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CONVERSION FROM CCA TO OTHER WOOD PRESERVATIVES: A TREATER'S PERSPECTIVE

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Abstract

Chromated copper arsenate (CCA) had been used as a preservative in wood for outdoor home improvement applications for decades. In 2002, CCA registrants announced their intention to voluntarily cancel many uses of CCA-treated wood in the United States. As a result, many pressure treating plants in the US changed from using CCA to alternative preservatives. These alternatives were mainly amine copper quaternary (ACQ-D), copper azole (CA-B), or borate (SBX).

Universal Forest Products successfully changed 24 treating plants from CCA to ACQ-D or to borate. Forethought and planning were crucial to getting this done safely, quickly and efficiently. An outline is included of the design/mechanical, cleanout/chemical, startup, and follow-up conversion phases.

Post-conversion challenges include sorting out what can and cannot be treated with CCA and enforcement of the new CCA label.

Introduction

Chromated copper arsenate (CCA) has been a standard preservative of choice for many wood preserving companies around the United States and elsewhere for decades. This was especially true for products commonly used around the home like decks, patios, docks, picnic tables, landscaping timbers, fencing and boardwalks (1).

On February 12, 2002, the United States Environmental Protection Agency (EPA) announced a voluntary decision by pesticide registrants to eliminate many of the existing uses of CCA pressure-treated wood in the US effective December 31, 2003. Other wood preservatives were available for all uses for which CCA was to be phased out (3). This transition would affect virtually all residential uses of preservative treated wood. The EPA published a notice of receipt of the voluntary cancellation/use termination requests on February 22, 2002, and solicited public comments (2). On March 17, 2003, The EPA granted the cancellation and use termination.

It is important to note EPA had not concluded there was unreasonable risk to the public from these products. Even so, there was a growing demand in the market for wood treated with the alternative preservatives. The voluntary withdrawal greatly accelerated the transition to new alternatives. The result: many pressure treating plants throughout the United States changed the preservative used from CCA to alternative preservatives in order to supply key US markets with CCA-alternative products. This transition occurred mainly between mid-2003 and early-2004.

Only a handful of wood preservatives exist today that are both registered with the EPA and have substantial building code approval to fill the markets vacated by CCA. The two main preservatives available to treaters are amine copper quaternary (ACQ-D) and copper azole (CA-B).

The purpose of this paper is to outline the process used by Universal Forest Products (UFP) to convert its plants from CCA to ACQ-D and to discuss the post-conversion challenge of understanding and enforcing what products can still be treated under the new CCA label.

Part I: Plant Conversion

Four main steps comprised the UFP conversion process: Design/Mechanical Conversion, Cleanout/Chemical Conversion, Start-up, and Follow-up. The actual shift from CCA to ACQ-D preservatives at UFP's 22 treating plants occurred over a 27 week period (including Christmas and New Years weeks)[*] in 2003 although design and planning work began in early 2002. In each plant there were some intricacies to be addressed; however, the same basic outline of conversion was followed. The procedure evolved with time to become more efficient in terms of speed, cost, and quality of results.

Stage I: Design/Mechanical Conversion.

During Stage I, the treating plant was modified to enable the plant to treat with ACQ-D. The plant was still operating with CCA during Stage I. Most Design/Mechanical Conversions were done in 2002, well in advance of the cleanout and actual chemical conversions to confirm plants were ready to switch in a quick manner and eliminate most downtime.

Capacity to hold CCA concentrate was much different than capacity needed to hold ACQ-D concentrates. CCA came in a one-part 60% concentrate, where copper amine and didecyldimethylammonium carbonate ("quat") come in approximately 11% and 50% individual components, respectively. The diluted concentrates forced UFP to add or expand CCA concentrate tanks so they could be used for copper amine and add quat concentrate tanks.

The CCA concentrate mix pump was replaced with a high flow rate pump to deliver the copper concentrate. Quat delivery systems to move quat from the concentrate tank into work tanks were added at all plants.

When switching to ACQ, any brass or bronze in the system had to be replaced. This included anything with a brass or bronze bushing, such as pump parts, safety pressure pop-off valves, cylinder door safety parts, hand operated brass valves for sight-tubes and sample ports, and other miscellaneous fittings.

ACQ concentrates and work solutions will foam under certain conditions. The foam can create major problems in treating plants, including sensor problems and overflowing worktanks. This led to some piping changes in the treating plants as well as the addition of an antifoam mix system. Sumps were rerouted to worktanks rather than water tanks. Return lines were rerouted to the bottom of worktanks with similar changes to the receiving lines on concentrate tanks.

