

Use of antistain chemicals by softwood lumber producers in the western United States during 2006—A survey

Christoph J. Schauwecker*
Jeffrey J. Morrell*

Abstract

A survey was conducted to determine the use of antistain chemicals by western softwood lumber producers in 2006. Half of those surveyed responded, and 31 percent of the respondents used antistain chemicals. The predominant species treated was Douglas-fir, but no single chemical was widely used. Instead, most mills used custom chemical formulations. The most common application method was by high-pressure spray unit. The results indicate that antistain chemicals remain an important part of the lumber production process due to customer perceptions regarding mold and discoloration.

Mold and stain prevention chemicals were first developed in the 1930s for the protection of air-seasoned southern pine lumber.¹ These treatments were widely used until the 1970s, when sodium pentachlorophenate, the predominant antistain chemical at the time, became a restricted use pesticide. Many mills did not want to assume the added burden associated with application of a restricted-use pesticide. Although a number of non-restricted use chemicals were developed, many mills either constructed additional kiln capacity or elected to live with the risk of discoloration. There remains, however, an attractive market for green Douglas-fir (*Pseudotsuga menziesii* [Mirb.] Franco) lumber for framing applications.

Hansen and Morrell² surveyed the users of antistain chemicals in the western United States in 1994 and found that the

market had become fragmented with a number of different chemicals being used to prevent fungal discoloration of lumber. At that time, 25 percent of the treated timber was destined for export markets where clean, stain-free wood commanded a premium price. A follow-up survey in 1999 found that the number of western mills using antistain chemicals had markedly declined, most likely due to the loss of the export market.³ However, 13 percent of respondents still used antistain chemicals, even though less than 1 percent of the material treated was destined for export.

Since 1999, a number of high profile lawsuits have heightened consumer concerns about mold fungi and to a lesser extent stain. At the same time, large retailers of lumber to the residential do-it-yourself market have demanded clean, mold-free lumber.⁴ The chemical suppliers have responded by providing a number of proprietary custom products. In order to assess the magnitude of change in the softwood lumber market, western softwood lumber producers were surveyed in 2006 to identify current trends in antistain chemical use.

Methods

The western softwood lumber industry was sampled by sending a survey to 116 producing members of the Western Wood Products Association (WWPA) in a 12-state area. The questionnaire closely resembled a 1994 survey,² except that, the list of antistain chemicals was updated. The survey focused heavily on production statistics, chemicals used to protect lumber and user experiences with these chemicals. Questions regarding the acceptability of stain in different markets were also included.

The authors are, respectively, Research Scientist, Viance Inc., Charlotte, North Carolina (cschauwecker@viance.net), and Professor, Dept. of Wood Sci. and Engineering, Oregon State Univ., Corvallis, Oregon (jeff.morrell@oregonstate.edu). The authors thank the Western Wood Products Assoc. for their assistance with the survey. This paper was received for publication in December 2007. Article No. 10444.

*Forest Products Society Member.

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¹ Scheffer, T.C. and R.M. Lindgren. 1940. Stains of sapwood products and their control. Technical Bulletin 714. USDA Forest Serv., Forest Products Lab., Madison, Wisconsin.

² Hanson, E. and J.J. Morrell. 1997. Use of anti-stain chemical treatments by the Western U.S. softwood lumber industry, 1994. Forest Prod. J. 47(6):69–73.

³ Anderson, R.C., E. Hanson, and J.J. Morrell. 2002. Use of anti-stain chemical treatments by the western U.S. softwood lumber industry, 1999. Forest Prod. J. 52(4):69–71.

⁴ Schwager, J. 2007. Personal communication. Home Depot Inc. John_Schwager@homedepot.com.

Table 1. — Number of mills using different chemicals used to prevent mold and stain on freshly sawn lumber on various wood species (n = 18).

Chemical	Number of respondents					
	Douglas-fir	Hem-fir	Ponderosa pine	Spruce	Douglas-fir-Larch	Other
Premier	2	1	--	--	--	--
Orange Shield	1	--	--	--	1	--
Anti Blu XL	--	1	--	--	--	1
Britewood PF 1	2	1	--	--	--	--
Britewood Z	2	--	--	--	--	--
Britewood XL	1	--	--	--	--	--
Bazooka	2	1	--	--	--	--
LTC - 3	--	1	1	1	--	--
Other	8	2	--	--	1	--
Total	18	6	1	1	2	1

The questionnaire was sent with a cover letter and a postage-paid reply envelope addressed to the mill manager at each location. This letter was followed by a reminder postcard 2 weeks after the initial mailing. Three weeks after the postcard, another survey was sent to each nonresponding mill along with a cover letter explaining the importance of the work and another postage-paid envelope. This was followed by another postcard to all nonresponding mills approximately 2 weeks after the second questionnaire had been mailed. Sixty-eight responses were received; however, 10 responses could not be used because these manufacturing facilities were not currently producing softwood lumber. The data were checked for errors, and production statistics were compared to values provided by the WWPA. The data were then compared to the results of the 1994 and 1999 studies to identify any trends emerging over the past 12 years.

