Avery Dennison Instructional Bulletin 4.14

Introduction to Digitally Printed Graphics

Revision 3

Introduction

Avery Dennison manufactures a wide range of materials suitable for the most diverse types of printers and inks, with widths up to two metres for pressure sensitive adhesive films and up to five metres for banner and flexible substrates.

This bulletin is intended to provide you with information to help achieve the best possible print quality and results required for your application. It explains the types of printers, inks and the process of printing on pressure sensitive adhesive films, including, printing techniques, printer settings and media profiles. When printing MPI (Multi Purpose Inkjet) films on digital inkjet platforms the following points need to be considered to ensure successful conversion and application of the film.

Key Points for Digital Printing

- Avery Dennison recommends the use of OEM inks as they have been qualified under the ICS Warranty Program and have undergone rigorous testing to ensure compatibility with Avery Dennison films. Please refer to the ICS Performance Guarantee Bulletins for details, available for download at: www.graphicsap.averydennison.com

- All solvent based inks contain high levels of solvent and can adversely affect the way the film is intended to perform, a minimum of ink should be applied to the material to avoid excess solvent build up without compromising print quality.

- When printing you should always use the correct ICC Colour Profile for the machine and media you are printing on. Using generic print modes can adversely affect the colour quality of your print and cause problems due to incorrect ink limits. Download Avery Dennison profiles at: https://avery-ap.color-base.com/

- Correct printing temperatures stated by ink manufacturers both ambient and substrate must be followed.

- It should not be assumed that a print is ready for finishing once it is dry to touch, solvent inkjet graphics must be dried and cured of all solvents before lamination and application.

- Prints produced using UV cured ink should be allowed to cure for a minimum of 12 hours.

- Solvent inkjet graphics after printing should be immediately opened up and allowed to breath by hanging prints vertically or loosely wound and standing off the ground to allow the solvents to move from the film. Avery Dennison recommends a minimum of 24 hours for normal flat surface applications and a minimum of 72 hours for vehicle applications where film is to be conformed. 96 hours for solid dark and black colours is normal.

- When creating artwork and graphics, an unprinted border of approximately 10mm – 20mm should be incorporated into the design to minimise the potential of edge curl occurring due to post curing of the inks. If cutting into solid colour Avery Dennison recommends a minimum of 72 hours, cutting whilst the ink is still wet will cause edge curl and/or adhesive failure.

- Trimming of the printed graphic should not be attempted until the ink has had sufficient time to completely cure. If trimming to an edge or into a printed area, the ink must be completely cured and not just touch dry. Trimming whilst the ink is still wet will ultimately cause edge curl and/or adhesive failure.

Note: It should not be assumed the film is fully cured after these recommendations, if the smell of solvent is still present or the film feels excessively soft or tacky, then the film will need further time to cure.

Ink Technology -

Solvent Ink (Hard, Mild and Eco Solvents)

Solvent inks use a chemical compound (solvent) as a carrier liquid and can be printed directly onto uncoated vinyl. Solvent inks rely on the carrier (solvent) to penetrate the film, before evaporating to leave behind the pigment (colour). Prints made with solvent inks are durable, waterproof and UV stable. They can be separated into the following categories.

- True or Hard solvents
- Mild or Low Solvents
- Eco Solvents

Important notes regarding solvent printers:

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- It should not be assumed that a print is ready for finishing once it is dry to touch, solvent inkjet graphics must be dried and cured of all solvents before lamination, cutting and application.

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- Ink drying is dependent on ambient temperature and humidity. Therefore drying times can vary dramatically depending on prevailing conditions. Solvents prints should be cured in a 22°C and 50% humidity ambient environment.

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- Trimming of the printed graphic should not be attempted until the ink has had sufficient time to completely cure. If trimming to an edge or into a printed area, the ink must be completely cured and not just touch dry. Trimming whilst the ink is still wet will ultimately cause edge curl and/or adhesive failure.

Note: It should not be assumed the film is fully cured after these recommendations, if the smell of solvent is still present or the film feels excessively soft or tacky, then the film will need further time to cure.

