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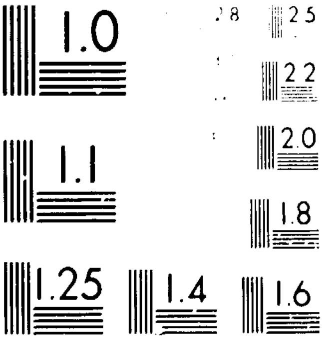
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Distr.
LIMITED

ID/WG.352/8
12 October 1981

ENGLISH

United Nations Industrial Development Organization

International Experts Group Meeting
on Pulp and Paper Technology

Manila, Philippines, 3 - 8 November 1980

PAST AND PRESENT STATUS OF THE PULP AND PAPER INDUSTRY IN MAURITIUS*

by

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V.81-30702

Introduction

The History of the pulp and paper industry in Mauritius dates back to 1862 when A E Soualle came to Mauritius specifically to experiment on the utilization of bagasse for pulp manufacture. Concomitantly, he took out a patent (Patent No 62, 24 October 1862) for the production of paper from vegetable wastes.

Attempts to develop a pulp and paper industry were again made in 1952 by Hisey and Raimondo and were pursued by Reid and Madsen in 1953 and Magill in 1956. The project was however abandoned by these pioneers as soon as certain overwhelming difficulties became apparent.

Since then the industry has not undergone any further development. A particle board plant using bagasse as raw material came into operation in 1971 but had to cease all its activities 7 years later as it has been constantly operating at a loss.

Presently, at the University of Mauritius, increasing emphasis is being placed on the optimal utilization of sugarcane by-products generally, the main areas of investigation being the exploitation of sugarcane tops and leaves for both food and fuel production and the fermentation of molasses and bagasse. Although it is believed that work on the manufacture of pulp and paper using bagasse and possibly sugarcane tops and leaves should also be initiated, it is unlikely that a sound study could be undertaken in the immediate future because of the dire lack of equipment in this particular field.

Availability of raw material

The major raw material available in Mauritius for pulp and paper making is bagasse, i.e. the fibrous residue left after extracting the juice from the sugarcane plant. Traditionally, bagasse has been and is still employed as fuel to meet the steam requirements of the sugar factories. In fact, of the 840,000 tonnes of dry bone bagasse produced annually for a normal crushing season of 6,000,000 tonnes cane (or 685,000 tonnes sugar), as much as 99% or approximately 831,000 tonnes are burnt directly in the furnaces.

It is however estimated that a surplus of bagasse can be obtained by factories crushing canes with a high fibre content (13% or more), equipped with a well-designed evaporation unit, and burning bagasse which has been previously dried by the flue gases of the boilers. Under such conditions, a surplus of about 5.6 tonnes of bone dry bagasse could eventually be made available from every 100 tonnes of cane crushed. On the basis that a modern pulp mill will require a minimum of about 350,000 tonnes of bone dry bagasse annually to be economical, the quantity of raw material required could therefore possibly be met under those strict conditions.

Suitability of bagasse

Bagasse from Mauritius sugar factories consists on the average of approximately 49% water, 49% fibre and 2% soluble solids. Whereas the soluble solids are composed mostly of sugar, the insoluble fibre component is made up, on a bone dry basis, of 25-39% cellulose, 24-30% pentosans, 12-18% lignin, and 1-5% ash; typical individual figures being :

Sugar Factory	(% dry basis)			
	cellulose	pentosans	lignin	ash
Bel Ombre S E	26.6	28.7	14.3	2.4
Rose Belle S E	27.6	27.8	13.0	1.8

Structurally, the cane stalk comprises different types of fibre tissues, of which the most important are the true fibres (tough rind and vascular tissues) and the pith (soft inner stalk tissues) :

Paper making fibres			
	True fibres	55%	
	Vessel segments	20%	
			75%
Pith			
	Parenchymatous cells	20%	
	Other nodes, etc	5%	25%
			100%

The true fibres and the pith, which occur in the ratio of approximately 2.5 : 1 w/w, have more or less the same chemical composition but differ widely in their structure. Thus, whereas the true fibres have a fairly high ratio of length to diameter (around 75) and a relatively high coefficient of expansion and contraction upon wetting and subsequent drying, the pith cells are irregularly shaped and do not bond together. Consequently, if on the one hand the true fibres will favour strength and cohesiveness of the bagasse fibres during pulping processes, the pith will on the other hand tend to weaken any pulp in which it is incorporated.

Moreover, owing to its greater relative surfaces, the pith will use up a significant proportion of the chemicals during the digestion process, leaving the fibrous elements of bagasse insufficiently cooked. Therefore, the better the quality of paper required, the more important thorough depithing becomes.

In the same way, the relative ease of hydration of bagasse fibres - though desirable as regards the power requirement for strength development -will give rise to high sheet density as well as unduly low sheet opacity of the final paper made from bagasse pulp. As a result, despite the fact that bagasse pulp possesses fair tensile strength it will have to be mixed, for the manufacture of fine papers, with longer and less easily hydrated fibres.

Storage of bagasse

Owing to its bulky nature, relative inflammability and tendency to ferment and decay under humid conditions, the handling, transportation and storage of bagasse are expensive operations. The methods of storage in use in Mauritius include baling and briquetting.