Results and discussion

The 12-state region surveyed produced 16.66 billion board feet (BBF) of lumber in 2006.⁵ The 58 softwood lumber mills responding (resulting in a 54.7 percent response rate) produced 6.46 BBF, or 39 percent of total production for the region. Eighteen mills used antistain chemicals to treat all or part of their production. These mills represented 6.13 BBF of total production, of which 1.64 BBF were treated with antistain chemicals. Three of the mills that responded exported a small to moderate portion of their production (5 to 25%) and treated 100 percent of their production. The 14.69 million board feet (MMBF) of antistain treated lumber produced by these three mills and destined for the export market, represented less than 0.9 percent of the material treated in the region during 2006.

Douglas-fir was the predominant species treated, making up 61 percent, or 1.01 BBF, of the material treated, while western hemlock (*Tsuga heterophylla* (Raf.) Sarg.), ponderosa pine (*Pinus ponderosa* Dougl. Ex Laws), spruce (*Picea* spp.) and lodgepole pine (*Pinus contorta* Dougl.) were treated to a much lesser extent (Table 1). The volume of Douglas-fir production that is treated probably reflects the need to protect this material for the green framing market.

Respondents used eight of the formulations listed in the survey, but eight others employed custom formulations from two

suppliers (Table 2). These custom formulations, however, contained the same active ingredients as the listed systems. These custom systems can have other additives to control nonbiological stains or may be premixed and diluted formulations that are ready to use systems and designed to avoid mixing at the plant. Mills predominately used high-pressure spray units to apply antistain chemicals (10 respondents).

Six plants used low-pressure spray units, five used dip tanks, and three plants used both a dip tank and a low-pressure spray unit (Table 2).

The shift to high-pressure spray systems reflects a trend to reduce liquid uptake, but these systems require more upkeep. This suggests that mills are willing to invest in technology for stain prevention.

The length of time a chemical has been employed by a mill may be used as an indicator of user satisfaction. Three mills have used the same chemical for more than 6 years (Table 2), while six others had used their current chemical formulation for less than 2 years, and two mills had only used their current antistain treatment for less than a year. Some care must be taken when interpreting this information since a particular system may have only been available for a short amount of time, but the data suggest that most mills are generally satisfied with the chemical they are currently using.

The chemical concentrations used by individual mills varied widely, even when two mills used the same product. The differences might reflect regional variation in stain susceptibility. In addition, five mills varied chemical concentration on a seasonal basis.

Mill managers used a variety of information sources to choose antistain compounds. Eleven percent based their decisions on experiences at other mills, another 11 percent used personal experience, and 17 percent relied on information provided by chemical suppliers. In addition, 22 percent used other information sources to make their purchasing decisions, including scientific trials at the plant, employee risk factors, and chemical effectiveness along with larger corporate purchasing decisions. A large number of mill managers (39%) consulted multiple sources prior to making a decision. Of those that based their chemical decision on multiple data sources, four used personal experience and information from other mills as part of their purchasing decision. Other managers combined information from chemical suppliers, personal experience, and university reports. This is a significant shift from the study done in 1999, when most mills indicated that they only used personal experience when selecting antistain chemicals.

Respondents were also asked to rate their level of satisfaction with antistain chemicals based on four statements (Table 3). Managers generally felt that the chemical they currently use performed well (mean level of agreement was 1.77 based on a 5-point scale where 1 = agree, 3 = neutral, and 5 = Disagree). Cost was not always a factor in chemical decisions with a mean response level of 2.94 to the price question. In general, respondents seemed to be more satisfied with their treatments compared to the results from the 1994, but

⁵ Random Lengths. 2007. North American lumber output. Random Lengths 63:12.

Table 2. — Chemicals used to prevent mold and stain on freshly sawn lumber in the Pacific Northwest and the method by which these systems were applied (totals may not add up because mills use more than one application method).