Soft water is required to treat with ACQ. Industrial sized water softeners were added to plants when a certain level of hardness in the water delivered to the plant was determined.

Mold inhibitor delivery systems were made larger and faster, so to deliver the larger amount necessary for treatment and mold control with ACQ.

The average cost for Stage I, Design/Mechanical Conversion, was just over US$80,000 for each plant, including piping modifications, tanks, parts, water softeners (if necessary) and antifoam/quat addition systems.

[*] UFP converted its first plant to ACQ-C in March of 2002 and then from ACQ-C to ACQ-D in 2003. Also, one of UFP's 24 plants was converted to borate.

Stage II: Cleanout/Chemical Conversion.

Stage II, the cleanout and actual conversion from treating with CCA to treating with ACQ-D was performed within a very tight time frame; less than 7 days at most UFP treating plants. It was planned so that plants were close to running out of CCA when conversion started. Plant management ordered or rented safety equipment and cleaning supplies prior to the beginning of the cleanout. Finally, plant personnel were prepped with sessions on safety with an emphasis on permit-required confined space* training.

Following safety training, the next action step was to move any CCA solutions out of the plant because CCA and ACQ are not compatible. CCA working solution and process water were transported to other treating plants where they could be beneficially used.

While CCA liquids were being shipped to other plants, personnel were consolidating all remaining liquids into one tank. As soon as a tank was empty, a crew of 3 UFP employees removed the door to the tank, took out any hazardous waste in the bottom of a tank, pressure washed the inside of the tank, removed the liquid, rewashed the tank, and removed the residue once more. This was repeated for all tanks in the plant as well as the treating cylinders themselves. Typically, three washes were sufficient.

After all tanks and cylinders were cleaned thoroughly, a water flush of the system pipes was performed to remove any CCA solution. Again tanks were emptied of their contents and liquids shipped.

The drip pad area where wood is held after treatment to contain any drips of preservative was pressure washed, along with tank farms, sumps, pits, and trams to remove CCA residues. All waste material was properly disposed of as hazardous waste.

When all hazardous waste was wrapped up, and the plant was confirmed clean, soft water was generated for the ACQ-D treating startup and the first truckloads of copper and quat were taken into the plant's concentrate tanks.

The average cost for Stage II, Cleanout/Chemical Conversion, was approximately US$35,000. This amount did not include hazardous waste disposal fees as the company believed that waste disposal was not truly part of the conversion cost but was more appropriately viewed as normal operating costs for the plant.

Stage III: Startup.

Treating with a new preservative could be frustrating without knowing how the chemistry of the new preservative and the wood work together. UFP had been treating with ACQ for almost 2 years at one location, and learned the basics of treating with ACQ before most plants switched. Startup at a plant was more than just mixing up new tanks of preservative and treating, as several maintenance and physical problems with the plant were identified and remedied on the fly. Plants were instructed to have backup parts in stock just in case.

Following the cleanout/conversion, work focused on getting the plant up and running smoothly. UFP's typical schedule called for the Stage II work to be one week and the Stage III start-up to begin Monday of the following week, typically with a different group from the corporate office. Usually the first charge would be run on Tuesday or Wednesday, but in the best case Monday, and worst Friday depending on problems found.

Troubleshooting to find problems in treating system pumps, valves, piping and software was performed. Flow-meters for mixing concentrates and work tank transmitters were calibrated to make sure the process control computer was dosing precisely during mixes and reading tank

* "Permit-required confined space" refers to a set of regulations promulgated by the US Occupational Safety and Health Administration ("OSHA") applicable to the entry of treating cylinders and process tanks.

volumes accurately, respectively. Process control software was adjusted at each plant to eliminate some excess foaming, and other parameters were changed to fine-tune plant operation. Work tanks were mixed up to working strength and working volumes with the proper amounts of copper, quat, antifoam, mold inhibitor and water only after all calibrations were complete.

Quality control methods on the new preservative solution and wood were gone over with treating personnel during this stage. This included the titration of ACQ treating solution to determine quat concentrations; a significant departure from CCA solution analysis.

Several charges (minimum of 5 of each species/retention level) were treated to qualify in the American Lumber Standards Committee (ALSC) program regulations, with a third party inspector agent on-site to confirm compliance with penetration and retention minimums required in AWPA.

All lumber and timber treated was labeled with new ACQ tags to conform to AWPA/ALSC guidelines.

Overall, the average costs of the startup were about US$36,000 per plant,.

Stage IV: Follow-up.

In the final stage of the conversion, follow up by corporate wood technologists was required with a focus on the efficient use of the new preservative. Most plants received 2 or 3 follow up visits.

