Value Analysis of Appearance-grading vs Combined Appearance and Stress-grading for Hardwood Logs

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Introduction

Cross-laminated timber (CLT) industries require a strong supply of lumber. Currently, only certain softwood species are accepted as raw material for CLT panels and hardwood species are not accepted at all due to the industry tradition of using only softwood lumber for structural applications. However, there is a strong belief that some hardwood species could be used as CLT raw material but the value of appearance-graded lumber vs stress-graded lumber continues to be the main barrier preventing it. A potential strategy to overcome this economic barrier is to produce a mix of appearance-graded and stress-graded lumber from hardwood logs. Using the NHLA grading system as a reference, a study was conducted where boards making 1COM and higher grades were graded by NHLA rules and boards grading lower than 1COM were grades using stressed-grade rules. The production of this product-mix could help hardwood sawmills to increase the value of log recovery.

Objectives

The goal of this study was to measure lumber recovery based on economic value when using a combination of appearance and stress grading rules in hardwood logs.

Material and Method

The overall method adopted for this particular research is shown in Figure 1.

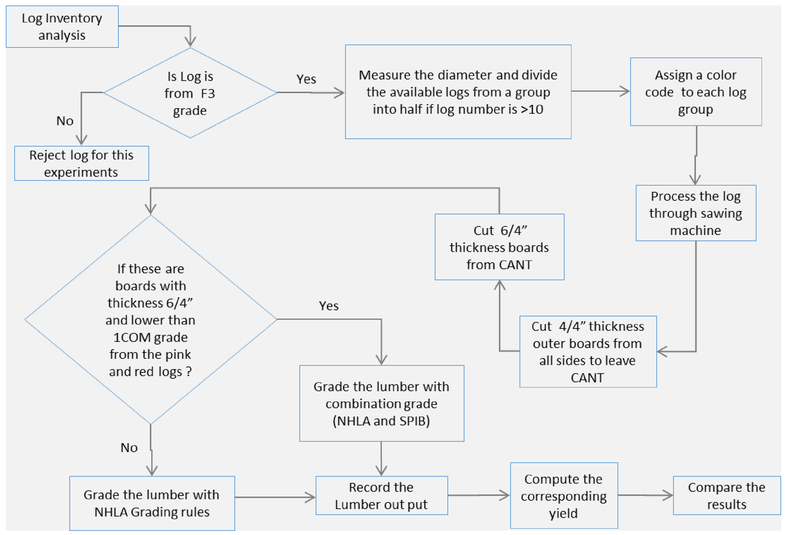

Figure: 1 Overall methodology of the research

Material

A total of 39 yellow-poplar logs of length 12 feet with zero-clear faces were sorted by diameter (12",13" and 14"') to produce 5 log groups. Logs were first color-coded as white, orange, blue, red and pink to track the log and lumber in process.

Sawing and Grading Method

In all cases, the outer boards in each log were cut to 4/4" thickness. A CANT was left to cut boards to 6/4" thickness as shown in Figure 2. Sample Boards produce from the white, orange and blue logs were graded using only NHLA grading rules (appearance grade) whereas boards produced from red and pink logs were graded using a combination grade (NHLA and SPIB rules).

Two graders were used for this experiment. Grader one graded under SPIB and NHLA rules while grader two graded under NHLA rules only. Only the boards with thickness 6/4" and lower than 1COM grade from the pink and red logs were graded using SPIB rules. The yield from the blue and orange coded logs were used as control samples. The price used for the revenue recovery analysis is shown in Table 1.

Table 1: Lumber types and corresponding unit price for revenue calculation as of OCT-2017

LUMBER TYPES	NHLA Price	SPIB price
FAS 4/4	1.03	
1COM 4/4	0.66	
2COM 4/4	0.48	
1x6 Pallet	0.34	
1x8 Pallet	0.34	
FAS 6/4	1.05	
1COM 6/4	0.78	
#1 (2COM 6/4*)	0.54	0.45
#2 (Pallet 6/4 x 6)	0.34	0.42
#3 (Pallet 6/4 x 8)	0.34	0.3

