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Wood Composites Manufacturing

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Wood Composites Manufacturing

The UMaine Advanced Structures and Composites Center has a complete Wood Composites Pilot Line allowing production of up to 4' x 8' oriented strand board (OSB), laminated strand lumber (LSL), particle board, MDF, and other cellulosic composites on a near-industrial scale.

Companies may opt for complete manufacturing – from log to panel – or select only certain unit operations, such as stranding, drying and screening. Recent studies include the use of innovative resin systems, wax substitutes and residuals to produce value-added products.

Strand Composites Pilot Line

LOG DELIVERY

Companies may deliver tree length, or pre-cut logs with a maximum diameter of 12”.

LOG CONDITIONING

Approximately ten 5' long x 12” diameter logs can be soaked and/or heated at a time to 150°F.

STRANDING

A Carmanah 12/48 Lab Strander converts logs into strands from 3” to 12” in length for OSB/LSL production.

A 48” ring holds two knives which protrude into the inner face of the ring. Strands are produced by advancing the log through the rotating ring at a specified rate. Projection of the knives in combination with ring speed determine the flake thickness, width is achieved by selection of the appropriate counter knife angle, and strand length through use of scoring knives. Specifications are provided on page 2 of this document.

SCREENING

An Acrowood Trillium™ and Diamond Roll combination screen is used to separate strands into three size fractions. Larger strands pass over the Trillium screen, with the remainder falling through to the Diamond Roll Screen. This material, in turn, is separated into intermediate and fine size fractions. The Trillium screen works well on both dry and green strands, due to the triangular geometry of the discs, which causes increased strand agitation and fine removal. A Gilson screen is available to quantify screening efficiency. Specifications are provided on page 2 of this document.

DRYING

Strands are dried on a Koch Bros. in-line conveyor dryer. The forced-air dryer is 3' wide x 10' long, with an additional 4' of infeed and outfeed. The dryer can evaporate up to 250 lbs. of water per hour, at a maximum temperature of 325°F and a fan capacity of



Top: Carmanah Lab Strander, Acrowood and Diamond Roll combination screens; Bottom: One of two Coil spinning disk atomizing resin blenders.

Wood Composites Manufacturing

7,500 cfm. Moisture content is determined using a Process Sensors Corp. near infrared meter.

A 5,000 board foot, Nyle dehumidification dry kiln is also available bringing strands to within +/- 1% of the target MC, usually within 24 hours.

RESIN BLENDING

Resin is applied to strands using one of two Coil spinning disk atomizing resin blenders (3' x 6' and 5' x 10'). The blender drum can be rotated up to 20 rpm, and the spinning disk atomizer to 15,000 rpm. Either 30 or 120 lbs, for the small and large blender respectively, of dry strands can be blended at a time. The resins (normally pMDI or PF) and waxes are sent to the blender by means of a peristaltic pumps. Wax emulsions are introduced using an air atomizer.

PRESSING

Boards are pressed in one of two press systems:

450 ton Dieffenbacher steam injection press: This press system is controlled by a PressMan system. Composite mats can be pressed with thermal oil (up to 450°F) or steam injection (up to 250 psi steam pressure). Steam injection allows for the pressing of thick strand composites.

4' x 8' Erie Mill & Press: 1800 ton hydraulic press (provides 725 psi on a full sized 52"x100" mat). The press is PLC controlled, with complete data collection for printout of press scheduling data and graphs. The press can be controlled in either position (to within 0.003") or pressure control (within 2 psi). Energy is provided either by hot oil (up to 500°F) heated platens or radio frequency (10 kV, 30 kW Thermex-Thermatron system).

CONDITIONING

Boards/panels are conditioned prior to testing in one of three walk-in environmental chambers.

TESTING

The UMaine Composites Center, an ISO 17025 accredited testing laboratory, has a full suite of ASTM wood products testing capabilities within its accreditation scope (such as ASTM D143, D198, D1037, D4761, etc.). A full list is available at composites.umaine.edu.



Top: 34" x 34" Dieffenbacher Steam Injection Press; Bottom: 4' x 8' Erie Mill & Press.

Carmanah Lab Strander Specifications

Maximum Log Size	12" diameter
Flake lengths	From 3" to 12" (3, 4, 6, 12 standard)
Flake thicknesses	From 0.010 - 0.060 (dependent on species, log temp and MC)
Maximum production	550 OD lb/hr (Aspen)
Ring speed	Range: 350-1000 rpm (638 rpm typical)
Ring ID	48"
Knife types	Plate and disposable
Knife angle	33 degrees
Counter knife angles	Available in 45, 50, 55, 60, 65, 70, and 75 degrees

Screen Specifications

Conveyor Size	21' long, 2' wide
Conveyor speed	VFD controlled, 0-110 fpm
Conveyor feed rate	Approximately 0-12,000 green pounds/hr.
Trillium screen	18 shafts, two zones of 9
Diamond Roll	Variable speed, variable inter roll opening