

Handbook on Pulp and Paper Processing

Author: NPCS Board of Consultants & Engineers

Format: Hardcover

ISBN: 9788178331140

Code: NI212

Pages: 704

Price: Rs. 1,875.00 US\$ 50.67

Publisher: Asia Pacific Business Press Inc.

Usually ships within **5** days

The pulp and paper industry comprises companies that use wood as raw material and produce pulp, paper, board and other cellulose based products. The pulp and paper sector presents one of the energy intensive and highly polluting sectors within the Indian economy and is therefore of particular interest in the context of both local and global environmental discussions. Increases in productivity through the adoption of more efficient and cleaner technologies in the manufacturing sector will be most effective in merging economic, environmental, and social development objectives. Papers are mostly used product starting from writing to packaging. It plays an important role in commercial field as well as in academic field also. Without paper nothing is expressible and reliable, so paper is part and parcel of our life. Adequate amount of raw materials for processing paper and pulp is available. Bamboo is the main raw material for Indian paper industry. New bamboo areas even at high cost are being trapped. Some of the examples of high yield pulping process are mechanical process, semi chemical process, alkaline chemical process, sulfite process, etc. Physical strength properties of paper depend on the quality of raw material, its pulping, bleaching and subsequent paper making processes. Technology has made it easy to process these raw materials in an economic and lucrative way to meet the global demand. Raw materials like, straw, bagasse, wood, bamboo is almost available in most of the places. So it is great opportunity for the entrepreneurs to start up such kind of industry. Paper Industry has tremendously increased in India in the last 20 to 30 yrs. The Paper industry is a priority sector for foreign collaboration and foreign equity participation up to 100% receives automatic approval by Reserve Bank of India. Several fiscal incentives have also been provided to the paper industry, particularly to those mills which are based on non conventional raw material.

Some of the fundamentals of the book are bleaching of bamboo cold, high yield semi chemical pulping of mixture of bamboo and mixed hardwoods, sulphate semi chemical process, kraft green liquor semi chemical process, neutral sulphite semi chemical process, thermo mechanical pulps for newsprint, zeta potential concept in paper sizing, sodium carbonate in alkali extraction during bleaching bamboo, maintenance engineering in pulp and paper industry, design and application of refiners in stock preparation, paper machine effluent etc.

This book explains about the various raw material, their processing and utilizations and also the possible waste treatment of such paper and pulp making industry. To draw attention for manufacturing quality product with all possible latest technologies is the main purpose of this book. The book is very resourceful for new entrepreneurs, technocrats, existing units and research scholars.

Contents

1. BLEACHING OF BAMBOO COLD
SODA PULPS
Results and Discussions

Constant Conditions
Pretreatment with Acid
Pretreatment with Alkali
Bleaching Conditions in Different Stages
Effect of Peroxide in Alkali Pretreatment
Pretreatment with Dye
Bleaching Conditions in Different Stages
Conclusions

Experimental
Raw Materials
Bleaching

2. HIGH YIELD SEMI-CHEMICAL PULPING OF MIXTURE OF BAMBOO AND MIXED HARDWOODS

Raw Material
Experimental and Results
Sulphate Semi-Chemical Process
Kraft Green Liquor-Semi-Chemical Process
Neutral Sulphite Semi-Chemical Process
Discussion

Sulphate Semi-Chemical Process
Green Liquor Semi-Chemical Process
Neutral Sulphite Semi-Chemical Process
Conclusion

3. DEVELOPMENT IN HIGH YIELD PULPING PROCESS

Mechanical Process
Semichemical Process
Chemical Process
Alkaline Chemical Process
Sulfite process
Organic Catalyst to High Yield Pulping
AQ Pulping Technology
Polysulfide-AQ Process
Alkaline Sulfite-AQ Pulping
Experimental

4. THERMO-MECHANICAL PULPS FOR NEWSPRINT MANUFACTURE FROM TROPICAL PINES

Raw Materials
Experimental
Preparation of Thermo-Mechanical Pulps
Results and Discussions

5. A STUDY ON REPLACEMENT OF SODIUM SULPHATE BY AQ-LARGE SCALE TRIAL

Anthraquinone an Aid to Pulping
Laboratory Scale Investigations at Central Research Laboratory, Dalmianagar
Plant Trial with AQ
Evaluation of Mill Pulp
Discussion and Results
Conclusions

