

# Handbook on Tall Oil Rosin Production, Processing and Utilization

**Author:-** Dr. H. Panda

**Format:** paperback

**Code:** NI247

**Pages:** 480

**Price:** Rs.1575US\$ 150

**Publisher:** NIIR PROJECT CONSULTANCY SERVICES

Usually ships within 5 days

Tall oil, a by-product of kraft pulping of pine wood, is formed by acidifying black liquor soap skimmings. It consists of resin acids or rosin, fatty acids, and neutrals. Crude tall oil is an excellent source of rosin and tall oil fatty acid, an industrial-grade oleic and linoleic acid blend. The bulk of the neutrals, largely esters of fatty acids, sterols, resin and wax alcohols, and hydrocarbons, boil at either lower or higher temperatures than the boiling range of the fatty and resin acids.

Tall oil itself has a variety of uses in industry. It is used as a frothing agent in the flotation process for reclaiming low grade copper- lead- and zinc-bearing ores, and as a solvent or wetting agent in a variety of textile and synthetic fibre manufacturing processes. The distilled fatty acids are used in soaps, detergents and disinfectants and as a base for lubricating greases, textile oils, cutting oils and metal polishes. They are also used as drying agents in paint, although synthetic substances are widely used. The fatty acids are unsaturated and on exposure to air undergo autoxidation and polymerization to form resin-like materials which form a tough protective coating. Resin acids are used in rubber polymerization and compounding, as size to impart water resistance to paper, and in adhesives and printing inks. Resin acids are the major component of a substance known as rosin, which is used by musicians to improve the grip of bows used for string instruments.

The book contains production details of different products like recovery of crude tall oil, Composition and properties of crude tall oil, Lab. Scale fractional vacuum distillation, tall oil soap acidulation, purification of sulphate soap, hydrodynamic separation of CTO, dimerization of tall oil fatty acid, black liquor soap recovery methods, tall oil in asphalt products and petroleum uses, tall oil in liquid soaps, tall oil in rubber, paper and printing inks etc. This book is very useful for scientists, scholars, consultants and technical institutions.

## 1. INTRODUCTION

Introduction to Tall Oil

History of Tall Oil

Production Process for Tall Oil

Recovery of Tall Oil

Composition and Properties of Tall Oil

Crude Tall Oil

Analysis and Testing of Tall Oil Products

Applications of Tall Oil

## 2. RECOVERY OF TALL OIL

The Chemistry of Tall Oil Fatty and Rosin Acids  
Chemical Composition of Tall Oil Fatty Acids  
General Reactions of Tall Oil Fatty Acids  
Reactions Involving the Carboxyl Group  
Chemical Composition of Tall Oil Rosin  
Dimer Acids Manufacture and Feedstock  
3. COMPOSITION AND PROPERTIES OF CRUDE  
TALL OIL  
Tall Oil Production and Laboratory Analyses at the Factories  
Studies on the Precursors of Indian Tall Oil  
Analytical Studies on the Composition of Crude Tall Oil  
Experimental  
Testing of Tall Oil with Standard Methods  
Fractionation of Samples  
Crude Tall Oil Recovery from Sulfate Soap  
Separation of Free Acids and Neutrals  
Preferential Esterification  
Saponification  
Methylation and Silylation  
Thin-Layer Chromatography (TLC)  
Preparative Argentation TLC  
Gas Chromatography (GC)  
Gas Chromatography—Mass Spectrometry (GC-MS)  
Results and Discussion  
Testing of Tall Oil with Standard Methods  
Group Fractionations  
Studies on the Composition and Component Distribution  
Fatty Acids  
Saturated Fatty Acids  
Monoenoic Fatty Acids  
Dienoic Fatty Acids  
Trienoic Fatty Acids  
Tetraenoic Fatty Acids  
Conjugated Fatty Acids  
Esterified Acids  
Resin Acids  
Neutral Components  
Gr. 1 Phytosterols  
Gr. 2 Monoterpene alcohols  
Diterpene Abietic and Pimaric Type Alcohols  
Fatty Alcohols  
Triterpene Alcohols  
Gr. 3  
Gr. 4  
Gr. 5  
Gr. 6 Oxosteroids  
Gr. 7 Dimethoxy Stilbenes  
Gr. 8 Resin Acid Methyl Esters  
Gr. 9 Diterpene Aldehydes  
Gr. 10 Esters of Fatty Acids with Diterpene Alcohols  
Gr. 11 Esters of Fatty Acids with Fatty Alcohols  
Gr. 12 Esters of Fatty Acids with Sterols and Triterpene Alcohols  
Gr. 13 Hydrocarbons

Sesquiterpene Hydrocarbons

Diterpene Hydrocarbons

Typical Features of Indian Tall Oil

General Properties

Component Distribution

Factors Influencing the Properties and Composition of Crude Tall Oil

Wood Species

Geographical Location (Climate)