Part II: Post-Conversion Discussion on the Retained Uses of CCA and the new Multi-Preservative Market

Understanding what products can still be treated under the new CCA label has proven to be a significant challenge in the conversion from CCA to alternative preservatives. It impacts a company's decision on how to utilize its production facilities and presents an ongoing challenge as it produces products for the new market-place.

Items which can still be treated with CCA are referred to as "retained uses." Retained uses are defined by the revised CCA label. As of June 22, 2004 that label read as follows:

> *" This product may only be used for preservative treatment of the following categories of forest products and in accordance with the respective cited standard (noted parenthetically) of the 2001 edition of the American Wood Preservers' Association Standards: Lumber and Timber for Salt Water Use Only (C2), Piles (C3) Poles (C4), Plywood (C9), Wood for Highway Construction (C14), Round, Half Round and Quarter Round Fence Posts (C16), Poles, Piles and Posts Used as Structural Members on Farms and Plywood Used on Farms (C16), Wood for Marine Construction (C18), Lumber and Plywood for Permanent Wood Foundations (C22), Round Poles and Posts Used in Building Construction (C23), Sawn Timber Used to Support Residential and Commercial Structures (C24), Sawn Crossarms (C25), Structural Glued Laminated Members and Laminations Before Gluing (C28), Structural Composite Lumber (C33), and Shakes and Shingles (C34); and in accordance with the respective cited standards of the 2003 edition of the American Wood Preservers' Standards: Lumber, Timbers and Plywood for Cooling Towers (C-30). Forest products treated with this product may only be sold or distributed for uses within the AWPA Commodity Standards under which the treatment occurred."*

Analysis of the label language reveals two deceptively simple concepts which have far reaching, yet perhaps not widely understood, implications. First, a product must be treated in

accordance with one of the referenced AWPA standards. Second, that treated product must then be used in the manner envisioned by that standard.

There are countless sawn lumber and timber products treated with waterborne preservatives everyday. Many of these products don't fit neatly into any specific AWPA standard and are treated under the generic lumber standard (4). As an example, a southern pine 2x4 could be treated under the generic lumber standard for "above ground use." There are many ways to use this piece of wood not referenced in any other AWPA standard. Unless a specific AWPA standard referenced on the new label can be identified, none of these qualify as retained uses because the generic lumber standard is included on the label only for salt water uses. This would include uses which one could argue are similar to other retained uses.

Another result of the requirement to treat CCA material to AWPA standards concerns non-standard material. Many products are not treated to AWPA standards. None of these products meet the label requirements even if their end use is identical to one of the retained uses. Meeting AWPA standards has been interpreted to include the requirements for quality control and product identification (5).

As for the requirement that products be used in the manner envisioned by the standard, this is perhaps an obvious element of the label but is already being challenged in the market. As an example, the label does not allow lumber to be treated to the standard for permanent wood foundation (6) and then used to build a deck. The AWPA standards for agricultural material, permanent wood foundation, and structural timbers are examples of standards being broadly interpreted by some in the market to justify the use of CCA.

EPA has made it plain there are serious implications for the use of CCA to treat products not included on the new label, and these implications affect every part of the supply chain from the treater to the wholesaler/retailer to the end user. The treated wood itself becomes an unregistered pesticide and provides EPA with a host of regulations to cite in an effort to enforce the CCA label requirements (7).

Another challenge is a rather cavalier attitude expressed by some treaters or purchasers. Whether due to a lack of understanding of the label, a feeling that it is someone else's responsibility, or an outright challenge to those charged with enforcing the label, this attitude cannot be allowed to endure. It ultimately damages credibility of the industry and overshadows the hard work done by the vast majority of the industry. USEPA has attempted to address this by the creation of a guidance document and a commitment to enforce the label through a combination of treating plant visits, retail lumber yard visits, and a mechanism for reporting label violations[†].

Conclusions

A conversion from one preservative to another can be very inefficient, costly and time-consuming if not properly prepared for and executed. Safety during conversion must be a primary consideration, followed closely by limiting downtime of the operation.

Overall, UFP spent roughly US$4,000,000 to complete our conversion from CCA to the next generation of wood preservatives for the Do-It-Yourself market. Improper management of the project from start to finish could cost a company much more in time, effort, money, or quality.

[†] www.epa.gov/compliance/complaints.html

As the industry morphs from a one-preservative market to a market with diverse products fitting more focused applications, the challenges exemplified by the CCA label will transition to a more general challenge: how to ensure that the right products are used for the right end-uses. AWPA standards along with the American Lumber Standards Committee ("ALSC") treated program for third-party inspection provide a framework for specification and identification of "good" treated products, but cannot police the market. The solution to this problem may prove the most difficult part of the conversion.

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