Baling is effected by hydraulic presses which form bales of about 50 cm x 45 cm x 70 cm in size, each weighing about 60 kg with a moisture content of approximately 50%. The bales are then stacked in such a way as to facilitate the circulation of air and dissipate the heat of fermentation. Normal air temperature is attained after 2 - 3 months when the moisture content of the bagasse averages 20-30%. It has been claimed that this range of moisture content should be maintained to counteract any adverse effects that might be imparted to the manufactured particle board.

Briquetting is practised on a much smaller scale to produce bagasse briquettes, which are used principally as fuel in the lime industry.

Wet preservation of bagasse by means of a biological liquor or acid to keep the pH to about 4.0 - 5.0 and hence prevent the bacterial deterioration of the fibrous material has never been adopted as it is apparently deleterious to the manufacture of particle board.

Concluding remarks

Suitable locations for a pulp and paper factory exist in Mauritius. In addition, it is quite probable that an adequate supply of bagasse could be ensured by the adoption of improved processing techniques, more efficient equipment and new agricultural practices such as close cropping.

However, although good quality water is also available the maintenance of a constant plentiful supply throughout the year could be a limiting factor especially during the dry season. The enterprise will also have to be competitive in order to survive and find a market that will absorb all its production.

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APPENDICES

(I) Total Mauritius Imports of paper and paperboard and of articles made thereof

	1976 Quantity (kg)	1976 Value (Rs)*	1977 Quantity (kg)	1977 Value (Rs)*
1. Paper and paperboard				
1.1 Newsprint paper	815,615	2,607,511	1,037,522	3,652,588
1.2 Other printing and writing paper (machine-made), in rolls or sheets	1,303,593	7,891,782	1,583,987	9,218,614
1.3 Kraft paper and kraft paperboard	123,479	975,435	286,541	1,245,084
1.4 Cigarette paper in bulk, rolls or sheets	—	—	1,712	25,746
1.5 Machine-made paper and paperboard, simply finished, in rolls or sheets	1,759,593	6,018,295	2,037,397	7,420,481
1.6 Fibreboards and other building boards of wood pulp fibres or of vegetables	350,139	501,212	364,849	703,117
1.7 Paper and paperboard in rolls or sheets				
1.7.1 Parchment or greaseproof paper or paperboard in rolls or sheets	5,427	67,240	10,928	116,020
1.7.2 Composite paper and paperboard in rolls	132,672	435,139	250,414	790,450
1.7.3 Corrugated paper and paperboard in rolls or sheets	59,037	314,114	25,223	131,277

1.7.4 Ruled or squared paper and paper-board in rolls or sheets	21,179	63,066	16,234	77,531
1.7.5 Paper and paper-board impregnated, coated, etc., in rolls or sheets other than printing and writing paper	569,735	2,960,276	1,111,437	6,589,137
1.7.6 Filterblocks of paper pulp	1,806	23,162	4,484	71,432
1.7.7 Wallpaper and lincrusta	5,389	138,571	11,963	415,947
2. Articles made of paper pulp, of paper or of paperboard				
2.1 Paper bags, paperboard boxes, and other containers of paper or paper-board	2,839,144	4,413,626	4,675,387	8,736,731
2.2 Envelopes, writing blocks, letter pads and similar paper stationery of the kind used in correspondence	115,096	1,593,787	97,281	1,190,353
2.3 Exercise books, registers, albums, diaries, memorandum blocks and other stationery of paper or paper-board	114,794	1,550,421	132,041	1,963,797
2.4 Articles of paper pulp, paper or paper-board (including paper and paper-board cut to size)				
2.4.1 Cigarette paper cut to size	61,287	734,336	78,204	1,222,083

2.4.2 Carbon and other copying papers cut to size	74,336	1,113,899	100,871	1,573,392
2.4.3 Other paper and paperboard cut to size	292,469	3,042,504	415,609	4,211,718
2.4.4 Bobbins, spools, cops etc. of paper pulp, paper or paperboard	25,836	167,966	50,806	481,532
2.4.5 Other articles of paper pulp, paper, paperboard or cellulose wadding	98,664	1,584,029	132,138	1,832,740

* 1 US dollar = 7.60 Rs

(II) <u>Process formerly used in Mauritius (Universal Board Co. Ltd.) for the manufacture of particle board</u>

Partial wet depithing (rotating screen)

↓

Disintegrating (rotor knives: particle size of 20 mm x 20 mm
wing beater mill 8 mm x 8 mm)

↓

Storage (Silo of 20 m^3 capacity)

↓

Drying (pneumatic jet drier: final moisture content of 3%)

↓

Storage (dry chip bunker)

↓

Milling (hammer mill)

↓

Classifying (tumbler screening machine –
3 fractions:
(i) fine particles (64%)
0.6 mm < f < 2 mm
for surface layer
(ii) coarse particles (28%)
f > 2 mm
for core layer
(iii) pith and dust (8%)

↓

Gluing	(dosing device and gluing blenders - surface layer bagasse: 10.5% solid glue on dry bagasse core layer bagasse : 8.6% paraffin wax : 0.5% fungicides :1.35% hardener < surface layer :2% on resin solids hardener < core layer :4% on resin solids)
Spreading	(spreading machines: average thickness of bagas mat = 19 mm density = 600 kg/m^3)
Pressing	(hot pressing at 150°C specific pressure = 20 kg/cm^2 pressing cycles = 6 min)
Conditioning	(5 - 6 days)
Trimming	(dimension of boards = 3050 mm x 1222 mm)
Sanding	(drum sanders)