Roundwood and Chip Storage

Other Factors

#### 4. CHEMICAL CHANGES DURING STORAGE OF CRUDE TALL OIL

Experimental

Results and Discussion

Drop in Acid Number

Esterification

Thermal and Acid Isomerization of Resin Acids

General

Results from Laboratory Storage

Crystallization

Changes in the Composition of Conjugated Fatty Acids

Aspects of the Storage of Turkish Crude Tall Oil

#### 5. LABORATORY-SCALE FRACTIONAL VACUUM DISTILLATION

Experimental

Still

Charges

Procedure

Analytical Procedures

Results and Discussion

Composition of the Distillates

Distribution of Tall Oil Constituents in the Distillates

Fatty Acids

Esterified Acids

Resin Acids

Neutrals

Sesquiterpene Hydrocarbons

Diterpene Hydrocarbons

Hydrocarbons from Decarboxylation of Resin Acids

Diterpene Aldehydes

Pinosylvin Dimethyl Ether

Diterpene Alcohols

Resin Acid Methyl Esters

Fatty Alcohols

Dehydrated Sterols

Sterols

Triterpene Alcohols

Esters

Unidentified Components

Composition of the Pitches

Components Not Eluted on GC

Volatilities of Tall Oil Constituents with Special Reference to Fatty and Resin Acids

General

Observations on the Laboratory Distillation

Brief Critique on the Laboratory Distillation

Conclusions

## 6. OZONOLYSIS AND EPOXIDATION OF METHYL MALEOPIMARATE

Results and Discussion

Ozonolysis and Epoxidation of Methyl Maleopimarate (Ib) and Other Related Compounds

Structural Assignment to 4a

Absolute Configuration of 4b

Structure of the Anhydride 6

Structure of the Epoxy Anhydride 5

Reaction of Peroxytrifluoroacetic with Bicyclo[2.2.2]oct-5-ene-endo-cis-2,3-dicarboxylic  
Anhydride (8)

Structural Assignment to 9

Structure of the Hydroxy Lactone 10

Experimental

Ozonolysis of Methyl Maleopimarate (Ib). Isolation of 4b, 5, and 6

Preparation of the Tetramethyl Ester of 6

Preparation of 5 by Direct Epoxidation of Ib

Preparation of 20

Reaction of 21 with Peroxytrifluoroacetic Acid. Preparation of 22

Reaction of Peroxytrifluoroacetic Acid with Olefin 8. Preparation of 5,6-Endo-epoxy-  
bicyclo[2.2.2]octane-cis-2,3-dicarboxylic Anhydride 9

Epoxidation of Olefin 8 with m-Chloroperbenzoic Acid. Preparation of Hydroxy Lactone 10

Preparation of 35 and 36 from 10

Preparation of 37 and 38

Preparation of Bromo Lactonic Acid 39 from the Olefinic Anhydride 8

Preparation of the Bromohydrin 41 of Dimethyl Ester 37

Preparation of 40, the C2 Epimer of 39

Discussion of Results

The Benzogulnone Adduct of Levopimaric Acid (XXVIII)

The Dimethyl Acetylenedicarboxylate Adduct of Levopimaric Acid

Other Adducts of Levopimaric Acid

## 7. TALL OIL SOAP ACIDULATION

Batch Process

Semi-Batch Process

Continuous Decanting Process

Centrifuge Process

## 8. RETROFITTING A TALL OIL ACIDULATION PLANT

### 9. PURIFICATION OF SULPHATE SOAP

### 10. HYDRODYNAMIC SEPARATION OF CTO

### 11. REFINING OF TALL OIL BY COLUMN LIQUID- LIQUID EXTRACTION

Introduction

The Pilot Plant at the Technical Research Centre of Finland

Trials with Mixed Pine-Birch Soap

Trials with Other Tall Oil Products

Conclusions

### 12. DIMERIZATION OF TALL OIL FATTY ACID

### 13. TALL OIL SOAP ACIDULATION AND SULFUR

### BALANCE PROBLEMS IN KRAFT MILLS

Soap Acidulation

Spent Acid Disposal  
Sulfur Losses  
Soda Losses  
Sulfur Balance  
Replace H<sub>2</sub>SO<sub>4</sub> with DGE  
Sewering DGE  
Modified C102 Production Technology  
Concluding Remarks

#### 14. BLACK LIQUOR SOAP RECOVERY METHODS

Woodstorage  
Digestion and Washing  
Soap Recovery in the Weak Liquor System  
Soak Skimmer Design and Operation  
Air Injection to Improve Recovery  
Influence of Hardwood Liquor on Soap Recovery  
Heavy Liquor Soap Recovery  
Soap Decanter Design and Operation  
Monitoring Soap Recovery Efficiency  
Summary

#### 15. CONTROLLING POLLUTION IN A LUWA TALL OIL DISTILLATION PLANT

Sources of Effluents from CTO Facilities  
Processes for the Distillation of Crude Tall Oil  
The Luwa CTO Distillation Process  
Effluents from the Luwa CTO Distillation Process  
Minimizing Effluents in CTO Distillation Plants

