Modern Technology of Printing & Writing Inks (with Formulae & Processes) 2nd Revised Edition

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Ink is a liquid or paste that contains pigments or dyes and is used to colour a surface to produce an image, text, or design. Ink is used for drawing or writing with a pen, brush, or quill. Thicker inks, in paste form, are used extensively in letterpress and lithographic printing. Ink can be a complex medium, composed of solvents, pigments, dyes, resins, lubricants, solubilizers, surfactants, particulate matter, fluorescents, and other materials. The components of inks serve many purposes; the ink's carrier, colorants, and other additives affect the flow and thickness of the ink and its appearance when dry.

India is among the fast growing printing & writing ink markets globally spurred by the rapid expansion of the domestic print markets. Backed by a strong demand from key end user segments such as package printing, newsprint, publishing and other commercial printing, the printing ink market in India has registered strong growth over the years. The printing ink industry is fragmented with hundreds of manufacturers and a large number of players in the unorganised sector.

Printing ink sector in India witnessed a growth of around 7.5% per annum during the Past years. Printed packaging accounts for around 27% of the demand for printing inks in India followed by newspapers at 20%. Commercial printing/promotional and printed advertising together account for around 19% of the demand. Other key end user segments for printing inks include books and stationery. With the print sector forecast to grow at around 8% per annum, in coming years, printing ink segment is expected to grow strongly.

This handbook is designed for use by everyone engaged in the printing & writing ink industry and the associated industries. It provides all the information required by the ink technical for the day-to-day formulation of inks. It supplies the details of the manufacturing methods, including large-scale production, and gives guidance on achieving quality assessment and total quality management specifications. The book also describes properties and uses of the raw materials used in the formulation of printing & writing inks.

The major content of the book are the colour and colour matching, raw materials, printing inks, ink formulations, applications problems, writing inks, project profile, how to estimate, order & handle ink, testing of writing & miscellaneous inks, testing of printing inks, rollers, waterborne inkjet inks. The book contains addresses of raw material suppliers, plant & machinery suppliers with their Photographs.

This book will be a mile stone for the entrepreneurs, existing units, libraries etc.

1. INTRODUCTION Visual Characteristics of Inks The colour of Inks The Transparency and opacity of printing inks The gloss of printing inks The nature of Printing Inks As Determined By The printing Process Flexographic and gravure inks Lithographic and letterpress inks Screen Inks The drying characteristics Absorption drying Oxidation drying Evaporation drying Chemical drying Radiation induced drying The Adhesive Nature of Printing Inks The Resistance properties of Printing Inks Lightfactness Heat resistance Abrasion resistance Product resistance Weathering

2. THE PRINTING PROCESSES

The Letterpress Process **Press Configurations** The Platen press Flat-bed cylinder press Rotary presses Letterpress forme production **Original plates** Line Plates Halftone plates **Duplicate plates** Make-ready: **Substrates** Applications Rotary Ink Quickset Ink High-gloss Ink Moisture-set Ink Water-Washable Ink New Ink Miscellaneous Job Ink The Offset Lithographic Process The Printing unit The damping system, The offset blanket

Press Configurations The small offset press Larger sheet-fed presses Web offset presses Blanket-to-blanket press Common-Impression drum presses Three-cylinder presses Oithographic platemaking Presensitised surface plates Wipe-on Plates **Deep-etch plates** Multi-metal plates Electrostatic imaged plates Chemical diffusion transfer plates Photodirect plates Laser exposed plates **Direct image plates** The driographic plate Process control Platemaking control Control in colour printing Inkduct pre-setting and control Substrates and inks Ultra-violet (UV) euring inkds 25 Infra-red radiation 25 Inks for lithography Dry offset of Letterst Fundamentals of Lithography Lithographic Problems The Gravure process The printing unit The inking system Doctor blades The impression roll Drying system **Press Configurations** Gravure cylinder preparation Conventional etching Single bath etching Halftone Process Double positive system-halftone gravure Halftone gravure Mechanical engraving Lasergravure Press control systems Substrates and inks Applications **Gravure Inks** The Flexographic Process The printing unit Press configurations Flexographic platemaking Rubber plates

