

Pulp and Paper Industry In CUBA

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INTRODUCTION :

Out of a number of small and big paper mills in Cuba, only 4 or 5 are being sized (60 tons/day) and are completely integrated pulp and paper mills. Shortage of technical men, shortage of long fibre, lack of good depithing systems for bagasse, non-availability of spare parts for American machines are some of the problems facing the industry. The Empresa Consolidada de Papel which controls the entire pulp and paper industry has ambitious plans to overcome all these problems and put the paper industry on a solid footing.

The pine and Eucalyptus trees planted in different parts of Cuba, 5-6 years back have come up very well. The ICIDCA (Instituto Cubano De investigaciones de los derivados de bas cana de Azucar) is continuing its research work on the economic utilisation of Banana stems for obtaining long fibre. At present, all the long fibre needed is imported in the form of sulphite wood pulp sheets. All the mills use bagasse pulp from 60% to 100% and make all qualities of papers. At present, there is no newsprint mill and all the newsprint is imported. The Empresa is planning to have a newsprint mill based on bagasse using chemicals, ground bagasse and chemical processes. No definite plan has been evolved yet for this.

Caustic is still imported from China or European countries and same is the case with other chemicals. In spite of all these hardships, the mills continue to work well and make quality papers. This has been made possible with a good maintenance programme taken up annually for a month apart from the normal planned shut downs every month.

I. PAPELERA DAMUGHEE :

The first and the latest mill that attracts anybody's attention is "Papelera

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ABSTRACT :

The author was invited by the Cuban Government to attend the 38th Sugar Technologists' Association of Cuba held at Santa Clara in October-November, 1968. The author partook in the By-Products division and presented a paper on "More Profitable uses for Bagasse & Pith". He had the opportunity to go round the important pulp and paper mills by Cuba along with the Chief of Technical Development — Empresa Consolidada de Papel Pulp and Artificial wood. This article describes in detail the position of paper industry in Cuba in 1968-69 and how the paper mills are faring there.

Damughee — a mill started in 1962 with all old types of machineries made in Cuba itself. This mill has specialised in making corrugating medium from 100% bagasse in a very simple way. Probably this is the only mill in the world that makes corrugating medium continuously from 100% bagasse.

PROCESS FOR MAKING CORRUGATING MEDIUM FROM 100% BAGASSE

Fibre Preparation :

The sugar mill and paper mill are only a few yards away from each other. Still, the screened bagasse (using rotary drums) is baled and stored in paper mill yard. The storage loss is of the order of 4%. The bales are broken in a bale breaker (30 HP) and the loosened fibre is weighed on a weigh scale continuously. Two belt conveyors running at 150'/min. carry this partially depithed fibre fast to the tumbling cylindrical digesters.

Digestion :

These cylindrical digesters (capacity each = 2 tons) are connected to a blower (50 HP) and suction is induced in the vessels. The loading chute is then connected to these belt conveyors, and bagasse is sucked in fast. The cooking cycle is 1½ hrs.

Filling	— 20 Mts.
Liquor charging	— 20 Mts.
Raising to pressure	— 20 Mts.
Cooking time	— 20 Mts.
Blowing	— 10 Mts.
	90 Mts.

The cooking conditions are as follows for corrugating medium.

Pr.	— 90 lbs./sq.in.
Total active alkali	12% on B.D. fibre.
Strength	— 45 g/l.
Cooking time	— 20 Mts.
Residual alkali	— 3 g/l.

These tumbling digesters (numbering 8) discharge pulp into a blow pit with agitators. As many as 50 charges are made every day. This hot pulp with liquor is then thickened to 6% consistency in a drainage conveyor and fed to screw press where alkali is completely removed. The pulp coming out at 25% consistency is diluted to 5% in a chest and passed through a refiner and thickener before it is sent to Hollander beaters. No screening is done for this, type of paper.

Stock Preparation :

The Hollander beaters are capable of taking 900 kgs. of pulp in a single batch. The normal beating time is 20 Mts. The S. R. is raised from 21 to 24 here. The pulp is then further hydrated in a refiner and Jordan and passed on to the head box of Bellmer Paper Machine. No additives are added except alum.

For a substance of 170 gms/sq. metre, this paper machine works at 100 metres/min. and no "shake" is used on the machine and no dandy roll is also employed. Press doctors are able to remove the fines and normally, the

machine runs very smoothly with an average of 4 cuts only per day. pH of the wire pit water is 7.

Development of S.R. at different points is as follows :

After blow pit.	—	15°SR.
After screw press	—	18°SR.
After pulp mill refiner	— —	21°SR.
After Hollander beater	—	24°SR.
After paper machine refiner	—	27°SR.
After Jordan	—	30°SR.
Head box	—	32-35°SR.