#### 16. ADVANCED POLLUTION CONTROL TECHNOLOGY IN THE STEAM DISTILLATION OF TALL OIL

Corrosion & Materials of Construction  
Reboiler Design  
Tower Internals  
Stability  
Conclusion

#### 17. NEW SEPARATION TECHNOLOGY FOR DISTILLED TALL OIL

Introduction  
Sorbex Process Outline  
Simulated Moving Bed  
Experimental Results  
Conclusions

#### 18. CARBON DIOXIDE PROCESS

Introduction  
Discussion

#### 19. FINNISH EXPERIENCE IN TALL OIL PITCH AS ASPHALT SUBSTITUTE

Background  
Tall Oil Pitch - Renewable Natural Resource  
Pitches in Asphalt and Pavement Characteristics  
Mixing and Laying of the Pavements in Field Experiments  
Wear Tests in Laboratory and On Field Show Improved Tendency  
Asphalt Paving Contracts in 1988  
Prejudices Disappear -The Future Is Open

#### 20. USES OF TALL OIL

Tall Oil Products in Surface Coatings  
Tall Oil in Alkyd Resins  
Tall Oil Formulations in Alkyd Resins  
Short Oil Baking Alkyd - Solvent Process  
Properties  
Short Oil Baking Alkyd - Fusion Process  
Medium Oil Alkyd-Fusion Process  
Long Oil Alkyd - Fusion Process  
Rosin Modified Alkyd-Fusion Process  
Glycerine Ester  
Maleic Modified Ester  
Distilled Tall Oil Epoxy Ester  
Other Uses for Tall Oil Products

Tall Oil in the Plasticizer Field  
Tall Oil Plasticizers  
Esterification of Tall Oil for Plasticizers  
Tall Oil in Adhesives and Linoleum Cement  
Tall Oil in Rubber Based Adhesives  
Tall Oil in Hot-Melt Adhesives  
Tall Oil Products in Linoleum Cements

## 21. TALL OIL IN ASPHALT PRODUCTS AND PETROLEUM USES

Tall Oil in Asphalt  
Roads  
Soil Treatments  
Roofing  
Adhesives  
Antistripping Agents  
Plasticizers  
Miscellaneous  
Tall Oil in Petroleum Applications  
Oil and Gas Well Fracturing  
Drilling Muds  
Demulsification Agents  
Corrosion Inhibitors  
Catalyst  
Lubricating Oil Additives

## 22. TALL OIL IN LIQUID SOAPS

Tall Oil in Disinfectants  
Tall Oil in Synthetic Detergents and Wetting Agents  
Syndet Types  
Syndet Products  
Tall Oil in Biodegradable Detergents

## 23. TALL OIL IN FLOTATION COLLECTORS AND CORE OILS

Tall Oil in Flotation Collectors  
Flotation Collectors  
Flotation Applications  
Tall Oil in Core Oils

## 24. TALL OIL IN RUBBER

Styrene-Butadiene Rubber  
Cold SBR Formulation (SBR 1500 Series)  
Hot SBR Formulation (SBR 1000 Series)

Cold High Solids SBR 2105 Latex Formulation (SBR 2100 Series)

Hot SBR Latex Formulation (SBR 2000 Series Type II)

Foam Rubber

## 25. TALL OIL IN PAPER SIZE

Papermaking Process

Rosin Sizing Materials

Forms of Size Available

Paste Size

Dry Size

Methods of Preparing Liquid Size

Cooking Process

Emulsion Process

Bewoid Process

Delthirna Process

Internal and External Sizing

Effect of Wet Strength Resins and Paper Coating Resins on Sizing

Sizing of Nonconventional Paper

Testing of Sizing

Water Resistance of Paper and Paperboard—T433 M-44 (Dry Indicator Method)

Water Immersion Test of Paperboard—T491 SU-63

Water Absorption of Paperboard—T492 SM-60

Water Absorptiveness of Nonbibulous Paper and Paperboard— T441M-60 (Cobb Test)

Degree of Curl and Sizing of Paper—T466 M-52

Ink Penetration Test

Fotosize Penetration Test—Lactic Acid Test

## 26. TALL OIL IN PRINTING INK

Typographic Printing and Typographic Inks

Heat-Set Inks

Steam-Set Inks

Newsprint Inks

Lithographic Printing and Lithographic Inks

Intaglio or Gravure Printing and Gravure Inks

Silk-Screen Printing Inks

Overprint Varnishes

Bag Inks

## 27. MISCELLANEOUS APPLICATIONS OF TALL OIL

Tall Oil Fatty Acids for Chemical Intermediates

Polymerized Fatty Acids

Azelaic and Pelargonic Acids

Tall Oil in Coprecipitated Barium Salts

Tall Oil in Defoamers

TALL OIL IN PIGMENT DISPERSANTS

## 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](mailto:npcs.india@gmail.com) **Website:** [NIIR.org](http://NIIR.org)

Sat, 17 May 2025 13:27:36 +0000