PAINT VARNISH SOLVENTS & COATING TECHNOLOGY

INTRODUCTION

Paint Ingredients
Pigments
Binder (or film former)
Solvents (or thinners)
Classification of Paints
High build, high solids and solventless paints
Application of Paints
The paint film
Coverage rate
Pigment Volume Concentration

GENERAL PIGMENTS PHYSICAL PROPERTIES

Classification of pigments
Physical properties
Colour
Primary colours
Additive colour mixing
Complementary colours
Colour of objects
Subtractive colour mixing
Colour perception
Colour blindness
Colour matching
Illuminant standards
Colour measurement
Colorimeters
Photo electric colorimeters
Reflectance spectrophotometers
Spectral reectance curves
Use of spectral reflectance curves in colour matching
Assessment of whiteness

PIGMENTS PROCESSING

Mineral Pigments and Extenders
Grinding
Ball Mills
The micronizer
The pin disc mill
Levigation
Manufactured Pigments
Precipitation
General Principles
Reduced Pigments
Co-precipitated pigments
Conditions of precipitation
Concentration of solutions
Temperature
Uniformity of stirring
pH value
Precipitation plant
Filtration
Filter presses
Vacuum filters
Rotary vacuum filter
Leaf type vacuum filter
Drying
Flushing (1)
Calcination
Subsequent processing
Vapour phase oxidation

PLASTICIZERS AND SOLVENTS

Solvents
General properties of solvents
Solvent power
Miscibility of solvents
Solubility parameter
Solubility of polymers
Measurement of solvent power (traditional method)
Kauri bufanol value
Rate of evaporation
Distillation range
Flash point and flammability
Explosive limits
Toxicity of solvents
Other solvent properties
Specific gravity
Moisture
Acidity or alkalinity
Non volatile matter
Classes of Solvents
Petroleum hydrocarbons
Low boiling petroleum fractions Petroleum ethers (ligroins)
Special boiling point solvents
White Sprit
Distillate
VM & P Naphtha (Varnish Makers and Painters naphtha)
Aromatic hydrocarbons
Toluol (commercial toluene)
Xylo (commercial xylene)
High aromatic solvents from petroleum
Solvent naphtha
Terpene solvents
Turpentines
Dipentene
Pine Oil
Alcohols
Methyl alcohol (methanol)
Ethyl alcohol (ethanol)
n-propyl alcohol (in-propanol)
Isopropyl alcohol (isopropanol)
n-butyl alcohol (n-butanol)
Diacetone alcohol
Esters
Ethyl acetate
n-butyl acetate
Oxo-acetates
Ethyl lactate
Ethers
Glycol ethers and ether esters
Ketones
Acetone (dimethyl ketone)
Methyl ethyl ketone
Methyl iso-butyl ketone
Cyclohexanone
Chlorinated hydrocarbons
Methylene chloride
Trichloroethylene
Perchlorethylene
Plasticizers
Esters
Camphor
Castor oil
First pressings castor oil
Blown castor oil
Chlorinated waxes

SYNTHETIC RESINS

Polymerization
Addition polymerization
Condensation polymerization
Functionality
Alkyd Resins
Raw materials for alkyds
Dibasic acids
Fatty acids
Alkyd formation
Fatty acid process
Alcoholysis or monoglyceride process
Dehydrated castor oil alkyds
Drying alkyds
Driers
Types of fatty acid employed
Applications of drying alkyds
Non-drying alkyds
Vinyl toluenated (VT) alkyds
Silicone alkyds
Thixotropic alkyds
Water soluble alkyds
Polyester Resins
Unsaturated polyester resins
Properties and uses of unsaturated polyester resins
Saturated polyester resins
Amino Resins
Urea formaldehyde resins
Manufacture of urea resins
Properties and uses of urea resins
Melamine formaldehyde resins
Manufacture of melamine resins
Properties and uses of melamine resins
Epoxy Resins
Curing by amino or phenolic resins
Curing by amines
Curing by polyamides
Curing by isocyanates
Epoxy pitch systems
General properties and applications of epoxy resins
Curing by amines
Curing by polyamides
Curing by isocyanates
Epoxy pitch systems
General properties and applications of epoxy resins
Epoxy esters
Polyamide Resins
Polyurethane Resins
Materials for polyurethanes
Isocyanates
Resins
Solvents
Film formation
Two pack type
Properties and uses
Moisture cured type
Blocked urethanes
One pack urethane alkyds
Vinyl Resins
Methods of polymerization
Vinyl co-polymers
Polystyrene Resins
Properties of styrene
Polymerization of styrene
Copolymers of styrene
Acrylic Resins
Properties of acrylic polymers and co-polymers
Thermosetting acrylic resins
Silicone Resins
Formation of silicones
Properties of silicones
USES OF SILICONES