Photopolymer plates Plate mounting Applications Flexographic Inks Flexographic Problems, The screen printing process Press configurations Screen Stencil Manufacture Mounting the Screen Application of the stencil After treatment Substrates and inks Application **Electrostatic Printing** Copper Plate and Die Stamping Non-Impact Printing processes Ink-jet Printing Continuous jet Impulse or drop on demand Electrophotography **Print Recognition** Letterpress Flexography Lithography **Offset Letterpress** Gravure Screen Printing Non_Impact printing Substrate Selection **General Paper properties** Runnability Printability

2. COLOUR AND COLOUR MATCHING The Physical nature of Colour Light Sources The Perception of colour The eye Defective colour vision Chromatic adaptation and colour constancy Metamerism Dichrosim Illumination quality and levels Additive and Subtractive Colour Mixing The additive primaries The subtractive primaries The CIE System Origins of colour in Printed Material Pigments Dyes Origins of colour Transparency and opacity

Colour Strenghtss Substrate effects **Colour Index Classificaton Graphic Reproduction** Three-colour printing Four-Colour printing Under colour removal Masking Half-tone dots Dot gain **Dot Generation** The Measurement of Colour Colorimeters Densitometer spectrophotometers Optical geometry The Recording of Colour data And the Specification of colour **Colour Difference** Colour Matching Selection of raw materials Matching techniques The colour circle Procedures **Oil Inks** Liquid Inks Instrumental Colour match Prediction **3. RAW MATERIALS**

Pigments Yellow Pigments **Diarylide Yellows** Ironoxide yellows Tartrazine yellow lake Chrome yellows Cadmium yellows Fluorescent yellow **Orange Pigments DNA Orange** Pyrazolone orange **Diarylide** orange Fast Orange 52G Benzimidazolone orange HL Ethyl lake red C Red Pigments Para Red Naphthol Red (Or Permanent Red Frre) **Toluidine Red** Permanent Red 'R' (Chlorinated Para Red) Carmine F.B. Naphthol F4R Naphtho Red LF Permanent Red FRL

Bordeaux FRR (F4R) Naphthol Red Naphthol Red Light Naphthol Red Dark Lithol reds Bon Red (Lack red C Bon) Lake Red C Lithol Rubin 4B **BON Maroon** PMTA Pink, rhodamine 6 G Molybdate Orange, Chrome Scarlet, Orange Chrome Calmium Red BON Arylamide Red, Naphthol Red FGR Quinacridone MagentaY Naphthol Carmine FBB Copper Ferrocyanide Pink Naphthol Red F5RK Benzimidazolone Carmine HF3C Naphthol Rubine F6B **Benzimidazolone Carmine HF4C** Rubine Red 6B Quinacridone Magenta B Benzimidazolone Red HF2B Naphthol Red F6RK Azo Magenta G Anthraguinone Scarlet Quinacridone Violet Benzimidazolone Bordeaux HF 3 R **Green Pigments Blue Pigments Violet Pigments Brown Pigments Black Pigments** White Pigments and Extenders Pearlescent Materials **Metallic Pigments Fluorescent Pigments General Properties of Pigments** Acid Dyes **Basic Dyes** Solvent Dyes **Disperse Dyes Drying Vegetable Oils** Linseed oil Tung oil (China wood oil) Oiticica oil Dehydrated castor oil Other oils Marine oils Non -dryign oils News inkd oils Non-drying vegetable oils Resins

Natural Resins Shellac Manila copal Asphalts Starch and dextrin Gum arabic Synthetic resins Pure phenolic resins Rosin-modified phenolic resins **Pigment Interactions** Hard resin interactions Film-forming properties Hydrocarbon resins Polystyrene resins and copolymers **Terpene** resins Silicone resins Alkylated urea formaldehyde resins Alkylated melamine formaldehyde resins Polyamide resins Poly (amide imide) resins Chlorinated rubber Cyclised rubber (isomerised rubber) Vinyl resins Polyvinyl alcohol Ketone resins Acrylic resins **Epoxide resins** Polyisocyanates and polyurethanes Nitrocellulose, N/C (Cellulose nitrateCN) Ethyle cellulose Ethyl hydroxyethyl cellulose (EHEC) Cellulose acetate propionate (CAP) Cellulose acetate butyrate (CAB) Sodium carboxymethyl cellulose (CMC) Chemical constitution Section V: Solvents Hydrocarbon Solvents Low boiling petroleum distillate-alipatic White spirt Paraffin oil (kerosene0 High boiling petroleum distillates-aliphatic Hydrocarbon solvents- naphthenic Aromatic hydrocarbons High boiling aromatic solvents Alcohols Glycols Ketones Esters Section VI : Plasticisers Section VII: Waxes Synthetic waxes Polyethylene waxes Polytetrafluoroethylene

