

NEW RESEARCH PROPOSAL

Q-08-LE

Optimization of log conditioning and peeling process and real-time monitoring of veneer surface roughness

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Anticipated Start Date: *September 2024* | Expected Duration: *24 Months*

Slide 1

VGPT1 Vega Gutierrez, Patricia Teresa, 9/14/2021

Need & Industrial Relevance

Bonding performance of veneer-based wood products depends in part on veneer surface roughness, which is impacted by parameters related to log quality, log conditioning, and the peeling process. The combined effect of these parameters on the surface roughness is not well-understood and direct measurement of veneer roughness is challenging. Thus, there is a need to

- (1) understand how different factors impact veneer roughness;
- (2) develop a real-time monitoring framework for veneer roughness prediction; and
- (3) predict the bonding performance of veneer-based products using veneer roughness.

Relevant WBC Research Themes

WBC RESEARCH THEMES : A3b, D4, D5

Long Term Goals

Development of an intelligent monitoring model for real-time estimation of veneer surface roughness using lathe vibration data and using veneer roughness information to predict bonding performance of veneer-based products.

Objectives

Specific objectives for the 1st year of the project are to:

- 1) Collect log quality and conditioning data.
- 2) Acquire lathe vibration signals during the peeling process.
- 3) Conduct data analytics and process lathe vibration signals.
- 4) Veneer roughness measurement (direct method).

Data Collection

Log parameters

- Length • Diameter (SE/LE) • Species • Sweep • Density (weight) • Stiffness (stress wave, UPT) • Heartwood/sapwood

Conditioning parameters

- Temperature • pH • time

Lathe parameters

- Time since sharpening • Knife angle • etc.

Vibration data

- signal segmented • de-noising • feature extraction/selection

Veneer roughness measurement

Method to be determined, 12"x12" specimens; likely will be done via optical profilometer

Data Analytics

- Impact of log parameters on vibration signal • Use extracted features to predict overall roughness • Establish roughness grade categories

Outcomes and Deliverables

Year 1

Expected Outcome	Deliverable (s)	2024				2025											
		S	O	N	D	J	F	M	A	J	J	A	S	O	N	D	
Log quality and conditioning data acquisition	Input dataset																
Vibration signal data acquisition	Sensory Dataset																
Veneer roughness measurement (direct method)	Roughness data (model output dataset)																
Data analytics	Pre-processed signals																
Dissemination of Phase I	Phase I progress report																
Initiate Phase II (AI and machine learning modeling, plywood fabrication, using roughness data for predicting the plywood bonding performance)	Phase II test plan																

Expected Practical Implications/Impacts

Development of an intelligent monitoring model for real-time estimation of veneer surface roughness using lathe vibration data and using the information to predict bonding performance of veneer-based products will lead to several beneficial impacts on the veneer-based products industry:

1. Provide a system for real time assessment of veneer lathes
 - a) focused early in the manufacturing process – when opportunities still exist to make adjustments
 - b) will include parameters related to log inventory
 - c) improved knowledge (real-time) of knife condition
2. Data analytics will link wide variety of material and process parameters
3. Use of low-cost and robust sensors will help to speed industry adoption
4. Model developed will provide a solution to a current gap in the industry: assessment of veneer quality (specifically, roughness) on a larger scale
5. Skills gained will be very valuable for student

Budget justification & request for funding

Funds are requested for a Graduate student at 0.49 FTE during academic year with equivalent summer appointment costs in year 1 using a base monthly salary of \$4,874 for a total of 28,659. The graduate student will be responsible for data collection and analysis.

Fringe benefits for graduate student follow institutional approved guidelines and start at 34% in year 1 for a total of \$9,774.

Graduate student tuition and fees are budgeted for 3 terms total with the per term academic year cost at \$5,187 per institutional guidance.

Funds are requested for the student to travel to the partner mill and to WBC meetings

BUDGET	AMOUNT
First Year Expenses	
GRA & Benefits	\$ 38,403
Tuition & Fees	\$ 15,561
Materials/Supplies	\$ 2,500
Travel	\$ 3,186
Other (specify):	
YEAR 1 TOTAL:	\$ 59,650
Expected future request amounts:	\$ 60,000

Thank You

Questions?