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Treatability of Steam-Pressed Scrim Lumber–SPSL

H. M. Barnes
Professor

R. A. Slay
Graduate Research Assistant

R. D. Seale
Professor

G. B. Lindsey
Research Associate II

Forest Products Laboratory
Forest & Wildlife Research Center
Mississippi State University
Starkville, Mississippi

ABSTRACT

This paper details our experience with treating a new class of structural composite lumber, steam-pressed scrim lumber. Data are presented for different treatment processes and carrier systems. Results similar to those for solid wood were obtained.

Keywords: Engineered wood composites; steam-pressed scrim lumber; treatability; full-cell process; empty-cell process; vacuum process; LOSP; oilborne; waterborne.

INTRODUCTION

Engineered wood composites (EWC) have become increasingly important as building components. Structural uses dictate the need for protecting EWC and providing increased durability. Composite protection has been reviewed in recently published monographs (Gardner et al. 2003, Kirkpatrick & Barnes 2006). This paper details our initial experiences with the post-manufacture treatment of a new class of structural composite lumber, steam-pressed scrim lumber (SPSL).

SPSL is defined as a composite of wood scrims (mats of wood strands) obtained through crushing small-diameter logs and gluing together in a steam-chamber press so that the wood fibers are primarily oriented along the length of the member. The least sectional dimension of the strands in the scrim shall not exceed 19 mm. The average length of the strands shall be greater than 20 times their least dimension. SPSL is considered to be a Structural Composite Lumber (SCL) product.

METHODS AND MATERIALS

Sample production-SPSL was produced from southern pine stock measuring 200 mm or less in diameter. In this patented technology, called TimTek™, logs were crushed in a set of crushing rolls and passed through a scrimming line producing scrim less than or equal to 6-mm thick and up to 2.4-m in length. After production, the scrim was dried in a kiln to a nominal 20% moisture content. Dried scrim was coated with a stage B resole phenol formaldehyde resin to yield 12 % resin solids and redried in a commercial conveyor dryer to 6% moisture content or less. The scrim was hand-formed into a beam and pressed in a proprietary steam chamber press to form a rough beam measuring 44-mm wide x 420-mm deep x 5.64 m long. A schematic

of the processing steps is shown in Figure 1. Pictures of the resultant product and processing steps may be found on the Internet (Anon. 2006).

Sample billets were cut from several beams into samples measuring 44- x 44-mm in cross-section x 610-mm long. Average density of the samples was 746 ± 52.4 kg/m3 (46.6 ± 3.3 pcf). Samples were segregated into treatment groups of equal density distribution shown in Figure 2.

Treatment

Four samples for each group treatment group x carrier x retention were treated. Treatment groups and cycles are shown in Table 1. All samples were end-sealed with phenol-resorcinol resin before treatment. Following treatment, all samples were weighed, measured, and cut to 18 in (457-mm) in length. Samples were examined and the penetration measured.

RESULTS

All samples showed 100% penetration regardless of the treatment cycle or carrier system used to treat the samples. Retention data are shown in Table 2. These data indicate that retentions obtained for SPSL are similar to those expected for solid wood. As expected, full-cell treatment with water yielded the highest retention in the study. It appears that Lowry treatment with oil reaches a maximum retention after one to two hours of pressure. Rueping treatment yielded the lowest retention as expected. The kickback in this process resulted in a net injection of 33-50% of the net injection obtained in the Lowry process, or 6-8 pcf oil as is customary with nominal oilborne treatments. Treatment with mineral spirits using a double vacuum cycle yielded retentions of the order of magnitude of the Lowry treatments. This would indicate that SPSL is a good candidate for LOSP treatments.

SUMMARY

This preliminary, limited study has shown that conventional cycles and carrier systems can be used to post-manufacture treat a new class of engineered wood composites, SPSL. Future plans include treatment with various preservative systems, evaluation in above-ground and ground contact exposures, treatment of full-sized beam sections, and investigation of in-process treatments/biocide addition.