6. ZETA POTENTIAL CONCEPT IN PAPER SIZING

Electro Kinetic (Zeta) Potential-A Concept
The Theory of Electrical Double Layer
Stern's Modified Double Layer

The Meaning and Limitations in the Application of
Electro Kinetic Theory
to the Paper Sizing
Behaviour of Alum in Water
Electro Kinetic Properties of Alum-rosin
Size Precipitate and the Sized Fibre
Conclusion
Nomenclature

Greeks

7. ECONOMICS OF BAMBOO AND HARDWOOD PULPING BY ANTHRAQUINONE CATALYSED-KRAFT-PROCESS

Experimental Design & Observations

Results & Discussions

Conclusion

8. EFFECT OF BLEACHED PULP VISCOSITY ON STRENGTH PROPERTIES OF BAMBOO SULFATE PULP

Experimental

Pulping

Bleaching

Physical Strength Properties

Chemical Analysis

Observations and Discussions

Conclusion

9. ALKALI/OXYGEN DELIGNIFICATION AND BLEACHING OF SODA BAMBOO PULP

Experimental

Discussions

Conclusions

10. ALKALI/OXYGEN DELIGNIFICATION AND BLEACHING OF SODA BAMBOO PULP, BAMBOO + MIXED HARD WOOD PULP (70 : 30) AND MIXED HARDWOOD PULP

Experimental and Results

Discussions

Conclusion

11. SODIUM CARBONATE IN ALKALI EXTRACTION DURING BLEACHING BAMBOO (D. STRICTUS) PULP

Experimental

Study on Sequentially Chlorinated (H/C) Pulp

Study on Chlorinated Pulp

Results and Discussion

Conclusions

12. EFFECT OF HEMICELLULOSES ON UNBLEACHED SOFTWOOD KRAFT PULP

Materials and Methods

Enzyme Treatments

Bleaching Experiments

Chemical Composition and Kappa Number Analyses

Microscopic Analysis

Numerical Measurement of Colour

Results and Discussion

Chemical Changes After Enzyme Treatment

Bleaching Experiments

Graff $\hat{\text{C}}^{\text{TM}}$ Stain

Numerical Measurement of Colour
Accessibility Changes and Simonsâ€™™ Stain
Deuterium Oxide Exchange
Simonsâ€™™ Stain
Conclusions

13. THERMODYNAMIC FUNCTIONS OF THE
REACTION BETWEEN LIGNIN AND
HYDROGEN PEROXIDE DURING BLEACHING

Experimental
Isolation of Thioglignin
Preparation of Hydrogen Peroxide Solution
Reaction of Thioglignin with Hydrogen Peroxide
Results and Discussion
Analysis of Kinetic Data
Order of the Reaction and Variation of Rate
Constant with Reaction Parameters
Validity of Arrhenius Equation (Reaction Rates and
Temperature Changes)
Estimation of various Thermodynamic Functions
Conclusions

14. SEQUENTIAL BLEACHING

Experimental Procedure
Discussions of the Results
Bleach Consumption
Physical and Chemical Properties
Pollution Load of the Filtrate
Conclusion

15. MANUFACTURE OF CORRUGATING MEDIUM PAPER
UTILIZING 100% BAGASSE FURNISH

Process Suggested for Making
Corrugating Medium from 100% Bagasse
Fibre Preparation
Depithing at Paper Mills
Digestion Cycle
Stock Preparation

16. EFFECTIVE UTILIZATION OF CHEMICALS IN
PULP AND PAPER MILLS

Digester House
Chemical Recovery Section
Bleach Plant
Chemical and Stock Preparation
Effluents

17. EFFECTIVE USE AND RECOVERY OF
CHEMICALS IN COLD SODA PULPING

Experimental
Chemical Treatment of E. Tereticornis
Eta Reed Sulphate Pulping
Evaporation and Burning Properties of Kraft and
Cold Soda Spent liquors
Results and Discussions
Chemical Consumption
Pulp Properties
Composition of Liquors

