IPPTA

Silver Jubilee International Seminar & Workshop
Appropriate Technologies For Pulp & Paper Manufacture
In Developing Countries.

New Delhi - 1989

PARTICLE BOARD FROM BAGASSE

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Abstract

In India, bagasse has been the traditional fuel used by the Sugar Industry although during the last about a decade or so there has been some impetus given for its conversion into kraft and writing paper.

The experience of the small and medium sized units which convert this agricultural raw material into paper has not been particularly hjappy mainly on account of high capital investment involved and relatively poor returns. Consequently, the recent trend has been to convert this raw material into other value-added, remunerative products notably medium density fiber-board, and particle-board. On account of our dwindling forest resources, the said products appear to have good potential for replacing wood which has traditionaly been in use in a wide spectrum of industry.

The technology for the production of these has been relatively new to our country and therefore, it is thought appropriate to discuss the same here in this paper in the Indian context.

Due to dwindling forest resources in our Country, bagasse has become an attractive raw material as an alternative to wood or bamboo in pulp and paper Industry. Unfortunately however, the experience of 25 tonnes per day paper plants based on bagasse has not been very encouraging for a

variety of reasons. 25 Tonnes per day capacity itself seems to be uneconomical for a paper unit based on agricultural residue. the problem of pollution created by these units is quite severe and market conditions at present are far from favourable. In this context production of particle-board from bagasse appears to be an attractive praposition, particularly for those sugar mills where surplus bagasse is available. this value-added product will not only help in improving the economy of Sugar Industry but also create more job apportunities in the rural areas. Particle board is gradually replacing wood or playwood in a wide range of applications because its strength properties and dimensional stability are comparable to those of wood and plywood and because it can be made available at a rate cheaper than that of wood or plywood[1]. The market survey and demand forecast has already indicated that the prospects of the particle board industry in our Country are bright. In India, the particles board consumption has increased from 8500 tonnes per annum adecade ago to 40,000 tonnes per annum in 1986-87. On the basis of an independent study carried out the maximum demand for particle board over the next few years is estimated as follow.

Year	87	88	89	90	91	92
Demand in thousand tonnes.	*35*	*41*	*47*	*55*	*62*	*75*

If on the basis of availability of raw-material, it is assumed that only 50% of the licences, letters of intent or registrations lead to establishment of actual production units the demand supply gap for particle-board would be of the order of 40,000 tonnes per annum.

Bagasse-based particle-boards have a wide range of applications in furniture, building and transport Industry.

a. Furniture Industry — It includes house-hold, office and shop furniture including tables, chairs, sofas, cupboards as well as partitions, pannels doors etc.

b. Building Industry- Particle boards can be used as false ceiling for decorative and accoustic purposes and also as air-conditioning duct coverings and ceiling tiles with lamination or vaneer as required.

c. Transport Industry- Now-a-days particle boards are gradually replacing wood/plywood in railways and State transport organisation for partitions, furniture flase ceiling etc.

Particle boards can be classified into[2] two catagories.

a. Thin boards (Thickness 10-12 mm)
380 to 400 Kg/cm^2

b. Medium boards (Thickness 35-45 MM)
325 to 360 Kg/cm^2

Process-Description Particle board manufacturing process consists of the following operations.

a. Bagasse-Depithing- Bagasse from Sugar mills is subjected to Hammer mill treatment to remove the fractured cells i.e. pith. If not removed properly the pith contributes to the poor strength properties of the final product and higher resin consumption during the manufacturing process.

b. Fiber Preparation: The depithed accepted bagasse is dried in dryers to reduce the moisture-content to two percent. For bagasse drying indirect heating method is usually adopted where the drying temperature goes down with the fall in moisture content of the bagasse. Thus the chances of bagasse catching fire during drying are minimised. The dried bagasse is then subjected to hammer mill treatment where upon the length of bagasse fibers is reduced to an acceptable size. The fibers are then passed over a multideck screen to segregate the bagasse particles by size.

c. Fiber-Glue Blending Bagasse fibers are then mixed with glue-mixture in a glue blender. Glue mixture consists of various components such as resins emulsifiers, hardners etc. A measured quantity of glue is mixed with bagasse fibers in glue blender.

Generally 8-12% glue is added, depending on the quality of the particle boards to be manufactured.

d. Partcle-Board Manufacturing line- Glue blended bagasse fibers are spread into a mat in such a way that coarser fibers or particles are conveyed to the core and the lighter particles are conveyed to both the surfaces of the mat. The particle board mat of the required thickness is formed on an endless sheet belt which is cut into raw-board lengths which are then conveyed to the pressing section.[1] The raw particle board is pessed in a hydraulically operated press at 215-235^{0}C and at pressure of 35 Kg/cm^2. The pressing cycle depends on the thickness of the board to be manufacted. The boards from the hot press are then cooled to 50-60^{0}C before being taken for stacking. Board cooling is carried out in a star-turner type cooling device. Board cooling is necessary, as they stick to each other if stacked when hot.

For smooth running of a particle board plant, assured supply of good quality bagasse is necessary. Faulty storage methods, affect the quality of stoared bagasse which is ultimately reflected in the strength properties of the final product i.e. particle board. Various treatment methods such as treatment with acetic acid, propionic acid or borax have been suggested to avoid microbial degradation of the stoared bagasse fibers. The limitation of the bagasse based particle board is its colour.[3] First, it is not as attractive as that of boards from hardwoods although the physicomechanical properties of it may meet the required standards. Secondly, there may be inconsistency in the shade of colour and even batch to variation of shade are some times observed in the particle board prepared from the same bagasse.

Acknowledgement

Sincere thanks of the author are due to Dr. D.G. Hapase, Director, Shri Hambirrao Mohite, Chief Executive, Dr. S.J. Jadhav, Chief Scientist, and Dr. S.P. Phadnis, of Deccan Sugar Institute for their interest and encouragement.

References

1. Vista consulting Technologists and Engineering Co. Pvt. Ltd., Pune, Techno Economic Feasibility Report For Bagasse-Based Particle Board Project of Dnyaneshwar S.S.K., Ltd. 3.3 and 7.5.
2. H. Frers - Particle Board from Bagasse
Azucar y Diversification (Santo Domingo) 1974, 33, (2-3 March-June), 52-56S.
3. Shukla, K.S., Prasad Janardhan- Building Boards From Bagasse: Part I P.F. Bonded particle Boards. J. Timber Dev. Assoc. India. 1985, 31 (4), 20-7 (Eng.).