

MWP – Young Researcher Abstract 2026

Project title: Understanding Wood Chip Variability for Smarter and More Sustainable Kraft Pulping	
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Abstract (approx. 200 words): The forest industry is continuously working to improve sustainability, resource efficiency, and process stability. In kraft pulping, natural variations in wood chip moisture, structure, density, and chemical composition can influence how cooking chemicals penetrate the material. This may contribute to variations in kappa number, delignification uniformity, and chemical efficiency. Because incoming raw material is complex and not always fully characterized before entering the process, improved analytical tools are needed to better support process decisions. My research focuses on improving the understanding of wood chip variability and chemical penetration during the early stages of kraft pulping. By combining near-infrared (NIR) spectroscopy with complementary imaging and microscopic approaches, I investigate how wood chip properties influence impregnation uniformity before kraft cooking. A major focus is on understanding why chemical penetration may be incomplete and why white cross sections can appear in wood chips after cooking, potentially indicating uneven impregnation. The long-term vision is to support smarter, more adaptive pulping processes, in which incoming chip properties can be assessed more effectively and process conditions adjusted based on raw material characteristics rather than on process uncertainty.	
Key words: Kraft pulping; wood chip variability; near-infrared spectroscopy; chemical impregnation; impregnation uniformity; process stability.	