

engineered wood
and panel solutions



Accelerating Global Wood Products Growth

PELICE Conference | April 13, 2018 | Atlanta, Georgia
By David Jones, Global Vice President, Hexion Inc.

§ Trends

- Population growth, urbanization
- Trends in style and materials are changing

§ Growth opportunities

§ Always a focus on sustainability

Trends

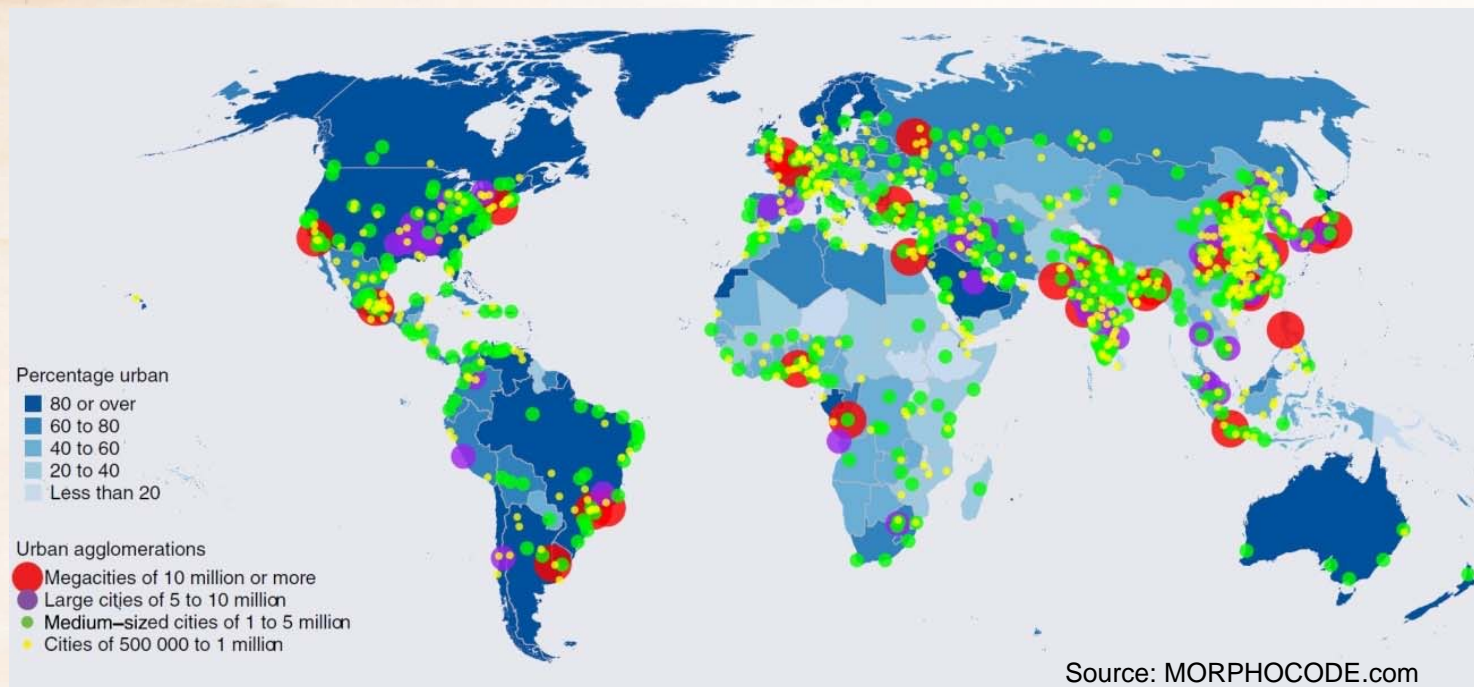


- § Diverging Global Population Trends
- § Urbanization
- § Emerging Economies Gaining Wealth
- § Intensified Global Competition for Resources
- § Increasing Pollution Concentration & Load
- § Technology Convergence



Source: Frost & Sullivan

- § By 2040 2.5 billion more people will live in an urban area
 - Moving from forest or farm to the city
- § Still want to connect with nature
- § Trend in biomimicry – Innovation inspired by nature



Design Trend Toward More Open Rooms Engineered Wood has Played Important Role

Airy, open rooms:

