

# Industrial Chemicals Technology Hand Book

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Growth in demand for chemicals in developing countries is high leading to substantial cross border investment in the chemical sector. The chemical industry comprises the companies that produce industrial chemicals. Chemicals are used to make a wide variety of consumer goods, as well as thousands inputs to manufacturing, construction, and service industries. The applications of industrial chemical are in various fields like in organic chemicals, paint, varnishes, resins, petroleum, pigments, printing inks, acrylics polyesters engineering thermoplastics. The chemical industry itself consumes 26 percent of its own output. In modern age chemical industries have permeated most extensively in comparison with other industries and are progressing at a very rapid pace. Chemical industry is one of the oldest industries in India. It not only plays a crucial role in meeting the daily needs of the common man, but also contributes significantly towards industrial and economic growth of the nation. The chemical industry forms the backbone of the industrial and agricultural development and provides building blocks for downstream industries; it is an important constituent of the Indian economy. The chemical industry in India which generates almost 13% of total national export is growing annually at a growth rate anywhere between 10% and 12%. Global chemical production is growing and the growth is contributed by the chemical industry of developing countries. The book contains manufacturing processes, reactions, equipments details, process flow diagram of number of chemicals, which have huge industrial uses. The major contents of the book are iodine from oil well brines, lactic acid from corn sugar, modern production of chlorine and caustic soda, organic chemicals, chemicals derived from methane and so on. This book is very useful for new entrepreneurs, industrialists, consultants, research scholars, technical institutions, chemists and libraries. This book is recommended to all related to field of chemical process technology.

## 1. Iodine From Oil Well Brines

Brine Collection

Brine Cleanup

Blowing-Out And Recovery

Iodine Finishing

Process Control

## 2. Lactic Acid From Corn Sugar

Dextrose, Whey, Or Molasses May Be Used For Lactic Acid Fermentations

Four Different Grades

In Commercial Practice Yields Of 85% Of Fermentable Hexose Are Normal

L. Delbruckii Is Culture Used; Corn Sugar Is Principal Fermentation Medium  
Calcium Lactate Is Produced During 4- To 6-Day Fermentation Period  
Recycled Calcium Sulfate Added To Aid Filtration  
Calcium Lactate And Sulfuric Acid React To Form Lactic Acid  
Stainless Steel Is Used For Acid Evaporators  
Calcium Lactate Is Also Processed As An End Product  
Fermentation Processes Operate Around The Clock  
Corrosion Is A Major Problem In Production Of Lactic Acid  
Foods And Tanning Industries Use Large Quantities Of Lactic Acid  
Salts And Other Derivatives Are Used In Diversified Industries  
Future Expansions In Lactic Acid Production Must Supply A Quality Product At A Lower Price

### 3. Modern Production Of Chlorine And Caustic Soda

Raw Materials  
Storage And Preparation  
Chlorine Production  
Caustic Preparation  
Hydrogen Chloride  
Filling And Storage Systems  
Instrumentation And Safety

### 4. Nitrofurans

Uses For Nitrofurans Extend Into Fields Of Both Human And Veterinary Medicine  
Synthesis Of 5-Nitro-2-Furaldehyde Diacetate Is Initial Phase Of Batchwise Procedure  
5-Nitro-2-Furaldehyde Diacetate Is Reacted With Semicarbazide To Form Nitrofurazone  
Synthesis Of Furazolidone Is Based On Reaction Of 3-Amino-2-Oxazolidone With  
5-Nitro-2-Furaldehyde Diacetate  
Analytical Tests Are Run On All Raw Materials And Final Products

### 5. Organic Chemicals

Chemicals Derived From Methane  
Synthesis Gas  
Chloromethanes  
Acetylene  
Hydrogen Cyanide  
Carbon Disulfide  
Chemicals Derived From Ethylene  
Polyethylene  
Ethylene Oxide  
Chlorinated Ethanes And Ethylenes  
Ethanol  
Ethylbenzene  
Acetaldehyde, Acetic Acid, Acetic Anhydride, Vinyl Acetate  
Ethylene Oligomers (Alpha Olefins) And Linear Primary Alcohols  
Ethylene-Propylene Elastomers  
Propionaldehyde  
Other Ethylene Uses  
Chemicals Derived From Propylene  
Polypropylene  
Acrylonitrile  
Propylene Oxide  
Isopropyl Alcohol  
Cumene

