

A LOOK AT SOMETHING NEW IN ANTI-STAIN TREATING OF GREEN LUMBER

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History

The lumber industry has a chronic problem with discoloration, stains, mold and deterioration of green lumber and in particular with green surfaced hemlock. The problems of stain, mold, etc., are brought to light by claims, complaints and loss of markets.

Lumber shipped from the mill to market in an unseasoned condition is susceptible to discoloration by sap stain and mould. Adequate chemical treatment can minimize fungal attack (including decay) during storage and transit for up to 24 months.

Success of sap stain and mold preventative treatment systems requires the establishment and maintenance of a protective envelope. All commercial treatments are surface treatments only, and penetration of active ingredients is limited to a few cell layers. If the integrity of the protective envelope is destroyed by further manufacture, further treatment is required to ensure adequate protection of the lumber.

Many mills are not fully aware of the seriousness of the problem of mold, stain, etc., and as a result tend to treat the problem lightly.

There are numerous means of in-plant treatment of green lumber with anti-stain fungicides.

a. Carrier Drive In Tanks

These were thought to be an effective method for treating green lumber with anti-stain chemicals. We have since found that often there is very little penetration or none of the chemical to the inner surfaces of planed lumber particularly on the wider widths of pieces.

Often times the carrier driver would not get proper coverage on the top courses of lumber if the level of solution in the tank was low or he did not create the proper wave action. Further, during cold weather, ice would form on the carrier ramp into the tank, the solution in the tank would freeze, then dipping of lumber ceased completely until the ice disappeared. This could be over an extended period of time and as a result many millions of feet of lumber is shipped untreated. Treating of lumber was severely reduced or stopped during periods of heavy snow fall in the yard. Shortage of carrier drivers, or carriers unable to keep up to production, frequently neglected to dip the lumber.

Another thing of particular significance is the Fisheries Department objecting to carriers carrying anti-stain treated loads through the mill yards. There is a degree of drainage which eventually is washed from the yard to the sea or rivers by rain-fall and natural runoff.

Further, certain employees object to the odor of the solution and are reluctant to drive in the tanks.

b. Fork Lift Dip Tanks

These can and probably are better than drive-in tanks and will probably do an effective job if the operator does in fact dip the load and does not by-pass the dipping process. Fork lift dipping is slow, and as more planer sorter systems are installed particularly in line with the packaging unit, it will not be satisfactory to remove each load of lumber from the system for dipping and then returning the load to the system. Fork lift dipping equipment is costly from a capital point of view.

c. Sawmill and Planer Spray Systems

Many mills have used these over the years but have been generally shop built and generally unsatisfactory in operation due to poor filtering systems, improper spray nozzles and lack of nozzles. Mill control was and is often lax, and much lumber could be processed through the planer while the spray booth was not functioning or only partially operating. Often times the solution mix would not be of sufficient strength to prevent sap stain and mold. As a result protection against stain or mold was insufficient or non existent.

There are of course mills that do a satisfactory job of anti-stain treatment. We are not applying a broad brush condemnation of the industry's approach to anti-stain treating of green lumber. There is, however, sufficient evidence that there are unknown volumes of poorly treated or untreated lumber reaching the market place. As a result the image of green lumber and in particular green hemlock has suffered. Unless our industry is prepared to apply corrective measures, it is conceivable that green lumber (hemlock) may give up part of its market by default.

d. Individual Piece Dip Systems

This system of anti-stain treating is one of the better methods of treating lumber. Each piece is held down by a floating type apparatus as it passes through a shallow tank filled with anti-stain solution. Providing the solution level is maintained at the correct level, each piece is individually

immersed in solution. Following the immersion, the pieces pass over an incline chain which allows excess solution to drain off. This method of treating lumber is satisfactory so long as the solution is maintained at the correct level.

After considering the problem, the industry felt something had to be done. Committees were formed to determine what course of action should be taken regarding the stain and mold problem.

It was decided that COFI would monitor the mills anti-stain program. An anti-stain treatment procedures manual was developed. It was designed to ensure maintenance of a consistently high level of anti-stain treatment and provide assurance that the product arrives in the market place in good condition.

The manual covers requirements for anti-stain chemical retention. It also sets out recommended procedures for application methods, sampling, testing, quality control, and reporting. The manual also provides for policing and enforcement.

It was also decided to run a test using an anti-stain chemical combined with a color and a water repellent to be applied by spray to green surfaced hemlock as protection against sap stain and mold.