CELLULOSE ESTER AND ETHER PRODUCTS

Cellulose Esters
Cellulose nitrate
Properties of cellulose nitrate
Testing
Cellulose Lacquers
Cellulose nitrate lacquers
Plasticizers
Evaporation rate
Viscosity
Diluents
Pigmented lacquers
Cellulose acetate
Manufacture of cellulose acetate
Properties of cellulose acetate
Cellulose acetobutyrate
Safety Regulations
Cellulose Ethers
Ethyl Cellulose
Properties of ethyl cellulose
Use of ethyl cellulose
Water soluble cellulose derivatives

VARNISHES

Oil Varnishes
Varnishes from fossil resins
Properties and uses of copal varnishes
Varnishes from modified phenolic resins
Tung oil varnishes
Tung oil pure (100 percent) phenolic varnishes
Properties and uses of tung oil phenolic varnishes
Tung oil coumarone varnishes
Physical properties of oil varnishes and films
Spirit varnishes

PIGMENTATION

Non-Aqueous Paints
Stage-1 Breakdown of aggregates
Stage-2 Wetting of pigment particles
Interfacial tension
Nature of the pigment surface
Surface active agents (surfactants)
Anionic surfactants
Cationic Surfactants
Non ionic surfactants
Properties of non-ionic surfactants
Ampholytic surfactants
Hyperdispersants
Stage 3-Stabilization of dispersions
Pigment settlement
Pigment flocculation
The Flocculation Monitor
Flocculation of stainers
Effect of solvent on flocculation
Flotation (or floating)
Flocculation during drying
Increase in viscosity (on storage)
Water Soluble Paints
Nature of the binders
Aqueous Emulsion Paints
Polymer emulsion paints
Pigment dispersion in the aqueous phase
Stabilization of the pigment dispersion
Dispersion of hydrophobic pigments

PAINTS (DECORATIVE & BUILDING)
Sealers
Preservatives for wood
Types of preservative
Application of wood preservatives
Preservative stains
The painting of wood
Behaviour of paint on wood
Preservatives for softwoods
Primers for softwoods
Painting of plywood
Primers for hardwoods
Finishing systems for wood
Exterior Several systems are in use
Primers for plaster and other wall surfaces
Types of primer for internal walls
Primers for exterior surfaces
Stopers and Fillers
Undercoats
Pigmentation
Flow properties of paints
Non-Newtonian flow
Thixotropy
Application to flow properties of undercoats
Formulation of undercoats
Media for undercoats
Pigments for undercoats
Examples of decorative undercoats
Note on materials
Finishing Coats
Oil based paints
Modern gloss finishes
Formulation of alkyd gloss paints
Note on materials
General properties of alkyd enamels
Thixotropic paints

COATINGS (WATER-BORNE)
Polymer Emulsions
Nature of emulsions
Formation of emulsions
Surfactants
Anionic surfactants
Formation of polymer emulsions
Homo and co-polymers
Vinyl Emulsion paints
Materials and manufacture of vinyl emulsion paints
Pigmentation
Protective colloids
Preservatives
Sequestering agents
Anti foam
Film formation and coalescing solvent
Properties and use of Vinyl Emulsion Paints
Acrylic Emulsions and Paints
Properties and uses
Water soluble binders
Early types
Modern types
Alkali silicates
Water soluble resins
Types of resin used
Alkyds
Other resins

METHODS OF APPLICATION

Brush application
Hand rollers
Pressure fed rollers
Dip coating
Flow coating
Curtain coating
Roller coating
Coil coating
Tumbling or barrel coating
Spray Methods
Conventional spray application
Spray guns
Hot spray application
Airless, spray application
Electrostatic spray
Paints for electrostatic spray
Silk screen coating
Electrodeposition coating
General principles
Anodic deposition
Cathodic deposition
Powder Coatings
Fluidized bed
Electrostatic spray
Flame spraying

