

Introduction to S.F. Ink Raw Material

Quick Overview

By

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SF Ink Raw Material

- Resins
- Oils
- Petroleum distillates
- Antioxidants
- Anti skinning agents
- water fighting compound
- Gelling agents
- Waxes
- Rheology modifier -clay
- Alkyds
- Gilsonite selects
- Pigments
- Dryer
- Tack reducer
- Flow improver
- Bitumen Varnish
- wetting & dispersing agent
- Emulsifiers
- Extenders
- Gloss control additive

Pigments

- Classification - Organic/Inorganic - Transparent /Opaque

Process Cyan- Phthalocynine Blue 15:3

Process Magenta- Rubine Red 57:1

Process Yellow – Diarylide Yellow – Yellow 12

- Carbon Black – N220, N330
- Titanium dioxide – White pigment
- Metallic pigments – Aluminum flakes for silver, bronze for gold

- **C.I. number** - Color Index is a commercial data base of dyes classified by their Color Index Generic Name and Color Index Number Constitution.
- **Oil absorption value** –The term oil absorption refers to the weight of linseed oil linseed oil, amber-colored, fatty oil extracted from the cotyledons and inner coats of the linseed. The raw oil extracted from the seeds by hydraulic pressure is pale in color and practically without taste or odor. that must be taken up by a given weight of dry pigment in order to form a paste

- **Particle Size** – Important for deciding process compatibility.
- **Alkali, Alcohol & Heat resistance** - It is important property considering end application.
- **Light fastness**- Measured by blue wool scale lies between 1-8.
- Pigments are available in powdered form or in press cake form.
- Compatibility of pigments with printing process is one of important selection criteria.

Resins

- **Significance of resins** – Clear, transparent film formation to bind pigments.
- Rosins are derived from pine trees. Rosin modified Phenolic resins are made by 1) varying ratio of condensate to rosin 2) varying type of phenol & formaldehyde ratio 3) varying degree of esterification & type of alcohol .
- **Phenolic resins are classified as** –
 - 1) Modified Phenolic Alcohol soluble
 - 2) 100% Phenolic
 - 3) Baking Phenolic
 - 4) Dispersion resins- Phenolic-drying oil polymerized xylol
- **Hydrocarbon resins-** Derived from petroleum products but price depends on price of crude oil.

Imp. Properties –

- **Melting Point-** Important for marking varnish
- **Molecular Weight** – Decides viscosity of varnish
- **Acid Value-** The acid number is a measure of the amount of carboxylic acid groups in a chemical compound, such as a fatty acid, or in a mixture of compounds. In a typical procedure, a known amount of sample dissolved in organic solvent is titrated with a solution of potassium hydroxide with known concentration and with phenolphthalein as a color indicator.
- **Cloud Point**
- **Dilution**

Alkyds

- An Alkyd is a polyester modified by the addition of fatty acids. They are derived from polyols and a dicarboxylic acid or carboxylic acid anhydride, hence the term alk-yd from "alcohol and acid or anhydride". The inclusion of the fatty acid confers a tendency to form flexible coating
- Length of oil
 - Short oil -
 - Medium oil
 - Long oil
- Imp. Properties
 - Acid number
 - % non volatile
 - Viscosity

Oils

- Drying- Form solid film at when exposed to air.-Linseed oil
- Semi drying- Doesn't form good film at room temp. -soybean
- Non drying – Don't form film so used as plasticizers.- Caster

- Iodine number is the determination of the amount of unsaturation contained in fatty acids. This unsaturation is in the form of double bonds which react with iodine compounds. The higher the iodine number, the more unsaturated fatty acid bonds are present in a fat.

- China wood oil is very fast drying so it is used in inks made to print on non absorbent substrate.

Petroleum Distillate

- Also referred as mineral oil
- Distillate IBP & FBP – 280 to 320 degree C
- Aromatic contents & Aniline point- **Aniline point** is defined as the temperature at which equal volumes of aniline and diesel oil are completely miscible. The value gives an indication of the aromatic content of diesel oil, since aniline is an aromatic compound which is dissolved on heating by the aromatics in diesel oil. The greater the aniline point, the lower the aromatics in diesel oil. A higher aniline point also indicates a higher proportion of paraffin.

Water repellent agents

- Why WRC are required?

WRC are blend of paraffin and synthetic wax. It is formulated to disperse homogeneously throughout the entire coating, providing superior water repellency immediately and fo the life of the film. In contrast, traditional silicones and wax solutions float to the surface of the coating, providing only short-term benefits. it enhanced film integrity by improving salt spray and humidity resistance. It also improved slip and mar resistance by its inherent waxy nature, with minimal effect on dirt pick-up, gloss and clarity.

