

## USING MILL-WIDE OPTIMIZATION TO MAXIMIZE PULP PRODUCTION AND STABILIZE OPERATIONS

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### ABSTRACT

The pulp and paper industry has been implementing advanced process control solutions to optimize individual process areas for over three decades, resulting in measurable and sustainable benefits. What has been missing, to avoid suboptimal outcomes at the mill level, is a mill-wide optimization layer to steer individual processes towards higher level objectives. The foundation of mill-wide optimization is mill-wide production planning, which in turn enables both mill-wide quality and energy planning. Implementing an online production planning solution is a crucial first step towards coordinating individual processes and optimizing the mill as a whole. The solution must be dynamic, handling both the current and future state of the mill, as well as discrete states of the process such as equipment stops and grade changes. Furthermore, it must run in real time and adjust automatically to changing process conditions.

This paper presents the findings of a trial project for a mill-wide production planning and online advisory solution designed specifically for kraft pulp mills and integrated mills. A process flowsheet model of the mill is periodically optimized to calculate the current and future production targets for each process area in the fibre line and recovery cycle. The future state of the mill is managed via an interactive user interface that is used to adjust current and future process limits, targets, states, and grades. The solution incorporates embedded models for critical process relationships needed to make production decisions, and highlights both current and future production bottlenecks.

The primary functions of the solution are to maximize production towards mill limits, balance pulp and liquor inventories, schedule process unit stops, slowdowns, and grade changes, adjust to unplanned process unit stops and slowdowns, run "what-if" production scenarios, and visualize the current and future state of the mill. The trial project was conducted at a kraft market pulp mill, and the results demonstrate significant improvements in production efficiency. The system provides real-time visibility into production status, enabling proactive decision-making and continuous improvement.

The paper reviews results from the trial baseline period, where historical data was modelled, and a "re-optimize the past" offline analysis was performed prior to the implementation of the online solution to estimate the potential benefits. Challenges encountered during the design and commissioning phase are discussed, as well as use cases demonstrating how the production planning solution is utilized in day-to-day operation for improving production performance and forecasting mill behaviour. The paper concludes by discussing the impact on total mill production and laying out planned solution enhancements.

**Keywords:** mill-wide optimization, process flowsheet optimization, autonomous mills, production planning, kraft mill optimization.