INDUSTRIAL PAINTS & COATINGS

Undercoats for Structural Steelwork
Finishing Paints
Non convertible
Coating
Chlorinated rubber
Primers for chlorinated rubber systems
Chlorinated rubber primer/sealer
Chlorinated rubber/MIO paints
Chlorinated rubber finishes
Other chlorinated rubber paints
Vinyl paints
Formulation of vinyl paints
Typical formulations
Properties and uses of vinyl coatings
Vinyl finish for metal
Bituminous paints
Convertibite Coatings
Alkyd base
Epoxy easters
Two pack systems
Epoxies
Typical formulations
Primers for metal
Epoxy finishes
General properties of two pack epoxy systems
Epoxypitch coatings
Uses of epoxy/pitch coatings
Polyurethane coatings
Painting Specifications

INDUSTRIAL FINISHES

Air drying types
Lacquers and non convertible coatings
Chlorinated rubber paints
Oxidizing types
Chemically cured coatings
Acid cured alkyd amino systems
Acrylic isocyanate systems
Stoving Types
Finishes
Vinyl resins
Polyurethanes
Thermosetting acrylic systems
Powder coatings
Material employed

MISCELLANEOUS COATINGS AND ANCILLARY MATERIALS

Paints for special floors
Paints for aircraft
Clear wood finishes
Motor car finishes
Paint removers
Trichlorethylene paints
Bacteriostatic and fungistatic paints
Fungistatic paints
Fungicidal wash
The preservation of stonework
Paints for plastics
Coating of pipelines

TESTING AND EVALUATION

Tests on liquid paints
Production control
Degree of dispersion
Viscosity
Specific gravity
Volatile content
Flash point
Opacity
Application and wet films
Brushability
Sag resistance
Measurement of wet films thickness
Spraying properties
Covering power
Drying time
Assessment of drying time
Overcoating time
Tests on dry films
Measurement of film thickness
Optical properties
Opacity of dry films
Colour comparison
Mechanical properties
Hardness
Flexibility and extensibility
Adhesion

MISCELLANEOUS FORMULAE

Colouring "Spirit" Varnishes
Manufacturing Hints
The Gums used in Making varnish
Shellac Varnish
Rules for varnishing
Preventing Varnish from Crawing
Asphalt Varnishes
Formulas
Bicycle Varnish
Bicycle Dipping Varnish (Baking Varnish)
Black Varnishes
Black Japanese Varnish
For Blackboards
Bottle Varnish
Can Varnish
Copal Varnish
Elastic Limpid Gum Varnishes
Enamel Varnishes
Antiseptic Enamel
Bath Tub Enamel Unaffected by Hot Water
A Colour Enamel
Cold Enamelling
Enamel for Vats etc.
Finishing Enamel for White Furniture
Quick Drying Enamel Colours
Engravers Varnishes
Floor Varnishes
French Varnish
Golden Varnishes
India Rubber Varnishes
Intay Varnish
Japanning Tin
Label Varnishes
Leather Varnishes
Metal Varnishes
Aluminium Varnish
Brass Varnishes Imitating Gold
Bronze Varnishes
Brown Varnish
Copper Varnishes
Decorative Metal Varnishes
Gold Varnish
Gold Varnish for Tin
Iron Varnishes
Stove Varnishes
Tin Varnishes
For Trays and Other Tinware
Varnish Substitutes
Zapon Varnishes
Paint Bases
Dark Green Paint for Blackboards
Bronzing Solutions for Paints
Paint Brushes
Black
Dead White on Silver Work etc.
White Coating for Signs. etc.
To Prevent Crawling of Paints
Fireproof Paints
Fireproof and Waterproof Paints
Preparation of the Bases
Composition of the Coating
Method of Operating
Properties
Paint Varnishing
Paint Dryers
Paints for Gold and Gilding
Gilding in Size
Gold Enamel Paints
Graining with Paint
Luminous Paints
Paints for Metal Surfaces
Brass and Bronze Protective Paint
Paints for Roofs and Roof Paper
Paints, Stains, etc. for Ships
Paints for Walls of Cement, Plaster Hard Finish etc.
Paints, Waterproof and weatherproof
Paints for Wood
Ivory Coating for Smooth, Light Wood
Miscellaneous Recipes, paints etc.
Tire preserving paint

**ALUMINIUM PAINT**

Uses and applications
Manufacturing process
Plant Economics
Plant & Machinery
Fixed Capital
Raw Materials
Total Working Capital/Month
Total Capital Investment
Turn Over/Annum