The physical test properties of the corrugating medium are as follows :

Substance	—	170 gm./sq. metre.
Thickness	—	12.6 thou.
Bursting strength	—	65
Tear strength	—	20
Tensile strength	—	24 M.D. 15 C.M.
Folds	—	590 M.D. 368 C.D.
B.F.	—	25
T.F.	—	98
B.L.	—	4280 M.D. 2760 C.D. 3520 Av.

(Tested in Seshasayee Paper Mills Lab. India).

Flat crush could not be tested. This quality corrugating medium is exported from Cuba to different other countries. The alum consumption is 5-6%. This is attributed to the high hardness of water used. The total hardness is of the order of 350 ppm.

II. "TECHNICA CUBANA" NEAR CARTINAZ :

This mill makes bleached variety of papers upto 55 tonnes per day. This is one of the few mills equipped with a good recovery system from bleach liquor obtained by cooking bagasse fibre. Almost all factories in Latin America using bagasse in pulp mill, do not have a recovery system.

Fibre-preparation :

The sugar mill and paper mill lie very close to each other. The sugar mill uses

rotary drums to remove pith and the screened bagasse is sent to paper mill yard by a belt conveyor. Bulk bagasse storage is employed in this mill and they find this more economical than baled bagasse storage system.

The bagasse heap is wetted with plenty of water every day and is maintained at 60-65% moisture. Special loader-dumper trucks are employed to convey this bagasse to live bottom bins and from here the bagasse is carried to the digester house, through a system of conveyors (belt as well as slat type). A weighing arrangement is also provided in between.

Digestion & Washing :

There are at present 3 batch type of rotating cylindrical digesters (each 2000 cu. ft. capacity) and a 4th one is being installed. Each digester can be loaded upto 6 tons bone dry fibre. The cooking conditions are as follows for fully bleached pulp.

90 lbs./sq. in. pressure, 17% total active alkali as NaOH, 105 g/l concentration, 30 minutes cooking time.

The cooking cycle is as follows :

Loading	—	30 Mts.
Charging liquor	—	15 Mts.
Raising to Pressure	—	90 Mts.
Cooking time	—	30 Mts.
Blowing	—	15 Mts.

The yield is 50% and K. No. 7.

The rotating digesters can blow pulp to a 200 m³ blow tank and pulp is washed in 3 single stage Impco washers 12 m³ per tonne of bagasse pulp black liquor is sent to SRP at 6% total solids. The impco washers are 12' long X 8' dia. and washing losses are about 1%. The pulp obtained is 18°SR and does not present much problem in washing in spite of the fact, no vacuum pump is employed.

Screening and bleaching :

The washed pulp is then screened in a single cowa screen and thickened and stored. The tailings are rejected for the present.

Single stage hypochlorite bleaching is adopted for bleaching this bagasse pulp. About 7% bleach liquor as available

Cl₂ is consumed and brightness obtained is of the order of 72-75°PV. Reversion of pulp brightness is still there as no caustic is used as a buffer to maintain pH. The bleached pulp is stored in "Impco" high density towers. The hypochlorite is prepared in the factory itself at a strength of 30 g/l.

Soda Recovery :

The thin black liquor is evaporated in in quadruple effect evaporators to 45% total solids and the concentration is brought upto 60% after cascade evaporators. The mill at present follows only soda process as they found more corrosion in digesters when sulphate liquor was employed.

This concentrated black liquor is burnt in combustion engineering furnace using two spray guns. A cotrell precipitation helps to recover the chemicals and overall recovery is 80% only. Fuel oil is normally used in furnace along with black liquor. A conventional continuous recausticizing system is employed — all make up is done here with caustic lye.

Paper making :

Normally, 60-70% bagasse, 20% imported bleached sulphite pulp and the rest waste paper are used as furnish. Some of the bagasse pulp is wetlapped and sent to another factory for making tissue paper.

Bleached wood pulp is dissolved in Hydrapulper at 6% consistency and passed through hydratrefiner and Jordan. Bagasse bleached pulp is not refined at all. Both are blended in a blending chest, where blue, TiO₂, clay, rosin, etc. are added in proper quantities. The whole thing is passed through centrifugal cleaners and jordaned once again to correct freeness.

"Rice-Baston" paper machine of 150" deckle width is used. No shake is employed. Freeness at head box is of the order of 35°SR. Rosin consumption is 1½% and 7 to 8% is utilised as the water is hard. The paper machine runs at 190 metres/minute and makes about 53 tons paper/day.

the pH at the wire pit is 4.5 to 5. As there are no sheet cutters, the paper is

rewound and cut to rolls of desired size and despatched. The physical properties of the paper are as follows as tested in Seshasayee Paper Mills Lab.

