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Global Mass Timber Panel (MTP) Industry During the COVID-19 Pandemic: Initial Findings

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Abstract

For nearly two years, the COVID-19 pandemic has continued to affect global economies in various ways. It has been disrupting supply/value chains of manufacturers in all sectors, and the mass timber panel industry has not been an exception. However, the exact extent of the impact is difficult to measure by conventional means because the mass timber panel industry is specialty oriented and does not follow a commodity model of other forest products sectors. It has navigated without losses the global recession of 2008. Global surveys of the industry conducted before 2020 have hinted an exponential increase of its output volume (projected more than 2 million cubic meters for 2020) and a healthy growth in regions outside Central Europe. The objective of presented project was to use another survey designed to capture the effect of current crisis. The paper presents preliminary outcomes available ahead of the formal conclusion of that survey.

Keywords: Cross-laminated timber, CLT, CLT business, CLT manufacturers, MTP business, MTP manufacturers, survey, industry survey.

Introduction, scope and main objectives

The global economy, fueled by sustainability concerns to save the planet, is moving towards using renewable materials for producing sustainable products. This trend has accelerated the use of wood in many aspects of life, including as construction materials. Wood is believed to make the urban and built environment a more sustainable space by providing an alternative to steel and concrete construction (Milaj et al. 2017).

With current innovations in engineered wood products, such as mass timber panels (MTP) and advanced construction technologies, wood has been increasingly perceived as a viable option for high-rise building material. Compared with concrete and steel buildings, high-rise buildings made mostly from wood are perceived more aesthetically pleasing, creating a positive living environment, and using materials that regrow (Larasatie et al. 2018). Due to these reasons, wood has important roles for achieving sustainable development goals (SDGs), particularly goal no. 11 (sustainable cities and communities) and no. 12 (responsible consumption and production).

The MTP industry is most prominently represented by adhesive-bonded structural cross-laminated timber (CLT), a commercially fabricated massive composite panel product comprised of cross-layered pieces of dimension lumber or structural composite lumber (SCL) bound together by structural adhesives. However, in this paper, we include some information on similar cross-laminated mass-timber panels made of dimension lumber but bonded with nails or hardwood dowels. While the most apparent distinction between these three is the way the layers are bonded together, they also differ substantially in the raw material sourcing, manufacturing technologies, load bearing capacities, and, consequently in the scope of potential uses.

Based on two global MTP industry surveys conducted in Year 2016 (the first survey) and 2019 (the second survey), 46 plant tours, and supplemented with information obtained from other sources, we observe increasing production of a complimentary set of cross-laminated, of mass timber panel products using glue, nails, wooden dowels and other alternative panel integration systems (Albee et al. 2018; Larasatie et al. 2020; Muszynski et al. 2017; 2021; 2020). In most countries outside the Alpine Region of Europe, growth of the MTP industry has been encouraged by governments motivated by the desire to find a stable, economically viable outlet for substantial volumes of domestic lumber of lesser quality.

The state of the MTP industry at the end of 2019 could be characterized as strong. At that time, we estimated the global annual output of the CLT industry to be approximately 1.44 million m³, based on 60 production lines. The global annual per-shift capacity in 2019 attributed to 58 specific production lines was about 0.94 million m³. The Alpine region still accounted for over 70% the output volume and nearly 62% of the annual per-shift capacity (Jauk 2019). Accounting for known CLT operations for which the produced volumes/capacities were outdated or not available, the total 2019 output was estimated to be in a range of 1.6-1.8 million m³. Considering the number of high-capacity plants that came on line or reached full capacity in 2020, annual production was expected to reach 2.0-2.5 million m³, or more than twice as much as estimated output volume in 2015/16 (Muszynski et al. 2017).

At the threshold of the 2020s the mass-timber panel (MTP) industry continued its exponential growth across the globe, including production on each of the inhabited continents. More than 25 years into development of CLT technology the industry still felt young and full of potential. However, that upbeat picture did not include the COVID-19 pandemic. The big question since its onset in the first quarter of 2020 is how the pandemic impacts the MTP industry and what are the perspectives of MTP players regarding the post-pandemic new normal. Therefore, in this paper, the aim of the 2021 survey (the third survey) has been to capture the effect of the global COVID-19 crisis on the MTP industry.

This paper is based on the initial findings of the third survey, along with previous reports of the first and second surveys (Larasatie et al. 2020; Muszynski et al. 2017; 2021; 2020). The principal premise of this work is that existing CLT operations across the globe provide a living laboratory for understanding the state-of-the-art and the development of the CLT industry.

Methodology/approach

The questionnaire for the third survey was carefully adapted from the first two. The changes focused at replacing a set off questions related to more static aspects of the technology with questions related directly to the effect of the pandemic. The updated survey was translated into seven languages: German, Italian, French, Japanese, Russian, Spanish, and Chinese by a professional translation company based in the U.S. Each translation to a foreign language was then translated back to English by native speakers of the respective languages who were familiar with the industry and the professional terminology used in the survey. Divergences between original and back-translated version were then discussed and corrected.

