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Tek Tip

Inkjet Inks at a Glance

Breaking Down Inkjet Ink Types; Solvent, Eco-Solvent, Latex, UV and Aqueous Inkjet Inks

Inkjet is by far the most diverse line in digital printing. Unlike “Indigo” or “Toner”, which refer directly to the inks themselves; the term “Inkjet” refers to the method of delivery that the ink is being deposited onto the substrate. What the ink make-up is, how they are treated, cured as well as the pros and cons of each vary greatly. Below there is a breakdown of the main inkjet ink types with quick definitions of their make-up and how they are processed by the press and accepted by the media. Understanding these differences will benefit your production overall by saving you time, money and hassle when processing your media.

Solvent Inkjet Inks Breakdown

Definition/how it works

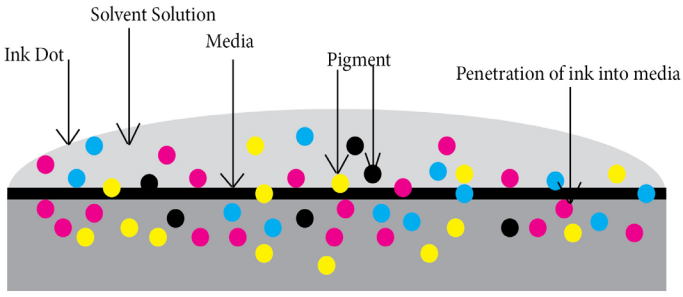
Solvent inkjet inks are made of up an oil-based solution (solvent) that holds pigment and resin. The solvent solution bites into the substrate and deposits the pigment. The solvent evaporates, or is “flashed off” with heaters on the printer, leaving mainly the pigment behind. However, some solvent does get left behind and it is recommended that 24 hours is allowed for solvent outgassing. Typically, solvents are corrosive to many plastics due to that remanence, making it hard to rely on the longevity of your production. Specifically, polycarbonates. The solution to that issue is JetView™ Solvent ink receptive coatings give the solvents something to “bite into” without damaging the material itself, as the inks and solvents never touch the material directly.

How Solvent Inks Interact with substrates

Solvent ink penetrates the substrates surface which creates permanent bond.

Cross section of a solvent ink drop: (Fig. 1) When the ink drop lands on the media, the solvents soften and dissolves the surface, which allows the pigment to be absorbed into the substrate. The solvent evaporates, leaving the pigment/resin behind as part of the substrate, forming a permanent bond.

Fig. 1



Pros

- Fade-resistant 5-7 years
- Water proof
- Abrasion resistant

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Cons

- Oil based carrier is corrosive to many substrates.
- Solvent inkjet print heads can be easily clogged which requires frequent cleanings/maintenance
- Ventilation in press room required.
- High VOC Emissions.
- Minimum of 24 hours period before any lamination or post processing is recommended. This can slow production time. Not allowing the proper amount of time for the material to properly cure before laminating with over-laminates or adhesives, can cause ink adhesion failures.

Typical Usage

Polyester based substrates, banner materials, vinyl, tradeshow graphics, window perforated media, treated papers, and Tekra's new JetView coated polycarbonate are all substrates or applications that are most common for solvent inkjet prints.

Eco-Solvent Inks Breakdown

Definition/how it works

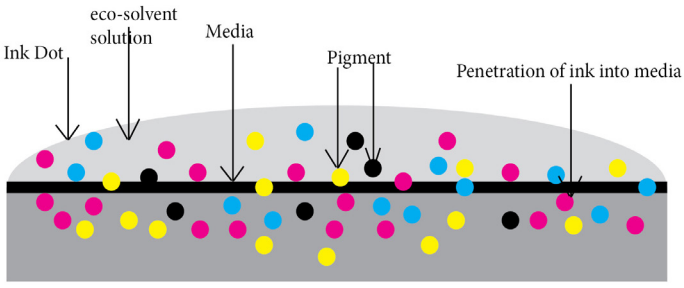
Eco solvent inks are compiled of pigment suspended in ether extracts from refined mineral oil. Extracts bite into the substrate and deposits the pigment, then the extracts are evaporated off with the heat. The ether extract is a mild solvent solution, which is more "Eco-Friendly" than solvent inkjet inks carrier solution. However, there are still solvents that are left behind from the ether extract, which can be corrosive to some materials over time, therefore, it is still recommended that 24 hours is allowed for outgassing. How the ink lays down and interacts with the substrate is the same as solvent inkjet, with a less hazardous carrier oil.

How Eco-Solvent Inks Interact with substrates

Solvent ink penetrates the substrates surface which creates permanent bond.

