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MILL PRACTICES THAT INFLUENCE THE OCCURRENCE OF SAP STAIN IN LUMBER

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MILL PRACTICES THAT INFLUENCE THE OCCURRENCE OF SAP STAIN IN LUMBER

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Introduction

Since 1928 the Division of Forest Pathology of the Bureau of Plant Industry, in cooperation with the Southern Forest Experiment Station, New Orleans, La., and lumber manufacturers, has been carrying on experiments directed at the prevention of sap stain in pine and hardwood lumber and logs.[1] At the time this experimental work was started, the pine and hardwood manufacturers in the Gulf States and lower Mississippi Valley were suffering serious losses in their lumber due to degrade caused by sap stain and mold fungi.

To date more than 200 chemicals have been tested to determine their stain-preventive qualities, and tests of other chemicals are now in progress. At present the chemicals which are giving best stain control include borax for hardwood, ethyl mercury chloride (Lignasan) for both pine and hardwoods, sodium tetrachlorophenolate (Dowicide-H) for hardwoods, and a mixture of sodium tetrachlorophenolate and sodium 2-chloroorthophenyl-phenolate (Dowicide-P) for pine or hardwoods. Soda solutions have been and are still being used to some extent for pine.

Because of a more critical attitude toward stain occurrence, enterprising millmen have taken advantage of the benefits to be derived from using preventive measures such as chemical treatments. It has been estimated that of the 4-1/2 billion board feet of lumber produced in the southern region last year, about 1-1/2 billion or one-third of the total output was chemically treated. Of the 1-1/2 billion treated, two-thirds was estimated to be pine and one-third hardwood.

The purpose of this article is to call the matter of stain prevention to the attention of millmen not using anti-stain treatments,

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[1] For pertinent references to literature dealing with the development of this work, the reader is referred to the bibliography at the end of this article.

and to point out some of the mill practices which influence the efficiency of chemical treatments used for sap stain control.

Stain-Free Logs Essential for Production of Bright Lumber

To produce bright lumber, the millman must start with stain-free logs. No chemical has been found that can be used practicably to remove stain once it gets into the wood. It is therefore essential that the logs be cut into lumber soon enough after the trees are felled to assure that stain is not present in the lumber before it is dipped. The allowable time between tree felling and lumber cutting depends upon such factors as temperature, moisture conditions, insect activity, and log storage practices. In warm, humid weather, stain may be observed within a week after the tree is felled. Hence an attempt should be made to cut as few logs as possible in advance of utilization at the mill. Even pond storage cannot be entirely relied upon to prevent stain if logs are stored in the pond for long periods. Spraying of the ends of logs with higher concentrations of the chemicals employed for dipping lumber has been found to retard stain occurrence where short periods of log storage are necessary. Such spraying is particularly applicable to hardwoods.

Correct Concentration of Dipping Solution Should Be Maintained

It will not be possible in this article to discuss the proper preparation and use of the dipping solutions. Information on vat construction and preparation of the chemical solutions can be obtained from the companies marketing the various stain preventives. However, three faulty practices are sometimes found which influence the effectiveness of the chemical treatments. One is the dilution of the dip below the concentration recommended by the manufacturers or distributors. The lowest concentrations of the dipping solutions at which stain and mold may be controlled have been carefully determined by experimental tests, and the lowest practical concentrations are the ones recommended. Hence to use weaker solutions may nullify the purpose for which the dip is used. The second bad practice is the occasional use of an open steam jet to prevent ice formation in the vat during cold weather. The addition of steam materially weakens the dipping solution and makes it impossible to maintain a proper solution strength. A steam pipe, the open end of which is not in the vat, can be arranged to give adequate winter heating, and will not reduce the stain-protective value of the dip. The third undesirable practice is the use of roofless dipping vats. Unroofed vats are particularly undesirable during rainy periods. Lumber needs the greatest protection during rainy periods, and to allow the solution to become weakened with rain water increases the chance for stain.

