Evaluation of Hexenuronic Acids in US Kraft Pulps

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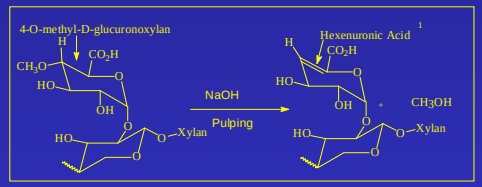
Abstract

This study examines the role of hexenuronic acids in US HW and SW kraft pulps. The presence of hexenuronic acids was found to be a dominant component of the pulp kappa number for HW kraft pulps, whereas, for SW kraft pulps, it was found to be a minor component. Acid hydrolysis studies on HW kraft pulps suggest that it may be possible to reduce the apparent pulp kappa number by 35 –50% with a mild acid treatment prior to bleaching. The level of hexenuronic acids in a HW kraft pulp can be influenced by the extent of delignification.

Background



Clayton, *Svensk Papperstidning*, 28(4):1165(1963). Johansson, M.H., and Samuelson, O., *Carbohydr. Res.*, 54: 295(1977). Teleman, A., Siika-aho, M., Sorsa, H., Buchert, J., Perttula, M., Hausalo, T., and Tenkanen, M., *Carbohydr. Res.*, 293(1): 1(1996). Vuorinen, T., Fagerstrom, P., Buchert, J., Tenkanen, M., and Teleman, A., *J. Pulp Paper Science*, 25(5):155(1999).

Industry Benefits

- Hexenuronic acids consume D, Z, C and released upon treatment with acid.
- Hexenuronic acids resistant to O and P-stage.
- Impact oxalic acid formation of bleaching and retention of NPEs.

Typical HexA contribution to pulp kappa number of a:

- Northern HW Scandinavian kraft pulp is 30 – 35%.
- Northern SW Scandinavian kraft pulp is 10%.
- Radiate pine kraft pulp is 10%
- Japanese *Fagus crenata* Blume kraft pulp is 28%
- Japanese *Pinus densiflora kraft pulp* is 10%

Objectives

- Evaluate content of HexA in U.S.A. furnish
- Examine influence of pulping technologies on the formation of Hexenuronic acids.

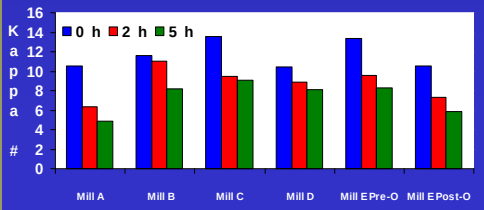
Methods

Hexenuronic acids in Pulp

- Utilize 25 gr (o.d.) pulp following procedure of Vuorinen, T. et *al*., 1996 International Pulp Bleaching Conference: Proceedings Washington, 43.
- Measured Δ kappa and 2-furoic acid by UV/Vis spectroscopy

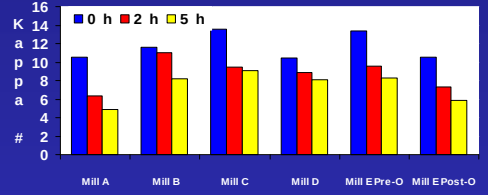
Results

Changes in kappa # after acid treatment of brownstock

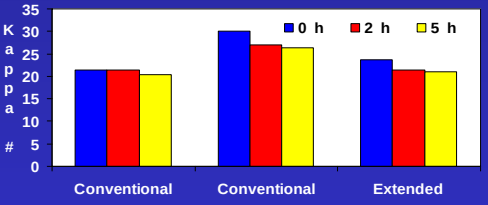


Mill HW Pulp After (0,2,5 h) Acid Hydrolysis

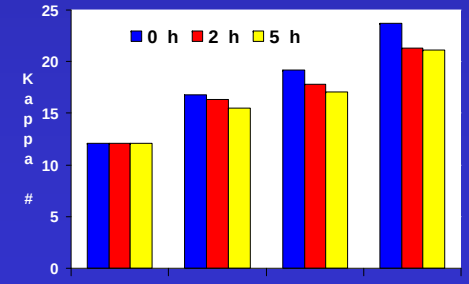
Results - continued



Mill HW Pulp After (0,2,5 h) Acid Hydrolysis

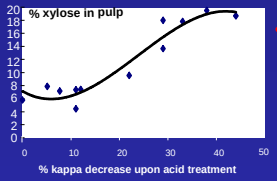


Mill SW Pulp After (0,2,5 h) Acid Hydrolysis



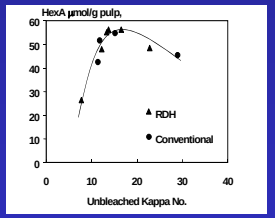
Lab SW Pulp After (0,2,5 h) Acid Hydrolysis

Results-continued

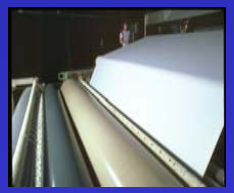


- Xylose content of kraft pulps correlates with hexenuronic acid content of kraft pulps

- Investigation into influence of batch cooking technologies on hexenuronic formation
  - RDH provides slightly diminished HexA formation
  - Extent of delignification most influential in controlling HexA contribution to batch/RDH pulps



Conclusions



- HexA contribute 22 - 55% of kappa # of commercial US HW kraft pulps and < 10% of commercial SW kraft pulps
- US HW pulp operations operate kraft pulping operations at a target kappa # that maximize HexA content in pulp.