Halogenated hydrocarbon waxes Fatty acid amides Petroleum waxes Slack wax Scale wax Fully refined paraffin wax Pettrolatum or petroleum jelly Microcrystalline waxe Ceresin wax Montan wax Montan esters Natural waxes Beeswax Carnauba wax Miscellaneous natural waxes Section VIII : Driers Liquid Driers Cobalt Paste Driers Section IX Miscellaneous Additives **Chelating Agents** Antioxidants Surfactants Anionic Surfactants Cationic surfactants Non-Ionic surfactants Amphoteric surfactants **Deodorants and Reodorants Pure Chemicals** Alkalis **Defoaming Agents** Laking Agents **Tannic Acid** Tannic acid substitutes Raw Materials For Radiation Curing Systems **Pigment Selection** Prepolymers Epoxy acrylates Polyester acrylates and unsaturated polyesters Urethance acrylates **Reactive Diluents** Photoinitiators Additives and Inhibitors

4. PRINTING INKS Manufacture of Inks and varnishes General Requirements The Manufacturig Processes The manufacture of oleo-resinous systems Deaeration and potting The manufacture fo polyer/solvent systems Varnish manufacture Cavitation mixer Rotor/stator mixer Manufacture of additives Liquid ink manufacture **Ball mills Bead Mills** Chips Pigment chip manufacture Manufacture of dye-based inks **Mixing Equipment** Butterfly mixers (Change pan) Rotor and stator high speed mixers. The 'star' impeller type The high-speed disperser The fixed or on-line mixer High-speed mixing Milling Equipment Three-roll mills Floating-rolling system Development of single cst rollers Bead mills. Open sieve mill Closed sieve mill Gap separation mill John mill Tex mill Dvno mill STS mill Electronically controlled Copra mill Boa 500 mill (Buhler Brothers Ltd) Co-ball mill Microflow mill **Ball milling** Disavantages of ball mills Handling, Storage and manufacture of uv Inks Manufacture of newspaper Inks Modern production trends Computerisation Costs of production and related subjects Maintenance strategy in the printing ink industry On failure maintenance 'Fixed time' maintenance 'Condition based maintenance Computers and maintenance The future Plant control system Further plant features Manufacturing plant

5. INK FORMULATIONS Letterpress Ink Platen ink for absorbent papers

Cylinder press ink of uncoated papers Quick-set inks of cated paper Letterpress ink dryign by oxidation Water-reducible inks Process inks Newspaper Coloured Inks Rotary black inks for newspapers Formula A: General-Purpose low mist black Formula B : Ink rail Formula C : Page-Pak Formula D : Keyless Inking (Indirect flexo) Lithoraphic Inks Typical inks and Varnishers Inks and varnishes for sheet-fed paper printing Sheet-feed label inks Small -offset Inks and varnishes for sheet-fed carbon board printing Ink for sheet-fed impervious substrate printing Inks for web-offset paper printing Coldset Heatset Gravure Inks **Publication Inks** Inks for catalogue printing Packaging inks for paper and board lables Metallic lable inks Paper wrapper inks Carton Inks Foil inks Foil board laminates Inks for polyethylene film Inks for treated polypropylene films Coated polypropylene films Cellulose films Polyester fims Wallcoverings Inks for paper Vinyl coated wallcoverings Speciality systems Metallic inks Aluminium-based inks Pearlescent inks flexographic Inks Sye-based inks Pigmented inks for specific substrates Paper and board Nitrocellulose coated films PVdC Co-polymer coated film Polyolefin films Metal and metallised substrates Almuminium foil Metallic inks Screen Inks Inks for paper and board

