MODELLING OF REAL OXYGEN DELIGNIFICATION PROCESSES

Jari Käyhkö[1*], Riku Kopra[1], Kari Peltonen[2], Markus Honkanen[3], Adriaan Van Heiningen[4]

[1] South-Eastern Finland University of Applied Sciences, FiberLaboratory, Finland Jari.kayhko@xamk.fi, +358400771157 Riku.kopra@xamk.fi,
[2] Andritz Ltd., Fiber Technologies Division, Finland, Kari.peltonen@andritz.com, +358408605322
[3] Pixact Oy, Finland, Markus.honkanen@pixact.fi +358407780481
[4] University of Maine, USA, Adriaan.vanheiningen@maine.edu, +12075812278

ABSTRACT

Previously, extensive work has been done on the modelling of oxygen delignification process, based on how the basic parameters i.e., temperature, kappa number, concentration of alkali and concentration of oxygen affect the delignification rate. However, these models are not used extensively to evaluate the performance of real processes primarily because they have not been able to properly consider all the essential issues affecting to delignification in practice. Two such issues are the mass transfer of oxygen, which defines the concentration of dissolved oxygen in the process and effects of carry over. In this paper, we present a new way to model the oxygen delignification process where these parameters, among other smaller things, are taken into account. The basic model and its parameters are defined in the literature, aid of delignifications and different laboratory tests, as well as essential information collected from mill processes and mill tests. An essential part of these studies was the information obtained from the oxygen dispersion in existing processes, measured with new continuous in-line bubble size distribution measurement and usage in the modelling the diffusion theory-based equation, which defines the mass transfer coefficient on the base of the oxygen bubble size and void fraction. This presentation demonstrates how different parameters effect the delignification rate and critically evaluates the accuracy of the modelling. This new approach provides the base to utilize modelling to understand, improve and control the mill scale delignification processes.

Keywords: chemical pulping, oxygen, delignification, modelling, mill process