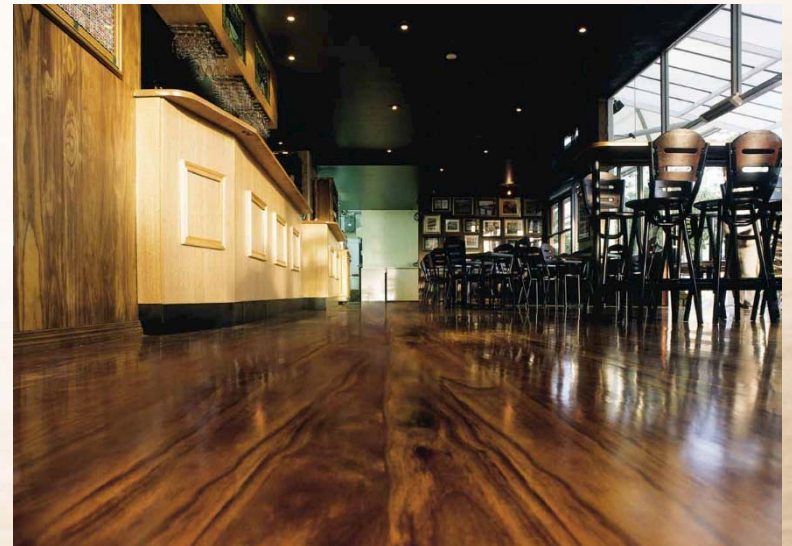
- § Higher ceiling height
- § Larger spans between support posts or walls
- § Larger window openings
- § Floor-to-ceiling windows
- § Exposed pipes and vents in urban buildings



Interior Designs are Using More Wood Wood Floors add Beauty, Style

Exciting Hardwood Flooring Trend

- § Carpet out of style now
- § Tile being replaced w/wood flooring
- § Options abound:
 - Improved durability
 - New colors
 - Easier installation
- § “Wood Look” used by tile industry



Higher-end Designs Include More Wood Seeing More Wood Exposed Overhead

Beams & Ceilings of Wood



- § Exposed wood glulam beams are popular in urban buildings
 - Provide structural support and beauty
- § Ceilings of wood or exposed wood in older buildings
- § New option to leave CLT ceilings exposed



Tall Mass Timber Buildings Headlines About Wood are Abundant



'Timberscrapers' could soon dominate urban skylines

Andrew Tarantola, 09.28.17

Timber Epoch

**How mass timber could
transform our cities (really)**

By Matt Shaw • November 14, 2017

August 7th 2017

**A GLIMPSE INTO THE
FUTURE: MASS
TIMBER PROJECTS**

**Would you live in a
wooden skyscraper?**

By Warren Cornwall Sept. 22, 2016

**Proposed timber tower
shoots high into Chicago's
sky**

Adam Williams October 14th, 2016

Is this the new “Age of Wood”?

Growth Opportunities

Hexion Provides the Enabling Technology for One Of The Most Sustainable Products – Engineered Wood



- § Important for Hexion to stay aware of trends and growth opportunities
- § New resins and adhesives require many months of development time
- § Testing to meet all requirements can be time consuming



Resins & Adhesives Enable Engineered Wood

Tall Wood Building Growth

How much will we see in the next 5 years?



