

PRESERVATIVE TREATMENT AND SEASONING OF RUBBER WOOD

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INTRODUCTION

Rubber wood is a valuable source of timber on accounts of its beautiful light colour, structure, grains and strength as well as machining, nailing, glueing and finishing properties. It can be used for making door frames, door shutters, windows, furniture, decorative articles, household utilities, panelling works etc., after appropriate preservative treatments and controlled seasoning.

Untreated rubber wood is very susceptible to fungal and insect attack due to high starch and soluble sugar contents and also due to the lack of phenolics which are inhibitory to these organisms. Sap stain (blue stain) fungus infection causes discolouration of wood making it less attractive and insects create bore holes which in turn make the wood less suitable especially for the manufacture of furniture. Therefore, sawing and treatment of the timber immediately after felling of the tree is the basic principle involved in the preservation of rubber wood against fungal and insect attack and decay.

PRESERVATIVE TREATMENTS

Rubber wood can be preserved by impregnating waterborne wood preservatives. This can be achieved by two methods:-

1. Non-pressure method or diffusion treatment.

2. Pressure method or vacuum/pressure impregnation treatment.

1 DIFFUSION TREATMENT

Diffusion treatment is recommended when rubber wood is to be used for making indoor furniture and does not require any costly machinery or equipments. The green sawn wood containing free water is placed in contact with a solution highly water soluble preservative chemicals. A concentration gradient is set up and the chemicals move from the zone of high concentration on the surface of the wood to the zone of zero concentration within the wood, till a state of equilibrium is reached.

The preservative solution containing Boric acid and Borax (Boric Acid Equivalent-BAE) at 10% concentration with 0.5% Sodium penta chloro phenate (NaPCP) is used for diffusion treatment. BAE is effective against insect attack and NaPCP, a fungicide, is effective against sap-stain fungus infection.

The following items are necessary for diffusion treatment:-

1. Treatment tank made by concrete or cement or painted mild steel having a length of 270 cm width of 90 cm and depth of 45 cm (inside). In such a tank 0.7 M³ (25 cft) wood can be treated at a time.

2. Plastic buckets, polythene sheets, tarpaulin, gloves and concrete or granite blocks in various sizes.

When large quantity of rubber wood is to be treated regularly, it will be advantageous to have a tank for storing the chemicals and an electric motor with pump for transferring the solution to the tank and back. The number of treatment tanks can also be increased.

Preparation of 10% BAE

Boric acid	- 5.00 kg
Borax	- 7.50 kg
NaPCP	- 0.50 kg
Water	- 100 litres

Solution A:

Take 80 litres of water in the treatment tank and add 5.00 kg boric acid and 7.50 kg borax (both are white powder) and dissolve thoroughly by stirring. Boric acid will tend to float but can be dissolved by hand. Boric acid and borax are non-poisonous to mammals though highly toxic to wood attacking insects.

Solution B:

Take 20 litres of water in a plastic bucket and add 0.50 kg NaPCP and dissolve thoroughly by stirring. NaPCP is a toxic fungicide and to avoid direct skin contact and inhalation, gloves and masks must be used while making the solution.

Add solution B to solution A and stir thoroughly to make the solution for treatment. This treatment solution can be used repeatedly. However, after each treatment the concentration of the solution will get lowered which can be determined by a hydrometer (range 700-1000). When the concentration of BAE gets lowered, sufficient quantity of boric acid and borax in the ratio 2:3 should be added to increase the concentration to the required level. When the solution becomes clotted with saw dust after repeated treatments it has to be replaced.

Methods of Treatment

Trees have to be sawn into planks and boards of appropriate size within 48 hours after felling. Immediately after sawing they should be immersed into BAE. The time of immersion varies depending on the thickness of the planks or boards and can be calculated from the following formula.

$$T = \frac{(3.2 \times t)^2 \times 60}{C}$$

Where T — Time of immersion in minutes
t — Thickness of planks in cm
C — Concentration in % BAE

Weights (concrete or granite blocks of various sizes) should be kept above the wood pieces for keeping immersed in BAE. Stirring the solution frequently will speed up the penetration of BAE into the wood. The approximate time required for immersion of planks/boards of different thickness in the solution is given below:-

Thickness (in cm)	Immersion time (in minutes)
1.2	10
2.5	40
3.8	90
5.0	160
6.3	250
7.5	360

Diffusion Storage

After taking out from the treatment solution the planks/boards should be drained, stacked closely and fully wrapped with polythene sheets or with tarpaulin to protect from sun, air, rain, etc till the diffusion process is completed. Duration of diffusion storage is at the rate of one week for every 6 mm thickness of the treated plank.