**ACRYLIC EMULSION PAINTS**

Properties
Manufacturing Process
Formulation
Acrylic type Gloss Emulsion Paints

BITUMINOUS ROAD EMULSIONS

Different Formulations
Plant Economics
Plant & Machinery
Fixed Capital
Raw Materials
Total Working Capital/Month
Total Capital Investment
Turn Over/Annum

CEMENT PAINT

Formulations for Dry Cement Paint
Manufacturing process of cement paint
Mixing
Grinding
Ball Mills
Plant & Machinery
Fixed Capital
Raw Materials
Total Working Capital/Month
Total Capital Investment
Turn Over/Annum

INSULATING VARNISH

Manufacturing Process
Method of Application
Plant & Machinery
Fixed Capital
Raw Materials
Total Working Capital/Month
Total Capital Investment
Turn Over/Annum

POWDER COATING

Properties of Powder Coating
Process of Powder Coating
Plant & Machinery
Fixed Capital
Raw Materials
Total Working Capital/Month
Total Capital Investment
Turn Over/Annum

PRIMER PAINTS & ENAMEL PAINTS

Formulations of Paint Primers
Formulations of enamel paints
Plant & Machinery
Fixed Capital
Raw Materials
Total Working Capital/Month
Total Capital Investment
Turn Over/Annum

**PAINT DRIERS**

- Formulation of Paint Driers
- Plant & Machinery
- Fixed Capital
- Raw Materials
- Total Working Capital/Month
- Total Capital Investment
- Turn Over/Annum

**PAINTS AND THINNERS INDUSTRY**

- Formulation for Dry Distemper
- Enamel Paints
- Red Oxide Primer
- Formulation of Thinner
- Process of Mfg. of Naphtha based thinner from crude naphtha
- Plant & Machinery
- Fixed Capital
- Raw Materials
- Total Working Capital/Month
- Total Capital Investment
- Turn Over/Annum

**REFRACTORY PAINT (GRAPHITE BASED)**

- Raw Materials
- Graphite paint for refractory coating (dip coating)
- Plant & Machinery
- Fixed Capital
- Raw Materials
- Total Working Capital/Month
- Total Capital Investment
- Turn Over/Annum

**SOLVENT AND THINNERS**

- Formulations
- Plant & Machinery
- Fixed Capital
- Raw Materials
- Total Working Capital/Month
- Total Capital Investment
- Turn Over/Annum

**TEXTURE PAINTS**

- Water Reducible Texture Paint
- Plant & Machinery
- Fixed Capital
- Raw Materials
- Total Working Capital/Month
- Total Capital Investment
- Turn Over/Annum

**THINNERS/SOLVENTS AND ITS ALLIED PRODUCTS**
Manufacturing Process
Process of Manufacture & Formulation
Thinner Formulations
Plant & Machinery
Fixed Capital
Raw Materials
Total Working Capital/Month
Total Capital Investment
Turn Over/Annum

**VARNISH (CLEAR) FOR WOOD (FLAME RETARDING TYPE)**

Furniture Varnishes
Manufacturing process of clear wood varnish (flame retarding type)
Weighing of the Raw materials
Plant & Machinery
Fixed Capital
Raw Materials
Total Working Capital/Month
Total Capital Investment
Turn Over/Annum

**PRESENT MANUFACTURERS/EXPORTERS**

Paints
Varnishes
Lacquers
Solvents
Paints

**SUPPLIERS OF PLANT & MACHINERY**

Storage/Mixing Tanks
Ball Mill
Reaction Vessels
Boilers
Powder Filling Machine
Weighing Balances
Experimental Testing Equipments
Labelling and Gumming Machine
Laboratory Equipments
Mixers/Blenders
Over Printing Machine
Filling Machines
Agitator
Crushing & Grinding Machines
Dryers & Drying Ovens
Ball Mills
Colloid Mills
Laboratories Testing
Paint Drying Apparatus
Paint Guns
Paint Kettles
Paint Manufacturers Machinery
Paint Mixers
Paint Ovens
Sprayers
Storage Tanks
Testers
Liquid Filling Machine

SUPPLIERS OF PACKAGING MATERIALS
Containers
Labels
Paper Waxed
Wrappers

SUPPLIERS OF RAW MATERIALS
Paint Colours
Calcium Carbonate
Drier
Toluene
Linseed Oil
Titanium Dioxide
Methyl Ethyl Ketone
Xylene Mixed
Zinc Oxide
Nitro Cellulose
Pigments
Stabilizers
Powder for Powder Coating