

DISSOLVED LIGNIN CARRYOVER MEASUREMENT IN O2 AND DO STAGES BRINGS OPPORTUNITIES FOR SIGNIFICANT IMPROVEMENTS IN FIBERLINE OPERATIONS

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ABSTRACT

The chemical industry faces an unprecedented price increase and raw material supply tensions. This has a significant impact on the pulp and paper industry, where chemicals are essential for various stages of the process, including bleaching operations. Specifically, in bleaching operations, chemical costs can account for up to 50% of the total operational cost. As chemical prices increase, the cost of producing pulp and paper also rises, affecting the profitability of pulp mills. Pulp mills must find ways to optimize their operations and reduce chemical consumption to mitigate the impact of these price increases.

Conventional fiberline control is solely based on the lignin content of the pulp fibers expressed as kappa number combined with brightness measurement in the bleaching stages. The kappa number is measured using a traditional multipoint analyzer with several sample locations sharing the limited capacity of one central analyzer thus resulting in low update rate and lack of redundancy. However, state-of-the-art technology nowadays is single point measurement which improves process control and robustness significantly, even though some mills still only use manual sampling and laboratory kappa measurement which inevitably means very low update rate and typically also poor repeatability. While the fiber lignin content and brightness indeed are critical parameters for the unit operations' control, it has been shown that the dissolved lignin in liquor phase, often referred to as black liquor carryover, plays a key role due to its impact on the occurring reactions. This carryover measurement has been a critical missing link in having a fully automated optimum fiberline process control.

This study presents results from evaluations of two new sensors for capturing the dissolved lignin carryover in the pulp stock, to properly account for its impact in oxygen delignification and chlorine dioxide stages. Mill data is combined with laboratory data which confirms the benefits of these novel control concepts, employing the new sensor tools.

Recent implementations of this technology have demonstrated a significant improvement in controlling bleaching chemicals, even at sites that already have advanced controls. The use of these sensors allows for fast control actions that are directly linked with the organic load and fiber kappa. As a result, pulp mills have achieved an average reduction of 50% in final brightness variability and 10% in total chemical consumption. These benefits highlight the potential of this technology to optimize bleaching operations and reduce chemical costs, helping pulp mills mitigate the impact of chemical price increases and raw material supply tensions.

Keywords: Bleaching process optimization, filtrate kappa, automated control, sensor application technology