# WOOD PRESERVATION - SHOULD WE RECONSIDER OUR APPROACH TO STANDARDS?

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The wood preservation industries in North America have enjoyed excellent growth throughout the twentieth century, first with crosstie treatments using creosote, then with pole treatments using pentachlorophenol and creosote, and most recently over the last quarter of the century with the treatment of construction and residential wood products with waterborne arsenicals, primarily chromated copper arsenate. Production of products treated with creosote and pentachlorophenol has remained steady for the last thirty years with the overall growth of the industry during that time being due almost entirely to the growth of the water-borne sector. However, even in the water-borne sector, growth has reached a plateau in the last 5 years, and chemical usage is declining slowly. This in itself is of little concern, but the reasons for this change and its direction are of vital importance to the future of the industry.

The last five years has seen rapid changes in attitude towards wood products in general, particularly from the viewpoint that production of wood products involves the harvesting of forests, a concept that has become less popular with some in society. During this same period, there has been a sudden awareness and growth in the recycled products market and this is spreading to building products. Steel framing is enjoying rapid market growth, in part by claiming to save trees and to be eternally recyclable, and while this is unlikely to have much overall impact on the treated wood market as a whole, in those areas where treated framing is used steel eventually could make major in-roads. For treated lumber in North America, probably the greatest threat comes from recycled plastic lumber in decking and fencing applications. Such products currently lack the requisite strength properties for applications such as joists and bearers, but they are promoted as offering superior properties to treated wood with respect to splitting, cracking, warping, twisting and other weathering related properties. At the same time they are promoted as being made from recycled materials containing no toxic chemicals. It should be noted that long term testing to back the performance claims is notably lacking.

The vast majority of treated wood used in residential applications is used above ground and exposed to the weather. This market is the most vulnerable to non-wood materials such as plastic lumber. Decks were originally constructed from untreated durable heartwood species such as western red cedar and redwood. While competition between these durable species and treated lumber continues, the changing resource base for both cedar and redwood mean greater production of non-durable sapwood from second and third growth forests, as well as heartwood of lower natural durability, and there is now recognition that untreated sapwood of both species benefits from treatment. This

represents a potential growth market for the wood treatment industry, provided that treatments compatible with the image of cedar and redwood are used.

Both western red cedar and redwood heartwood have given good service life in decks and other residential construction applications. In addition structures made from both species are not only visually appealing initially, they maintain their aesthetic quality for a long time due to enhanced resistance to cracking, splitting, warping and twisting inherent in these species. The advent of preservative treated lumber, extended long term performance of softwoods species such as southern yellow pine, Scots pine, ponderosa pine, radiata pine etc. in terms of protection from biodeterioration, but over time it has become apparent that this protection from biodeterioration is not matched by similar protection from weathering effects. These differences in weathering properties can be ascribed to the inherently higher percent swelling and shrinkage properties of pine species. The lack of protection from these weathering related effects had little initial impact on the growth of treated lumber, but undoubtedly it is now affecting the decision-making process as replacement of the original structures occurs. Effective water repellent additives for CCA treating solutions were introduced around 1989 and these have been shown to have a dramatic impact on the swelling and shrinking of treated lumber in service. However, the final wood products treated with these formulations now being marketed provide little real benefit to the consumer as the retentions of the water repellent additives currently being used by most treaters provide little more than a cosmetic initial water beading effect, rather than longer term wood product stability in service.

The water repellent market may have stalled because of lack of promotion and subsequent financial return to promote the additional benefits to the consumer, a tendency in marketing wood products to approach the lowest common denominator, or perhaps because of a lack of standards to provide an assurance of superior products and product values. It is in regard to the latter aspect that I believe our current approach to standards may be inadequate now and for the future.

The AWPA is the primary standards setting body for wood preservation in North America. The recent approaches from CSA to AWPA provide at least tacit evidence of this even from a Canadian perspective. Within the AWPA standards setting process are embodied guidelines for preservative acceptance. These guidelines address many different aspects relating to the performance of wood preservatives but they fail to address two key factors, namely expected service life of the product, and the weathering characteristics of treated products. These omissions are noteworthy and important to the future of the wood preservation industry.

In the past, the AWPA has generally been, with one or two notable exceptions, very good at developing appropriate standards for the preservation of industrial products such as crossties, poles, piles, etc. In these applications long service life is paramount in the mind of the specifier, i.e. consumer, of the product. As each industrial preservative was developed it was simply compared with the previous one and a relatively, and arguably, flat plateau of performance was obtained at the retentions specified for any particular

commodity. In general it was accepted that the treated wood would not decay or succumb to insect attack for 50 or more years. Other properties of the treated products were generally of minor importance compared with long term service life.