Pollution Loads
Properties of Spent Liquors
Material Balances
Conclusions
18. EFFECTIVE USE AND RECOVERY OF CHEMICALS IN
COLD SODA PULPING WITH PARTIALLY CLOSED SYSTEM
Chemical Treatment of E. Tereticornis
Results and Discussions
Conclusions
19. MAINTENANCE ENGINEERING IN PULP
AND PAPER INDUSTRY
Inspection
Lubrication
Servicing
Maintenance Problems
20. LIMITATION TO SATISFACTORY OPERATION OF
WET END OF PAPER MACHINE
Basis Weight Profile
Head Box Pulsation
Drainage Formation and Sheet Structure
The Head Box
Rectifier Roll Head Boxes
Micro Turbulence Head Boxes
Web Formers
Twin Wire Forming
Schmidt Classification
Norman Classification
High Consistency Forming
Ancillary Equipments
Wet Web Strength
Limitations of Water Removal on Pressing
Conclusion
21. DESIGN AND APPLICATION OF REFINERS
IN STOCK PREPARATION
Conical Refiners
Shallow Angle Refiner
Steep Angle Refiners
Double Disc Refiners
Safety Devices
Influence of Machine Variables on Refining
Batch Refining
Machine Refiners
22. WET FELT DESIGNING TECHNIQUES
Pressing
Case Study
Recommendations
23. MODERNIZATION AND OPTIMUM UTILIZATION OF
EVAPORATORS FOR HARDWOOD BLACK LIQUORS-MILL
EXPERIENCE
Hardwood Black Liquors
Recovery Boilers and Required Liquor
Solids
Original Evaporator Units

Installation of a Pump in Between First
Pass and Second Pass of Concentration Effects of
Both Units
Conversion of Concentration Effect of
First (OLD) Unit to a Finisher
Introduction of a New Finisher Effect
Utilization of Vent Vapour from Finisher
Changing the Liquor Entry from Tangential to Radial and
Modification of Flash Chamber
Utilization of Vapour from Improvised Finisher of
Old Street
Conclusions

24. PAPER MACHINE EFFLUENT

Experimental
Discussions
Mode of Treatment for Paper Machine Effluent
Results
Conclusion

25. CONICAL REFINERS AND WIDE-ANGLE REFINERS IN CONTINUOUS AND BATCH REFINING SYSTEMS FOR BAMBOO AND HARDWOOD FURNISH

Introduction
Types of Refining Systems in the Mill
Conical and Wide Angle Refiners Strength, Development and Power Consumption

26. USE OF "NO PICK"™ ROLL IN PAPER MACHINE PRESS SECTION BASED ON SHORT-FIBRED TROPICAL HARDWOODS AND AGRICULTURAL RESIDUES

Theoretical Considerations
The Problem
Press Section Before Modification
Press Section After Modification
Discussion
Conclusions

27. CONSUMPTION OF FURNACE OIL IN RECOVERY BOILERS

Storage
Viscosity
Velocity
Turbidity & Causticity
Silica
Inverse Solubility
Organic Content and Calorific Value

28. NECESSITY TO RENOVATE AND MODERNIZE PAPER MACHINE

Fourdrinier Part
Press Part
Dryer Section
Calender Stacks
Pope Reel
Conclusion

29. WET END OPERATION OF A PAPER MACHINE

Approach Flow
Head Box

The Slice
Approach System, Head Box and Slice at W.C.P.M.
Sheet Formation and Drainage on the Fourdrinier
Shake
Suction Boxes
Dandy Roll
The Couch
Conclusion

30. CLEANING SYSTEM-SHOWER FOR PAPER MACHINE

Mechanical Cleaning
Classification of Water Shower
Wire Cleaning Shower
Knock off Shower
Trim Knock-off Shower
Couch Roll Cleaning Shower
Return Roll Cleaning Shower
Dandy Cleaning Shower
Felt Shower
Special Features of Water Showers
Material of Construction
Insert Type Nozzle
Protective Shell
Programming
Filters