Cross section of an eco-solvent ink drop: (Fig. 2) When the ink drop lands on the media, the eco-solvents soften and dissolves the surface, which allows the pigment to be absorbed into the substrate. The eco-solvent evaporates, leaving the pigment/resin behind as part of the substrate, forming a permanent bond.

Fig. 2



Pros

- Can print on many uncoated substrates.
- Maintenance of press is less time consuming than on solvent inkjet presses.
- Ventilation is not required.

Cons

- Can take longer to dry or require more heat to evaporate the oil than solvent inks.
- Minimum of 24 hours period before any lamination or post processing is recommended. This can slow production time, and not allowing the proper amount of time for the material to properly cure before laminating with over-laminates or adhesives, can cause ink adhesion failures.
- Alcohol and glass cleaners can remove the ink, so the durability is not as good as solvent inks.

Typical Usage

Polyester based substrates, banner materials, vinyl, tradeshow graphics, window perforated media, treated papers, and Tekra's new JetView Solvent coated polycarbonate are all substrates or applications that are most common for eco-solvent inkjet prints.

Latex Inkjet Inks Breakdown

Definition/how it works

Latex inks are formed with pigmented water based inks that use aqueous-dispersed polymer. The surface is positively charged (purple lines shown in fig. a) and attract negatively charged latex polymer particles, which encapsulate the pigments, all of which are carried through the inkjet press by water. Radiant heaters and airflow are incorporated into the printer to evaporate the liquid the latex polymer pigment is suspended in. This causes the polymers to coalesce (form as one mass) and adheres to the substrate.

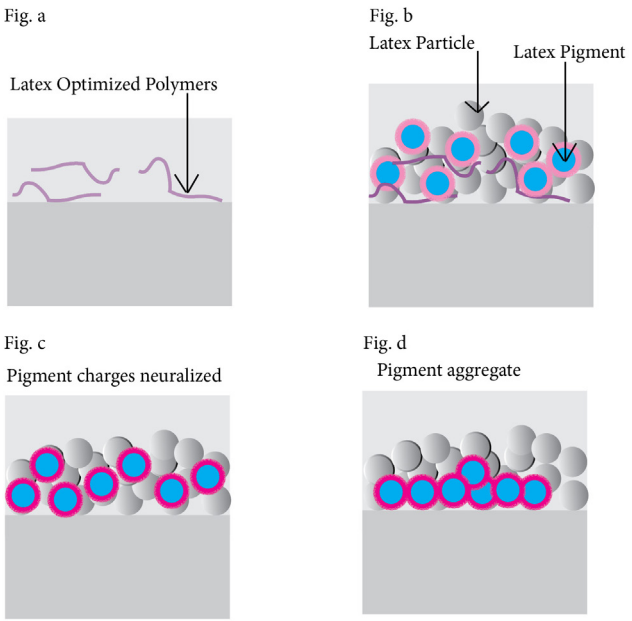
How Latex Inks Interact with the substrate

Latex inks sit on the surface of the material, creating a layer of flexible inks that move with the media. They are placed using a series of charged particles carried in water, which is evaporated with heat.

Cross section of an HP Latex Ink Droplet.(Fig. 3)

Figure 2 shows Latex inks utilizing HP Latex optimizer to assist in pulling the particles down towards the substrate and improving dot placement accuracy.

Fig. 3



Pros

- No VOC emissions means no ventilation is required and it is considered a "Green Product".
- Material is completely cured and post processing capabilities should be available immediately. (Outgassing time of 24 hours is still recommended by Tekra. Customer should refer to the ink manufacturers recommendations for proper cure times).
- Inks are not as coercive. They sit on the surface of the media, and do not penetrate it the same way the solvent inks do. This allows for less degradation of certain medias.
- Latex inks are flexible and will stretch with the movement of the media.

Cons

- Can take longer to dry or require more heat to evaporate the oil than solvent inks.
- Minimum of 24 hours period before any lamination or post processing is recommended. This can slow production time, and not allowing the proper amount of time for the material to properly cure before laminating with over-laminates or adhesives, can cause ink adhesion failures.
- Alcohol and glass cleaners can remove the ink, so the durability is not as good as solvent inks.

Typical Usage

Polyester based substrates, banner materials, vinyl, tradeshow graphics, window perforated media, treated papers, and Tekra's new JetView Solvent coated polycarbonate are all substrates or applications that are most common for eco-solvent inkjet prints.

UV Inkjet Ink Breakdown

Definition/how it works

UV inks are composed of oligomer and monomer acrylate resins along with photo initiators. When this composition is exposed to UV radiation, free radicals are released that cause the polymerization of the compound to harden to a dry 'ink film'. The pigment is encapsulated within this film, and the carrier is not evaporated like the other ink types, it is "cured" and hardened. There are two types of UV radiation that can be used for curing; LED light source (low-heat, long-life) or a mercury arc lamp (higher heat, shorter life). Whichever light source is being used is passed over the top of the inks as they are laid down to cure quickly before the ink spreads and then locks the ink into the place it was dropped. These inks sit on the surface of the media.

