

TECHNIQUES USED IN THE QUALITY IMPROVEMENT OF
RUBBER WOOD AND POSSIBILITIES OF FURTHER
IMPROVEMENTS BY RADIATION CURING

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The techniques used in the upgrading of rubber wood has been explained to you by Mr Hope Todd. His early attempts to perfect the process of boron treatment of rubber wood in collaboration with the Forest Department and the Rubber Research Institute (RRI) are well documented. The RRI has also assisted a team of Japanese scientists screening some fungicides for the prevention of blue stains in rubber wood caused by a blue stain fungus and this work is continuing.

Before one could consider possibilities of further improvements in rubber wood by processes such as radiation curing it is necessary to have some idea of the properties of rubber wood.

Rubber wood is homogeneous and pale straw coloured. Its grains are straight and its texture moderately coarse. It is classified as a light hard wood. When treated with known suitable chemicals, the wood is made resistant to attack by insect borers and most fungi. It is also moderately easy to re-saw and easy to plane.

Detail properties of rubber wood are given in appendix 1 which has been compiled from several publications.

These technical merits of rubber wood, would enable a better appreciation of the intrinsic qualities of the wood particularly at a time when every one is concerned about the extensive exploitation of our primary forest. In order to achieve the economic scale of operations of existing primary and secondary wood based industries in the country one could consider rubber wood as one useful resource. Every tree of rubber wood used for furniture allows a tree in our natural forests to stay alive. If the popularity of rubber wood for furniture and other panelling continues to increase we can expect our forests to continue flourishing. For the sake of future generations we should all hope that it does and we must explore all possibilities of new technologies such as radiation curing to further improve the quality and aesthetic value of the product.

The big question we must ask is how feasible is this process of radiation curing. Let us concentrate for the present on surface coating of wood panels using electron beam (EB). We are aware that for the purpose of evaluation an electron beam curing plant has been installed in Jakarta under the RCA project with IAEA / UNDP assistance. This plant was equipped with an electron beam machine of 50 mA, 300 KeV and was designed to study the economic aspects of EB curing of coatings on wood panel. A fixed capital investment of around US \$ 928,000 was needed to complete the construction of the plant in 1985. The capacity of this plant is about 1.8 Million pieces of coated wood panel (1.2x2.4 m) per year. This would be equivalent to the total sawn rubber wood availability in Sri Lanka which is about 100,000 tonnes.

The Indonesian experience with this machine is that if the price of coating material is less than US \$ 3/kg and the production is more than 70% from the maximum production capacity the coated product may compete with the conventional coating products. The amount of coating material absorbed on the surface of the wood will depend on the number of voids in the wood and we presume that in the case of rubber wood the chemical treatment effectively blocks some of the voids in the rubber wood thereby reducing the amount of monomer absorbed. We have no experimental evidence to prove this.

While lauding the efforts made by the Atomic Energy Authority to hold this executive management seminar in collaboration and support from the IAEA, the executive managers should be given an opportunity to get first hand information on EB curing.

REFERENCES

Planters' Bulletin (RRIM) March 1977.

Economic analysis of an electron beam curing coating plant by F. Sundaradi CAIR, Batan, Indonesia. 1986, (Internal communication).

Economics of making irradiated wood plastic products. by A. E. Witt and J. E. Morrissey. Modern Plastics, January, 1972.

Properties of radiated wood-plastic flooring vs. other materials

Property	Test method	Units	Radiated wood-plastic ^a	Epoxy terrazzo	Vinyl tile
Abrasion resistance	ASTM-D-1044	Depth (mils) after 4000 cycles	8.5	50	19
Loading to indent	ASTM-D-1324	Load (lb.) to indent 25 miles	560	not applicable	212
Hardness modulus	ASTM-D-1324	Slope at 100 lb. load (p.s.i)	16500	not applicable	12000
Coefficient of friction	Dynamic-surface versus rubber	—	0.561	0.545	0.527
Coefficient of linear expansion	Thermal	10^{-5} in/in/	0.6	18.0	18.0
Combustibility	ASTM-D-635	—	Self exting	Self exting	Self exting

a - Perma Grain paraquet flooring.

Appendix 1

Properties of Rubber wood compiled from publications

Property	Green	Air-Dry
(1) Moisture content based on weight on wood when dry (%)	52	17.2
(2) Specific gravity		
Oven dry	0.57	0.55
Air dry	0.61	0.58
(3) Weight		
Oven dry (lb/ft ³)	38	36
As tested (lb/ft ³)	57	40

Property	Green	Air-Dry
(4) Shrinkage (green to oven dry based on green dimensions)		
Volumetric (%)	8.2	—
Radial (%)	2.3	—
Tangential (%)	5.1	—
(5) Compression		
Parallel to grain		
— Stress at limit of proportionality (lb/in ²)	2096	2525
— maximum crushing strength (lb/in ²)	3761	4680
— modulus of elasticity (x 100 lb/in ²)	1453	1507
Perpendicular to grain		
— stress at limit of proportionality (lb/in ²)	605	485
(6) Hardness (load to imbed a 0.444" diameter steel sphere to one half its diameter)		
Radial surface (lb)	676	974
Tangential surface (lb)	702	981
End surface (lb)	858	1068
(7) Shearing parallel to grain (stress the plane of failure begin)		
Radial (lb/in ²)	1241	1527
Tangential (lb/in ²)	1378	1653
(8) Cleavage (strength in lb/in width of specimen 3" long — the plane of failure begin)		
Radial	334	308
Tangential	369	410

Property	Green	Air-Dry
(9) Machining Properties		
(i) Sawing (classification – easy, fairly easy, moderately easy, slightly difficult, difficult and very difficult)		
set sawing	slightly difficult	moderately easy
cross-cutting	easy	easy
(ii) Planing		
Ease of planing	easy	easy
Quality of finish (classification – smooth, moderately smooth, rough, wooly)	smooth	smooth
(iii) Boring		
Ease of boring	easy	easy
Quality of finish (classification – very smooth, fairly smooth, slight rough, rough, tearing of grain)	rough	rough
(iv) Turning		
Ease of turning	–	easy
Quality of finish (classification – smooth, moderately smooth, slightly rough, rough)	–	rough

Property	Green	Air-Dry
(10) Seasoning Properties		
Classification – sound, slight moderately, severe)		
Cupping	Slight	
Bowing	Slight	
Twisting or spring	Sound	
End checks	Slight	
Splitting	Slight	
Surface checks	Slight	
Insect attack during seasoning	moderate	
Stain during seasoning	moderate	
(11) Colour	pale straw	
	colour	
(12) Nailing (classification – excellent, good, poor, very poor)	good.	