The process of comparison of new preservative systems to existing products has continued to this day, and has been more or less followed in recent approvals of ACQ Type B, Ammoniacal Copper Citrate, Copper Azole, CDDC, and ACQ Type D. A similar approach has been taken with chlorothalonil in the oil-borne preservative area. While this approach remains in practice, it must be questioned whether we are developing and standardizing products that are in tune with current markets for our products. Undoubtedly, for industrial treated products, longevity in service remains the greatest need. Peripheral requirements, for example climbing characteristics of poles have served to favor one preservative (pentachlorophenol in oil) over another (CCA). However, the general philosophy of optimum longevity appears to be in step with the industrial market requirements.

In the treatment of residential lumber, however, the philosophy of maximum service life has to be questioned, especially where materials that are easy to replace are concerned. Recent approaches to building standards revolve around the concept that expected building component service life expectations should be related to the ease of replacement of the particular component rather than the hazard to which it is exposed. In terms of wood components in a structure, this means that structural wall components such as sill plates and framing should last for the life of the structure, say 50 to 100 years because they are inherently difficult to replace. Foundation components would fall under the same expectation. Siding should last 20 to 25 years, as should exterior windows, while decks and fences should be expected to last 10 to 15 years. Using these criteria, our current system of preservative approvals is out-moded and is in danger of becoming obsolete. The current system does not provide treated products which can compete effectively with other materials not subject to the wood preservative industry's criteria and scrutiny. History is replete with examples of highly developed products which are superseded by dramatic changes in technology. Merchant sailing ships, mechanical cash registers, and more recently typewriters are three simple examples.

Wood preservation standards should reflect the needs of the final consumer and standards writing bodies should make a realistic appraisal of these needs. The AWPA is hindered in this respect by the absence of consumers of residential treated lumber, or for that matter retailers of residential treated lumber, from the membership of the organization. However, if we accept the premise of standardizing products based on criteria of a minimum service life, as well as desirable attributes, then we will be able to grow the industry into the 21st century. In the case of decks and fence materials above ground (Use Category H3 under the proposed AWPA Use Category system) this might mean a minimum service life of 10 years, a mean service life of 15 years, cracking and splitting characteristics similar to that of redwood heartwood, and recycling characteristics at the end of service.

How would we achieve standards such as this? Consider that California Redwood heartwood has been accepted as providing such characteristics for many years. A considerable data base exists on the natural durability of this material. One relatively easy concept would be to use redwood heartwood as a control material in test protocols for treatments targeted at Use Category H3. Enough old growth heart redwood exists for such purposes. Over the past 20 years, new treatments for H3 applications have generally been compared to CCA oxide at 0.25 pcf (4.0 kg/m$^3$). At this retention CCA Type C H3 treated southern yellow pine lumber has significantly longer service life from fungal or insect attack than is the case for untreated redwood heartwood. However, as mentioned above, it can be argued that this is a case of overkill on protection from biodeterioration while providing a product lacking in desired attributes in regards to appearance characteristics. Our protocols tacitly accept the notion of relative performance. I believe that substitution of control materials would provide an easy solution to the development of appropriate treatments and retentions.

In a similar vein H1 and H2 treatments should be compared to materials that give known adequate performance. Ironically, H1 treatments are generally for framing (and arguably sill plate) applications where using the building code approach the product needs to last for the lifetime of the structure. In such instances longevity is important and an appropriate control may be CCA at 4.0 kg/m$^3$ in a situation not exposed to the weather. For exterior millwork under H2, pentachlorophenol at 5% in a 3 minute dip has been shown to provide protection for approximately 20 years and should be the control on which to base relative performance. We should seek to provide treatments that are appropriate and adequate for this end use and the consumers expectations.

So how do we deal with in ground applications of treated wood? Here things become more complex. If we deal with things on a commodity basis then the criteria can be set for each different commodity. For poles the criteria can remain maximum service life in the different biodeterioration zones and the treatments and retentions dealt with accordingly. Ironically, moving to a restricted number Use Category system may present challenges due to differing expectations between end uses. I would suggest that for in ground products designed to support a deck or a fence with a 15 years service life then the in ground supports should also provide a 15 year service life in ground contact. Again, it has been generally accepted that redwood heartwood provides a 15 - 20 years performance in ground contact structures. Rather than using southern pine stakes treated to 6.4 or 9.6 kg/m3 with CCA Type C oxide as controls in our development programs, we should consider using old growth heart redwood stakes to provide a more realistic control material relative to the products we are trying to develop.

Does this mean lowering the biodeterioration protection crossbar. Almost certainly. But why provide products that will last forever, be difficult to dispose, look bad in the eyes of the consumer, and be replaced by non-treated wood products just to maintain our pride in longevity? We don't see the manufacturers of the non-treated wood alternates coming to the AWPA and similar bodies asking for our blessing. Instead they are taking a building products approval approach and are then marketing their products on the basis of provide

attributes that the consumer desires, rather than using our industry's industrial product mentality applied to a consumer products market.

If it is to continue to grow, our industry must learn to respond to our customers needs. Our customer base is now more diverse than in the era of industrial treatments. We must acknowledge this fact and ensure that our standards are appropriate for all of our consumers' needs and expectations, rather than maintain allegiance to only one sector of the market. Achieving this goal is relatively straight forward, having the will to do so may be another issue.