CWPA Proceedings, 2008, pp 1-5

TREATED WOOD SERVICEABILITY – A KEYNOTE PRESENTATION

Alan Preston
Vice President – Research and Development
Viance, LLC
Charlotte, NC 28217, USA

1. Introduction

The North American lumber treatment industry is firmly rooted in the provision of treated commodities used in high visibility areas such as decks and fences. While for some thirty years competition for these products came mostly from naturally durable lumber, the last ten years has seen new challenges from wood plastic composites and plastic lumber. These competitors are promoted mostly as providing superior serviceability over time compared with treated lumber products. Options exist to enable treated lumber products to meet this challenge and this paper seeks to address these issues as an umbrella paper for the specific symposium papers that follow.

In order to discuss where opportunities lie in area of treated wood serviceability we need to define the potential goals, the product performance expectations, the various factors that affect "serviceability", issues relating to appearance of treated wood in service, the value and impact of wood protection on the use of wood products as sustainable materials, and finally the value extraction processes needed and the role of marketing for treated wood products in providing desirable solutions and serviceable products. This paper attempts to address these themes.

2. Discussion

In discussing the issue of serviceability in treated lumber products, it is instructive to step back and examine the roots of the industry. These lie primarily in the development of CCA treated SYP in the US east starting in the early 1970s as an alternative to the use of old-growth durable softwoods such as western red cedar and redwood. This development spawned the rapid growth in the business through the following 2 decades in providing long term protection of SYP lumber from decay and termites. The treatment of the sapwood in pine species provided superior decay and termite performance to old-growth heartwood of redwood and cedar, although the lumber integrity attributes during weathering exposure was inferior to those materials.

This last factor was considered to be a tradeoff to be lived with as in most markets there was little competition from redwood and cedar, and no other materials existed which provided equivalent competition. However, the development of an established wood

plastics composites industry over the last decade has now altered that situation. Such WPC products are promoted as providing lower maintenance and superior appearance properties over time as compared with treated lumber in exposed applications.

One of the challenges facing the treated wood products industry from these alternative materials competing in the PTW markets for non- or semi- structural applications, is that their key values being touted are the serviceability aspects, and they are aggressively marketing such perceived attributes. Our industry faces the dilemma that while solutions and opportunities exist with developed technologies for wood protection, such technology is useless without value extraction, which is achieved by providing consumers with desired choices. However, to do this the industry must break out of its dominant non-marketing mentality, a tall order to say the least. Furthermore, there will come a day when structural WPC components become available that would present an even greater challenge to the viability of the PTW industry – and this will inevitably happen at some point.

A number of factors impact the serviceability of treated wood products. These include basic durability from decay and insects, the wood species being used, sawing patterns used and the impact of these on grain orientation, surface finishing which may include the effects of surface planing profiles on serviceability, the effect of moisture control and stabilization technologies included in the wood treatment system, and also integrated or secondary treatments for protecting product surfaces from the effects of weathering which can impact product color over time, as well as substrate and wood structure integrity.

It is a given that preservatives or other protection methods are needed as appropriate for the use, hazard, species and product expectations as regards service life. To a large extent cost considerations drive protection technology choices, at times favoring lower cost over serviceability. It is fair to say that toxicological and ecotoxicological factors can also drive choices that favor lowered perceived risk over durability in service. Life cycle analysis, when carried out in a comprehensive and non-biased manner, can be used as a sound basis for such decisions.

Beyond the voluntary choice of a preservative at any given time, for many years now the choice of preservative has been subject to regulatory processes on biocide use. This is increasingly the case and in recent years the biocide choices have narrowed substantially due to the impact of the European Biocidal Products Directive on available materials. However, biocide choices are still changing and in some areas growing, albeit very slowly, in the post-BPD era, but it remains true that the very high present day biocide regulatory costs preclude the development of a new biocide exclusively for wood protection. In addition, also driven by European initiatives, non-biocide protection is likely to grow, at least in part driven by registration challenges to biocides, especially in countries such as Canada, where there are high regulatory hurdles and lower biological hazards.

3. Wood species effects

The wood substrate is an often overlooked contributor to treated wood serviceability. In consideration of inherent wood stability, it is generally recognized that old growth redwood and western red cedar, as well as slow grown northern pines, most firs and some tropical hardwoods have above average stability. Conversely, fast growing and southern climate pines, lower lignin hardwoods and fast grown plantation softwoods of a variety of species, including redwood, tend to have lower inherent stability during service exposure. Choice of substrate can impact serviceability, but such choices must be coupled with treatment parameters.

