

# Bagasse Pulping

RAMALINGA SETTY T.K.\*, SUBRAMANIAM A.\*\*

## INTRODUCTION :

The per capita consumption of paper in the country has hardly reached 2 kilo grams. This is negligible compared to the per capita consumption in the advanced countries which is 200 kilo grams and more, the production of paper and board in India being about 15 lakh tonnes. Unfortunately in India the population growth absorbs quickly the production increase.

## EFFORTS TO IMPROVE FOREST BASED R. M. AVAILABILITY TO THE PAPER INDUSTRY

The raw material availability for manufacture of paper in the country viz, Bamboo, Hardwoods have depleted to such an extent that they cannot sustain the production capacity of paper in India, however low it is, compared to the per capita consumption of other countries.

In this context the Government have allowed free import of pulp and waste paper to save the forests.

Shedding their original stance of monopolising forestry and supply of forest based materials, every paper mill have been asked by the Governments to find their own source of raw material. With long deliberations and hesitation the paper producers have taken to all out efforts to afforestation. To aid this, the Government had to see ways and means to lend, a helping hand to the paper mills to own or lease the forest land. Here it is praiseworthy that Bangalore has set the pace by the fact that Karnataka Government and the Mysore Paper Mills Limited are setting up captive plantations of suitable species, be Eucalytus or other suitable pines etc. But this gives the raw materials after a long wait of 6 to 15 years. The available forest is not able to sustain the industry in this long wait.

## ALTERNATE RESOURCES :

It is in this context that the need for alternate raw materials for paper making have assumed a greater importance. Search for a material of perennial availability and of annual growth sought to meet future growth. Sugar cane bagasse assumes the greatest of importance, to ensure a perennial supply.

## ASSURANCE FOR BAGASSE :

Sweet is the news, for paper people, that the sugar production in the country has touched 8 million tonnes, as reported recently. The additional demand is generally being met by the new capacities of sugar factories created of late and are being planned. With the old philosophy of using up of all the bagasse generated, as a disposal is changed, to that of conservation of bagasse by adoption of drying of the bagasse, efficient use of steam, as well as supplement heat and other energies.

If these sugar factories could have been planned to cater to the paper industry, better economies could have been achieved in these fields and more bagasse conserved, to meet the raw material needs of about two million tonnes of paper produced in the country, supplemented by others.

## HOW MUCH OF BAGASSE AVAILABLE :

In the present condition of the country starved of fuel, and more so of the southern region of India, where no coal is available, a switch over from bagasse fuel to coal fuel in sugar mill is far fetched.

Running of the boilers more efficiently and introducing greater control in heat usage, the sugar industry

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\*Consultant

\*\*Sr. Manager (Finance) H.P.C. Ltd.

can optimise its operations and economise on the fuel requirement and generate surplus bagasse. Thus the technological developments in sugar industry to reduce fuel consumption is of paramount importance. As can be seen, generally sugar factories use mill-wet bagasse, having a moisture of 50% and more. If this bagasse is dried even partially, more and more of bagasse can be spared.

Many a sugar mills have adopted recycling of their boiler hot stack to dry the bagasse partially. Every effort must be made in this direction. The mill wet bagasse has about 30% pith. This pith can be separated in the sugar mill itself and used as boiler fuel/feed. Here there is the distinct advantage of conveying reduced quantity of bagasse depithed.

Depithing must be judicious, and well controlled to see not much of damage is done to the fibre. This is achieved by completing depithing process when the bagasse is fresh.

#### HOW TO ACHIEVE THIS :

Thanks to the two of the giant paper mills in the south, The Mysore Paper Mills Limited, and the Tamilnadu Newsprint Limited, who have either built captive sugar mills, or have tie up with sugar mills. These mills use the bagasse generated exclusively for pulp making using both the old chemical pulping or the other new processes for production. Also some of the sugar mills have built paper mills to use their surplus bagasse.

#### ADVANTAGES OF DEPITHING IN SUGAR MILLS :

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Most of the available residual sugars, are leached out in wet depithing. This helps in reducing the damage to the stored bagasse fibre. All these go to prove that we must have bagasse mills rather than sugar mills, where sugar becomes by-product. This can be done, if only a paper mill runs the sugar mill as a captive raw material plant than an independent sugar mill.

#### SURPLUS BAGASSE STORAGE :

All the surplus bagasse is generally released to the paper mills which are located in different localities. This surplus bagasse is collected and stored both at sugar mills and paper mills. The transportation will be staggered to meet the transport availability. The mills store bagasse for 12 months running and also for a further safe period to meet the finalisation of procurement contract etc.

#### LOSS IN STORAGE OF BAGASSE :

Loose bagasse rapidly deteriorates because of its getting compacted and also have insufficient ventilation for the moisture and others to get dissipated.

Of late it has come to light, to chagrin of many a bagasse processors that the bagasse is getting badly degenerated, rapidly to start slowing down laterly.

The residual sugars, also have caused internal fires. Thus technological studies are to be made, for containing this.

From these it is also deduced that storing and accounting of bagasse is one of the most important subjects. Gone are the days when it was just assumed that the loss in the weight of bagasse is confined to the loss in moisture and poor yield of pulp is confined to this reduction to weight.

A few years ago a bagasse based mill built a big bagasse inventory with a view to escape a situation of running out of bagasse (because of the vagaries involved in the commercial transaction), living from hand to mouth existence as also to acquire a control over the procurement price; but landed with a curious problem.

When the stock got exhausted it was observed that

30% and above was the difference in weight between the procured weight and computed weight of bagasse used for pulp making. Strangely experiments conducted proved that in storing there was clear reduction in weight of about 30% not only due to loss in moisture content at about 8% per month to start with and at about 6% after five months, but also due to degradation set in indicating the loss of mass, causing reduction in yield, of pulp, by almost 25%. Both these showed up as excess consumption/storage loss of bagasse. This needs a thorough investigation.