The thickness of planks and approximate duration of diffusion storage is given below:-

Thickness (in cm)	Duration of storage (in days)
upto 2.5	30
2.6 to 3.8	45
3.9 to 5.0	60
5.1 to 6.3	75
6.4 to 7.5	90

After completion of the diffusion storage, the treated planks should be air dried or kiln dried for seasoning and then used for making indoor articles and furniture.

Advantages of diffusion treatment

- No costly machinery or equipments needed.
- Chemicals cheaper.
- Solution could be used repeatedly.
- Need only one seasoning.
- Chemicals do not discolour the wood. The treated wood retains its natural colour.
- Gets full penetration of chemicals from the surface of the wood to the zone of zero concentration.

Disadvantages of diffusion treatment

- Treatment must be done immediately after felling.
- Diffusion period is much longer and hence quick utilisation of treated timber is not possible.

- Diffusion treated rubber wood can only be used for the manufacture of indoor articles as the boron compounds (BAE) have a tendency to leach off under wet and exposed conditions.

2. VACUUM-PRESSURE TREATMENT

To ensure maximum durability and permanent protection against fungal and insect attack and wood decay, rubber wood should be subjected to vacuum-pressure impregnation. Chemical impregnation through this process is easy with rubber wood as it is very permeable. The Bethell or Full-Cell vacuum-pressure treatment process is adopted for this purpose using a Copper-Chromium-Arsenic (CCA) preservative. A water soluble, fixed CCA wood preservative called 'ASCU' is now available in the market.

The treatment is done in a pressure cylinder, of appropriate size, for 1½ to 2 hours. The Standard size of a pressure cylinder ranges from 4M³ to 12M³ (approximately 150 to 450 cft) per charge. As a result of deep penetration of preservatives wood treated by this method could be used safely for making articles like doors, windows, furniture and other household items which are used in wet and exposed conditions where decay and deterioration are high.

In this process various delay may occur. To overcome this delay and to impart perfect protection to the timber from fungal and insect attack the following precautionary measures have to be taken:-

- 1) Immediately after felling, the tree is cut into logs and the cut ends of the logs sprayed with 0.2% NaPCP and 0.5% Aldrex 30-EC.

- 2) If treatment could not be carried out within seven days after cutting, it is advisable to spray the sawn planks with a mixture of 10% BAE and 0.5% NaPCP.

Pre-seasoning

Freshly cut rubber wood planks will have 60% to 75% moisture content (M.C.). Prior to vacuum-pressure treatment the M. C. of wood has to be brought down to 25-27% by air seasoning. This can be achieved by stacking them in an aerated shed for 2 to 3 days.

Method of Treatment

After pre-seasoning, the planks/boards are charged into the pressure/cylinder by stacking them with crossers so as to allow free air circulation around them. The door of the cylinder is tightly closed. An initial vacuum of 6.6 cm of Hg is then created in the cylinder and maintained for 30 minutes. This will help the removal of as much air as possible from wood. At the end of this period (initial vacuum period) the 'ASCU' wood preservative dissolved in water in 5% concentration is introduced into the cylinder. When the cylinder is filled with the preservative solution, a pressure of 3.5 to 12.5 kg/cm² is applied. The preservative starts impregnating into wood. The pressure inside the cylinder is maintained until the desired absorption of preservative is achieved which varies depending on the end use of the planks. The protective preservative retention is 7.0 to 8.0 kg/m³ (225g-250 g/cft).

When the absorption of the preservative is completed, the preservative system is withdrawn from the cylinder and a vacuum of 38 to 56 cm of Hg (final vacuum) is applied for 15 minutes to prevent from

dripping of chemical. The planks are then taken out and stacked with crossers in an aerated shed for 4 to 5 days. Within this period the moisture content of treated wood will reach 30%-45%. The treated planks are then subjected to final seasoning to bring down the M. C. to 10-12%.

