

Avery Dennison Instructional Bulletin 4.14

Printing and Finishing of Digitally Produced Graphics

When printing and finishing 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.

Introduction

A common method to reproduce high-quality full-colour artwork is to use wide-format or grand-format digital print technologies. 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, media profiles and how to go about successfully finishing these products for end use.

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 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
- Limit the total amount of ink as much as possible when printing using the correct ICC colour profile and RIP settings to avoid excessive solvent build up and retention in the film. Avery Dennison recommends a maximum total ink limit of 250%
- 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
- Dry Solvent inkjet graphics immediately after printing 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.
- 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.
- 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
- 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 tacky, then the film will need further time to cure.

Ink Technology and Processing Recommendations

In addition to printers being categorised by the way they print, printers can also be classified according to the type of ink they use.

Solvent Ink (Hard, Mid 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
- Avery Dennison recommends the use of OEM inks as they have been qualified via 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
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 - Dry Solvent inkjet graphics immediately after printing 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
 - 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.
 - 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
 - Trimming of the printed graphic should not be attempted until the ink has had sufficient time to completely dry.
 - If trimming to an edge or into a printed area, the ink must be completely dry 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 tacky, then the film will need further time to cure.

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 films 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
- Avery Dennison recommends the use of OEM inks as they have been qualified via the ICS Warranty System 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

- Limit the total amount of ink as much as possible when printing using the correct ICC colour profile and RIP settings to avoid excessive solvent build up and retention in the film. Avery Dennison recommends a maximum total ink limit of 250%.
- Correct printing and drying 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, prints produced using UV cured ink should be allowed to cure for a minimum of 12 hours.
- Ink drying is dependent on ambient temperature and humidity, therefore drying times can vary dramatically depending on prevailing conditions.
- When designing graphics, an unprinted border of approximately 10mm – 20mm should be incorporated into the graphic to minimise the potential of edge curl occurring.
- Trimming of the printed graphic should not be attempted until the ink has had sufficient time to completely dry.
- If trimming to an edge or into a printed area, the ink must be completely dry and not just touch dry. Trimming whilst the ink is still uncured will ultimately cause curl and/or adhesive failure.
- 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.

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 remove evaporate the carrier, this process allows the polymers and pigments to harden and remain on the surface of the film. Prints made with latex ink are durable, waterproof and UV stable.

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- Limit the total amount of ink as much as possible when printing using the correct ICC colour profile and RIP settings to avoid excessive solvent build up and retention in the film. Avery recommends a maximum total ink limit of 250%.
- Correct printing and drying 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, it is imperative that the correct dry and cure temperatures for the media and environment are used to ensure the ink is completely cured. Only then can the material be finished and applied directly after printing.
- When designing graphics, an unprinted border of approximately 10mm – 20mm should be incorporated into the graphic to minimise the potential of edge curl occurring.

ICS Qualified Print Platform and Recommended Print Films

A comprehensive list of ICS Qualified OEM printers and ink is available for download, please refer to the respective bulletin for printer specific durability statements and compatibility:
<http://www.graphicsap.averydennison.com>

Media Profiles

Media profiles can be added to RIP software to further enhance the colour consistency and replication, they define the way your printer and ink configuration reproduces colours on specific media.

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

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

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: www.graphicsap.averydennison.com

Overlaminating

For extended 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 decals 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 matt
- Can provide anti graffiti protection

Ink Colour Configurations

Not only can digital printers have different types of ink but they can also come in an assortment of colour configurations. The standard being CMYK, in order to expand the achievable colour gamut, printer manufacturers have added additional ink colours. 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)

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 <http://www.graphicsap.averydennison.com>.

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

Types of Digital Printers

Digital wide format printers come in various shapes, sizes and forms. Print quality and resolution can vary greatly across the vast amount of digital printers available in today's market. The type of printer used will be defined by the end use or application of the graphic being produced. All Avery Dennison MPI (Multi Purpose Inkjet) films can be used on the following printer types.

- Roll to roll – printers up to 5m wide that print from roll material and then wind the printed material onto a take up roll.
- Flatbed – printers designed to print onto material in sheet form
- Hybrid – printers that can handle both roll and sheet material

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 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, higher quality
- Printing temperatures (pre heat and platen)
 - If the printing temperature is too high, it can cause banding
 - If the printing temperature is too low, it can cause mottling

RIP (Raster Image Processing) Software

Digital printing begins with a digital illustration, image or combination of these elements 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 computer files within the illustration into printer specific language.

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

- Always test painted surface for suitability by applying masking tape to an inconspicuous area and removing quickly. If any paint is removed pressure sensitive materials should not be applied.
- Ensure all application tools are in good condition.
- When applying tiled graphics begin with the lowest tile and finish with the highest tile.
- When applying tiled graphics to vehicles ensure the tile closest to the rear of the vehicle is applied first, working towards the front of the vehicle, or from the bottom and working up.
- Apply pressure to the graphic during and after application to ensure correct adhesion and performance of pressure sensitive materials.
- Follow all Occupational Health & Safety regulations.

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.

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 Specialist Installers who have been specially trained and certified in accordance with our recommended techniques.

You can review the Specialist Installer list here: <http://carwrapsanz.com/specialist-installers/>

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 Graphics Solutions representative.