Manufacture of Bleached Bagasse Pulp by Pandia System

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Baled bagasse received from the Mysore Sugar Company is partly stacked in the storage yard and the remaining quantity is unloaded directly at the platform from where it is fed to the wet depithing system. This arrangement enables the mill to save unnecessary expenses in storing and handling the entire quantity of bagasse received from the sugar mill. The partially depithed bagasse is further upgraded by the wet depithing system.

This operation is carried out in a Rietz disintegrator-cum-depither in wet state. For this purpose the bagasse needs pre-soaking in water, because the bagasse bundles and particularly Parenchyma cells swell with water absorption and the pith becomes loose and easily separable. Soaking operation is an essential part of this process. Otherwise breaking of useful fibre at the Rietz is more and all the same pith removal is poor.

Bales are broken manually and the baling wires removed. The broken bales are transported via a slat conveyor into a 15 ft. diameter Black Clawson hydrapulper. Bagasse is churned in this hydrapulper at consistency of 2 to 3% for about 15 to 20 min. in continuous operation. Churning of the bagasse by means of a powerful rotor driven by 160 HP motor at 185 rpm helps in quick soaking and opening of the fibre bundles. From the hydrapulper the stock is pumped to the Rietz disintegrator. To control the time of soaking without interrupting continuous operation of the unit, necessary recirculation lines are provided. At the base of the hydrapulper, sand traps and magnets are provided to arrest pieces of stone, loose sand and iron trash etc., to protect the unit against possible damages. The Rietz disintegrator-cum-depither is a vertical type of swing hammer mill having number of hammers of different shapes and designs. This machine serves a very useful purpose in further pulling out with and fines to the extent of 25 to 30% present in the partially depithed bagasse and at the same time considerable amount of water is removed from the depithed bagasse to attain a consistency of about 20%. Opening of fibre bundles in the disintegrating process has a marked influence in helping the chemical penetration during the process of cooking in Pandia digester in a short time. The bagasse coming out of the Rietz drops on a horizontal slat conveyor having perforated bottom through which further quantity of water is removed. The bagasse received from the Rietz has a residual pith content of 10-12% and about 10% water soluble organic matter.

Cooking of Bagasse:

The cleaned bagasse is further transported by an inclined slat conveyor to the Pandia continuous digestion system. Ahead of the Pandia digester there is a paddle mixer which receives the bagasse and acts as a shredder. From the paddle mixer the bagasse is fed through a vertical chute to the screw feeder mechanism of the Pandia unit. The screw feeder helps in further squeezing out water from bagasse. Considerable quantity of water solubles as well as pith are removed along with the squeezed

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out water through the perforated throat of the screw feeder. During the process of squeezing out, the bagasse attains a dryness of about 40% and forms a plug to prevent escape of steam from the cooking zone. Besides the plug formed by bagasse, a blow back valve has been provided to closely control the escape of steam from the digestion zone.

Th operation of transporting conveyors, screw feeder, blow-back valve, both the Pandia tubes and the discharger which is electrically interlocked is controlled from a central panel so that if there is any interruption in any unit operation, the entire system trips off.

The Pandia digester consists of two horizontal tubes each having a length of 24'-10" and 36" diameter, and located one over the other operating in series. Cooking liquor is injected in the high pressure zone at the entry of the digester alongwith ste m. The screw conveyor in the first tube is usually of the mixing type to ensure uniform heat transfer, thus uniform pulping. The cooking of bagasse proceeds as the bagasse is carried from the first tube to the second tube. Both the tubes are equipped with variable speed drives so that the retention of bagasse in the cooking zone can be suitably adjusted depending on the quality of pulp required.

Normally the cooking is carried out at a pressure of 100 lbs. p.s.i. using 14% NaOH for 10 to 12 minutes. Fibre to liquor ratio inside the tube is maintained in the vicinity of 1 : 3.5. White liquor received from the chemical recovery contains 100 gms/1 tr. NaOH and the cooking liquor is adjusted with the spent black liquor to maintain the requisite bath ratio. The pulp produced under these conditions is soft and easily bleachable. The $KMNO_4$ no. of pulp is from 9 to 9.5 and having a freeness value of 21-23°SR.

