PROCESS SIMULATION TO SUPPORT DECISION, TROUBLESHOOTING AND OPTIMIZATION

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ABSTRACT

When a pulp and paper mill encounters operational problems, needs process or equipment changes, or wants to validate such changes, process simulation can be helpful. It provides guidelines, validates information, predicts impacts, and compares possible future scenarios. In the case of troubleshooting, parameters and process variables can be calculated to help understand and solve the problem. If deciding between several proposals for a new installation, simulation can forecast process conditions, stream parameters, and consumption requirements for each scenario. After process or equipment changes are implemented, calculations can compare predictions with actual process values and identify areas for improvement and optimization.

The application of process simulation to real-case situations usually follows a sequence of tasks: 1. understand the problem/needs, 2. study the process, 3. draw the process in the simulation software, 4. define inputs, outputs and equipment parameters, 5. converge and validate the simulation, 6. simulate scenarios, process changes, etc. WinGEMS software, commercialized by Valmet was chosen to build the models and perform calculations based on energy and material balances.

Examples of application accomplished by RAIZ are broad and diversified.

In an evaporation area there were periods when it did not operate at the expected capacity. To identify critical equipment and evaluate significant changes over time, a detailed model of this mill section was created. Calculations were performed to determine heat transfer coefficients for each evaporator, steam consumption, temperatures, and solids content in black liquor.

Water use reduction is a priority for pulp and paper mills. Simulation can be helpful in predicting the impacts of closing circuits, such as in the bleaching line where the formation of deposits is critical. In a proactive approach, by applying WinGEMS models to simulate the reuse of process streams to wash pulp, it is possible to predict the accumulation of non-process elements (NPE) and even chemical consumption due to eventual changes in organic carry-over of pulp. For a reactive response, other options can be explored through simulation to evaluate more adequate configurations to reduce NPE concentration in critical streams.

Since the software permits both stationary and dynamic modes of simulation, it can predict the effect of sudden or instant changes in conditions. For example, a break in a paper machine and its consequences in the water need of the main condenser were simulated to identify ways to improve its control. Or if there is a momentaneous reduction of evaporation capacity, is possible to find how the fibre line should adjust washing flows or production to avoid overflow in filtrate tanks that affect the inlet of wastewater treatment, with minimum loss of production.

Many more examples considering several areas and problems of pulp and paper production are available, showing the importance of having the skills to simulate the process in order to optimize it, support technical decisions, or even overcome difficulties.

Keywords: Process simulation, Optimization, WinGEMS, Evaporation, Water use reduction