Gms. Wt.	—	56.5
Thickness	—	3.15 thou.
Tear strength	—	M.D. 30.5 C.D. 29.0
Tear factor	—	53 av.
Breaking length	—	2580 M.D. 2092 C.D.
Average	—	2385
Burst factor	—	9.5
Folds	—	M.D. 9 C.D. 6
Size	—	12 secs.
Ash	—	8.5%
Brightness	—	81°PV.

III PAPELERA PULPA CUBA :

This mill is different from other mills in the sense that this is the only one employing a "Pandia" continuous digester for making bagasse pulp. All other mills employ batch tumbling digesters. This mill makes 22000 tonnes of semi chemical and bleachable grade papers at present. The bagasse pulp percentage employed ranges from 60% to 95%, the rest being made up by imported sulphate pulp and waste kraft. No Soda Recovery Plant is in operation here.

Fibre Preparation :

A sugar mill 3 miles away supplies all the necessary bagasse for this mill. The bagasse is depithed in Horkel depithing machines in moist condition and baled in semiautomatic Thibodeaux balers and transported to paper mill as bales. The partially depithed bagasse bales are stacked in paper mills using a crane. The transport from the stacks to the depithing station in paper mills is done by rail road open wagons.

The secondary depithing system consists of a bale breaker "horkel" dry depithing arrangement and a magnet to eliminate wires etc. The loose fibre is lifted by means of a bucket elevating conveyor.

This mill has expansion plans to increase the capacity from 60 tonnes to 100 tonnes bleached varieties. As such, a good wet depithing system, hot stock raffination at high consistency, better washing arrangement, etc. are being thought of.

Digestion, washing and screening :

The "Pandia" continuous digester has four tubes horizontal 21' long, 36" diameter and is provided with a 15" screw feeder. A paddle mixer helps to mix the fibre with black liquor before it is compacted by a compaction screw. This screw feeder is driven by 150 HP motor and runs at 60 RPM. The cooking conditions for bleachable varieties are as follows :

Cooking time	—	17.5 Mts.
Total active alkali	—	450 kgs. per tonne of pulp.
Yield	—	40-42%
Pressure	—	110-lbs./sq.in.
Sulphidity	—	20%
Liquor concentration	—	200 g/l.
Rate of production	—	2.4 tonnes/ hour.

The cooking conditions for semichemical pulping for liner board manufacture are as follows :

12% total active alkali on B.D. fibre.
60% yield.
Pressure. 100 lbs./sq. in.
Liquor conc 80 g/l.
Cooking time 17.5 mts .
Residual alkali in Black liquor — 15 g/l as Na ₂ O.

Steam consumption. 2.2 to 2.4 tonnes per tonne of pulp.

Production rate. 3 tonnes/hour.

The pulp is washed on two single stage impco washers face 14' X 8' dia and then raffinated on a Jones refiner and sent to screening. After screening, the pulp is thickened to desired consistency and stored. At present, bleaching is not practised though there is provision for chlorine, caustic and Hypochlorite addition. The 3 stage bleach plant (Impco make) is not being used at all at present, as the mill concentrates on making semichemical pulp for liner boards.

The interesting features in stock preparation system is the proportioner for different kinds of pulp — bagasse, imported wood pulp, broke, waste paper, etc. This proportioner works very well and hence the quality of paper has minimum variations.

The paper machine is "Black Clawson" Hydroflyte fourdrinier type, which is said to work well — pH at the wire pit for bleachable varieties is 4.8 to 5.2 and for unbleached varieties 7. From October 15th to Nov. 15th, 1968, annual maintenance shut was undertaken. There is a good laboratory attached to this mill where there are excellent facilities for testing and controlling quality.

Apart from these 3 major mills mentioned above, "Papelera Modersa" and "Papelera Cubana" are worth mentioning. These are not integrated pulp and paper mills. Only stock preparation and paper machines are working with pulp obtained from other factories and imported pulp. Papelera Cubana makes good tissue paper and packing cartons. The tissue 22 gms/sq. metre is made on a Black Clawson Yankee Machine. Bagasse pulp from Technica Cubana and waste paper are used as raw stock. This machine makes 15-20 tonnes of tissue per day.

A Beloit Machine with 6 cylinder moulds and a combination MG and MF Machine are also working well here.

The Empresa Consolidada de Papel headed by Mr. Soto and Mr. Bastanzuri is fully conscious of the necessary improvements and problems facing the industry in Cuba. The expansion plan is to be completed in the coming 4 to 5 years. The paper industry will assume very great importance by that time as the sugar output will reach 10 million tonnes by 1970. The utilisation of bagasse more profitably in the pulp rayon and artificial wood industry will be lying heavily on the Empresa Consolidada de Papel. There is no doubt, Cuba will make great strides in bagasse utilisation for these industries

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REFERENCES

1. Discussions in Havana at Empresa Consolidada de Papel.
2. Visits their technical in all the above Paper mills with their technical teams.