The mass of bagasse will develop higher temperature and low pH. Under these conditions, hydrolysis of bagasse is occasioned, causing loss of weight.

Evidence is available of hydrolysis because of chemical reactions taking place, particularly on residual sugars, during storage. This could be treated as predigestion.

The storing of depithed bagasse may not present much problem other than extraction of 1st come first served basis.

The extraction of sugar from the parachyma cells is difficult and thus left in the stored bagasse. This pith, removed from the depithers revealed about 20% sugar.

The pith from depithers consists of paranchyma cells and vessel segments as well as fine fibres. The bales stored emit acetic acid smell.

The normal practice for the two different units viz., sugar and paper built miles away is only commercial interaction, at present.

The bagasse bales stocks shrink in the height, by almost about 1% and to about 30% by volumetric contraction.

#### PROBLEM OF BAGASSE :

It is well recognised by all the sugar technologists that cane preparation and extraction is a barbaric treatment of the cane, in order to extract as much of sugar as possible and reduce the residual sugars in the mill wet bagasse. This barbaric treatment, will have

done a telling damage to the bagasse fibre. Quite a lot of the bagasse fibre is shortened, at least.

This aided by the mechanical depithing will increase the fibre loss. In this context, diffusion process in sugar industry is to be looked for. In this diffusion process the barbaric treatment of bagasse is stopped and wholesome bagasse is generated. In fact, this was the concept encouraged by Sri. S. N. Gundu Rao, a reputed sugar technologist.

Surplus bagasse due to the reason of lone distance transaction in wet condition carrying 50 to 58% moisture, is expensive. Also the supplies are uncertain, as it depends on the sugar mills themselves. It is common knowledge that the crushing season of a sugar mill varying between 150 to 220 days, while being lower than 150 days is of common occurrence, working above 220 days in a year is not unknown. But the fuel exchange method of bagasse procurement is very difficult both on the vagaries of operations of this scheme and on the availability of coal, more so in the far flung area in the south India.

#### IDEAL BAGASSE :

The washed and depithed bagasse, from the captive source gives the best bagasse both for processing and storing, and if so from diffusion process.

This depithing is in the mutual interest. The pith is produced and this help enrichment of the bagasse. This bagasse can procure better returns to the sugar mills and the paper mills. The sugar mills gets the pith readily at no cost and sell the enriched bagasse at a better price. This bagasse has less sugar. Possibly this washed bagasse does not degenerate so much on this score.

Even the general bagasse should be able to get enriched, if the experiments taken up in Kerala are taken to logical end, where the pith is digested selectively by a certain fungi.

#### PULP PLANT CAPACITY :

An another factor of importance is about the capacity of the pulp plant in an integrated mill. It is to be considered, if all the generated bagasse is used up

for pulping as and when generated, the bagasse will have preserved the best of qualities. This will certainly mean working of the pulp plant seasonally parallel to the sugar canecrushing season. The rest of the period could be used either for purchased surplus bagasse of other sugar mills or use it for other raw materials for up keep of the plant.

#### BAGASSE PULPING :

During storing, the bagasse is softened. Hence the storing could be treated as pulping process.

Depithing is generally adopted as a prelude to cooking. It has been observed that whenever there was a failure in the depithing sheet, pith content of bagasse, going to digester, increases to almost double. In this situation, production of pulp capable of running on the machine needs almost one and half times the caustic. It is reported by Sri J. Manohar Rao, the Managing Director of Sugar Federation, that in one of the mills, he has visited abroad, had no depithing facility, but their caustic consumption was almost double. This pulp presented no press-stickiness or any other paper making problems. Such a mill cooking-practice to be studied carefully.

#### DEPITHING & DISPOSAL PITH :

The best way of pith disposal is making the same into briquettes along with other available bio-mass materials like, wood dust, bamboo dust and the coal breeze. The lead given by Mandya National Paper Mills Limited in this direction, is commendable.

By long storage, some of the fibrous material get degenerated also. This bagasse is subjected to vigorous hammering in the depithing equipments. This caused more removal of true fibres than removal of pith alone, as hydrolysed bagasse is too soft to stand harsh treatment. This goes to prove the need for proper adoption of the depithing apparatus depending on the conditions of bagasse as obtained after storing.

The pith cells being thin walled, dissolve under the action of active alkali preferentially, under controlled conditions. Contrary to this expectations of

selective destruction of thin walled pith more susceptible fibres generated due to degeneration also get dissolved.

Thus the stored and hydrolysed bagasse has to be judiciously treated to :

- (a) Increase pulp yield due to part retention of strength giving vessel-segments.
- (b) Reduction in capital/revenue costs and of power needs.

#### EXTRACTION OF BAGASSE FOR PULPING :

These bales are normally baled with thin steel wires.

These wires get rusted and become small pieces.

These pieces of wire get enmeshed in the bagasse and get through the process of

1. Slurrying
2. Depithing
3. Digestion

Every effort to eliminate these iron pieces is made with no success. These pieces have to be removed by setting or magnets. The iron pieces coming at the surface are picked up by the magnets, the pieces imbedded in the bagasse layer however thin it is, it is not possible to be drawn towards the magnet. These pieces find their way into the digestion and choke the blow passage, in addition to the eroding of the pipes, the digester vessel well and other equipments that come in contact with the iron pieces, causing a lot of damage.

#### IMPROVING THE QUALITY OF BAGASSE PAPER :

The other aspects of bagasse pulp/paper making is of blending of bagasse fibre with other fibres particularly of Eucalyptus for making better quality paper.

In conclusion, it is to be stated bagasse will be the promising basic raw material for paper making.