Improvement of Yield from Indian Raw Materials

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This write-up reviews briefly world trends in increasing % pulp yield. The cooking and bleaching processes used by Indian Mill as will as % yield from bamboo are discussed. Suggestions have been put forward for increasing yield with the existing cooking/bleaching techniques.

In addition it has been suggested that attention should be paid (i) to make use of bamboo thinnings and(ii) to use bagasse semichemical/chemi-mechanical pulp along with groundwood from hard wood for newsprint.

1 INTRODUCTION

The writer is associated with Tribeni Tissues Pvt. Ltd., which makes use of Indian raw materials on a limited scale. This mill is the only manufacturer of cigarette tissue papers and other speciality tissues papers not only in India but in South East Asia and West Asia. Raw materials used by this mill are sunn hemp, old hemp materials, old jute materials and wood pulp. The mills approach to get the maximum possible yield from these materials is by exercising rigid controls on (a) the quality of the raw materials (b) cooking and bleaching processes as well as (c) on in-process fibre losses.

This write-up deals with the main Indian raw materials such as bamboo, hardwoods, agricultural residues etc. which are not being used by this mill and hence, the views, ideas and suggestions put forward have not been tried. However, it is hoped that ideas expressed and suggestions put forward will result in a fruitful discussion of the subject.

2 SHORTAGE OF FIBROUS RAW MATERIALS

It is well known that India has limited resources of fibrous raw materials for paper making. At the present rate of production of paper to meet even a comparatively very low per capita consumption in the country, the industry is finding it difficult to meet its fibrous raw material requirements. This is engaging the serious attention of the Govt. of India, State Governments as well as the paper industry itself. Bamboo is the main raw material for Indian paper industry. New bamboo areas even at high cost are being tapped. In addition, more and more of hard woods and agricultural residues are being used these days to meet the growing demand. But it appears that availability of raw materials is going to lag behind the industry's requirements for quite a long time.

3 IMPROVEMENT OF YIELD FROM FIBROUS RAW MATERIALS

It may be added that shortage of raw materials is als obeing felt in countries such as U.S.A., Canada, U.S.S.R., Norway and Sweden. In these countries very careful attention is being paid. A scientific and methodical approach is resorted to for forestation. In addition more and more attention is being paid to make use of hard wood, and other fibrous raw materials such as kenaf etc. At the same time research and development work is going on extensively to get higher yields from the conventionanl raw materials by the modification of pulping and bleaching techniques. The development of disc refiners has given the pulp maker access to completely new pulp qualities in the yield range between 55-60% for chemical pulp and the 96% ground woods. A break through of this kind should be expected to have a tremendous impact on the pulp industry. In Finland one of the newsprint mills estimates that it requires 1 c.m. less wood to make one ton of newsprint by making use of chemi-mechanical pulp in place of chemical pulp in the furnish. It has been possible to make newsprint from 100% refiner ground-wood. In producing refiner ground wood, it has been possible to use cheap saw dust as a raw material upto 15-20% with no noticeable change in pulp quality and this has resulted in further reduction in cost as well as increased yield. Thames Board Mills are using refiner ground wood from soft wood thinnings (2½ to 4" dia.) for the manufacture of carbon board, which again means higher yield. In Japan, Oji Paper Company is making newsprint with more than 50% hard wood, consisting of 16% ground wood 22% chemical-mechanical and 14% semi-chemical — and without the use of chemical pulp at speed of 2,000 ft/mt. It is interesting to know that Nepa Mill is also switching over from a furnish of 42% chemical pulp + 58% stone ground mechanical to 33% chemical + 34% stone ground mechanical and 33% cold soda chemi-mechanical.

In India bamboo is the main raw material and is likely to be so in future. Major portion of the paper tonnage manufactured in India is for writing and printing purposes. Pulping and bleaching of bamboo is being carried out by the time-honoured old sulphate process in most of the mills. Bleaching was carried out mainly by hypochlorite and recently most of the mills have changed over to C.E.H. bleaching. Yield is 38/42% as bleached

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pulp, varying from mill to mill depending on the measures taken by each mill to cut down fibre losses.

An increase of 1% in the pulp yieyield from bamboo will mean that from the quantity of this material being consumed currently an additional 10,000 tonnes of paper can be produced annually. In other words, there will be a saving of about 25,000 tonnes of the raw material or 25 lakh rupees per annum. If the yield could be increased by 4% it will mean a raising of about 1 crore rupees per annum or about 40,000 tonnes additional paper from the quantity of bamboo being consumed at present.

4 POSSIBLE APPROACH TO INCREASE % YIELD

4A 1. With the existing methods for cooking and bleaching

Generally speaking each mill using bamboo as the main raw material follows the same cooking conditions with regard to percentage of cooking irrespective of the quality of bamboo. It is well known that quality of bamboo received at each mill is not the same from supply to supply. Any changes (chemical/biological) take place during storage in the open bamboo yard where it is exposed to sun, rain and other atmospheric conditions. If the quality of bamboo is not constant, it is but natural that cooking conditions should be altered accordingly so that the quality of unbleached pulp (and therefore % yield) remains unaltered. An approach on the following lines should be helpful to get better yield. This approach is being followed at Tribeni Tissues and it helps not only to control yield but also quality of the pulp, the consumption of chemicals as well to steam line production of paper conforming to established standards.

i. As far as possible efforts should be made to supply the mill with air-dry bamboo in sound condition and the same should be used for cooking with minimum storage period in the yard.

ii. If some bamboo is received which deviates from normal standard quality, cooking conditions should be altered accordingly so that the unbleached pulp of required characteristics (measured in terms of viscosity or Kappa number etc.) is obtained.

iii. To achieve the object as under (ii) above, it will be necessary to use less chemicals for cooking when the bamboo is green and/or has higher moisture content on the weight of bamboo. Similar will be the case when chemically/biologically degraded bamboo is used.