Thin film screen inks Ultra thin film screen inks Oxidation drying gloss inks Inks for Impervious surfaces Metal signs Metal containers Inks for sheet plastic inks for glass Inks for Plastic containers Polythene containers **PVC** containers **Textile Inks** Daylight fluorescent Inks Process inks Uv and Electron Beam curing Inks Inks for day offset application on plastics and metal Ultraviolet curable silk screen Ultraviolet curable varnish and coatings Non-Mipact Printing Electrostatic imaging Inks for jet printing Typical ink formulations Inks for the Electronics Industry Printed circuit products Inks for Wallcoverings **Textile Transfer Inks** Sterilisation Inks Metal Decorating Inks. **Decorationof sheets** Printing a pre-formed container **letterset** Printing

6. APPLICATION PROBLEMS Stocking in the Pile or Rewind picking Fill In Poor Binding and Rub Setoff Piling and Caking Trapping Show Through and Strike Through Ink Not Following the Fountain Ink flying and Misting Ghosting, Shadow, Streaks, and Slurs Ink Drying on rollers Plate Wear Crystallization

7. WRITING INKS Manufacture of Writing Inks Packing

Inks for writing and Fountain Pens Ferrogalo-tannate inks Standard Copying and Record Ink Standard Writing ink Iron gallate Inks : (Ink Powders and Tablets) Manufacture of Inks Tablets Action of Hydrochloric Acid and Sulphuric Acid in Inks Pormulae for Various Blue-Black Inks Manufacture fo iron gallo-tannate inks Manufacture Aging of writing Dating a document Dye based Fountain Pen Inks Washable Inks Quick drying Inks Alkaline Writing Inks blue Alkaline Writing Inks **Prussian Blue Inks Ball Point Pen Inks** Stamp-Pad Inks Basic dyes Acid dyes Method of Manufacture Inks for Recording Instruments **Drawing Inks-Black and Coloured Black Drawing Inks Coloured Drawing Inks** Marking Inks Preparation of silver Inks Aniline black Inks Inks containing other metals Coloured marking lnks ; Ink for Multiple Copies purposes Hectograph Inks; Method of Preparation **Stencil Duplicating Inks** Inks of Hectograph Carbon Papers, Carbon Papers and Typewriter Ribbons Inks or Carbon Papers Hectograph Carbon Papers Stencil Sheets Felt, Pen, Sign Pen, Fibre Tip Inks Mothod of Manufacture Al:cohol Based Inks Hydrocarbon Based Inks Invisible or Sympathetic Inks Inks for Special Materials Inks for Plastics Ink for Marking Photographs Ink for stamping oiled stencils Inks for Glass and Porcelain Ceramic Inks Ink for Metals Time Card Ink

Meat Stamping Ink Show Card Inks Embossing Inks Ruling Inks Artist Colours Colour Combination a) Water Pints

8. PROJECT PROFILE

9. HOW TO ESTIMATE, ORDER & HANDLE INK Estimatin Ink Requirements Ordering Ink Handling Inks

10. TESTING OF WRITING & MISCELLANEOUS INKS Writing Inks Sedimentation Test Hue and Intensity **Clogging Test** Stability Test **Total Solids** Iron Content Gravimetric Method Determination of Corrosion **Ball Point Pen Inks** Stamps pad Inks **Determination of Glycerol Content** Assessing the performance of stamp-pad ink **Drawing Inks Opacity or Transparency** Mold Growth Marking Inks Stencil Inks Viscosity Drying time Presence of toxic and noxious materials Caution Presence of Aniline Oil Miscibility with thinner Stability Skinning property Dup; icating Inks Test for Lead

11. TESTING OF PRINTING INKS Specific Gravity

Viscosity Penetration Molecular Refraction **Refractive Index Covering Power and Gloss Evaporation Rate** Acid Number **Sponification Number Iodine Number Detection of Chinawood Oil** Detection of Rosins and Resins **Testing of Pigments** Light Resistance The Resistance of Pigments of Bleeding Resistance to Acids and Alkalies Particle Size of Pigments 375 Wettability and Absorption The Testing of Finished Inks

12. ROLLERS Inks and Rollers Used

13. DIRECTORY
India Standards on Inks and Allied Products
List of Suppliers fo Printing & Writing Ink Machinery
List of Suppliers of Raw Materials to Ink Industries
List of Major Manuracturers fo Printing Inks In India
Directory of Ink % Allied Products Manufacturer's In India

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, Startup 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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