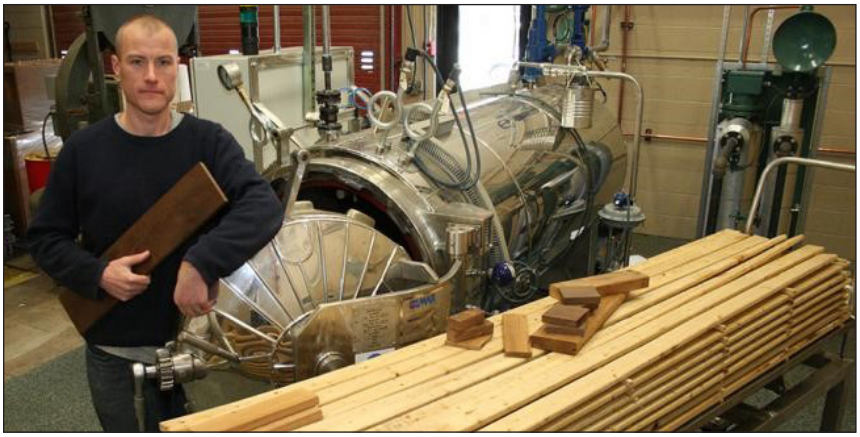
RESEARCH in Progress

Forest Products Laboratory

Improving Exterior Performance of Thermally Modified Timber (TMT)

Thermally modified timber (TMT) is a popular product in European markets, where increasing restrictions leave fewer options for durable wood to be used in construction (Militz 2008). TMT is a nascent but growing market in North America, with an increasing number of producers each year (Sandberg and Kutnar 2016). TMT presents an excellent opportunity for wood utilization in moderate exterior exposure, such as elevated decking, exposed vertical handrails of bridges, and horizontal cladding. This potential pairs well with the USDA Forest Service commitment to hazardous fuels reduction and improved utilization of urban forest timber in that target species could be converted into value-added products through thermal modification.



University of Minnesota–Duluth (UMD) research associate Matt Aro pictured with the UMD pilot thermal modification kiln. This kiln will be used to produce thermally modified materials for this project.

Background

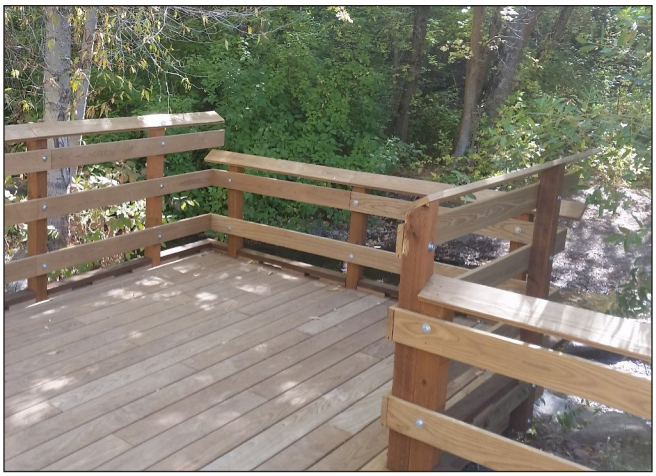
Efforts are currently underway at the American Wood Protection Association (AWPA) to develop quality control protocols for the production and eventual standardization of TMT. However, limitations exist for the current use of TMT in certain applications. For example, severe biodeterioration hazard regions (such as the Southeastern United States) and areas of high termite pressure are currently not suitable for TMT because it possesses limited resistance to insect damage (Esteves and Pereira 2008), especially in ground contact. In addition, data on environmental impacts of thermally modified wood are unavailable.

Objective

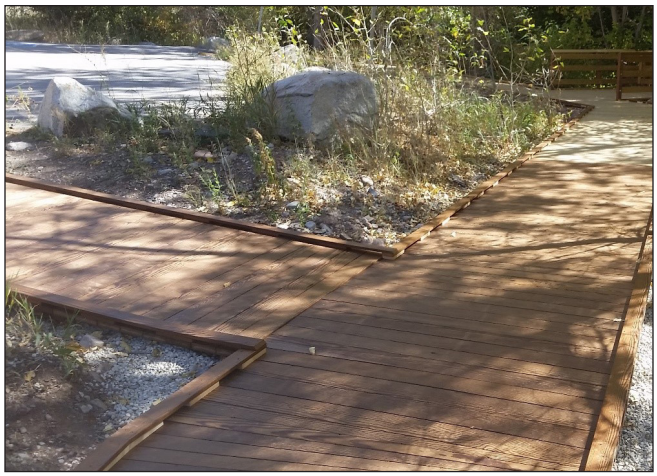
The objective of this project is to provide much-needed baseline data that would lead to increased use of TMT, particularly in severe-hazard regions. Ultimately, this research has potential to grow the TMT market and provide economic returns to regions that harvest wood and to manufacturers and distributors of TMT.

Approach

The University of Minnesota Duluth Natural Resources Research Institute (NRRI) will provide thermally modified woods of species identified by the Forest Products Laboratory (FPL) as of interest and will conduct mechanical tests of TMT stocks. FPL will conduct leaching tests to provide baseline data on potential adverse environmental impacts that might hinder the use of TMT; NRRI will analyze leachates



Decking of commercially available thermally modified ash installed in southern Utah. (Photo provided by Paul Cowley, Uinta Wasatch Cache National Forest.)



Thermally modified yellow pine, also currently commercially available, with thermally modified ash toe rails installed in southern Utah. (Photo provided by Paul Cowley, Uinta Wasatch Cache National Forest.)

for chemical composition. Because termite resistance is a vulnerability of TMT, FPL and NRRI will jointly explore the compatibility of TMT with chemical treatments to increase termite resistance. Finally, TMT will be installed in a demonstration walkway at FPL to compare its performance with previously installed chemically treated, naturally durable, and composite decking and handrails.

Expected Outcomes

If thermally modified wood proves to be suitable for the targeted wood species, which will include lodgepole and ponderosa pines, new markets would open for utilization of these species and their removal from forest lands would be accelerated. The outcomes of this research will also provide new data on the environmental impacts of thermally modified wood and new treatment options that may improve termite resistance. Improved termite resistance is a much-needed goal for thermally modified wood and would increase its utility in more southern locations with higher termite pressure.

Timeline

Wood species are currently being selected for the project, with thermal modification set to begin in spring 2019. Chemical and mechanical tests will be completed by fall 2020, with aboveground evaluations performed for a minimum of 5 years. A demonstration walkway will be installed at FPL at the conclusion of the project and inspected annually for a period of 10 years.

Cooperators

University of Minnesota Duluth

USDA Forest Service, Forest Products Laboratory

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References

Esteves, B.; Pereira, H. 2008. Wood modification by heat treatment: A review. BioResources. 4(1): 370–404.

Militz, H. 2008. Processes and properties of thermally modified wood manufactured in Europe. In: ACS symposium series, vol. 982, pp. 372–388. Oxford University Press.

Sandberg, D.; Kutnar, A. 2016, Thermally modified timber: recent developments in Europe and North America. Wood and Fiber Science. 48(1): 28–39.