

## **HYDROGEN PEROXIDE in an ECF BLEACH PLANT: CENIBRA's INDUSTRIAL EXPERIENCE**

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### **ABSTRACT:**

With the purpose of expanding production of ECF bleached eucalyptus Kraft pulp, CENIBRA evaluated in laboratory and mill tests alternatives with the application of hydrogen peroxide in its ECF bleaching sequence  $D_0EoD_1D_2$ . The addition of hydrogen peroxide in this production line aims at a chlorine dioxide demand optimization and an increase of the production, maintaining  $90 \pm 0.5\%$  ISO brightness. The following sequences were investigated:  $D_0EopD_1D_2$ ,  $D_0EoD_1P$ ,  $D_0EoD_1(QP)$  and  $D_0EopD_1P$ . Industrial results confirmed the laboratory tests, showing replacement rates varying from 1.1 to 2.4 kg  $ClO_2$ /kg  $H_2O_2$ . More attractive replacement rates were obtained for the addition of 2.5 kg  $H_2O_2$ /adt in the last bleaching stage ( $D_0EoD_1P$ ). However, a larger substitution of the total chlorine dioxide demand was found with the sequence  $D_0EopD_1P$  (5 kg  $H_2O_2$ /adt divided between both application points), which decreased the demand by 7.7 kg of  $ClO_2$ /adt for kappa number 8.6 pulp. In addition, pulp and effluent characteristics are described for each alternative, as well as corrosion rates of titanium under alkaline conditions (pH < 11), with low concentrations of hydrogen peroxide (< 0.1%). Results show that the addition of hydrogen peroxide in existent bleaching plants allows increased production without a modification of the chlorine dioxide generation at acceptable levels for operation costs and pulp properties.

**Key Words:** ECF peroxide bleaching; sequence flexibilization; production increase; replacement of  $ClO_2/H_2O_2$ ; titanium corrosion; Eucalyptus spp.

### **1. INTRODUCTION**

During the last two decades, pulp-bleaching plants underwent a large number of modifications. Bleaching processes using chlorine chemicals still dominate and will maintain this dominance. Modern bleaching technology makes use of oxygen and oxygen derivatives, such as hydrogen peroxide, peracids and ozone. In their implementation special attention must be given to the bleach plant material compatibility in order not to destroy the equipment.

### **2. OBJECTIVE**

This paper demonstrates CENIBRA's laboratory and plant experience with the application of hydrogen peroxide in the  $D_0EoD_1D_2$  type ECF bleaching sequence. The aim was to increase the production flexibility and to substitute a part of the chlorine dioxide with hydrogen peroxide for market brightness ( $90 \pm 0.5\%$  ISO). The existing capacity for the generation of chlorine dioxide should be sufficient despite the production increase. The existing bleach plant should be used and not be affected by corrosion.

### **3 - EXPERIMENTAL**

For comparison purposes, in the laboratory and at plant level the implementation of hydrogen peroxide in the ECF -  $D_0EoD_1D_2$  bleaching sequence was investigated, aiming at a brightness of  $90 \pm 0.5\%$  ISO. Thus, the bleaching sequences evaluated were:  $D_0EopD_1D_2$ ,  $D_0EoD_1P$ ,  $D_0EoD_1(QP)$  and  $D_0EopD_1P$ . Table 1 shows the most important conditions. In sequence  $D_0EoD_1(QP)$  a chelating agent at a constant dosage of 0.6 kg/adt was added, together with hydrogen peroxide and sodium hydroxide. The washing of the pulp between the bleaching stages was carried out with 9 m<sup>3</sup>/adt in the laboratory and in the plant at 8 to 10 m<sup>3</sup>/adt in the diffusion washers as shown schematically in Figure 6.

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## **Tappi Pulping Conference Proceedings Orlando 1999 3 Volumes:**