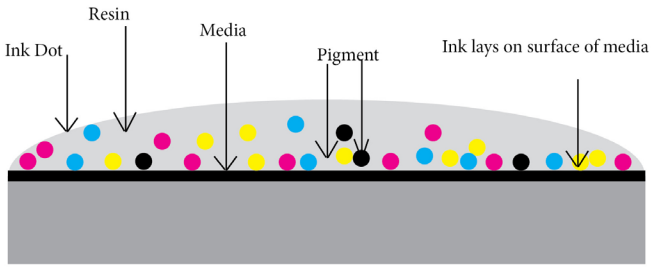
How UV Inks Interact with the Substrate

The UV ink is dropped and cured to the surface of the material without penetrating it.

Cross Section of a UV-curable ink drop (Fig. 4)

When the ink drop lands on the media, a layer containing the colorant sticks to the media surface. Unlike solvent, the colorant does not evaporate but is instantly hardened by intense UV light polymerization (curing). This leaves a durable film covering the media.

Fig. 4



Pros

- Less ink is used because it does not penetrate the surface of the substrate.
- Instantly cured. (Outgassing time of 24 hours is still recommended by Tekra. Customer should refer to the ink manufacturers recommendations for proper cure times).
- Adhere well to most surfaces creating a broad market scope for printer.
- Adhere to many surfaces without a print-receptive coating. However, for optimum adhesion, coatings or pre-treats are recommended. Tekra's Jeview™ UV coated line of ink receptive films will greatly improve the ink adhesion levels when laminating adhesives post-print, allowing print to pass necessary peel-test.
- Vibrant prints.
- Build-up of ink can create a 3-D or "textured" effect that mimics embossing.

Cons

- Inks are expensive, as are the presses in comparison to solvent inkjet inks.
- Inks are cured and dry almost immediately and build up on the surface of the media, when run at high speeds, this can create a 'banding' effect.
- Slower run times than other Inkjet presses.
- Not recommended for materials that are expected to stretch (i.e. vehicle wraps) due to brittleness (cracking).
- Print head maintenance is required in a similar fashion to Eco-solvents.

Typical Usage

Rigid Substrates, Glass, wood, metal, pop signage and roll materials such as banners, vinyl, label stocks and some fabrics, wide Format, large-scale media, alternative objects (doors, ceiling panels, edible food items).

Aqueous Inkjet Ink Breakdown

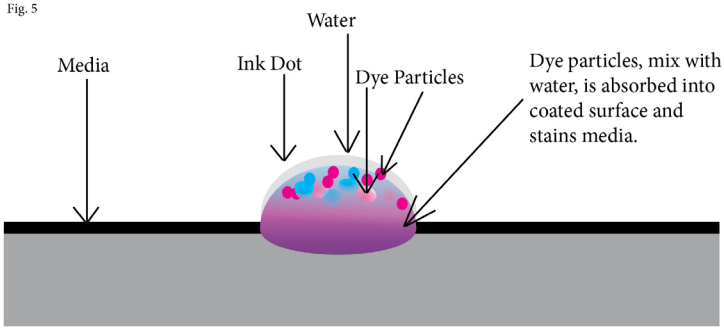
Definition / how it works

Aqueous inks are pigments or dye carried through the inkjet system via water. These are often referred to as 'dye inks' the colorant is dissolved into the water, turning it into a dye. Then the dyes are absorbed or stain the media as they are laid down and the remaining water is evaporated off, drying the ink in place using heat. The colorant dust are tiny particle that allow for very small dots that lay down smoothly. This method creates vibrant colors and smooth gradients and high resolutions.

How Aqueous Inks Interact with the substrate
Aqueous inks formed by the pigment dissolving into the water carrier, forming a dye and are absorbed into the coating layer.

Cross Section of an aqueous ink drop. (Fig. 5)
The pigment is encapsulated in water, which then mixes together to form a dye. The dye is the absorbed into the surface, staining the coating and the remainder is evaporated off with heat.

Fig. 5



Pros

- High resolution images.
- Eco-Friendly.
- Quick Dry-time.
- Vibrant images.

Cons

- Will fade quickly with UV-light exposure.
- Need specialty coating on many substrates, specifically, plastics.
- Inks will run or smear with exposure to water.

Typical Usage

POP signage, short-run promotional indoor applications, short-term applications when exposed to UV, tradeshow graphics.

As you can see from this technical tip, there are some significant differences between the inkjet inks and how they interact with media. Hopefully this article has left you with a better understanding and will allow you to make appropriate selections to improve the quality of your prints.