Advantages of vacuum-pressure treatment

- Treated wood can be used quickly.
- Preservative chemical does not leach off in wet and exposed conditions.
- The treated timber can be used for making indoor as well as outdoor articles.
- Treatment can be done before and after machining.
- This treatment prevents fungal decay, dry rot attack, soft rot attack, insects attack, wood worm attack, termite attack and marine borer attack.

Disadvantages

- Need costly treatment plant and electricity.
- Chemical is comparatively costly.

- Need two (pretreatment and post treatment) seasoning schedule.
- Each treatment requires large quantity of water.
- Treated wood does not retain natural colour.

SEASONING

Adjusting the level of moisture in timber to the level of Equilibrium Moisture Content (E.M.C.) is termed seasoning. When the moisture content of wood remains constant in equilibrium with the surrounding humidity (i.e., without absorption or desorption of moisture) it is known as E.M.C. It is usually 12% at normal temperature in most part of our country. If the wood is not having the desired E.M.C. either adsorption or desorption of moisture will take place, depending on the surrounding atmosphere and the timber starts swelling or shrinking.

Seasoning of the treated rubber wood can be done by air drying or kiln drying method, a comparison of which is given below:-

Air seasoning	Kiln seasoning
1. 15% M.C. can be achieved	6% M. C. can be achieved. However, 10-12% M.C is sufficient for rubber wood.
2. 56 days air seasoning is necessary for 25 mm boards	6 days kiln seasoning at 30°C for 25 mm boards.
3. 63 to 84 days air seasoning is necessary for 50 mm boards	10 days kiln seasoning at 30°C for 50 mm boards.
4. Shrinkage (at 15% M.C.) a) Radial - 0.9% b) Tangential - 2.7%	Shrinkage (at 12% M.C.) a) Radial - 1.2% b) Tangential - 1.8%
5. Air seasoned boards can be machined at a higher speed.	Kiln seasoned boards can be machined only at a comparatively lower speed.

Main defects of Rubber wood during Seasoning

The seasoning defects of rubber wood are the following:-

1. Warping

Warping can be classified as (a) bowing, (b) cupping (c) twisting or spring. Long and narrow pieces tend to bow easily and short broad planks show cupping. Long planks which are broad and thin show twisting or spring.

The warping defects are mainly due to the occurrence of tension wood and can be reduced by clamping or by keeping heavy weights on the boards at the time of seasoning. The boards may be close-stacked providing a gap of 45 cm between them. Care should be taken to use even sized stackers having thickness equal to that of the boards to be seasoned. Warping due to tension wood can also be controlled to some extent by different sawing patterns.

2. End-Splitting and Surface checking

This defect can be controlled by sawing the boards 10 mm

away from the pith. Wax coating at the cross section during kiln seasoning will be helpful to minimise endsplitting. However, boards in 100 cm length and 10 cm width and furniture parts below 50 cm length and 12 cm width will not usually create much seasoning problems.

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Price of Rubber in Kottayam market.

(Rupees per quintal)

Month		RMA 1	RMA 2	RMA 3	RMA 4	RMA 5	Latex (60%) (drc)	EBC 2x
June	1988	1895	1842	1800	1786	1725	2900	1485
July	1988	1930	1885	1850	1828	1755	3000	1510
August	1988	1990	1940	1920	1894	1826	3025	1545
September	1988	2006	1972	1939	1904	1862	3160	1590
October	1988	1990	1958	1925	1902	1856	3315	1593
November	1988	1903	1868	1827	1792	1699	3320	1510
December	1988	1885	1845	1791	1757	1674	3211	1492
January	1989	1873	1833	1781	1755	1699	3232	1465
February	1989	1868	1834	1809	1789	1764	3239	1490
March	1989	1889	1875	1855	1834	1809	3207	1545
April	1989	1920	1904	1884	1858	1839	3056	1570
May	1989	2150	2095	2050	2020	1978	3079	1655
June	1989	2402	2349	2319	2284	2233	3061	1922