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Efforts at AWPA to Create a Pathway for Standardization and Incorporation of Thermally Modified Woods

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ABSTRACT

Thermally modified woods are a nascent but growing industry in North America, which has seen an increase in both the number of producers as well as annual board footage of material produced. These products are being marketed as a sustainable alternative to tropical hardwoods in areas of non-structural, above ground application. The AWPA P9 committee (non-biocidal wood protection) is responsible for the establishment of Task Groups to consider nonbiocidal wood protection methods and the development of protocols for standardization. Thermally modified wood has been a continual action item on the P committee agenda with no real action taking place, except for the production of Guidance Document N in 2012 and years of active discussion. The goal of this presentation is to inform audiences on these continued efforts, report on progress to date, and to present a conceptual pathway for standardization now that sufficient producer interest exists within the American Wood Protection Association.

Keywords: wood modification, non-biocidal treatment, standard development, use class category system

INTRODUCTION

Thermally modified wood (TMW) is becoming increasingly popular in North America with several producers in the continental US and Canada. This technology originated partly at the Forest Products Laboratory through the foundational work of Alfred Stamm and others but saw limited use in North America [1]. Through the European cooperation in science and technology (COST) actions in Europe, TMW has seen huge gains in popularity and production volume [2]. The issue of standardization and eventual inclusion into the AWPA book of standards has been a topic of much debate. Given the maturity of the technology and the growing number of producers, it seems in the best interest of the Association to continue in this endeavor. However, previous efforts at standardization of other non-biocidal treatment methodologies have had limited success in the AWPA and those hurdles are discussed in this paper. The goal of this paper is to summarize current efforts within the P (preservative standard) committees to provide a pathway for adoption of TMW into the AWPA book of standards.

EFFORTS AT STANDARDIZING OTHER NON-BIOCIDAL TREATMENTS

The P9 committee was created in 2009 to develop and maintain standards for wood protection through the use of non-biocidal methods. That same year, individual task groups were created to address the following: naturally durable wood species, barrier systems, thermal modification, and chemical modification. The barrier task group was soon disbanded for lack of interest but was resurrected in recent years with a focus on marine pilings in order to reduce environmental impacts of wood in aquatic environments. The bulk of progress made within this committee has been on naturally durable woods as well as on chemically modified wood. These efforts are summarized below.

Naturally Durable Wood

The naturally durable wood task group was chaired by Dr. Paul Morris (FP Innovations Researcher, Canada) and was active from 2009 to 2012. After several requests back to the executive committee, it was determined that the task group was unable to proceed in developing a standard for naturally durable woods. The main reason being variability in product performance over the wide range of species. The task group eventually concluded that there was no path forward that would result in a meaningful standard for naturally durable wood. The efforts of this task group are documented in Morris et. al (2011)[3].

While the outcome of these efforts was mostly unsuccessful, Morris et al. (2011)[3] offers good discussion of the challenges that arose, which could be easily applied to current efforts within the Association aimed at standardizing TMW. The lack of a supporting trade organization or applicable QA/QC methods are two vital pieces to this discussion that overlap with the current hurdles in TMW standardization. Additionally, the issue of grandfathering species already listed in the building codes for TM seems reasonable, but technical literature needs to be developed on best use practices and maintenance.

Acetylated Wood

In 2010, Appendix XX was submitted to a task group within P9, which was eventually converted into Guidance Document L [4] That same year, three proposals were submitted to the committee by Eastman chemical: a proposal for a new P59 standard for acetylated wood [5], a proposal to recommend 16% bound acetyl for UC1-3B, and a proposal to recommend 16% bound acetyl for UC4A. Both proposals recommending the 16% bound acetyl were modified on the floor to reflect an increase to 18% bound acetyl, which the membership considered to be more in line with the data available on performance of acetylated wood at the time. The P standard proposal was approved along with the proposal to recommend 18% bound acetyl for above ground use. The ground contact 18% bound acetyl proposal received a No vote that was deemed persuasive and therefore was referred back to the committee. No proposals were submitted between 2011-2014; during this time there were substantial changes in leadership due to changing personnel with the committee. In 2017, a proposal was submitted to recommend a UC4A retention for 20% bound acetyl and that the lower 5% tolerance limit for a charge must exceed the minimum, which passed unanimously. The P59 standard for Chemically Modified Wood was last reaffirmed in 2022 with unanimous support. Additionally, an A standard was also created under the purview of P5 for determination of percent bound acetyl [6].

The outcome of these efforts were successful in creating a path for standardization of acetylated wood. However, no commercial acetylated systems have been approved through AWPA to date and instead standardizations have been completed through the ICC-ES evaluation service report (ESR) process and acetylated wood has yet to be included in either Section U1 (User Specifications for Treated Wood) or Section T1 (Processing and Treatment Standards) in AWPA.

