodium hydroxide and sodium sulfide, known as white liquor, that break the bonds that link lignin to the cellulose. This method was used to carry out chemical pulping of wood in the laboratory series digesters with six bombs, each of capacity 2.5 liters . Besides this, single pan balance, pulp disintegrator, centrifugal washer, pulp shredder, burettes and pipette were also used for this process. White liquor ($NaOH+Na_2S$) were used with known sulfidity and total titrable alkali (TTA) as NaOH of known concentration. Cooking of raw material was carried out in the laboratory series digester in which the bombs rotate in an electrically heated oil bath. Each bomb was loaded with 300 gm O.D. wood chips. The calculated volume of white liquor and water was added to the bombs, which was tightly screwed and placed in the oil bath. Pulping conditions in one series of cook can be varied by changing the chemical charge or the cooking time for each bomb . A conventional cooking schedule for the series digester is as follows:

- Time from room temperature to 100°C = 30 minute.
- Time from 100°C to cooking temperature = 100-105 minute.
- Time at cooking temperature = Variable.

The calculation involved in determining the mass of the wood that has to be used in a cook, the amount of cooking chemical and water that has to be added and the procedure that has to be used in determining the H factor were given for a typical cook. The following cooking conditions were

assumed using 300gm (O.D. basis) of the chips and by using white liquor of 16% active alkali (as Na_2O) and 25% Sulfidity.

- Material to liquor ratio = 1.3
- Cooking temperature = 170°C
- Time to temperature = 105 minute
- Time at temperature = 60 minute
- To obtain 300gm of O.D. chips it was necessary.
- (100/100-MC) X 300 gm of A.D. Chips.
- Cooking of 300 gm O.D. chips using 16% active alkali as Na_2O required.
- 16 X 300/100 gm = 48 gm of cooking chemical.

The volume of white liquor of 25% sulfidity that has to be added to the chips to give a 16% active alkali (as Na_2O) cook to be 1000 x 48 / C = Concentration of Na_2O in the white liquor in gm/l.

- For a material to liquor ratio of 1.3 for 300 gm of chips the total volume of liquor in the bomb to be 900 ml. = 900 – (Moisture in the chips + Volume of white liquor)

Pulp washing: This procedure was used for hard wood pulps. In this method, at the end of the cooking period the bombs were removed from the bath and quenched in water. When cooled, each bomb was emptied on a 26 cm diameter Buchner funnel fitted with a terylene filter cloth, to remove the black liquor from the pulp. The chips were broken by hand and then heated for 10minutes with 8litres of hot water (80-90°C). This was followed by disintegration in a laboratory disintegrator for 10 minutes at 80°C temperature. The pulp was finally washed on a Buchner funnel with hot water at 800C until filtrate was colourless.

Pulp yield determination: The pulp yield was determined by weighing the pulp (W total AD weight of pulp) and taking two representative samples each of 50 gm for determining the dryness (Dry content per 100gm A.D. weight). The samples were weighed and dried in a ventilated oven at 105±3°C overnight. The dried samples were weighed and the yield was determined as follows:

$$\text{Dryness \%} = \frac{A}{B} \text{ X100}$$

$$\text{Pulp Yield \%} = \frac{W \textbf{ X } \text{Dryness of pulp}}{\text{O.D. weight of chips taken}}$$

Where,

A = O.D. weight of pulp taken for dryness

B = A.D. weight of the pulp taken for dryness (50 gm)

W = Total A.D. weight of the pulp

Pulp storage: If pulp is required to store longer time solution of formaline sprinkled on the pulp (37-41%). Bleaching of Chemical pulps with chlorine dioxide after delignification, the colour of the pulp becomes dark brown and for the requirements of white paper, the pulp has bleached. Bleached Kraft

pulp and bleached sulfite pulp are used to make high quality, white printing paper. Unbleached Kraft pulp is used to make brown paper shopping bags and wrapping paper of high strength.

The chlorine dioxide was included along with chlorination by substituting 10-15 % of chlorine in chlorination stage after extraction. The purpose of chlorine dioxide was to enhance and stabilize the final brightness of the bleached pulp. This method provides procedures for optimization of chlorine dioxide, bleaching conditions mainly for the use in laboratory. In this method, water bath, polyethylene bags were used and sodium chlorite, sodium acetate and acetic acid were also used as reagents.

Use of chlorine dioxide in later bleaching stages was necessarily required for determination of optimum amounts of chemical to be added to achieve the desired brightness. Brightness and to a lesser degree chlorine consumption, were the factors considered when determining the optimum dosage. The conditions used during chlorine dioxide bleaching stage are:

- Consistency % -- 8.0
- Temperature, °C – 70
- Time (Minutes) 180
- The P^H is maintained at around 5.0

Small scale trials were made on 20gm pulp samples which have already passed through the chlorination and extraction stages. If the chlorine dioxide was used in the first bleaching stage, trials were made using 1%, 2% and 3% available chlorine. The amount of sodium hydroxide buffer required to maintain the pH at around 5 during the reaction period was also measured. The required volume of water and sodium hydroxide to give the desired pulp consistency and pH were heated to around 70°C and added to the pulp contained in a plastic jar. The required amount of chlorine dioxide solution was added from a measuring cylinder to the hot slurry. The jar was placed in a temperature controlled bath and the pH of the stock was tested at intervals and adjusted as per requirements. At the end of the reaction period the pulp was thoroughly washed with water, care being taken to avoid loss of fines. Large scale samples were prepared using the optimum conditions. This was done in a covered bucket. Mixing was done by hand using rubber gloves. Evaluations of bleached pulps was carried as per procedure given in test method No. TM I-C3.

RESULT AND DISCUSSION

Primary pulping analysis record of *Leucaena leucocephala* was also observed and results of different particulars were noticed. These particulars are Bomb number (415/13 to 415/17), dryness of raw material (94%), raw material weight (212gm), weight of oven dried raw material (200gm), Liquor to raw material ratio (4:1), total volume of water (700ml), water in law material (12ml), liquor to be added (385.2ml), water added for dilution (303ml), anthraquinone was used as additives (between 0.15%/3 to 0.2%/4), active alkali charge as NaOH (16%), sulfidity (20%), Chemical required (32gm), cooking liquor concentration (83.1g/l, temperature and cooking time required between 0 to 50°C 30 minutes, 50 to 100°/60 minutes, 100 to 150°/90 min.(1.5hrs) and 150 to 165°/120 minutes (2.0 hrs) as mentioned in Table (4).

CONCLUSION

Lastly it can be said that Kraft/soda pulping process to remove lignin by white liquor can be used for paper making.

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