Use of degraded bamboo results in appreciably lower yield and weaker pulp. Therefore even if the cooking conditions are controlled to get more or less normal pulp yield from such type of bamboo (or any other raw material) the actual yield is less than what it would have been if the raw material was in sound condition as degradation of the raw material before pulping means permanent loss of the material itself.

In the same way bleaching can be carried out under optimum controlled conditions so that the quality of bleached pulp (in terms of viscosity etc.) is the same irrespective of the quality of unbleached pulp.

4A 2. IN-process Fibre Losses

% Yield from fibrous raw materials should be measured in terms of tonnage of paper as this takes into consideration fibre losses. A mill may be getting higher % pulp yield but may be making less paper from a certain quantity of raw material than another mill which might be getting somewhat lower pulp yield but has a better control on fibre losses. At Tribeni Tissues, systematic studies have been carried on fibre losses and suitable steps have been taken to reduce these losses as much as practicable and considerable success has been achieved during the last 15 years or so. Efforts still continue to reduce these losses further. The result of all these efforts has been that though through fraction at the machines has gone up considerably due to higher machine speeds and freer stock, the fibre losses have not been allowed to go up.

4B. Research and Development to Improve Yield

A great deal of research and development work is going on to improve % yield of pulp from fibrous raw materials all over the world even where raw materials resources are not as limited as in India. Pulping (cooking and bleaching) technology has made a good deal of progress during the recent past and if research and development work is carried out on the right lines there is a possibility of an increase of at least 5% yield from Indian raw materials. In other words, the combined effect of steps discussed under 4A and 4B is likely to result in an additional yield of about 10%.

Research work is likely to take a course which aims to leave as much hemicelluloses and lignin with the pulp as possible; some of which can be retained in the bleached pulp under careful bleaching conditions. In other words, such a work will tend to aim (i) making of semi-chemical pulp and chemi-mechanical pulp (preferably using bi-sulphite process with magnesium sodium based (ii) its disintegration by disc refiners and (iii) bleaching in five or more stages.

If the research and development work on the above lines yields encouraging results existing pulping equipment will need replacement and modification also.

5. BAMBOO THINNINGS

It will be interesting to know as to what use bamboo thinnings (branches etc.) are being put. In my opinion, these can be profitably converted into semi-chemical pulp which can be used as such by the board industry and for fluting medium. After bleaching it can be mixed with conventional bamboo pulp and used for writing and printing paper. In case it is possible to make use of bamboo thinnings, % yield from bamboo resources will naturally go up considerably. Utilisation of bamboo thinning can also come under the purview of research and development work to improve yield from Indian raw materials.

6. BAGASSE AND OTHER AGRICULTURAL RESIDUES

Use of straws (wheat and paddy) on large scale as a raw material for Indian paper industry should be ruled out as these are required for feeding cattle. Bagasse is being used in other countries such as Mexico and Philippines successfully but its use in India has been a limited one.

A chemical pulp from bagasse cannot be used for newsprint due to these inherent characteristics which are entirely different from the conventional furnish used for newsprint. At the same time to make paper from bagasse chemical pulp at high speeds viz. 2000 ft/mt. and above is out of question.

I have been all along thinking that there is a possibility of making newsprint from a furnish consisting of 50% semi-chemical or chemi-mechanical bagasse pulp and 50% stone-ground or refiner-ground hard wood pulp, after proper disintegration and bleaching to the required brightness. A successful utilization of this furnish for newsprint will result in a much higher yield from bagasse than chemical pulp from this material which finds a limited use in the Indian paper industry. Research and development work to make newsprint from the above furnish should in my opinion be initiated at an early date and conditions for the suitability of this furnish established so that newsprint projects can go ahead. Utilization of bagasse in this manner will be a landmark in the history of Indian Paper Industry as it will solve the problem of availability of suitable raw materials for newsprint and at the same time will enable the industry to make use of hardwoods on a large-scale.

7. THE PROBLEM IS PRESSING

The problem to improve yield from raw materials becomes of still greater importance when rising property values make land too valuable for growing forests. Already a number of U.S. pulp and paper companies forced with the necessity to improve profit margins are considering converting their forest lands to other uses, such as commercial, industrial and residential. Some lands can give quadruple returns when converted to agriculture.

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boo plant. To investigate the nature of alkali action at different temperatures on bamboo, these authors have carried a number of experiments to find out how alkali behaves in softening the fibre from the body of bamboo chips and if it is posible to pro- [illegible] from outer surface and inner hollow surface of bamboo stem increases, dissolving out lignin, waxes and easily solube hemicellulosic portion. The intensity of this reaction is evident from the intensity of cracking of the outer surface or skin of bamboo piece kept under soak-