Oxo Chemicals  
Propylene Oligomers, Dodecene, And Nonene 91  
Acrylic Acid And Esters  
Glycerin  
Chemicals Derived From Butanes And Butylenes  
N-Butane Derivatives  
Isobutanes  
Butylenes  
Isobutylene  
Butadiene  
Higher Aliphatic Hydrocarbons  
Cyclopentadiene  
Isoprene  
N-Paraffins  
Linear Olefins  
Primary And Secondary Higher Alcohols  
Chemicals Derived From Benzene, Toluene, And Xylene  
Chemicals From Benzene  
Styrene  
Cumene (Phenol)  
Cyclohexane  
Maleic Anhydride  
Detergent Alkylate  
Nitrobenzene (Aniline)  
Chlorobenzenes  
Derivatives Of Toluene  
Toluene Diisocyanate (Tdi)  
Benzoic Acid  
Benzyl Chloride  
Chemicals From Xylene  
Terephthalic Acid (Dimethyl Terephthalate)  
Phthalic Anhydride  
Isophthalic Acid  
Naphthalene Derivatives

## 6. Paint, Varnishes, Resins

Butyl Acetate  
N-Butyl Acetate  
Iso-Butyl Acetate  
Sec. Butyl Acetate  
Tert-Butyl Acetate  
Manufacturing Process  
Note  
Reaction  
Flow Diagram  
Uses  
Grades  
Toxicity  
Epoxy Resins  
Properties  
Properties Of Typical Commercial Bisphenol A Epoxy Resins.  
Manufacturing Process  
Formaldehyde

Manufacturing Process  
From Methanol  
Hexamethylene Tetramine  
Manufacturing Process  
From Formaldehyde And Ammonia  
Reaction  
Flow Diagram  
Uses  
Grades  
Toxicity  
Solubility Of Pentaerythritol  
Manufacturing Process  
From Formaldehyde And Acetaldehyde  
Reaction  
Flow Diagram  
Note  
Uses  
Grades  
Specifications Of Pentaerythritol  
Toxicity

## 7. Petroleum And Its Products

The Nature Of Petroleum  
Largest Energy Supplier  
Product Names  
Refined Product  
Product Specifications  
Product Yields  
Petrochemicals  
Refining Schemes  
Feedstock Identification  
Crude Oil Pretreatment  
Crude Oil Fractions  
Gasoline  
Volatility  
Sulfur Content  
Octane Number  
Distillates  
Residuals  
Producing More Light Products  
Cracking  
Vacuum Distillation  
Reconstituting Gases  
A Modern Refinery  
Petrochemicals  
Process Details  
Crude Desalting  
Crude Distillation  
Hydrotreating  
Catalytic Reforming  
Catalytic Cracking  
Coking  
Hydrocracking

Polymerization  
Alkylation  
Ether Processes  
Future Processing

## 8. Pigments

Carbon Black

From Oil Or Natural Gas (Furnace Process)

Reaction

Flow Diagram

Note

From Natural Gas (Channel Process)

Reaction

Note

Uses

Grades

Titanium Dioxide

Typical Pigment Properties Of Anatase And Rutile  $\text{TiO}_2$

Typical Crystal Properties Of Rutile And Anatase  $\text{TiO}_2$

Manufacturing Process

Sulphate Process

Note

Reaction

Chloride Process

Note

Grades

Toxicity

Manufacturing Process

From Zinc Metal

(French Or Indirect Process)