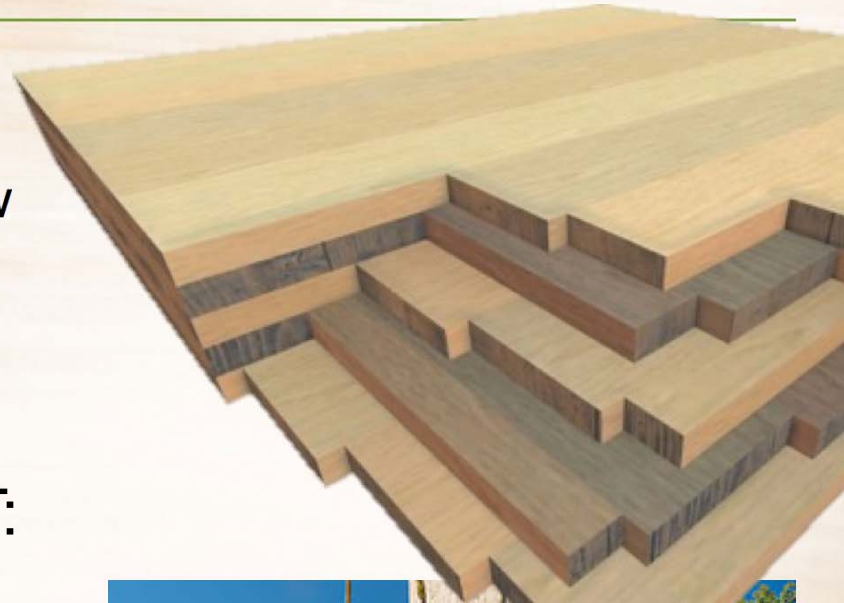
Tremendous potential

- § MPP/CLT producers up and running now
- § Building codes being evaluated
- § Architects busy designing new buildings

Hexion's new adhesive for MPP/CLT:

- § MF adhesive with minimal waste
- § High heat/fire resistant adhesive
- § Excellent manufacturing productivity
- § UL GreenGuard Gold certified