**Pulping and Papermaking of Nonwood Plant Fibers** Z.M.A. Ainun,S. M. Sapuan,R.A. Ilyas,2023-04-01 Pulping and Papermaking of Non wood Plant Fibres presents the latest technologies associated with the papermaking process With chapters specific to each non wood species the book provides step by step guidance on processes such as pulping bleaching blending and beating Non wood fibers are practical for pulp and paper production due to their chemical content of cellulose hemicellulose and lignin percentages Beginning with a general overview of non wood fibers in the papermaking process chapters then take a deep dive into different raw materials and their processes including bamboo corn stalk pineapple leaves and sugarcane This book is an essential resource for researchers scientists and industry specialists Provides comprehensive coverage of the processes involved in pulp and papermaking technology for each species of non wood raw materials Written by the leading research and industrial experts in the field of pulping bleaching blending beating and papermaking processes Includes step by step processes and methodologies *1999 Proceedings* Technical Association of the Pulp and Paper Industry. Pulp Manufacture Division,1999 **Nonwood Plant Fibers for Pulp and Paper** Pratima Bajpai,2021-01-09 Nonwood Plant Fibers for Pulp and Paper examines the use of nonwood plant fibers for pulp and paper worldwide pulping capacity of nonwood fibers categories of non wood raw materials problems associated with the utilization of non wood fibers pulping bleaching chemical recovery and papermaking of nonwood raw materials the use of nonwood plant fibers in specific paper and paperboard grades and the advantages and drawbacks of using nonwood fiber for papermaking and future prospects This book gives professionals in the field the most up to date and comprehensive information on the state of the art techniques and aspects involved in pulp and paper making from nonwood plant fibers Provides comprehensive coverage on all aspects of pulping and papermaking of non wood fibers Covers the latest science and technology in pulping and papermaking of non wood fibers Focuses on biotechnological methods a distinguishing feature of this book and its main attraction Presents valuable references related to the pulp and papermaking industry **Wood Fibres for Papermaking** Maria Cristina Area,2014-05-06 Firs and pines dominated the global picture of the raw materials for paper industry until the 1950s At that time the interest in introducing new species mostly hardwoods led the researchers intensify efforts to look for the fibrous characteristics and their combinations that could represent the relationship between fibres pulp and paper The pulp and paper industry has shown mainly in the last two decades a strong North South displacement This is to a large extent due to the favourable climate which promote the development of the trees Similarly the paper fibres have gone from being almost exclusively softwoods from natural forests of the Northern Hemisphere cold regions such as spruce and fir to fast growing species of short fibres such as eucalyptus and willow and poplar hybrids from plantations These new species that begin to dominate the paper panorama not only differ from classic ones in fibre length but they present particular characteristics like large amounts of juvenile wood different fibrillar angle and so on because trees are used increasingly at

younger age This leads us to question whether the old paradigms concerning the relationships between fibres characteristics and pulp properties are still valid or should be reviewed and updated in which case the basic fibre parameters their influence in pulping and refining and their impact on paper quality should be redefined To establish the state of the art on the topic this book analyses the publications of the last decade to verify the morphological characteristics of the fibres which are nowadays considered relevant Relatively recent data were surveyed because of the continuous changes that occur in the species by genetic improvement

**Handbook of Pulp, 2 Volume Set** Herbert Sixta, 2006-03-17 In this two volume set Dr Herbert Sixta head of the cellulose and viscose research department at Lenzing AG in Austria has brought together a team of authors to produce the first comprehensive handbook on the market Alongside the traditional aspects of pulping processes pulp used in industry and paper pulps this book describes all pulping processes used for paper and board manufacturing as well as waste liquor treatment pulp bleaching and environmental aspects while also covering pulp properties and applications From the content Chemical Pulp Mechanical Pulp Recovered Paper and Recycled Fibers Analytical Characterization of Pulps This handbook is essential reading for all chemists and engineers in the paper and pulp industry

**Tappi Journal** , 2000 Eucalyptus Kraft Pulp Refining Vail Manfredi, 2024-04-26 This book presents a brief history of papermaking followed by comments regarding wood as a source of fibers including its chemical and anatomical characteristics and the influence of these aspects on the quality of the pulp produced In addition the author describes the effects of the pulping process mainly a chemical process on pulp quality and how these wood characteristics influence both the refining process as the quality of the final paper The book further provides a broad discussion based on experimental results on the contribution of the main operating refining variables and the main strategies that can be used industrially to optimize the operating results From this evaluation the parameter that complements the specific edge load theory is identified This parameter is related to the retention time of the fiber flocs inside the refiner

**Lignocellulosic Fibers and Wood Handbook** Mohamed Naceur Belgacem, A. Pizzi, 2016-04-14 This book will focus on lignocellulosic fibres as a raw material for several applications It will start with wood chemistry and morphology Then some fibre isolation processes will be given before moving to composites panel and paper manufacturing characterization and aging