Each of language version of a questionnaire was placed into Qualtrics, an online survey platform, for appropriate delivery for easy access by the target respondent. Each respondent also had access to the English version of the questionnaire. We generated unique survey links for every targeted respondent to check the progress of their responses and guide follow up contacts.

Our population was 122 global mass timber panel (MTP) manufacturers known to the research team at the time of deploying the survey. The list of companies used in the first and second surveys were revised and expanded to include a possibly complete representation of companies producing cross laminated panels constructed with mechanical connectors (nails and hardwood dowels) as well as companies who launched production until early 2021. The information on new companies was acquired through trade journals, online

searches, personal contacts, and regional trade associations. Whenever possible, the questionnaires were sent to individual contacts, targeting company owners, executives, sales managers, and/or production engineers. General company emails were used when no personal contact could be identified. Data collection was incomplete at the time of this writing, but consisted of 15 responses, representing a 12% response rate.

Initial findings

To ensure anonymity, information is presented in aggregate format and when discussing regional differences, the data is parsed by large regions defined in a way to avoid exposing information from a single manufacturer (Figure 1). Nearly half of responses comes from North American companies, followed by other countries in Europe than Alpine region (27%), Asia Pacific including Australia and New Zealand (20%), and Alpine region in Europe (0.07%). These companies are varied in their annual MTP production output, ranging from one to six digits of m³/year.

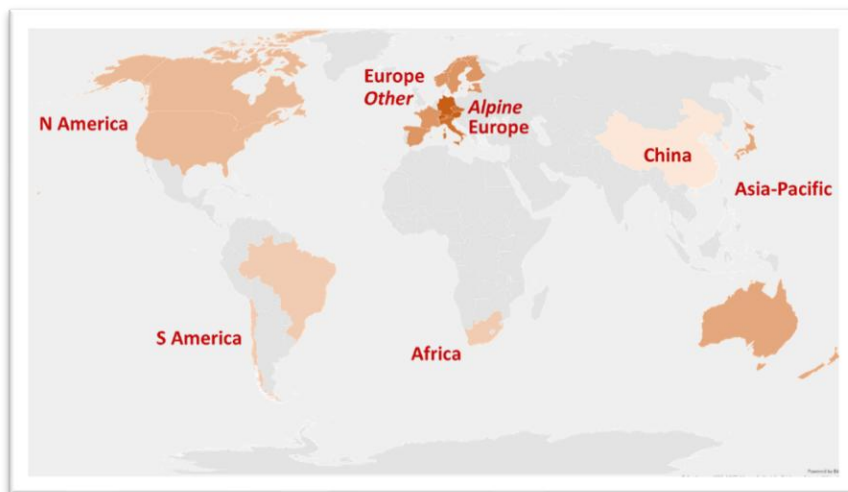


Fig. 1: CLT/MTP producing regions.

Ownership of the CLT/MTP plants varies from family enterprises to international holdings. Since almost all panels are custom produced for specific projects, there is no size standard for MTP panels. As a result, press types and sizes greatly varied (Figure 2).

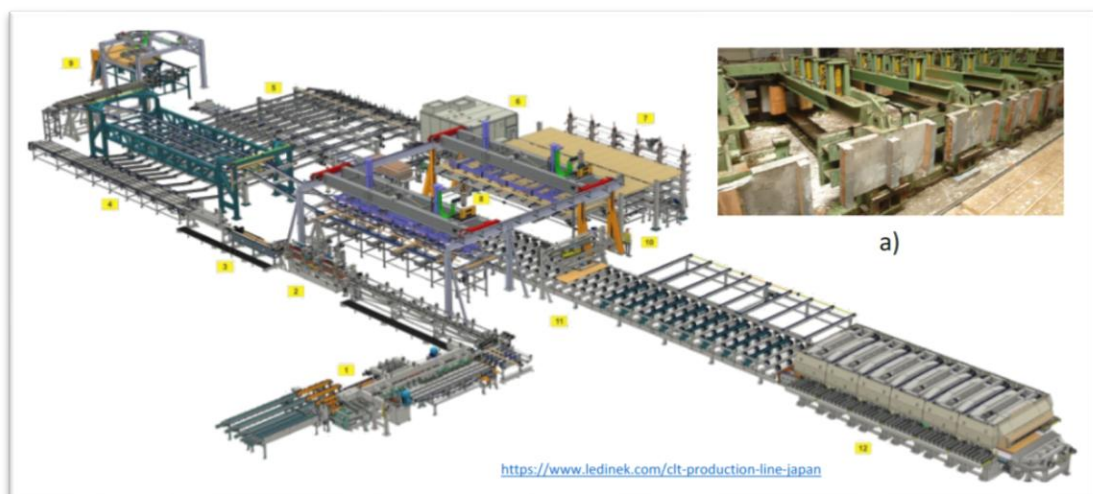


Fig. 2: a) DYI hydraulic press; b) press embedded in a turn-key automated line.