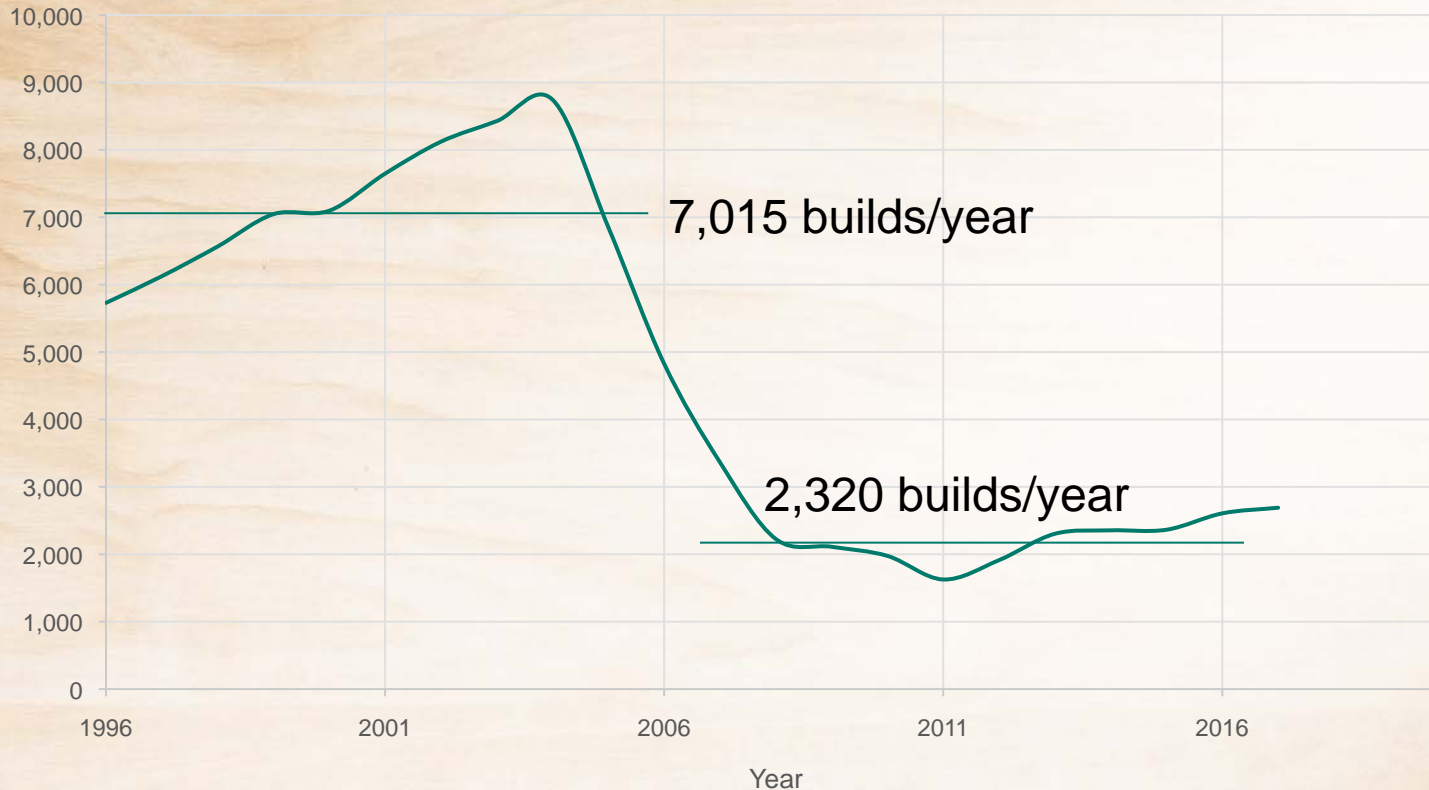
MPP/CLT Growth Just Starting



Are New Home Sales the Path to Growth?

Columbus, Ohio Case Study

New Home Sales Columbus, Ohio



Behind the data:

Land is available

Labor is tighter,
but available

Incomes only
up slightly to
\$58,000/yr

Home values
way up to
\$350,000 ave.

Source: The Columbus Dispatch

Affordability is still an issue

A Time for Modernization Particleboard & Medium Density Fiberboard



Advanced Mills Driving Growth

- § New mills coming online in North America
- § Increased focus on integrating the furniture/flooring value chain – less imports?
- § Requires faster curing resins
 - Every new line will commission with amino resin technology
- § Anticipate older mills may shift to specialty products
- § EPA TSCA Title VI - CARB II emission levels are now in place



New Product Development for Growth Hexion's Current Wood Focus Areas

Research Project Focus

- § Outdoor living areas
 - Beautiful decking boards
- § Fire Life Safety
 - Protective coatings for wood
 - Heat resistant adhesives
- § Faster processing
 - Continuous OSB line resins
 - High speed PB line resins
- § Increased durability
 - Moisture resistant
 - Pest resistant



International Growth

Look to Latin America, Russia & Africa



International Markets Picking Up

§ Central/South America

- Growth returning
- PB & MDF lead the growth
- Still struggling with “wood culture” for residential homes

§ Russia

- Excellent supply of wood
- OSB, PB & MDF growing
- Still difficult to do business

§ Africa

- Still too early, but has potential

Always a Focus on Sustainability

Wood is an Amazing Material

§ Wood is Low Cost, Renewable Resource

- Powered by sun, locally available
- People now understanding benefits of a managed forest

§ Compared to Wood:

- One ton of concrete utilizes 5x more energy
- Steel utilizes 24x more energy

§ Engineered wood/accessory products can use up to 95% of each tree



Sources: Environment Industry Magazine, Popular Science, ACC

Forestry for a Low-Carbon Future

United Nations Climate Change Strategies



Food and Agriculture
Organization of the
United Nations

Forestry for a low-carbon future

Integrating forests and wood products
in climate change strategies



FAO
FORESTRY
PAPER

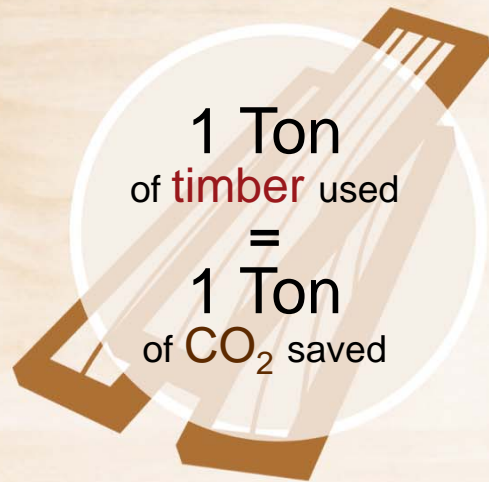
177

Wood Key to Hitting Paris Agreement Goals

- § 177 page paper about integrating forests and wood products
- § Forests & wood products can help reduce global warming to “pre-industrial” temperatures
- § Forest management can increase carbon sequestration

Architects and Designers are on Board They understand the Wood Sustainability Story