Description of Experiment

Color

1. The principle of the "Cherry Brown" application to dry lumber was followed.
2. Cherry Brown we believe originated with Weyerhaeuser who wanted to identify dry (a different thickness from green lumber) so that there would be no confusion on the job site between green and dry lumber.
3. This system and the use of Cherry Brown has been so successful that the use of the color could not be discontinued, even if the mills wanted to. The market place wants the product and we assume, mainly because of appearance. There are more mills adding this process to their planer operations.

Application

1. The spray equipment used to apply the Cherry Brown color was vastly different than the shop or home made sprayers.
2. Filtering and spray nozzles, plus recirculation of over spray give very little trouble, but does require regular attention, but this can easily be maintained by planer mill personnel.
3. Application of Cherry Brown is uniform.
4. There is no odor escaping from the spray booth. Odor is drawn off by the planer suction system attached to the spray booth. This is a high pressure system and does create a fog within the spray booth, but is readily controlled by the suction system.

5. The application of the solution is such that it is barely discernable on the board, but coverage is identified by the color of Cherry Brown.
6. In our view we believed that by using a golden yellow color mixed with the anti-stain solution and applied after the planer, we would have a mill control point, to identify and guarantee the anti-stain solution was in fact applied. Lack of color on the lumber would immediately notify and alert the graders at the planer that there was a malfunction in the spray booth and that anti-stain chemicals were not being applied.
7. The use of color (golden yellow) also informs the customer that anti-stain chemicals have been applied.
8. Most important the application of anti-stain with a spray booth is not affected by weather. There is no reason that treatment should not be applied under any weather conditions, including cold weather.
9. A water repellent and anti-stain chemicals are mixed together and applied at the same time. We had no real evidence of what the water repellent would do, but thought that if it did adhere to the lumber it may restrict free water from penetrating in between boards and hopefully would avoid the typical soaking wet appearance of green hemlock treated only with the usual anti-stain solution.
10. Through the courtesy of one of the mills, a test run was arranged for Saturday, January 14, 1978, as follows:
 - a. 9 packages of 2 x 4 - 10' rough green hemlock would be used.
 - b. 3 packages would be planed and run through without treatment (control).
 - c. 3 packages would be planed and treated with normal anti-stain solution.
 - d. 3 packages would be planed and the full treatment of anti-stain, gold/yellow color and water repellent would be applied.
 - e. Following the planing and treatment, each board in all loads were numbered and identified. Pieces containing stain and/or decay were also recorded.
 - f. All boards in all packages were evenly infected with various mold spores, etc., supplied by Western Forest Products Laboratory (WFPL). This was to ensure that all nine packages started with a common base of infection.
 - g. All packages were strapped in the usual manner and stored in the mill yard without protection.
 - h. The nine packages were assembled in groups of three, e.g. control, anti-stain only and anti-stain/color/water repellent.
 - i. It was planned that the first group of three packages (1 control package, 1 anti-stain package and 1 anti-stain/color/water repellent package) would be held in storage in the mill yard for six months to July 1978, opened and examined at that time.

- j. The second group of three packages to be opened January, 1979.
- k. The third group of three packages to be opened after 24 months of storage (January, 1980).

As of this date February 12, 1979, the first group of three packages was opened after 6 months on July 21, 1978. The second group of three packages was opened after 11 months on December 20, 1978.

Test Objectives

The test objectives are simple and straight forward.

- 1. To define a means of applying anti-stain treatment in an effective way on 100% of the lumber regardless of weather.
- 2. To develop a means of mill control to ensure and quickly identify that in fact anti-stain treatment was being applied. For this purpose a golden yellow color was chosen.
- 3. To determine the effect of the use of water repellents on green lumber.
- 4. To supply a product with an improved appearance, more readily acceptable in the market place and more able to be competitive with other lumber products (i.e.)
 - dry southern pine
 - dry Canadian lumber
 - spruce/pine/fir, etc.
- 5. To eliminate the stigma of stain, decay and mycelium in green hemlock in particular.

Test Results - Summary First Group - 6 Months

The first evaluation was made at the end of six months and covers the first 3 of 9 packages.

The purpose of the project was to evaluate a sap stain, water repellent color added treatment against a normal sap stain treatment package and a control package with no treatment at all.