Ink Technology - UV Curable Ink

UV curable inks rely on components in the ink reacting when exposed to UV light, and cure or harden upon exposure. Unlike solvent inks, UV ink components do not penetrate the film, but form a layer on top. UV inks can be used on all types of vinyl. Be aware that some ink types may not allow the film to conform and can affect the film's flexibility. Prints made with UV Curable inks are durable, waterproof and UV stable. There are three main types of UV curable ink.

- Rigid UV ink – for rigid substrates
- Flexible UV ink – for flexible substrates
- Flexible and Conformable UV Ink – for conforming and wrapping applications

Important notes regarding UV printers:

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- UV Printers use media type profiles for different films and substrates. Make sure you are using the correct Profile for the media you are printing onto.
- UV Prints will be touch dry straight from the printer, it should not be assumed that a print is ready for finishing at this stage, prints produced using UV cured ink should be allowed to cure for a minimum of 12 hours.
- When designing graphics, an unprinted border is recommended as some Rigid UV inks can crack when put through a vinyl cutter. Trimming of the printed graphic should not be attempted until the ink has had sufficient time to completely dry.
- Prints produced with Rigid or Flexible UV cured ink are not suitable for applications where the film is required to stretch or conform. Only specially designed inks that can stretch and conform are suitable for 3D or conforming applications. Talk to your printer manufacturer if you need more information.

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Ink Technology - Latex Ink

Latex Ink consists of a liquid that carries latex polymer and pigment particles to the surface of the print media. The carrier in Latex ink is predominantly made of water, although it contains other additives to allow it to pass through the print head efficiently. In order for the carrier in the ink to evaporate, the printer utilises fans and high heat to evaporate the carrier, this process also makes the polymers and pigments harden and remain on the surface of the film. Prints made with latex ink are durable, waterproof and UV stable.

Important notes regarding latex printers:

- It is very important to use the correct Printer Profile Settings for your media, using profiles that are "HP Certified" from the HP Media Finder is recommended.

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- Limit the total amount of ink as much as possible when printing using the correct Printer Media Profile and ICC Colour Profile. Do not change the ink limits set in the Certified Profile. Typically they should be set to 100%.

- Media profile ink limits on Cast Films should be set at between 90% and 120%. For solid and vibrant colours on flat panel signage you can go up to 120% if it's already in your Certified Profile. For vehicle wrapping and conforming it is recommended to use between 90%~100%.

- Drying (Curing) Temperature is very important for Latex Printers, if the temperature is too low the inks do not cure correctly. They may be touch dry on the surface but will "Re-Wet" over time and fail. For most PVC films a curing temperature of between 106° ~116° is normal for most standard print speed settings.

ICS Qualified OEM Printers, Inks and Recommended Print Films

A comprehensive list of ICS Qualified OEM printers and qualified ink types are available for download, please refer to the respective bulletin for printer specific durability statements and compatibility: www.graphicsap.averydennison.com

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ICC Media Profiles

ICC Media Profiles can be installed within your RIP software to further enhance your colour accuracy and consistency, they define the way your printer and ink combination reproduces colour on specific substrates.

Different types of pressure sensitive adhesive films require different production methods, have different components, or can have different white points. Each combination of media, printer, ink, RIP software and resolution requires its own ICC media profile.

ICC media profiles can contain the following information:

- RIP Software name and version
- Printer model
- Media name and type
- Ink type and configuration
- Print mode: passes, uni or bi-directional
- Head speed and head height
- Vacuum settings
- Heater temperatures
- Resolution, ink-drop mode
- ICC Colour information

Avery Dennison offers the most comprehensive selection of media profiles in the industry. Specific profiles for your printer, ink and RIP combination are available via the Avery Dennison Graphics Solutions website: https://avery-ap.color-base.com/

Overlaminating

To provide durability, scuff resistance and anti graffiti protection an Avery Dennison digital overlaminate (DOL) film or screen printable clear should be used. See Instructional Bulletin 4.06 for processing tips. Printed graphics must only be overlaminated after the ink has had sufficient time to dry or cure.