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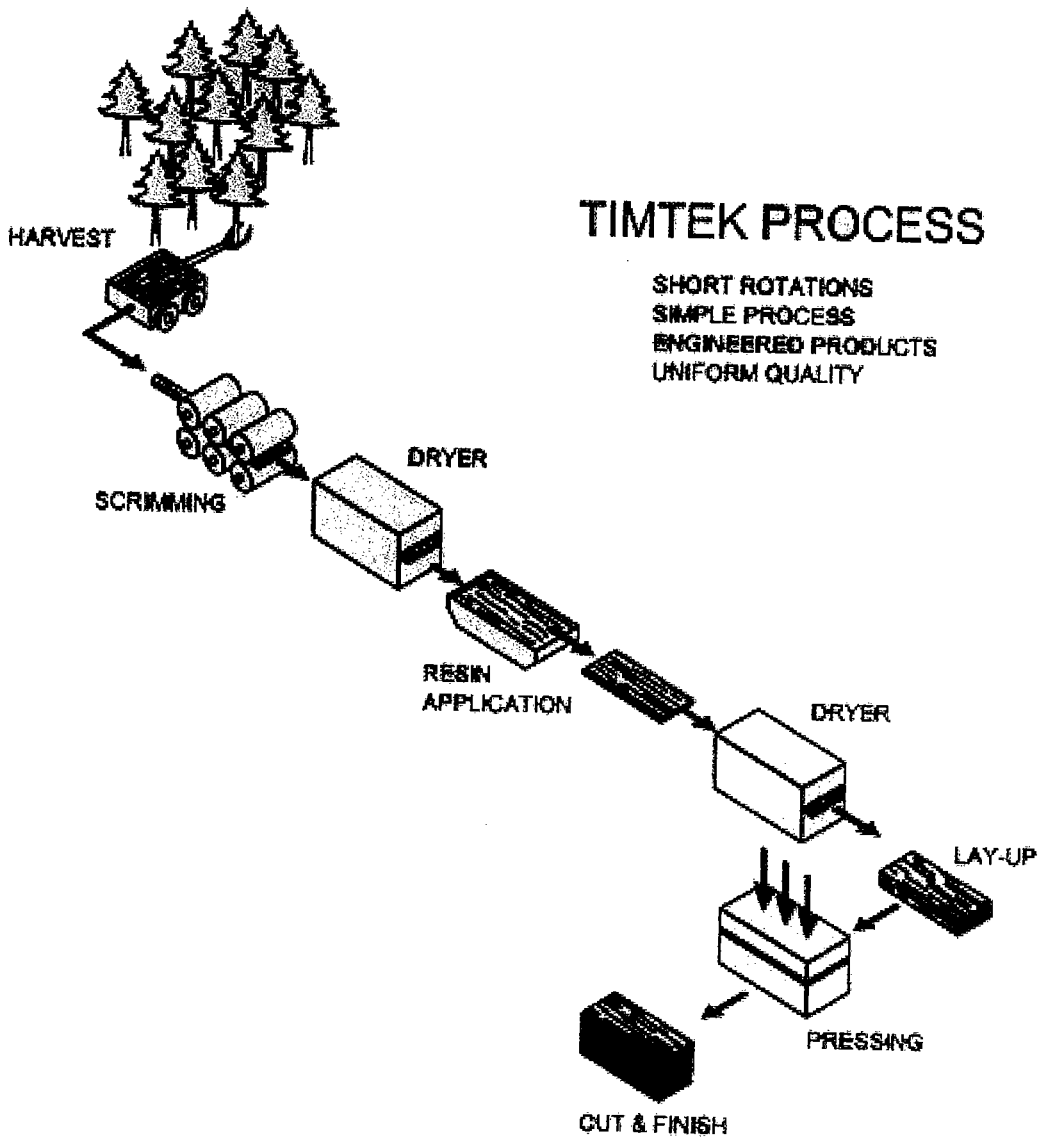

Figure 1. Schematic representation of the SPSL production line (Anon. 2006).