Beyond wood species, a universally important, and these days often ignored, factor influencing wood product serviceability, is the effect of sawing patterns and hence grain orientation on performance. Live, or similar high productive sawing, methods produce predominantly flat sawn lumber, which has higher strength values but also is prone to increased checking in service. Conversely, quarter sawing or methods to produce vertical grain lumber have lower productivity, but can produce higher value lumber, with attributes of lower strength but significantly enhance stability in service with decreased propensity to checking. These stability differences are due to the inherent lower radial shrinkage values of wood species relative to the tangential shrinkage values. One approach we are developing is the manufacture of engineered decking with vertical grain surfaces through a combination of preservative and adhesives technologies to provide highly stable and long lasting decking from pine, or other, species.

For quite a number of years outside of North America, deck serviceability attributes have been improved by the use of upper surface profiling on the wood surface using a 6mm diameter semi-circular pattern. Our research over the last decade has shown that the effects seen on radiata pine in Australasia, are also applicable to southern pine decking. Fundamental research on the cause of these improvements is lacking, but studies are underway to determine whether increased surface area and more even moisture loss play a role, or whether the effect of channeling of checks is the predominant cause. Various other profiles have been used, included rounding of top surfaces, and various other grooving patterns, while kerfing of under-surfaces has been used in order to relieve top surface stress leading to unsightly checking. Another concept is to create patterns on the top surface of softwood lumber such that the wood checks in random, non-longitudinal checks, such as see in many hardwood species. This would allow multiple small randomly oriented checks to dissipate wood surface stresses differently, and more pleasingly, than is the case with the usual deep longitudinal checks found in exposed softwood lumber.

Wood protection methodologies to provide moisture control and/or stabilization of treated wood products were developed many years ago, and various forms of these treatments existing in certain market segments in various countries around the world. Their primary function is to prevent wood from checking and distorting in service. Moisture control can be achieved through simple water repellent technologies, although wood species effects complicate applications. Stabilization involves cross-linking techniques, which may or may not be water repellent. In the field of protecting wood products in service from

moisture ingress, there is much scope for innovation, including the development of ultra high water repellency for wood, the use of cost effective non-wax based materials, the use of water soluble water repellents, further development with cross-linking agents to provide dimensional stability and water repellency simultaneously, formulations that are effect in treating and protecting difficult to treat species. Beyond the product needs, this field is also a fertile area for fundamental research.

A final area that has perplexed the wood products world for many years, and remains a significant challenge in providing a cost effective solution, is the issue of wood surface discoloration. This usually comes in the form of surface graying in service. This is caused by a combination of ultraviolet light and water degradation of the wood surface, combined with the development of micro-fungi in these exposed weathering zones. The two effects can be independent of each other, but normally are found to co-exist. The usual approach is to combat these effects with surface coatings applied during service. However, it would be most useful to develop a protection treatment that mitigates the micro-fungal aspects by a slow release of active biocides, slows the UV effects by the presence of UV absorbing pigments or UV absorbers, or through cross-linking treatments to prevent chemical breakdown of surface layers. To say much research is needed in this area in order to provide solutions is an understatement, to say the least.

One hopeful sign of potential progress in this field is that the AWPA recognizes these challenges and in 2006 established a Task Force to develop standards for appearance products. This Task Force developed a draft Protocol for standardization of products for appearance products in 2007 which includes a number of test methods and criteria, including the Canadian-developed decking method. AWPA sub-committee P-6 is now working to develop the necessary test method standards to fulfill the T-2 protocol starting in 2008.

The final challenge for the treated wood industry is to market protected wood products as added value materials with positive attributes. All the preceding technology world is useless without effective marketing to consumers. It is the author's opinion that the wood products industry is undervalued because we sell wood, rather than marketing a value added material. One key reason is that ours is an internally competitive industry, but until there is some type of integrated approach to marketing treated wood products the existing declining trends will continue.

It is ironic that in this era of increasing populations, and decreasing fossil resources, wood from trees provides the ultimate structural renewable material. If we continue to sit back and wait for the future to be ours at some time in the future, our materials may by then be viewed as irrelevant or out of date. A better approach is to actively develop materials and treatments that are both profitable and in the interests of a sustainable world. Wood is not a perfect homogenous material, but we in the treating world can, do and should provide added value inputs to improve on its natural features

4. Conclusions

Treated wood serviceability has become a major factor in consumers' choices for products, wherein treated wood is viewed as being high durability, but high maintenance and as having low serviceability in terms of appearance characteristics. Technologies exist to improve all the factors involved and can make pressure treated wood products the material of choice in a sustainable world. To realize these goals, however, our market approach paradigm will need to be changed in order to market such value added products as performance materials.