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Treated Wood Overview — A Product Constantly Changing

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Until recently it never occurred to me to put together a *Pallet Enterprise* article about treated lumber. While many products in society utilize treated wood, very few pallets are manufactured from treated lumber. Over the last couple of years, the introduction of heat treated pallets has increased interest in the concept of treated wood products. A recent change in the most common treatment chemicals has altered the landscape of this segment of the forest products industry. This article is intended to be a 101 level educational article about treated lumber and wood treating options. I will only touch on some of the areas of interest. Treated lumber is a complicated issue which requires some technical knowledge.

History of Wood Treating

Much of the early history here came from a booklet published by the American Wood Preservers Institute. Since his early days man has used many techniques and products to protect and preserve wood. Wood used for outdoor applications had been dipped, doused and coated with a wide variety of solvents, paints and shellacs. For interior applications, wood had been polished, waxed and lacquered. After thousands of years, man finally developed an economical and effective treatment method after the middle of the nineteenth century. It was early in the twentieth century before man perfected it to a useful and economical practice.

As early as the early eighteenth century Europeans were experimenting with solutions of mercury chloride and were trying alternative solutions like copper sulphate by 1760. By 1837, a process called Kyanizing (named after one of its inventors) was in vogue which again used mercury chloride, but this depended on total immersion in the solution. In 1838 John Bethell was granted a patent for injecting creosote into wood under considerable pressure, literally beginning a new era in wood preservation.

By the 1880s, many different processes were in use in the U.S., major attention being devoted to the use of zinc chloride with other substances such as glues and tannic acid. The process, known as Allardyce, provided for initial impregnation with zinc chloride and subsequent treatment with creosote; the Boulton process involved boiling under vacuum.

In 1906, J.B. Card patented a process that involved one-movement impregnation with a mixture of zinc chloride and creosote, which became a standard for crossties and remained in use until 1934.

The common treating process throughout most of the 20th century for widely used commercial treating operations was pressure treating. Pressure treating continues to be the method of choice today. Dry lumber and wood products are loaded on cars, rolled into a treatment chamber, put under a vacuum, and then exposed to chemicals under pressure. This sets the tone for absorption by the wood. After a treatment time of several hours, the chemical is drained, and another vacuum eliminates excess chemical before the treated products are removed from the chamber. Treated products are allowed to sit on a drip pad for a number of hours before either placing the products into inventory or shipping them out to a customer. The construction of drip pads, along with reusing treatment solutions, and capturing drip pad remnants for filtration and reuse, are all common to today's pressure treating processes.

While people still use some brush on chemical protections for spot applications, the bulk of wood treating today is done in pressure treated cylinders, particularly for chemicals that require penetration under force. Chemicals like CCA, creosote, and ACQ use similar equipment and processes. Each typically requires a

dedicated system because mixing and changing chemicals from one treatment batch to another can cause serious problems. The switch from CCA to ACQ at the end of 2003 naturally caused treaters to seek ways to make a chemical transition and use their old systems. This requires great care in cleaning because mixing treatment chemicals can cause costly chemical reactions. There are some treaters today who use a single system for different chemicals, but the attention to successfully cleaning a system turns many treaters against this concept.

Chemical Products and Applications

In the late 1800s, creosote and zinc chloride were the two principle treatment chemicals. Creosote proved to be the better option and remained the main preservative through World War II. Penta chlorophenol and CCA came on the scene sometime around WWII. Penta was often used in agricultural applications, such as fencing, and creosote was used in many heavy industrial wood products, such as cross ties and utility poles.

