

## Developing Composite Boards Using Rice Husks and Coir Pith

M. N.N.B. Madumal, A.N.R. Weerawansa, H.M.S.K. Herath  
*Uva Wellassa University, Badulla, Sri Lanka*

and

S.M. Liyanage  
*Coconut Development Authority, Narahenpita, Sri Lanka*

### Introduction

Accumulation of unmanaged wastes, especially in developing countries such as Sri Lanka, has resulted a great concern on environment. At present, with industrial growth and technology development, waste generation is increasing from different industrial sources. Disposal of this waste has been amajor problem. Hence, an acceptable solution for this issues is essential (Bach, 1999). Therefore, this study was designed to utilize the generated waste from rice and coconut fiber industries, in large amounts.

The objective of this research was to develop composite boards, using coir pith and rice husk, which aim to meet the same mechanical properties of medium density fiber board as the standard check. Through this research the mechanical properties of newly developed boards were measured and statistically compared with the standard properties of medium density fiber board.

### Methodology

Rice husks, coir pith and phenol formaldehyde resin (binder) used to produce composite boards. Coir pith required for this research was collected from coir mounts of coconut fiber factory, Nattandiya, Coconut Development Authority. Rice husk was collected from a small scale rice mill located in Rambukkana. Fresh mounts were collected all the time as raw materials to preserve the original quality. At the collection time, surface layer of the mount was scrapped out.

The coir pith and rice husks samples were subjected to dry under open sunlight at room temperature in a clean surface area. Extraneous materials were removed by hand sorting. Proportions of raw materials and resin for the board development were taken as given in Table 1.

Table 1. Treatment combination.

Treatment	Selected ratio of components		
	Coir pith	Rice husks	PF resin
1	300 g	-	30 g
2	-	300 g	30 g
3	Standard MDF board (Control)		

Mixing of either coir pith or rise husks with binding agent was undertaken. Resin in liquid form was sprayed evenly on to the particles using a nozzle. Once the resin was mixed with the raw materials, the mixture was fed to mould and allowed to make into a sheet. The sheets were subjected to cold press by hand press and then sample was compressed under high pressure at 20 MPa and 175 °C temperature by using the hydraulic press machine for 15 minutes.

## Results and Discussion

In this research nine types of panels were made with dimensions of 500 × 500 × 8 mm. Also, the mechanical properties such as density, hardness, internal bonding, and water absorption were measured (Table 2).

Table 2. Mechanical properties of composite boards.

Treatment	Description	Mechanical properties			
		Density (kg/m <sup>3</sup> )	Hardness (Pounds)	Internal Bonding (MPa)	Water Absorption (%)
1	Coir pith	0.68333 <sup>B</sup>	476.67 <sup>A</sup>	1.0333 <sup>AB</sup>	12 <sup>A</sup>
2	Rice husk	0.63333 <sup>B</sup>	416.67 <sup>A</sup>	1.0000 <sup>B</sup>	14 <sup>A</sup>
3	Control	0.75000 <sup>A</sup>	500.00 <sup>A</sup>	1.2000 <sup>A</sup>	12 <sup>A</sup>

\*The means that do not share the same letter are not significantly different at p=0.05

Density of coir pith composite board was 0.6833 kg/m<sup>3</sup> and it was greater than the density of rice husk composite board. Both sample boards had equal values to the minimum values of specifications of the MDF boards. The highest value was shown in composite board made up of coir pith and it was about 476.67 pounds and that value is greater than the hardness of rice husk composite board (Table 2).

In this research Phenol formaldehyde was used as the binding agent and with the best action of that, the coconut and rice husk based composite boards had shown the required values for internal bonding.

Value of water absorption of coir pith composite board was determined equal to the minimum required range, 10-12%.

## Conclusions

It is emphasized that the coir composite board is making the use of outdoor excellently. According to the test results, it can be concluded that the adhesive phenol formaldehyde in the ratio of 10% in the MDF board made of coir pith and rice husk gave mechanical properties which are compatible with the requirements of the standard MDF boards commercially available. The successful production of composites requires extensive technological development to overcome the handling and processing problems, but the end result has been a high quality product that will stimulate the consideration and development of other value-added building materials using agricultural residues in Sri Lanka.

## References

Bach, L., 1999. Structural board manufactured from split straw. Proceedings of the Meeting of the Eastern Canadian Section of the Forest Products Society, Winnipeg, Manitoba.