Wood has Excellent Lifecycle Benefits



Sources: Environment Industry Magazine

Wood Has a Great Sustainability Story

One of the Easiest, Best Ways to Sequester CO₂ - Wood Framed Houses



million tons/year
of CO₂ sequestered *just* by Hexion's global customers

Formaldehyde Emission Update

New EPA Rules and Science are Reassuring



- § EPA TSCA Title VI – CARB II levels for board products – compliance date (manufactured by date) June 1, 2018
- § Since 2010 – with 30+ additional scientific publications – scientific landscape is reassuring - current standards and safeguards are protective
- § Hexion is supporting a broader chemical industry effort with retailers on their chemical strategy
- § Formaldehyde is a naturally occurring and essential compound
 - Human blood: \approx 2500 ppb (constant)
 - Human breath: 1.0 – 2.0 ppb

Recent 2017 Publication Assessing Indoor Formaldehyde Exposure

- q Evaluated approximately 32,000 indoor air samples
- q Substantial majority were <40 ppb. That is well below the World Health Organization (WHO) safe indoor air guidance of 80 ppb.

Data from Sheehan et al 2017 . Potential Exposure and Cancer Risk from Formaldehyde Emissions from Installed Chinese Manufactured Laminate Flooring. Risk Anal. Nov 15.

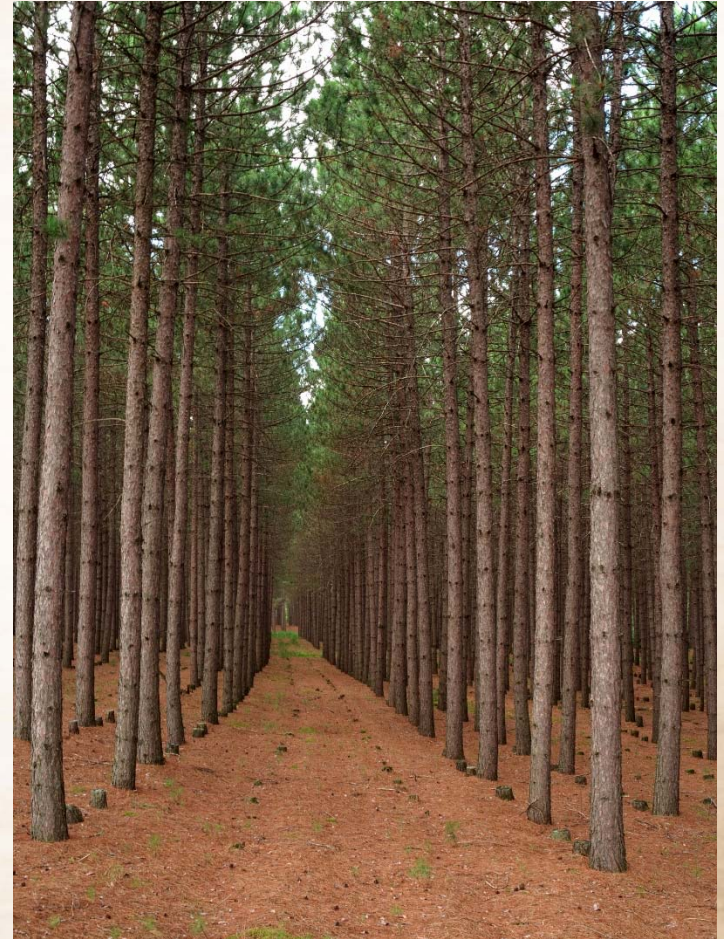
Formaldehyde breaks down readily in the body
Inhaled formaldehyde is quickly metabolized and ultimately converted to carbon dioxide and exhaled

Latest Fad of Forest Bathing

Has the “Age of Wood” gone too far?

Forest Bathing: Hugging a tree and breathing in the natural aromas

- § Can the chemicals that plants and trees give off be good for your health?
- § Yes, say forest bathers, who are immersing themselves in nature to combat stress and improve their immune system
- § Popular in Japan and California
- § Breathing in the natural polyphenols and formaldehyde



-
- § Advocate for wood and engineered wood products
 - We have solutions for growing urbanization
 - Now is the time – take advantage of the tall wood building positive press
 - § Continue to capitalize on our sustainability story
 - § Hexion will provide the enabling technology:
 - To drive productivity improvements
 - And create new engineered wood products

engineered wood
and panel solutions



Thank You For Your Attention