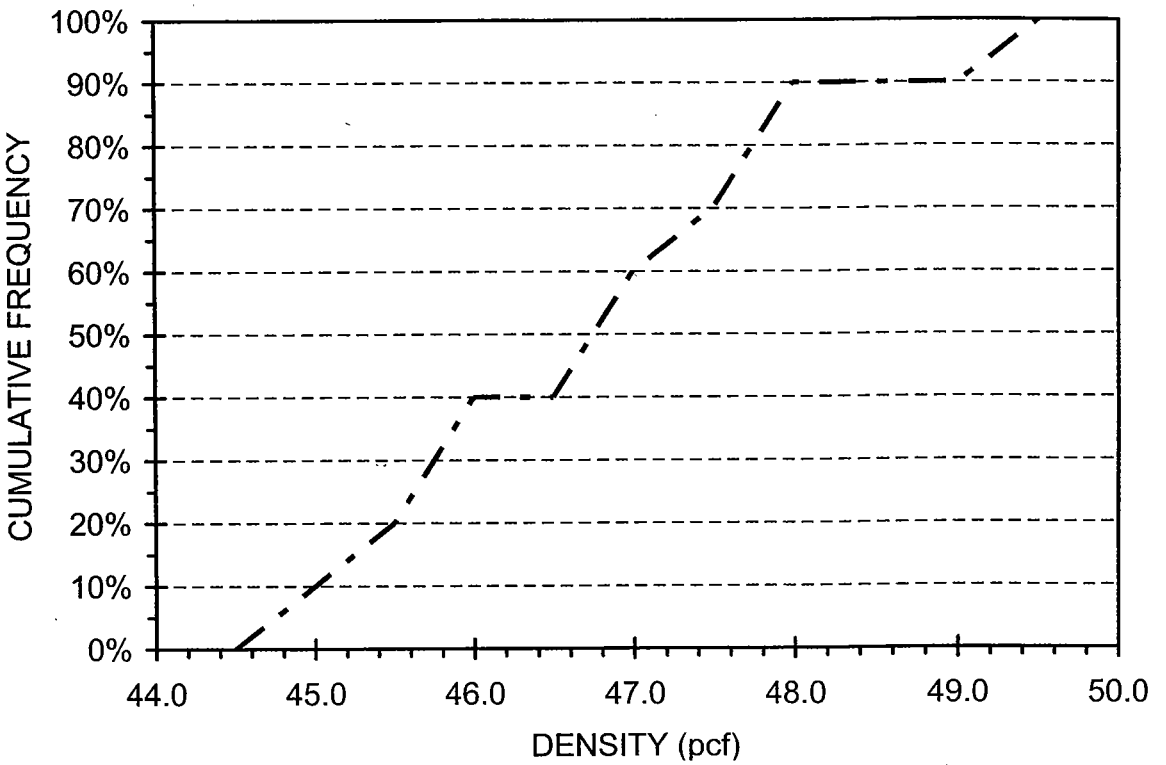

Figure 2. Cumulative frequency diagram for density of SPSL samples treated in the study.

Table 1
TREATABILITY STUDY DESIGN FOR SPSL

Process	Carrier	Cycle
Full -cell	Water	Vacuum at 28+ in Hg-30 min. Fill under vacuum Press at 150 psig for 3 hours
Lowry	P9 type A	Fill at atmospheric pressure Press at 150 psig for 1, 2 or 3 hours Final vacuum at 28+ in Hg for 30 min.
Vac-vac	Mineral spirits	Vacuum at 28 in Hg for 15 minutes Vent to atmostpheric; hold for 5 min. Vaccum at 28 in Hg for 15 min.
Rueping at 10, 30 psi initial air	P9 type A	Initial air at 10 or 30 psig for 15 min. Fill and press at 150 for 2 hours Final vacuum at 28+ in Hg for 30 min.

Table 2
RETENTION RESULTS FOR TREATMENT OF SPSL.

Process	Carrier	Retention (Std. dev.)			
		pcf		kg/m ^{3}	
Vac-vac	Minieral spirits	12.10	(1.21)	193.8	(19.4)
Full-cell	Water	23.22	(1.93)	371.9	(31.0)
Lowry empty-cell 1-hr pressure	P9A	9.60	(0.88)	153.8	(14.0)
Lowrey empty-cell 2-hr pressure	P9A	11.41	(0.51)	182.9	(8.2)
Lowry empty-cell 3-hr pressure	P9A	11.12	(1.04)	178.2	(16.7)
Rurping empty-cell 10 psig initial air	P9A	7.64	(0.69)	122.4	(11.0)
Reping empty-cell 30 psig inital air	P9A	5.72	(0.28)	91.6	(4.5)