31. SUITABILITY OF KENAF CTMP FOR LINERBOARD

Experimental
Raw Material
Particle Size
Reduction and Washing
Injection Process
Fiberizing and Refining
Kraft Pulping
Pulp Testing and Handsheet Formation and Testing
Results and Discussion
Andritz Sprout-Bauer Pulping Trials
FPL Pulping Trials
Kenaf and Loblolly Pine Pulp Blends
Conclusions

32. NEWSPRINT FROM BLENDS OF KENAF CTMP
AND DEINKED RECYCLED NEWSPRINT

Experimental
Results and Discussion
Conclusion

33. FEASIBILITY OF USING KENAF
CHEMITHERMOMECHANICAL PULP IN
PRINTING AND WRITING PAPER

Results and Discussion
Andritz Sprout-Bauer and FPL Pulping Trials
Postbrightened Kenaf Thermomechanical Pulp
Conclusions
Experimental
Raw Material, Particle Size Reduction, and Material Wash
Injection Process

Fiberizing and Refining Process

Testing of Pulp and Forming and Testing of Handsheets

Postbrightening of Kenaf TMP

Brightness Reversion

34. MESTA/KENAF AS RAW MATERIAL FOR KRAFT PULPING

Raw Material

Experimental

Chemical Constituents of Mesta

Pulping and Sheet Making

Discussion

Physical Characteristics

Chemical Constituents

Pulping Bleaching and Black Liquor Characteristics

Morphological Studies

Properties of Pulp Sheets

Fibre Classification Results

Conclusions

35. RESPONSE OF KENAF VARIETY, HC-583

TO DIFFERENT LEVELS OF NITROGEN

Materials and Methods

Results and Discussion

Plant Height

Basal Diameter of Stalk

Dry Yield of Stalk

Increase in Dry Yield of Stalk per Kg. N Applied

Conclusion

36. PREHYDROLYSED KRAFT COOKING OF

JUTE STICK (EFFECT OF PREHYDROLYSIS CONDITION)

Experiments

Raw Materials

Digestion

Bleaching

Chlorine Water Bleaching

Analysis of the Pulp

Results & Discussion

A. Effect of Prehydrolysis Treatment on the Chemical Composition of Jute Stick

B. Loss of α -Cellulose and Lignin after Prehydrolysis and Kraft Cooking of Jute Stick

Results of Bleached Pulps

Conclusions

37. HIGH YIELD PULP FROM JUTE STICKS

38. GREASE PROOF PAPERS FROM SULPHITE JUTE STICK PULP

Raw Material

Pulping

Conclusion

39. CHEMICAL RECOVERY BOILERS FOR PULP MILLS

USING AGRICULTURAL RESIDUES AS RAW MATERIALS

Present and Future Prospects of Agricultural Residue Usage in India

Advantages of Use of Agricultural Residues

Special Shelter Type Design for Smaller Units

40. PROBLEMS IN BL EVAPORATION IN INDIAN RAW MATERIALS

Black Liquor Screening

Black Liquor Soap Problem

Carbonaceous Deposits

Scale Formation and its Removal

Results Achieved

Technical

Vapour Side Scale

Method of Feeding Black Liquor

Mixed Feed

Quintuple Effect & Forced Circulation Evaporator

Forced Circulation Evaporator

41. UTILIZATION OF UNCONVENTIONAL RAW MATERIALS

Advantages at a Glance for New Process

Cooking Liquor and Position of pH (Cold) during Pulping

Pulping Conditions and Delignification

Yield and General Properties of Pulp

Chemical Composition of Unbleached Pulp

Bleaching of Pulp

Paper Making Properties

Black Liquor and Recovery

Environmental Protection

Air Protection

Water Protection

Future Looks

Sulfite Shuttles into Space

42. UTILIZATION OF AGRICULTURAL RESIDUES USING MECHANO-CHEMICAL PULPING PROCESS

Pilot Plant Trials at Cellulose and Paper Branch,
Forest Research institute and colleges, Dehradun

Production of Rice Straw Pulp

Production of Wheat Straw Pulp

Production of Bagasse Pulp

Production of Paper

Mechano Chemical Pulping on Industrial Scale

Chemical Preparation

Cooking

Search for Alternative Raw Material

Variables in the Process

Modification of Bagasse Pulping by Partial Replacement of
Sodium Hydroxide by Sodium Carbonate