The benefits of overlaminating are:

- Protection from scratches and abrasion
- Protection from UV light and enhanced durability
- Colour enhancement
- Change the finish of the film – gloss, lustre or matte
- Some DOL films have anti-graffiti properties
- Some DOL films have self healing properties

Ink Colour

Configurations

Digital printers can have an assortment of colour configurations, the simplest being CMYK (Cyan, Magenta, Yellow and Black). In order to expand the achievable colour gamut of a printer, manufacturers have added additional ink colours and finishes. Below are examples of some of these configurations:

- Cyan, Magenta, Yellow and Black (CMYK)

- Cyan, Magenta, Yellow, Black, Light Cyan and Light Magenta (CMYKcm)

- Cyan, Magenta, Yellow, Black and White (CMYKw)

- Cyan, Magenta, Yellow, Black and Metallic (CMYKMt)

- Cyan, Magenta, Yellow, Black, Light Cyan, Light Magenta, Light Black and Orange (CMYKLcLmLkOr)

- Cyan, Magenta, Yellow, Black, Orange, Green and White (CMYKOrGW)

- Cyan, Magenta, Yellow, Black, Light Cyan, Light Magenta, Light Black, Orange and Red (CMYKLcLmLkOrRd)

Note: For information on durability and compatibility with Avery Dennison MPI films, please refer to the specific ICS Performance Guarantee Bulletin that corresponds with the printer/ink combination that you are using. These can be obtained from www.graphicsap.averydennison.com

Please refer to the OEM ink manufacturer's specification data sheets for actual ink durability and UV stability.

Printer Settings

Digital print quality is largely determined by the printer settings, these settings can affect speed, quality and resolution of the printer. These parameters include:

- Resolution – 360 dpi, 540 dpi, 720 dpi etc.
  - lower resolution = faster printing, lower quality
  - higher resolution = slower printing, higher quality
- Number of passes – 2, 4, 8, 16 pass etc.
  - 2 pass = faster printing, lower quality
  - 16 pass = slower printing, higher quality
- Print head direction
  - uni-directional (print head prints in one direction only) = slower printing, higher quality
  - bi-directional (print head prints in both directions) = faster printing, lower quality
- Printing temperatures (preheat, print platen heat, post heat)
  - If the printing temperature is too high, it can cause banding
  - If the printing temperature is too low, it can cause mottling

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RIP (Raster Image Processing) Software

Digital printing begins with a graphic design, digital illustration, image or combination of these elements created on your computer. In order for this to be reproduced on print media, certain things such as the type of printer, ink and software need to be considered.

RIP software is required to translate the graphic file into data the printer can use to produce a printed image.

Some common types of RIP software:

- ONYX Graphics – Production House, Poster Shop, RIP Centre
- Roland Versaworks
- Caldera VisualRIP and GrandRIP
- ErgoSoft PosterPrint
- ColorGATE
- Mimaki RasterLink Pro
- Scanvec Amiable Photo Print
- Wasatch SoftRIP
- AIT Shiraz
- EFI Fiery

Substrate Cleaning and Preparation

For preparation and cleaning of substrates the pre-cleaning and final cleaning process outlined in Instructional Bulletin 1.01 must be followed.

Application

Avery Dennison has Instructional Bulletins for most application surfaces available for download at:
https://graphicsap.averydennison.com/en/home/resource-center/literature-library/instructional-bulletins.html

Warranty and Limited Remedy

This instructional bulletin describes a technique. The information contained herein is believed to be reliable, but Avery Dennison makes no warranties, express or implied, including but not limited to any implied warranty of merchantability or fitness for a particular purpose. To the extent allowed by law, Avery Dennison shall not be liable for any loss or damages, whether direct, indirect, special, incidental or consequential, in any way related to the technique of making a graphic regardless of the legal theory asserted.

The above information provides basic information on how to apply pressure-sensitive graphics. The instructions are designed to help ensure success across a broad range of applications. Depending on the size and complexity of applications, a certain amount of expertise is needed.

Professional applicators can be hired to ensure proper application of finished graphics. When mounting graphics in remote geographic areas, professional applicators can offer the added benefit of local service.

Avery Dennison has a vast network of Certified Installers who have been specially trained and certified in accordance with our recommended techniques.

You can review the Certified Installer list here: Find a Graphics Installer

Consider hiring a professional whenever the application requires:
- Multiple panels to be registered
- Complex surfaces, such as rivet and corrugated trucks
- Harsh environmental conditions (i.e. outdoor applications in high heat climates)
- Remote geographic locations

For further information, contact your local Avery Dennison representative.