Gelling Agents

- Why gelling agents are required? & how it works.

Gel varnishes are used as extender varnishes in S.F. offset inks .

Viscosity of ink is mainly adjusted by viscosity of varnish. Due to gelling action viscosity of varnish is increase so gelling agents are added. Gelling agent brings together reactive sides of resin. Usually following compounds are used as gelling agents.

- Aluminum Trialkoxides-
- Oxaaluminum Acylates -
- Aluminum Chelates -

Waxes

- Waxes are used in small quantity around 1-3 % to increase rub resistance of ink.
- PTFE – (**polytetrafluoroethylene**) is fluropolymer well known by the DuPont brand name **Teflon**. It has no melting point and has impact on gloss.
- Polyethylene wax – It is around 35-38% dispersion powder. It is used where gloss of ink is key parameter.
- Microcrystalline wax :-It is used in larger quantity than PTFE & has no impact on gloss.

Rheology Modifier

- Rheology modification by oil absorption

Addition of bentonite clay increases viscosity of ink. For black ink coarser clay is used and for color ink fine particle clay is used. Oil absorption capacity of clay is high so viscosity is increased after addition of clay. Usually around 0.5 to 3 % clay is added. Also addition of calcium carbonate or kaolin also increases viscosity of ink but has little impact on tack. Ink viscosity is reduced by addition of mineral oil.

Dryers

- Dryers are used as catalyst to accelerate the conversion of liquid coating to dry film by oxygen absorption there by increasing the rate of cross linking & film formation . Dryers are heavy metal soaps of organic acid & sold as solution in mineral spirit with specified metal content. In S.F. inks Manganese & cobalt are used as dryer in combination with metal content around 6 to 12 %, where cobalt is used as surface dryer & Manganese work as through dryer.

Tack reducer

- Tack is resistance to split. Ink tack is depend on varnish composition. Tack of ink is based on amount of resin & kind of resin used in varnish. According to substrate ink tack is decided. White petroleum jelly is used as tack reducer & it is known as ink duct additive because it can be added into ink in at duct. Petroleum distillate are also work as tack reducer but it is added at manufacturing time. Addition of mineral oil also increases flow of ink.

Flow improver

- Ink flow is measured on flow plate, which is tilted at 45, 60 or 90 degree to plane, ink flow measurement is comparative test, and measurements are taken after 10 minutes of application of known quantity of ink. Tridecyl alcohol which is popular as TDA is used as flow improver. TDA improve solubility of resin better the solubility of resin better the flow of ink. Usually use of TDA is avoided and mineral oil is added to improve flow.

Bitumen Varnish

- What is bitumen & why it is used in ink?

Ans-> Bitumen varnish is used in low price coldset & conventional sheetfed inks. Bitumen varnish is tar dissolved in mineral oil. To make bitumen varnish first mineral oil is heated in oil jacketed tanks till melting point of tar slowly tar is added and by using stirrer it is dissolved. Bitumen varnish increases depth of ink so ink looks dark and show high density.

Wetting & Dispersing Agents

- Why they needed & How they work?
- After dispersion it is important to maintain stability of dispersion to avoid aggregation and agglomeration wetting and dispersing agents are added. Alkyds also work as wetting agents. Lower the surface tension higher wetting. Electrical double layer also play important role in dispersion.

Extenders

- Why extenders are used?

Extenders are pigments used in ink to reduce cost by replacing pigments. It is used in small amount . Calcium carbonate is widely used as extender pigment because, it is available cheaply and has no impact on shade. It has low oil absorption value . Kaolin also known as china clay. It is also used as extender pigment. Addition of kaolin has impact on rheology of ink.

Gilsonite select

- What are gilsonite select?

It is resinous hydrocarbon & soluble in aromatic and aliphatic solvents.. It is categorized by softening point. It has high molecular weight around 3000 & relate to Gilsonite's "semi-polymeric" behavior when used as a modifying resin in polymeric and elastomeric systems. Cross linking and addition type reactions have been observed. Gilsonite is known to react with formaldehyde compounds under certain conditions. The low oxygen content relative to nitrogen suggests that much of the nitrogen has basic functionality. This probably accounts for Gilsonite's special surface wetting properties.

- How it is used in ink?

- Ans- It is dissolved into mineral oil only in black ink.