Addition of Sodium Sulphide in Cooking Liquor in
Bagasse Pulping

Conclusion

43. FEASIBILITY OF RECYCLED NEWSPAPERS HARDBOARDS

Experimental Design and Analysis

Materials

Processing

Acetylation

Adhesive Application

Board Manufacture

Testing

Results and Discussion

Static Bending Properties

Tensile Strength Properties

Water Absorption and Thickness Swell

Linear Expansion

Concluding Remarks

44. RESTORING BONDING STRENGTH TO RECYCLED FIBERS

Dry-Fiberized Fiber Characteristics

Mechanical Treatment

Fractionation

Strength Additives

Chemical Treatments

Blending with Virgin Fiber

Papermaking Variables

Wet-Formed Papers

Pressing

Air-Formed Papers

Conclusions

Methods and Materials

45. CHEMICAL MODIFICATION OF AGRO-FIBER FOR THERMOPLASTICIZATION

Experimental Procedures

Esterification Procedure

Thermal Analysis

Pressing of Esterified Fiber

Electron Microscopy of Pressed Fiber

Swelling of Pressed Fiber in Water

Results and Discussion

Esterification of Lignocellulosics

Thermal Analysis

Swelling of Pressed Fiber Pellets in Water

Conclusions

46. POTENTIALS FOR COMPOSITES FROM JUTE AND

ALLIED FIBERS

Plant Utilization for Composites

Potential Composites for Agro-Resources

Geotextiles

Filters

Sorbents

Structural Composites

Non-structural Composites

Molded Products

Packaging

Combinations with Other Resources

Chemical Modification for Property Improvement

Conclusions

47. AN APPROACH TO "INPLANT COLOUR REDUCTION"™ OF

BLEACH PLANT EFFLUENT USING CALCIUM

HYPOCHLORITE

Experimental

Discussion

48. DESILICATION OF SULPHATE WEAK BLACK

LIQUOR BY THE ADDITION OF LIME

Experimental

Procedure of Desilication

Results & Discussion

49. TREATMENT OF PULP & PAPER MILL WASTES

Pulp and Paper Industry Water

Consumption

Nature and Effect of Impurities

Primary Treatment

Sedimentation Units

Sludge Handling & Disposal

Secondary Treatment

50. DECOLOURIZATION OF WASTE WATER

FROM BLEACHED-KRAFT PULP & PAPER

MILL USING ALUM AND CLAY

Materials and Methods

Results and Discussion

Sludge Blanket

Effluent Quality

Colour Removal

Removal of Suspended Solids

COD Reduction

Conclusion

51. REMOVAL OF SOLUBLE SILICA FROM

SULPHATE GREEN LIQUOR

Experimental

Carbonation

Green Liquor Analysis

Results & Discussion

52. TRENDS IN ASH CONTENT OF STRAW

PULPS-AN EXPLANATION

Experimental

53. MINI LIME TREATMENT OF DISSOLVING

PULP MILL COLOURED EFFLUENT

Sources of Colour in the Pulp Mill

Effluent

Present Work

Chlorination of Lime Treated Effluent

Calcining of Effluent Sludge

Causticization Using Lime Obtained from Effluent Sludge

Conclusion

54. COLOUR AND COD REDUCTION OF

BLEACH EFFLUENTS

Experimental

Results and Discussions

Colour of the Effluents

Phenolic Compounds

Rate of Colour Reduction

Chemical Oxygen Demand

Conclusions

55. EFFECT OF pH ON SULPHITE PULPING OF

HOLOCELLULOSE OF E. TERETICORNIS

Experimental

Preparation of Cooking Liquor

Titration of Cooking Liquor

Sulphite Pulping

Neutral Sulphite Pulping

Preparation of Cooking Liquor

Chemical Analysis of Sulphite and

Neutral Sulphite Cooked Holocellulose

Results and Discussion Effect of pH and
Cooking Time on Yield
Effect of pH and Cooking Time on Klason Lignin
Effect of pH and Cooking Time on Alpha-Cellulose
Effect of pH and Cooking Time on
Pentosans
Effect of pH and Cooking Time on
Acidic Sugar
Effect of pH and Cooking Time
On Methoxyl and Acetyl Groups