PROGRESS TO DATE ON THE ADDITION OF TMW TO AWPA

In 2009, an instruction was created under the purview of P9 (non-biocidal treatments) to evaluate the thermal treatment of wood. Each task group was instructed to appoint a chair and members, establish task group objectives/deliverables, and set timetables for completion of work. In 2012, the first discussions were held at the AWPA meeting in San Diego, CA, USA and as a result, a draft guidance document was produced. One main topic of discussion was centered around the fact that TMW does not seem to perform well against termites and that since large portions of the country do not have termite pressure, TMW might be suitable in those areas. In 2013, a draft guidance document was proposed by Dr. Jerry Winandy (Forest Products Laboratory) and following a discussion on the inclusion of a "standard reference preservative" for field tests, the proposal was accepted unanimously. The following year, formatting changes were made to this same guidance document to bring it into alignment with the newly formatted guidance document A and was approved unanimously and was incorporated as Guidance Document N (AWPA 2023d)[7]. The thermal modification task group was disbanded in 2014, only to be resurrected in 2017 due to a growing number of producers joining AWPA. The discussions in 2018 were focused on quality control validation measures for TMW and a request was issued to P5 to address this topic. In 2020, the TMW task group was again disbanded, citing the prevailing opinion that TMW is very difficult to standardize given the number of process variables that could be included and the absence of analytical tests to confirm adequate modification. A lack of producer interest in North America was stated as further confounding the issue. Shortly after however, producer interest began to increase in the Association around TMW, and in 2021, work began on a technical summary of academic and commercial progress on thermal modification in North America. This summary has yet to be published but is nearing completion. During the 2021 meeting, a motion was made to consider a new use category for non-structural, non-insect applications and to remove the termite requirements from Guidance Document N, which both passed unanimously. In 2023, discussions were re-started on creating a joint task group with P5 to determine suitable analytical methods for TMW and it was also decided to hold this symposium at the 2024 Annual meeting.

HURDLES FOR NON-BIOCIDAL TREATMENTS

Efforts aimed at standardization of non-chemical based treatments, including naturally durable wood, acetylated wood, and thermally modified wood, have highlighted some shared challenges.

- **Lack of consensus on appropriate QA/QC methods –** Thermal modification is a tightly controlled process that would easily lend itself to quantifiable measures of wood modification [8], but there is on-going debate as to which analytical methods are best suited and what can feasibly be implemented in practice at a commercial facility [9]. This same issue was raised repeatedly during standardization efforts for acetylated wood and many analytical methods were proposed as a result. These methods would be analogous to the various A standards that currently exist for treated wood products.
- **Lack of a unified trade association –** In 2019, there were efforts to charter a North American Thermally Modified Wood Association, but at the time there were not enough producers and those efforts simply timed out. Given the higher numbers of producers currently operating in North America, this could be revisited in the future. The existence of a dedicated trade association specific to thermally modified wood would provide a platform for advocacy, outreach, and education to help inform end users.
- **Little information on suitability of North American wood species to TM processes –** Similar to chemically modified wood, most European processes rely heavily on consistent wood material properties to reduce product variability. This includes using clear grained woods that are of uniform density and predictable quality (e.g., radiata pine). There are many new potential markets for utilization of North American wood species, some of which constitute either underutilized species or flammable fuels marked for reduction (e.g., ponderosa and lodgepole pine, cedars, junipers, various hardwoods). Use of these materials for wood modification could provide an excellent means to meet these goals (Kocaefe et al. 2011)[10]
- **Conflicting data on insect resistance –** the majority of scientific literature indicates low to non-existent resistance of TMW to subterranean termites, which are present across much of the continental US. Discussions to date have included the development of use class categories that define areas of low termite pressure or alternatively to explore supplemental/synergistic treatments that may impart additional insect resistance.
- **Defining proper markets –** as TMW is more expensive than pressure treated lumber, it is not really a direct competitor in these markets. However, TMW does provide a potential alternative material for more specialized market

demands, such as those that have traditionally relied on use of tropical hardwoods. Producers and specifiers of treated woods should not consider modified woods as a threat to their markets as it still has limited usage, especially in areas of termite activity (Gamache and Espinoza 2017)[11].

THE PATH FORWARD

For standardization of TMW to be successful, the following items need to be addressed:

- ✓ Define a use class category for TMW
- ✓ Develop/recommend test methods for QA/QC of TMW
- ✓ Provide end user technical literature on the proper use and maintenance of TMW
- ✓ Test additional synergistic treatment options that could be used to increase insect resistance
- ✓ Obtain long term field test data for TMW in a variety of climate conditions
- ✓ Explore the suitability of North American wood species for TM processing

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