

PROFITABLE UTILIZATION OF PITH A WASTE IN BAGASSE BASED PAPER FACTORIES

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Bagasse is the fibrous residue left, after sugarcane is crushed in the sugar factories for extracting its juice. Bagasse is a mixture of rind portion of the sugarcane which contains the real cellulose fibre and white non-fibres parenchyma cell portion of the sugarcane known as the pith in which the sugarcane juice is stored. While the fibrous rind portion is very valuable for the manufacture of pulp and paper, the pith portion which does not contain any cellulose, hinders the process of manufacture of paper from bagasse. Therefore, the bagasse based paper factories adopt various measures for de-pithing bagasse and use the fibrous portion alone for the manufacture of paper and discard the pith portion. This pith is a waste material in the bagasse based paper plants.

However, this waste material can be advantageously used as:

1. fuel in the boilers;
2. cattle feed;
3. for the production of furfural and other products.

The ways and means of utilising the waste material - pith of the bagasse based paper plants, are explained in this article.

WHAT IS PITH AND WHY IT IS A WASTE?

Due to sharp decline in the availability of traditional fibrous raw materials like wood and bamboo which are mainly forest based and also due to the restrictions imposed by the Government in order to arrest indiscriminate falling of wood in the forests to keep up ecological balance, more and more pulp and paper factories are being established in other countries as well as in India using bagasse as the raw material. Bagasse is the fibrous residue left after the sugarcane is crushed in the sugar factories for extracting its juice. As it comes out of the mills, the bagasse contains about 50 % moisture and, therefore, it is known as 'Mill-wet bagasse'. The approximate composition of mill-wet bagasse is as follows:

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1. Moisture	50.0 %
2. Fibre/Pith	47.0 %
3. Sugar	2.5 %
4. Insolubles(ash)	0.5 %

The approximate composition of bone-dry bagasse is as follows:

1. Cellulose	45.0 %
2. Pentosans	24.0 %
3. Lignin	20.0 %
4. Sugar	5.0 %
5. Ash	1.0 %

All the constituents of bagasse with the exception of moisture are combustible and, as such, bagasse is used as captive fuel in the sugar factories boilers for raising steam required for the generation of motive power and electric power.

Sugarcane has a hard rind which is a source of high quality cellulose. On the other hand, inside the sugarcane there is a white non-fibrous parenchyma cell portion which contains the sugarcane juice and is known as pith, which has no cellulose in it. When the sugarcane is crushed for extracting its juice, the hard rind portion as well as the pith portion of the sugarcane is left out when the cane is deprived of its juice and this residue is known as bagasse. Thus bagasse contains a portion which has a high cellulosic value and a portion which has no cellulose at all. But both these portions are combustible and hence they can be used as fuel, but not as fibre in a paper industry. Apart from its draw-back of not having any cellulose, the pith interferes in the process of manufacture of paper from bagasse hence it has to be eliminated before bagasse is cooked with chemical for producing the pulp. This separation of pith from the bagasse is known as depithing. The bagasse-based paper plants have adopted primary depithing practices at the sugar factory to remove the pith as far as possible to reduce the bulk of material to be transported and secondary depithing operations at the paper factory site to remove the remaining pith as far as possible. Thus, the pith separated from the bagasse at the sugar factories as well as at the paper factories, is usually considered as a waste.

In many places the pith so separated, is thrown away or washed out with the effluents, thereby creating many other problems. Therefore, pith is considered to be a waste material in the bagasse based paper plants, though in the recent years it has been advantageously used for some purposes.

(A) PITH AS FUEL

While burning the mill-wet bagasse in the sugar factory boilers the entire bagasse, including the rind as well as the pith portion is burnt, but when the pith is separated from the rind portion, new problems are introduced in burning pith alone. This is due to the fact that pith has a very low bulk density and, as such, pith particles are very light and are likely to be carried away in the furnace resulting in incomplete combustion. Therefore, though normally the sugar factories and paper factories which burn pith, burn it in a loose form, it has been found appropriate to briquette or pelletise the pith and burn it in the boilers to have a stable burning. But, sometimes the energy output: input ratio in pelletising pith and burning it in the boilers is not very encouraging and this pelletisation has been found to be uneconomical. Some factories have been combining pith with other kinds of powdered fuels and burn it in fluidised-bed furnaces advantageously. However, there is a lot to be done in burning pith efficiently in the boilers.

(B) PITH AS CATTLE FEED:

Though bagasse is used in the formulation of cattle feeds by mixing it with molasses and other nutrients and sold under the name 'Bago-Molasses Feed', still experience has shown that animals cannot digest the complete bagasse as such. It has been observed that when the hard rind portion of bagasse is removed and pith alone is utilised in the feed composition, animals relish it better. In view of this, Cuba has set up many cattle feed manufacturing units making use of the pith separated in the bagasse based paper and particle board plants as one of the ingredients of the cattle feed. A large quantity of pith based cattle feeds are made in Cuba every year. In some instances the digestability of the animals in consuming pith based feeds is increased by adopting what is known as

'Steam Explosion'. This means, the pith is digested under pressure and blown into a tank by which the pith is partly cooked and split up by which the digestability of animals is increased. The use of pits as cattle feed has been well proved in Cuba and other countries should be able to instal similar plants to make use of pith advantageously.

(C) PITH FOR THE PRODUCTION OF FURFURAL

Furfural is an organic chemical, which is widely used as a solvent in the petroleum refineries for the purification of the lubricating oils. Furfural is also used as a raw material in the manufacture of furane resins. Furfural is also used for making Nylon-6 and Nylon-66 fibres, which are very strong fibres used in the manufacture of parachutes.

Furfural can be produced from any agricultural commodity like corn cobs, rice husk, peanut husk, bagasse etc. In the whole world, a firm known as 'Quaker Oats' at Chicago, is having a monopoly on the production and sale of furfural in different countries. They originally used corn cobs as raw material for the production of furfural, but in the recent years, they have switched over to bagasse also in some of their plants. The process consists in hydrolysing the pentosans content of these agricultural commodities by digesting them under pressure with sulphuric acid when furfural is formed and distilled by blowing steam into the digester. Thereafter, the furfural is concentrated by fractional distillation.

Though bagasse is one of the raw materials for the production of furfural, the actual portion of bagasse which is more suitable for the production of furfural is the pith. Thus, the pith which is separated in the sugar factories and bagasse based paper factories, can be advantageously used for the production of furfural and many derivatives of furfural as indicated above. In India there is only one plant known as the Southern Agri-furane Ltd. in Tamil Nadu to produce about 3000 tonnes of furfural from bagasse. There are 2 small plants of 300 tonnes per annum capacity each to produce furfural from rice husk. A big plant is being set up in Punjab for the production of furfural from rice husk.