Biermann's Handbook of Pulp and Paper Pratima Bajpai, 2018-05-17 Biermann's Handbook of Pulp and Paper Raw Material and Pulp Making Third Edition is a comprehensive reference for industry and academia covering the entire gamut of pulping technology This book provides a thorough introduction to the entire technology of pulp manufacture features chapters covering all aspects of pulping from wood handling at the mill site through pulping and bleaching and pulp drying It also includes a discussion on bleaching chemicals recovery of pulping spent liquors and regeneration of chemicals used and the manufacture of side products The secondary fiber recovery and utilization and current advances like organosolv pulping and attempts to close the cycle in bleaching plants are also included Hundreds of illustrations charts and tables help the reader grasp the concepts

being presented This book will provide professionals in the field with the most up to date and comprehensive information on the state of the art techniques and aspects involved in pulp making It has been updated revised and extended Alongside the traditional aspects of pulping and papermaking processes this book also focuses on biotechnological methods which is the distinguishing feature of this book It includes wood based products and chemicals production of dissolving pulp hexenuronic acid removal alternative chemical recovery processes forest products biorefinery The most significant changes in the areas of raw material preparation and handling pulping and recycled fiber have been included A total of 11 new chapters have been added This handbook is essential reading for all chemists and engineers in the paper and pulp industry Provides comprehensive coverage on all aspects of pulp making Covers the latest science and technology in pulp making Includes traditional and biotechnological methods a unique feature of this book Presents the environmental impact of pulp and papermaking industries Sets itself apart as a valuable reference that every pulp and papermaker engineer chemist will find extremely useful

**Journal of Pulp and Paper Science** ,1999      **Index of Conference Proceedings** British Library. Document Supply Centre,2000      **Handbook of Natural Fibres** Ryszard M. Kozlowski,2012-09-21 Growing awareness of environmental issues has led to increasing demand for goods produced from natural products including natural fibres The two volume Handbook of natural fibres is an indispensable tool in understanding the diverse properties and applications of these important materials Volume 2 Processing and applications focuses on key processing techniques for the improvement and broader application of natural fibres Part one reviews processing techniques for natural fibres Silk production and the future of natural silk manufacture are discussed as well as techniques to improve the flame retardancy of natural fibres and chemical treatments to improve natural fibre properties Ultraviolet blocking properties enzymatic treatment and electrokinetic properties are also discussed Part two goes on to investigate applications of natural fibres including automotive applications geotextiles paper and packaging and natural fibre composites NFCs for the construction and automotive industries The use of flax and hemp textiles made from jute and coir antimicrobial natural fibres and biomimetic textile materials are also considered before a final discussion of enhancing consumer demand for natural textile fibres With its distinguished editor and international team of expert contributors the two volumes of the Handbook of natural fibres are essential texts for professionals and academics in textile science and technology Focuses on key processing techniques for the improvement and broader application of natural fibres Reviews processing techniques for natural fibres including silk production and the future of natural silk manufacture Discusses ultraviolet blocking properties enzymatic treatment and electrokinetic properties among other topics

TAPPI Engineering/Process and Product Quality Conference & Trade Fair ,1999      Recycling and Deinking of Recovered Paper Pratima Bajpai,2013-11-21 Paper recycling in an increasingly environmentally conscious world is gaining importance Increased recycling activities are being driven by robust overseas markets as well as domestic demand Recycled fibers play a very important role today in the global paper industry as a

substitute for virgin pulps Paper recovery rates continue to increase year after year Recycling technologies have been improved in recent years by advances in pulping flotation deinking and cleaning screening resulting in the quality of paper made from secondary fibres approaching that of virgin paper The process is a lot more eco friendly than the virgin papermaking process using less energy and natural resources produce less solid waste and fewer atmospheric emissions and helps to preserve natural resources and landfill space Currently more than half of the paper is produced from recovered papers Most of them are used to produce brown grades paper and board but for the last two decades there is a substantial increase in the use of recovered papers to produce through deinking white grades such as newsprint tissue market pulp By using recycled paper companies can take a significant step toward reducing their overall environmental impacts This study deals with the scientific and technical advances in recycling and deinking including new developments Covers in great depth all the aspects of recycling technologies Covers the latest science and technology in recycling Provides up to date authoritative information and cites many mills experiences and pertinent research Includes the use of biotech methods for deinking refining and improving drainage      **Progress in Paper Recycling** ,1999      **Absorbent Technology** P.K. Chatterjee,B.S. Gupta,2002-03-20 This publication discusses the theoretical aspects of absorbency as well as the structure properties and performance of materials The chapters are arranged in an approach for the reader to advance progressively through fundamental theories of absorbency to more practical aspects of the technology Topics covered include scientific principles of absorbency and structure property relationships material technology including super absorbents non woven natural and synthetic fibres and surfactants absorbency measurement techniques and technology perspective The reader is provided with current status information on technology and is also informed on important developments within the field

**TAPPI Pulping Conference, 1999 Proceedings** ,1999      Nordic Pulp & Paper Research Journal ,2006      *Appita Journal* ,2007      **Cellulose Chemistry and Technology** ,2004

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