Railroad expansion in the late 1880s and early part of the 20th century helped make creosote the preferred treating chemical for a good portion of the treated wood market through WWII. By the time the 1960s arrived, more people desired treated lumber to make consumer related products. Products like picnic tables and exterior decks helped CCA (chromated copper arsenate) become the green treated lumber that people accepted as being a safe, long lasting product. Although there were occasional cases of concern over the arsenic and chromium elements of CCA, the public at large accepted this chemical as being safe. The wood treating industry had to defend its environmental flanks frequently, particularly by lobbying Congress to prevent unnecessary and potentially destructive regulations and legislation. By the turn of the century, public concern over some of these heavy metals had reached a high level. While the industry generally considered CCA to be the ultimate preservative, all preservatives are chemicals and all utilize metals and elements that are poisonous.

Several waterborne preservatives are commonly used, including CCA, alkaline copper quat (ACQ), copper azole (CA), ammoniacal copper zinc arsenate (ACZA), and sodium borate (SBX). Oil based preservatives, such as creosote and penta chlorophenol, are used for some industrial and agricultural products, such as crossties, fencing, and utility poles. Borates are another class of waterbourne chemicals. They do not have any fixation properties. Instead borates seek moisture throughout the wood. Thus, they can be applied with deep penetration without using pressure treatment. They will seek moisture through the wood and distribute themselves. Of course, they can easily come back out as borate treated wood is exposed to precipitation.

CCA bonds with wood to form what is called chemical fixation that prevents chemicals from leaching out. Some environmentalists have detected levels of arsenic and chemicals around products that are constructed from CCA wood many years after construction and claim there was chemical leakage, when in fact any trace of chemicals came from the sawdust on the ground left during the construction phase, not the wood structure itself.

Because of law suits and environmental concerns, the chemical manufacturers were able to get the significant number of law suits dropped when they agreed to phase out CCA for consumer products, such as decks, furniture, etc. The industry replaced most CCA with ACQ for treating products for consumer applications. ACQ, a relatively new chemical that did not have a long track record, is a much more expensive chemical which makes full utilization of the chemical even more important. Since the end of 2003, most consumer treated lumber products have been manufactured using ACQ. It is much more expensive than CCA, is similar in weight, but has some less desirable characteristics. In addition to being more expensive, ACQ does not have the fixation to the wood property that CCA has. Transition to the new chemical took place more smoothly two years ago than many had expected. While ACQ has taken over for CCA in commercial applications, the EPA does not believe there is any reason to remove or replace existing CCA-treated structures, including decks or playground equipment. In addition, EPA is not recommending that existing structures or surrounding soil be moved or replaced. CCA will continue to be used for EPA-approved industrial and commercial applications.

Four companies are prime suppliers of ACQ – Arch Treatment Technologies, Chemical Specialties, Inc., Osmose Wood Preserving, and U.S. Borax, Inc.

The new chemical formulation has caused significant problems with fasteners. All waterborne chemicals interact with many metals, hence with fasteners. The approved fasteners for CCA and ACQ are similar, but ACQ and copper azole cause more corrosion problems. A common construction nail may gradually corrode in CCA, but it may not last a year in ACQ lumber. The list of fasteners that may be recommended by some people is extensive, but hot dipped galvanized and steel nails and metal connectors are generally recommended; zinc coated (galvanized) fasteners and connectors should provide corrosion protection that is at least equivalent to that of hot-dip galvanized products. Galvanized steel and stainless steel should not be mixed in the same connection. Users of treated wood should check closely with suppliers and chemical manufacturers when selecting the appropriate fasteners. Otherwise, the consequences could be wooden products that look good when built but develop problems far too quickly.

The most common wood species used for pressure treating is Southern Yellow Pine (SYP) which grows across the southern tier of states from East Texas to Virginia. A large portion of SYP is pressure treated for all kinds of applications because few species of wood anywhere in the world take treatment as well as SYP. Its positive inherent characteristics include high strength (one of the strongest softwoods on the market), high nail holding capability, and good durability.

For more information about treated lumber and treated wood products, you may contact the Southern Forest Products Association and Southern Pine Council at www.southernpine.com, or the American Wood Preservers' Association at www.awpa.com.

Wood treating requires knowing what you are doing. Regulations, standards, grademarking, properly handling chemicals, the list of technical things to know and do is long.