Delay in Dipping Lumber Should be Avoided

Experiments have shown that a delay of more than 2 days in dipping lumber may nullify any advantage to be derived from a chemical treatment. If insects are present in the logs at the time of cutting, a delay of even 2 days may mean that the chemical will not prevent stain. Stain-producing organisms grow very rapidly during warm, humid weather, and in less than 3 days they can penetrate so deeply into the wood that they cannot be reached by the chemical. A delayed treatment may make the rough lumber appear bright, but the dressed lumber will show that the stain-producing organisms continued to penetrate the wood.

Re-saw mills and mills maintaining a concentration yard and dipping the lumber after it arrives at the yard will do well to take cognizance of the above statements. If the mills cutting the logs can be induced to use the chemicals properly, the lumber should be dipped at the time of sawing. Bad roads or other factors sometimes cause a delay in delivering the lumber to the concentration yard or to re-saw mills, and during such periods of delay the lumber dipped immediately is far less liable to stain than that dipped later.

Rain Washing Should Be Avoided as Much as Possible

The millman must remember that the commonly used lumber dips are applied in water solutions. Hence, since the chemicals are soluble in water, their effectiveness will be decreased if proper care is not taken to prevent their being washed from the lumber surfaces by rain. Buggies along the green chain often are in the rain from the time the first board is loaded onto them until they are filled and hauled into the yard; and at some mills this may take a couple of days for certain lengths of lumber. It may still be raining when this same lumber is piled. Under such conditions, some of the dip may be washed from the boards, and if poor seasoning conditions follow the piling, stain may occur. Since lumber under such conditions is already at a disadvantage, it should be piled in a manner that will be conducive to the fastest possible drying. This may require that on rainy days a wider space be left between boards than is left under ordinary practice at the mill. If low foundations are in use or if random-width lumber is being piled, a wide central flue might be used to improve circulation through the pile.

Provide Good Pile Covers

All completed lumber piles should be provided with a good cover. The cover should be elevated sufficiently above the pile to permit proper movement of air through the pile. Such a cover should not only top the

piles erected on rainy days, but should be a part of the yard practice at all times. Some yard foremen object to the roof being raised above the pile, stating that the wind blows off the elevated covers. This difficulty can be overcome by placing a crosser stick over the cover and tying it to a lower crosser with twine, or by using heavy dimension material to weight down the covers. Although a close-fitting cover may keep rain out of the pile, it likewise tends to prevent air circulation through the pile and may sometimes aid stain development.

Adequate Foundations, Well Elevated, Are Essential to Stain Control

Circulation of air through and around the bottom is essential for proper movement of moist air down through the pile. This calls for two yard practices which should always be in use. One is the provision of adequate foundations, properly elevated, and the other is proper eradication of weeds and other vegetation from around the foundations.

The proper height for the foundations will depend upon the drainage of the seasoning yard and the style of piling used. Low yards require higher foundations than high, well-drained yards, but in any case the rule to follow is to install foundations of sufficient height to provide ample space for free circulation of air under all parts of the pile. Generally speaking, when self-crossing is the style of piling used, greater ventilation is required than when narrow crosser sticks are used. It might be well to mention here that poor yard sanitation in connection with crosser sticks can also be the cause of delayed seasoning and consequent stain. When the sticks are carelessly thrown around the pile foundations, they not only stop air circulation, but also increase fire hazard and the chances for decay and stain in the stickers. Provisions should be made for piling the stickers either in the yard or in storage sheds.

Proper Pile Alinement Allows Better Air Circulation in the Yard

Thus far, in speaking of ventilation we have mentioned only the ventilation of individual lumber piles. Since changes are made from time to time in the lay-out of yards at permanent mills, and since portable mills often set up temporary drying yards, a word should be said about the yard lay-out. The seasoning yard should be planned so as to provide for unobstructed alleys on all sides of the piles throughout the yard. Hence there should be alinement of the piles not only in front but along the sides and in the rear. Staggered piles and narrow, uneven rear alleys materially decrease the rate of loss of water from the drying yard.

Summary

Chemical treatments have been devised that are aiding southern manufacturers in producing lumber relatively free from sap stain. Certain yard and seasoning practices must be observed if full benefit is to be derived from the use of these dips:

1. Maintain a supply of stain-free logs. Do everything practical to avoid having felling crew cut far in advance of the mill's capacity to utilize the logs.