Chemical Retention

- 1. At the test run the spray apparatus was set up to apply chemical at a rate to retain .05 mg/cm² to the surface of the lumber.
- 2. Cuttings or samplings were taken from several pieces in each package and evaluated by W.F.P.L. personnel to determine chemical retention. It was found that retention was .042 mg/cm² or approximately 18% lower than originally intended at the time of the test.
- 3. The test run was too short to properly monitor the desired level of application. However, under normal planer mill operation the application of chemical, etc., can readily and accurately be monitored.

Weight

1. It was originally intended to weigh all nine packages of lumber at the time the test was run (January 1978) but due to an oversight this was not done.
2. In July, 1978, when the first group of three packages were examined, it was then agreed to weigh all nine packages with the following results.

Control	Anti-Stain Only	Anti-Stain/Color/ Water Repellent
Pkg. 1 - 3250 lbs.	Pkg. 4 - 3150 lbs.	Pkg. 7 - 2700 lbs.
Pkg. 2 - 3000 lbs.	Pkg. 5 - 3050 lbs.	Pkg. 8 - 2900 lbs.
Pkg. 3 - 2800 lbs.	Pkg. 6 - 2950 lbs.	Pkg. 9 - 2625 lbs.
Ave. weight <u>3117 lbs.</u>	<u>3050 lbs.</u>	<u>2742 lbs.</u>

Moisture Content

A piece by piece measurement of moisture in all 3 packages showed as follows:

Pkg. 1 - Control - weight loss in 6 months	19.2%
Pkg. 4 - Anti-Stain Treated only (6 months)	21.7%
Pkg. 7 - Anti-Stain/Color/Water Repellent (6 months)	32.9%

NOTE: Original weight was estimated according to "Estimated Shipping Weights Chart."

Stain-Mold-Decay

Each piece of lumber in the 3 test packages were rated on a scale of 0 to 3, or from no fungal growth to heavy fungal growth.

Pieces with very little or only a suspicion of fungal growth were marked "one" on the scale. Obvious to heavy fungal growth were marked "two" on the scale, etc.

Rating	Sap Stain/Mold/Decay				Decay Only
	0	1	2	3	
Control Pkg. 1	27	58	60	50	19
Anti-Stain Pkg. 4	144	49	2	0	1**
Anti-Stain/Color/ Water Repellent Pkg. 7	155	39	1	0	2**

**Decay at beginning of test.

NOTE: Results of the 12 months test re stain, mold, decay, etc., have not been prepared.

Comments - re Anti-Stain/Color/Water Repellent

1. The appearance of lumber treated with it is superior.
2. The lumber dries out more rapidly in the core of the package than the sap stain or control package.
3. At the end of the 6 months the lumber lost about 50% more water than the control and 25% more than the sap stain treated package.
4. The golden/yellow color did not wash away with the rain.
5. There was no surface water in any portion of the package. Control and sap stain treated packages were very wet throughout.
6. Approximately 12% of the pieces in the anti-stain/color/water repellent package contained 19% or less M.C. as compared to about 6% in the other two test packages.
7. Hemlock brown stain (tannin, oxidation, etc.) is less pronounced on all three packages treated with color/water repellent than on the other six packages. This indicates a total drying effect of the color/water repellent treatment.

Other Comments

It appears that the water repellent is stopping the flow of free water in between the pieces and protects the pigment from washing off. This indicates that a pigment, such as zinc oxide which is innocuous to man, but has anti-fungal properties, could be incorporated as a potential anti-stain ingredient. There may be other mildewicides which could serve as anti-stain chemicals, but were never considered because they were not water soluble. Incorporation as a pigment may open up new possibilities. This may be an important feature in the future if in the interests of ecologists, fisheries, etc., chlorinated phenols are no longer permitted as an anti-stain agent.

Conclusion

I am reasonably confident the proper application of a combined anti-stain/color/water repellent solution by the mills will greatly improve the appearance and acceptability of green hemlock in all markets.

We recognize that further testing and sampling will have to be done before all markets can be covered.

We can readily observe that there can be some objections by some mills with regard to a new installation or changing an existing one. However, we think back to the period when pulled to length packages were introduced, followed by a uniform steel strapping policy and sticker attached. There was a certain amount of objection at that time, but it is doubtful anyone would now want to turn the clock back and not use packaged lumber.

It appears that the time has arrived when all mills should adopt a uniform policy of anti-stain treating.

Hopefully the results from tests and test shipments will provide the vehicle upon which such a policy may be based.