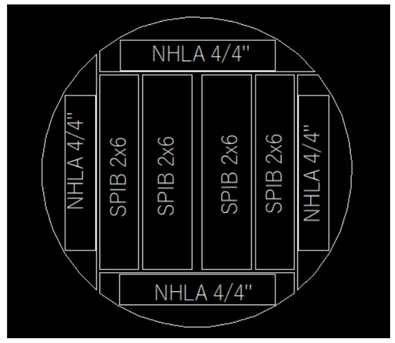

Figure 2: Generalized log sawing procedure for the experiments

Results

From this yield analysis, it was observed that diameter 12" and diameter 14" logs will lose revenue by 0.2% and 2.93% for combined grading at the current price of SPIB graded lumber if 2 COM and below is graded with SPIB. 13" diameter logs have shown a slight increase in revenue by 0.81%. The revenue comparison of the logs is presented in Figure 1. Comparing with the control samples, 12" diameter logs has reduced revenue recovery by 7.66% but 13" diameter logs show increased revenue recovery by 4.75%. If only pallet grade (6/4X6 and 6/4X8) are graded with SPIB, all three log groups will add more revenue. Diameter 12", 13" and 14" logs will add 3.86%, 3.93%, and 2% revenue compared to only NHLA grading respectively as shown in Figure 2.

TABLE 2: Observed log Yield NHLA only (in board feet)

CC	N	Dia (in)	FAS 4/4	1COM 4/4	2COM 4/4	1x6 Pallet	1x8 Pallet	FAS 6/4	1COM 6/4	2COM 6/4	Pallet 6/4 x 6	Pallet 6/4 x 8	Total
Orange	10	12	132	229	90	6	0	36	27	126	81	0	727
Blue	8	13	109	167	112	6	0	22	48	108	81	60	713
Total			241	396	202	12	0	58	75	234	162	60	1440

TABLE 3: Observed log yield NHLA +SPIB (in board feet)

CC	N	Dia (in)	FAS 4/4	1COM 4/4	2COM 4/4	1x6 Pallet	1x8 Pallet	FAS 6/4	1COM 6/4	#1 (2COM 6/4*)	#2 (Pallet 6/4 x 6)	#3 (Pallet 6/4 x 8)	Total
Red	9	12	97	187	141	6	0	0	9	198	18	27	683
Pink	7	13	102	147	84	6	0	66	39	135	9	0	588
Total			199	334	225	12	0	66	48	333	27	27	1271

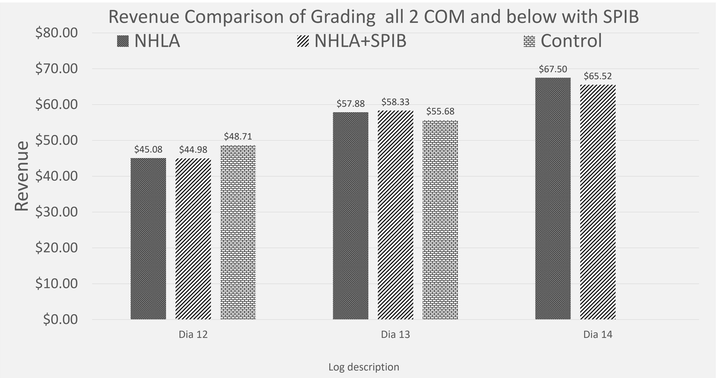

Figure 4: Revenue recovery comparison for combined grading- 2COM and below with SPIB

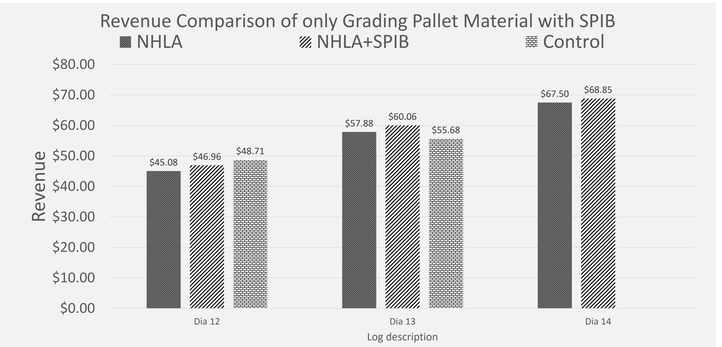

Figure 5: Revenue comparison for combined grading -only 6/4x6 and 6/4x8 graded with SPIB

Conclusion

With reference to the observed results, it is not possible to claim that combined grading will add more value compared to NHLA grading, if 2COM and below is considered for SPIB grading. But, if only 6/4x6 and 6/4x8 pallet graded lumber from NHLA are graded with SPIB, it will add more revenue. At the current price, it is not recommendable to switch the grading practice but if the price of the SPIB graded lumber is higher than the current market price of NHLA graded lumber it is advisable to adopt combined grading.

Future Work and Direction

Wood has the highest degree of variation and our sample size for this observation is too minimal to reduce the effects of this variation. So, the results from this observation do not guaranty the actual scenario of the log yields and revenue recovery. It required more sample size and sensitivity analysis of the revenue recovery to understand the possibility of the strategic change.

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