Trade name	Supplier	Active ingredient	No. of mills	No. of respondents per application method			Dilution	Length of use (years)
				Dip	Low pressure	High pressure		
Premier	ISK	3-iodo-2-propynyl butyl carbamate and propiconazole	2	--	--	2	1:30 to 1:34	1 to 2
Orange Shield	Diacon	propiconazole	1	1	--	1	1:120	1 to 2
Anti Blu XL	Arch		1	1	--	--	1:120	0.25
Britewood PF-1	Contechem	3-iodo-2-propynyl butyl carbamate	2	--	1	1	1:40	8
Britewood Z	Contechem	propiconazole	2	--	--	1	1:50	4 to 6
Britewood XL	Contechem	propiconazole and didecyl dimethyl ammonium chloride	1	--	--	--	--	6
Bazooka	Kop-Coat	diiodomethyl p-tolyl sulfone, 3-iodo-2-propynyl butyl carbamate and propiconazole	2	--	--	2	1:40 to 1:120	1
LTC-3	Kop-Coat	3-iodo-2-propynyl butyl carbamate	1	--	--	1	1:20	5
Other	--	--	8	2	5	2	--	1.5 to 15
Total	--	--	18	4	6	10	--	--

Table 3. — Respondent perceptions regarding antistain chemical price, handling, performance and value on a scale from 1 to 5 (1 = agree with the statement, 3 = neutral, and 5 = disagree).

Statement	Average scale value	SD
The chemical we currently use has a low price	2.944	0.998
The chemical we currently use poses few handling problems	2.00	1.05
The chemical we currently use performs well in preventing stain	1.77	0.732
The chemical we currently use is a good value	2.16	0.618

Table 4. — The acceptability of stain in different market segments according to the mill manager.

Market	Responses (number)	Response rate (percent)		
		1 (acceptable)	2 (neutral)	3 (not acceptable)
Export	28	7	7	86
Molding/millwork	25	12	12	76
Windows/doors	23	4	9	87
Home centers/ lumberyards	36	25	22	53
Glulam and other industrial users	23	4	44	52
Professional contractors	27	30	40	30

satisfaction levels were similar to those obtained in the 1999 survey.

Forty respondents in the current survey indicated that they did not use antistain chemicals and 7 others indicated that they had used antistain treatments in the past. The major reason for discontinuing chemical use was increased kiln capacity or a closer match between current production volumes and dry kiln capacity. One mill discontinued use of the antistain treatments due to state laws, while another mill noted that it had outsourced its planer operations. Thus, it is likely that some production from this mill was treated but it was not possible to determine how much. Of the 40 mills that did not use antistain chemicals, 9 reported economic losses totaling \$941,500 during 2006, from fungal stain, while four of the mills that used antistain chemicals also reported losses totaling \$208,000. The majority of losses from the latter group were incurred by

one mill, which reported losses of around \$100,000. No reason was given for the loss.

Mill managers were also asked to indicate how acceptable stain was in different market segments based on the categories of acceptable, neutral or not acceptable (**Table 4**). Respondents indicated that stain was least acceptable in the window and door market, while it was most acceptable in the “other” category or when lumber was sold to professional contractors. More than half of the respondents believed that stain was not acceptable in the home-center/lumberyard market. Previous surveys showed that only 35 percent and 45 percent of respondents in 1994 and 1999, respectively, believed that stain was not acceptable in the home-center/lumberyard market. Even though most respondents did not use antistain chemicals, a

majority indicated that stain was not acceptable in one or more markets. These shifts indicate that moldy wood is less acceptable and attempts to reduce this damage have resulted in increased kiln capacity and use of antistain treatments.

Although some of the respondents differed, the formats of the 1994, 1999, and 2006 studies were nearly identical as was the study population, allowing use to assess trends. Anderson et al. (2002) noted a sharp decrease in the number of mills using antistain chemicals between 1994 and 1999. However, this trend has reversed itself during the past 6 years, most likely due to the increased mold litigation risk. The number of antistain chemicals available to mills has dramatically increased since 1994, indicating that chemical companies are interested in the market and are actively developing new treatments. Chemical selection criteria have also changed. In 1994, most mills used personal experience as their guide. Most mills now

use a number of different criteria, including on-site trials and the experience of other mills for chemical selection. In addition, application methods have shifted away from dip tanks toward more maintenance intensive high-pressure spray units. A number of factors have also remained constant over this 12-year period. For instance, Douglas-fir is still the predominant species treated and perceptions about antistain chemicals have changed little since 1999. However, the perceived acceptability of stain in the market place has consistently decreased across all customer groups, indicating a continual need for either chemical treatment or kiln-drying to prevent damage.

Conclusions

Sap-stain control remains an important component of lumber production in the western United States. The number of

mills treating with antistain chemicals has increased over the past 6 years, most likely in response to the mold litigation risk. This is particularly true for the do-it-yourself market, which is surface-appearance oriented.

Mill managers now realize that stain is not acceptable in a majority of markets, regardless of whether they used antistain chemicals. Increased kiln capacity or reduction in production, not lack of concern about stain, appear to be the primary reasons for discontinued chemical use. The number of chemicals available to mills continues to increase as more suppliers enter the market, while mills seek to make more informed choices about these chemicals by consulting a number of information sources prior to making a chemical decision. The results suggest that the market remains strong for antistain treatments on the West Coast.