When asked to compare their CLT/MTP production before the outbreak of COVID-19 and following implementation of various closures and restrictions to their current production, our respondents to-date are perfectly divided into three categories of those who managed to increase the production, some were forced to decrease the production level, while others maintain the production at the pre-covid level. For companies who stated an increased production, it is mainly due to previously planned business expansion. While companies experiencing a decreased number cited changes in demand as the cause.

COVID restrictions on the workplace and the inability of employees to work due to COVID (like) symptoms have affected one company to reduce 75% of its production, compared to the pre covid. The other company, with 70% of decreased production than the pre covid mentioned an increase in raw material cost as one of the major problems.

Three of our respondents mentioned there are changes in their markets before and after COVID-19. Two of them have an increase in medium-scale public buildings while another respondent has more demand in single family residential housing for the last year.

Discussion and conclusions

Since the publication of the first survey (Muszyński et al. 2017), substantial production capacity has been added outside the Alpine region of Europe, including a new plant in South Africa, a pilot plant in China, two short lived lines in Indonesia and feasibility studies conducted in South Korea, Brazil, and Chile. In most countries outside the Alpine Region, the growth of CLT/MTP industry has been encouraged by the governments. It is motivated by the desire to add economic values for their domestic lumber, with some lesser quality species. The incentive programs used as a tool in these campaigns vary by country in terms of scale, form, and duration. It is important to note that not all of these programs are successful.'

Despite a history of over twenty years in Alpine Europe, cross-laminated timber is still a relatively new product. Industrial organization theory suggests that innovativeness differs across an industry's life cycle (Utterback 1994). Product innovation is higher during early stages of the life cycle and declines as industries mature, while process innovation gains importance in later stages. Evidence of this early product innovation is creation of dowel-bonded, cross-laminated panels; nail bonded, cross-laminated solid wood wall; mass plywood panels; and dowel laminated timber (DLT) decks, produced in North America, in which all laminations run parallel to each other.

Given the unique nature of the industry, we are not confident that mass timber panels will follow the theorized pattern where one dominant product design is accepted, becomes a standard, and subsequently manufacturers concentrate on process efficiencies. It is important to stress that the mass timber panel industry is an exception to the traditional commodity-oriented forest products industry at large, even if one compares it to other sophisticated Engineered Wood Products (EWP) such as glulam, Laminated Veneer Lumber (LVL), Parallel Strand Lumber (PSL), or I-joists.

Large panel dimensions, weight, and high unit value work against standardization (Muszyński et al. 2021). In fact, almost all mass timber panels are custom manufactured for specific jobs, which requires a substantial level of flexibility in the manufacturing process. Previous findings show that a very low percentage of mass timber panels are produced as "blanks" (Muszyński et al. 2017), and even these are made "to order", not placed into inventory. Due to this, we do not expect a significant amount of standardization or commoditization to take place in the short to medium time frame. This is despite the fact that standardization is the normal approach for mainstream forest sector companies when they develop new products, and is an expectation often expressed by experts both within and outside the industry.

When considering the development of the mass timber sector, it must always be kept in mind that manufacturing mass timber panels is one component of a complex process that results in a final product, a usable structure. Panels are not directly marketed to general consumers. Success of a panel manufacturing

operation requires a deep immersion in a complex building ecosystem and a greater than in traditional construction technologies level of integration of project management along the supply chain. This is why many mass timber panel producing companies house their own engineering design teams and almost as many own construction services companies. Vertical integration through control of these operations within that ecosystem assures a seat at the table and helps guarantee a market.

The adoption/diffusion of a new product into the market is typically a lengthy process led by “innovators” (Rogers, 2003). The signature mass timber buildings being created around the globe today are designed by innovating teams which almost invariably include panel manufacturers along with partners representing other elements of the supply chain involved in projects from their earliest stages. Early adopters learn from the experiences of innovators. If the outcomes achieved by the innovators are sufficiently positive, these early adopters then enter into the picture, and this is when product volumes can see significant growth. Eventually, the less innovative members of the marketplace also adopt the product or technology. The ecosystem described above likely slows the adoption/diffusion process since alignment of multiple innovators is necessary, not just a single buyer adopting a new product.

Given currently available information, we feel it is safe to predict further product innovation as the global mass timber panel industry continues slow- to medium-paced growth, even as the ultimate impact of pandemic on the industry remains unclear. It is also safe to say that innovation in the production of panels is closely related to innovation in connectors, construction technology, integrated project management and a constellation of allied products and services they depend on.

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