

Handbook on Pulp and Paper Processing

Author:- NPCS Board of Consultants & Engineers

Format: hardcover

Code: NI212

Pages: 704

Price: Rs.1875US\$ 150

Publisher: NIIR PROJECT CONSULTANCY SERVICES

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.

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's Stain
Numerical Measurement of Colour
Accessibility Changes and Simons' Stain
Deuterium Oxide Exchange
Simons' 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
Arecanut 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

Fri, 21 Mar 2025 00:29:49 +0000