Note

Reaction

Flow Diagram

From Zinc Sulphide Ores

Reaction

Flow Diagram

Note

Uses

Grades

Toxicity

## 9. Pigments, Paints, Polymer Coatings Lacquers, And Printing Inks

Powder Coatings

Electron Beam (Eb) And Ultraviolet (Uv) Curable Coatings

Current Automotive Coating Trends

Coatings For Plastics

New Cross-Linking Technologies

Printing Inks

Pigments

Inorganic Pigments

Organic Pigments

Pearlescent Pigments

Aluminum Pigments

## Lacquers

### 10. Potassium Borohydride Manufacture

Like Sodium Borohydride

Metal Hydride's Process

Potassium Borohydride's Properties

First Make Sodium Hydride Dispersion

Next Major Step-Make Sodium Borohydride

Mineral Oil Dispersion

Splitting Comes Next

Analytical Program

### 11. P-Xylene From Petroleum

Low Temperature Crystallization Is The Standard Recovery Method

Eutectic Point Limits P-Xylene Yield To 10% Of The Xylene

First Crystallization Stage Produces 80% Purity P-Xylene

Secondary Crystallization Increases Product Purity To Better Than 95%

Product Quality Depends Largely On Crystallization Techniques

### 12. Reagent Grade Chemicals

Standardization

Barium Chloride

Sulfanilic Acid

Magnesium Sulfate

Ferrous Ammonium Sulfate

Potassium Metaperiodate

Cuprous Thiocyanate

Analysis And Packaging

Future Prospects

### 13. Salt Manufacture

The Brine Must Be Purified Before Use

Multiple Effect Evaporators Are Used For Vacuum Pan Salt

Salt Evaporation Has Many Special Problems

Dewatered Salt Must Be Dried, Screened, And Packaged

Grainer Salt Is Made By Evaporation In Open Pans

### 14. Sulfuric Acid From Anhydrite

Theoretical Studies And Chemistry Of Anhydrite Process

Contact Process

### 15. Synthetic Methanol Production

History Of Synthetic Methanol

Foreign Development

Operating Data For Methanol Process

Gas Stream

Steam Systems

Water Systems

Synthesis Gas Preparation

Addition Of Carbon Dioxide

Compressor Cycle

Converter System

Converter Auxiliaries

Refining By Distillation  
Loading And Shipping  
Instrumentation  
Chemical Control  
Maintenance Procedure

## 16. Synthetic Nitrogen Products

Nitrogen Fixation  
Nitrogen Oxides  
Ammonia  
Other Processes  
Calcium Cyanide  
Ammonia  
Manufacturing Processes  
Carbon Monoxide Shift  
Carbon Dioxide Removal  
Water  
Hot Potassium Carbonate  
Monoethanolamine (Mea)  
Sulfinol  
Propylene Carbonate  
Rectisol-Refrigerated Methanol  
Giammarco-Vetrocoke  
Final Purification  
Methanation  
Nitrogen Wash Operation  
Copper Ammonium Carbonate Scrubbing  
Selective Oxidation Of Carbon Monoxide  
Cryogenic Purifier  
Compression  
Ammonia Synthesis  
Modern Single-Train Ammonia Plants  
Uses Of Ammonia  
Nitric Acid  
Chemistry Of Ammonia Oxidation  
Processes  
Uses Of Nitric Acid  
Ammonium Nitrate  
Urea  
Uses Of Urea  
Melamine  
Aliphatic Amines  
Methylamines  
Hexamine  
Hydrazine  
Manufacture  
Hydrazine Handling  
Hydrogen Cyanide  
Manufacture  
Other Compounds

## 17. Synthetic Resins & Plastics

Introduction  
Polymer Structure And Nomenclature

Properties Of Resins And Plastics  
Important Classes Of Plastics And Ins: Thermoplastics Polyolefins  
Vinyl Resins  
Polystyrene And Styrene Copolymers

Acrylics  
Polyesters  
Engineering Thermoplastics  
Important Classes Of Plastics And Resins: Tosets 433  
Polyurethanes  
Phenolic Resins  
Unsaturated Polyester Resins  
Epoxies  
Silicone Resins  
Polymer Synthesis  
Free Radical Addition Polymerization  
Ionic Chain Addition Polymerization  
Ring Opening Addition Polymerization  
Polymer Modification  
Polymerization Methods  
Polymer Rheology  
Fabrication Of Plastics  
Extrusion  
Injection Molding  
Reaction Injection Molding (Rim)  
Compression And Transfer Molding  
Pultrusion  
Blow Molding  
Thermoforming  
Rotational Molding  
Foamed Plastics  
Plastics And Environmental Issues

## About NIIR

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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.



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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.

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