56. UTILIZATION OF AGRICULTURAL RESIDUES
FOR PULP, PAPER AND BOARD

Rice Straw
Writing and Prints Paper
Grease Proof Paper
Wrapping Paper
Straw Board
Fibre Boards
Wheat Straw
Writing & Printing Paper
Greaseproof Paper
Straw Board
Jute Sticks
Writing and Printing Paper
Wrapping Paper Pulp Yield and Sheet Characteristics
Straw Board
Newsprint Grade Refiner Groundwood Pulp
Constitution of Hemicellulose
Greaseproof Paper, Strength Properties of Standard Sheet
Building Board
Bagasse
Writing and Printing Paper
Wrapping Papers
Rayon Grade Pulps
Greaseproof paper
Straw Board
Fiber Board
Newsprint
Cotton Stem
Writing and Printing Paper
Miscellaneous Raw Materials
Areca nut Husk
Ground Nut Shells
Tea Stem
Caster Stems (*Ricinus Communis*, linn)
Sun Flower Stalk
Arhar Sticks (*Cajanus SP*) and Jawar Stalk (*Sorghum SP*)
Sugar Cane Leaves
Paddy Husk

57. PROVISION OF CAPTIVE POWER GENERATION IN
A 30 TPD AGRO-BASED PAPER PLANT AS A MEANS OF
IMPROVING CAPACITY UTILIZATION
Capacity Utilization

Power Availability
Captive Power Plant
Recommended Scheme
Features of the Scheme
Fixed Costs
Variable Costs
Average Cost of Power Generation
Economics and Discussion
Conclusion

58. ENERGY CONSERVATION IN PULP AND PAPER INDUSTRY—SOME THOUGHTS

Paper Industry
Deliberations
Total Energy Concept
In-Plant Power Generation
Energy Distribution and Utilization
Overdesign and Capacity Utilization of the Equipment
Energy Audit
Short Term-Long Term Action Programme
Short Term Schemes
Long Term Schemes
Generation
Short Term
Long Term
Transmission
Short Term
Long Term
Utilization
Short Term
Long Term
Waste Streams
Energy Conservation Approaches
Factor Affecting Energy Efficiency
Research and Development
National Energy Programme
Summary and Conclusions

About NIIR

NIIR PROJECT CONSULTANCY SERVICES (NPCS) is a reliable name in the industrial world for offering integrated technical consultancy services. NPCS is manned by engineers, planners, specialists, financial experts, economic analysts and design specialists with extensive experience in the related industries.

Our various services are: Detailed Project Report, Business Plan for Manufacturing Plant, Start-up Ideas, Business Ideas for Entrepreneurs, Start up Business Opportunities, entrepreneurship projects, Successful Business Plan, Industry Trends, Market Research, Manufacturing Process, Machinery, Raw Materials, project report, Cost and Revenue, Pre-feasibility study for Profitable Manufacturing Business, Project Identification, Project Feasibility and Market Study, Identification of Profitable Industrial Project Opportunities, Business Opportunities, Investment Opportunities for Most Profitable Business in India, Manufacturing Business Ideas, Preparation of Project Profile, Pre-Investment and Pre-Feasibility Study, Market Research Study,

Preparation of Techno-Economic Feasibility Report, Identification and Section of Plant, Process, Equipment, General Guidance, Startup Help, Technical and Commercial Counseling for setting up new industrial project and Most Profitable Small Scale Business.

NPCS also publishes various process technology, technical, reference, self employment and startup books, directory, business and industry database, bankable detailed project report, market research report on various industries, small scale industry and profit making business. Besides being used by manufacturers, industrialists and entrepreneurs, our publications are also used by professionals including project engineers, information services bureau, consultants and project consultancy firms as one of the input in their research.

Our Detailed Project report aims at providing all the critical data required by any entrepreneur vying to venture into Project. While expanding a current business or while venturing into new business, entrepreneurs are often faced with the dilemma of zeroing in on a suitable product/line.

NIIR PROJECT CONSULTANCY SERVICES , 106-E, Kamla Nagar, New Delhi-110007, India. **Email:** npcs.india@gmail.com **Website:** NIIR.org

Mon, 27 May 2024 21:39:44 +0530