2. Do not dilute the dipping solution below the recommended strength, and do not allow dilution from steam or rain. Provide the vat with a roof.

3. Dip the lumber immediately after sawing or within 2 days at most.

4. As the dipping solutions are water-soluble, prevent rain washing by using adequate pile covers, and provide extra chances for drying of the lumber in piles erected in the rain.

5. Adequate pile foundations, properly elevated, should be provided, and the ventilation thus provided should not be obstructed with weeds or other vegetation or with crosser sticks.

6. The drying yard should be laid out with wide front and rear alleys, and a reasonably wide spacing between piles should be provided. The foundations should be arranged so that the piles will be in alinement rather than staggered. This will allow better yard ventilation and consequently better drying conditions.

Bibliography

(1) Chapman, A. Dale, and Scheffer, T. C.
1933. New chemical treatments for the control of sap stain and mold in southern pine and hardwood lumber. Southern Lumberman 146 (1851): 25-30, illus.

(2) Harrison, G. N.
1932. Committee on sap stain control. Reports on progress of federal sap stain control work. Southern Lumberman 145 (1841): 59-60, illus.

(3) Lindgren, R. M.
1929. Sap stain and mold control at southern mills. Southern Lumberman 136 (1763): 60, 62, illus. Lumber Trade Journal 96 (5): 29-30, illus.

(4) _____
1930. The deterioration of logs in storage and its prevention. Southern Lumberman 138 (1776): 49, illus. Lumber Trade Journal 97 (6): 20.

(5) _____, Ralph M.
1930. Preliminary experiments on control of sap stain and mold in southern pine and sap gum by chemical treatment. Lumber Trade Journal 97 (9): 25-26, illus.

(6) _____
1930. Control of sap stain and mold in southern pine and sap gum: preliminary experiments on control by chemical treatment. Southern Lumberman 139 (1779): 62, 64, illus.

(7) _____
1930. The control of sap stain in southern pine and sap gum. American Lumberman 2887: 46-47, illus.

(8) _____
1930. Prevention of deterioration in stored logs by chemical treatment. Lumber Trade Journal 98 (9): 37-38. Southern Lumberman 141 (1793): 250.

(9) _____ and Chapman, A. Dale
1931. Progress in the use of chemical treatments to protect stored logs from deterioration. American Lumberman 2926: 46-48, illus. Southern Lumberman 143 (1806): 75-76, 96, illus.

(10) Lindgren, Ralph M., and Chapman, A. Dale
1931. Use of chemical treatments to protect stored logs. Barrel and Box and Packages 36 (12): 27-28, illus. (Abstracted from Southern Lumberman 143 (1806): 75-76, 96, illus.)

(11) _____, R. M., and Scheffer, T. C.
1931. Prevention of sap stain and mold in southern woods by chemical treatment. Southern Lumberman 142 (1796): 42-46, illus.

(12) _____, Ralph M., and Scheffer, Theodore C.
1931. Encouraging results with chemical treatments for the prevention of sap stain and mold in southern woods. American Lumberman 2912: 35-37, illus. (Same article as in Southern Lumberman 142 (1796): 42-46, minus the preliminary test table.)

(13) _____, R. M., Scheffer, T. C., and Chapman, A. D.
1932. Recent tests of chemical treatments for preventing deterioration in stored logs. Southern Lumberman 145 (1834): 19-21, illus.

(14) _____
1933. Tests of chemical treatments for control of sap stain and mold in southern lumber. Journal of Industrial and Engineering Chemistry 25 (1): 72-75, illus.

(15) Scheffer, T. C.
1934. Dipping for control of sap stain at small pine sawmills. Southern Lumberman 149 (1883): 109-110, 114-116, illus.

(16) _____ and Chapman, A. D.
1934. Dipping tests for control of sap stain, mold, and decay in southern lumber and logs. Southern Lumberman 149 (1881): 37-40, illus.

(17) _____ and Lindgren, R. M.
1932. Some minor stains of southern pine and hardwood lumber and logs. Journal of Agricultural Research 45: 233-237, illus.