The conditions of cooking as mentioned above are maintained to give a free residual alkali of 8 to 10 gms. NaOH per litre in the spent black liquor which is found to be optimum for satisfactory washing of the pulp and subsequent recovery operations. The low free residual alkali in black liquor greatly retards the filterability of brown stock and therefore the washing of pulp is adversely affected. High free residual alkali prevents precipitation of lignin and lowers the viscosity of the thick black liquor. Compared to low viscosity of black liquor from bamboo pulping, black liquor produced from bagasse pulping is more viscous and presents problem in soda recovery operation. If the free alkali in the black liquor exceeds 10 gms/1tr., alkali losses at the pulp-mill increase and at the same time foaming takes place during screening and cleaning operations.

Two-stage washing is carried out using Kamyr rotary vacuum washers, each having a diameter of 2.25 metres and surface area of 17.68 M^2 to handle about 40 tonnes of bagasse pulp per day. Because of the slow drainage property of bagasse pulp compared to the conventional long fibre pulps, the brown stock washers should provide more washing area and the filters should be equipped with coarser wire mesh for better washing to remove spent liquor as well as undesirable materials from the brown stock. It is estimated that per tonne of unbleached pulp production 14 m^3 of thin black liquor is produced in the two-stage single zone brown stock washing system. The black liquor has a total dissolved solid content of about 80 gms/ltr.

Screening and Cleaning of Pulp :

The unbleached washed stock is stored in a storage chest at a consistency of 4 to 4.5%. The stock is pumped from this chest to an overhead metering box where it is further diluted with back-water from the thickener to a consistency of 0.8 to 1%. Screening of this pulp is effected by 2 Trimbey rotary screens operating in series. The primary Trimbey screen has got a screen plate with a perforation of 0.075" holes and the secondary screen is equipped with a screen plate of 0.055" perforations. The accepted stock from the secondary screen is pumped to a two-stage centricleaning system for removing sand, shives and other extraneous matters. Finally

the screened and cleaned pulp is thickened by a rotary thickener to a consistency of about 10%. The rejects from the primary and secondary cleaning are led to a Johnson Vibrating screen. The accepts of the vibrating screen are recycled back to the vibrating system. The rejects from the secondary centri-cleaning system are either sewered or collected over a hill side screen for the manufacture of mill wrappers.

Bleaching of Bagasse Pulp:

The screened and unbleached bagasse pulp. received from the thickener is stored in a horizontal mid-feather type storage chest. The unbleached bagasse pulp having a $KMnO_4$ no. of 9.5 is soft and easily bleachable. Bleaching of bagasse pulp is carried out in a three-stage conventional bleachery employing chlorination, caustic extraction and hypo sequence. Control of stock consistency, temperature and pH in every stage of bleaching operation is extremely essential to avoid degradation of pulp. The total chlorine demand for bleached bagasse pulp is hardly 4% to attain a brightness level of 85° GE. The bleached bagasse pulp shows an overall yield of 45% based on fully depithed bagasse. Of the total chlorine demand 65 to 70% is dosed on the chlorination stage so as to avoid excessive chlorine consumption at hypo-stage which is extremely detrimental for bagasse pulp. The effective storage capacities in chlorination, caustic extraction and hypo towers provide a total bleaching time of about 8 hours at 30 tonne/day pulp production level. (Chlorination—$1\frac{1}{4}$ hrs.; Caustic Extraction—$2\frac{1}{2}$ hours; Hypo—$4\frac{1}{4}$ hours).

Chlorination is carried out at room temperature and the chlorinated pulp has got a PH of 2 to 2.5. The vast chlorinated stock mixed with caustic soda solution entering the caustic tower has got a pH of about 11. In the hypo tower the pH is maintained between 9 and 10 and the finally bleached pulp after washing has got a pH between 7.5 and 8. In the caustic tower the temperature is maintained around 65°C. Caustic extraction is a very critical stage in the bleachery where a good portion of shives, dirt and pithy material are digested and removed in successive washing operations. Hypo bleaching is carried out in a temperature of 35 to 40°C. At the hypo bleaching stage dilute caustic soda solution is used for buffering to maintain the proper pH. Samples of final bleached pulp from the washer are collected for laboratory evaluations so as to have a thorough control over the final product sent to the stock preparation and paper machine.

Inconsistency in operation and maintenance of various operating conditions show a serious damaging effect on the pulp.