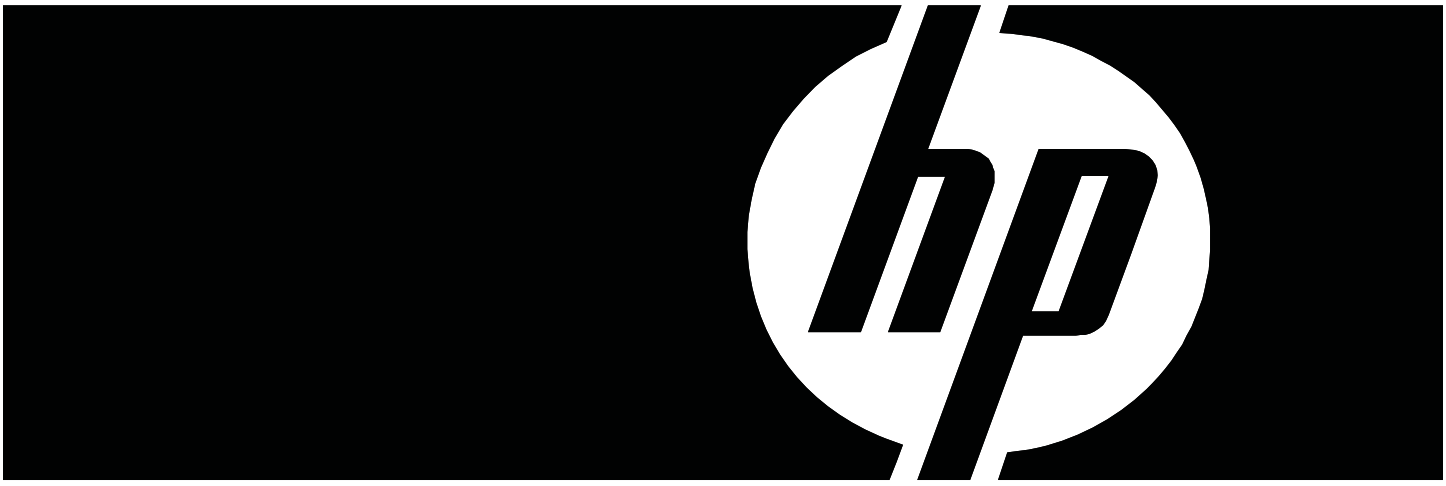
Tips & Tricks for Corrugated Plastic

On UV-Cure Printers



Corrugated plastic or fluted polypropylene, known commonly by its brand-names Coroplast™, IntePro®, Plasticor®, Cor-X®, and others, is a popular media for UV-curable inkjet printing applications. This document describes a number of recommended techniques to get the most out of your UV printer and this media type.

Media Selection

There are many suppliers and many product variations of corrugated plastic. Not all products are identical in how well they work with UV-curable inkjet printing. We have experienced poor performance with media from one supplier and markedly improved performance with media from a different source, with no other changes to the printer, workflow, or environment. If the media you have obtained from one source is not performing well, investigate an alternate product or supplier. Test a small quantity first to ensure that you have located a superior product.

Media Preparation

Like many synthetic materials, corrugated plastic is prone to problems with static electricity. Static causes two issues with the media. First, the static charge attracts dust particles to the media prior to printing. When ink is applied to the dirty media, the ink adheres to the particles on the surface of the media rather than the media itself. This ultimately leads to the appearance of "pinholes" or other defects when the particles are wiped away. The second problem with static is that the electrical charge attracts the ink droplets away from their intended targets and causes the droplets to land in the wrong place. The typical end result is a "haze" or "ghosting" of faint ink around the desired print area.

To avoid these problems, wipe down the media prior to printing using isopropyl alcohol. Other methods can be used to reduce static in the general printer environment, but wiping down each sheet of media is recommended regardless of other anti-static methods.

Server Configuration

Best results on corrugated plastic are obtained when the smallest quantity of ink is used. Every media has a property known as adhesion, or how well the cured ink attaches to the media surface. Adhesion can be quantitatively measured. When too much ink is used, poor adhesion can result, and corrugated plastic is one of the most sensitive medias to this effect.

When configuring your server, use color management settings that will process and print the image with the smallest amount of ink. Indications that your software is putting down more ink then desirable are enhanced swath to swath or "lawn mower" banding and/or an "orange peel" or wrinkling effect in areas of heavy coverage followed by a loss of adhesion in these same areas.

HP Software RIP

HP print server products include a color transform or profile named "Generic Low Ink Coverage". This color profile will apply the smallest amount of ink and is recommended for use with corrugated plastic. Alternatively, the RIP transform specifically named for "Coroplast" may also be used.

Onyx RIP Products

Users of the Onyx print server products (RIP Queue, Poster Shop, Production House) will find that the "out of the box" color profiles supplied by Onyx tend to lay down heavier coverage of ink until the profile has been calibrated to your own printer. Since no current third-party RIPs support the use of the printer's on-board color sensor, an external device is required to perform this calibration. External device support varies depending on the software used. The semi-transparent nature of most fluted polypropylene media can compound the difficulty of taking accurate color readings with any device.

To determine what Onyx profiles use the least ink, you can check the inkload of profiles within the Onyx software by looking at the value within the "Ink limit table" found in Media Manager. A value of 4.0, for example, is equivalent to 400% ink (100% each of C, M,Y, and K), while a value of 2.5 equates to 250% ink.

Outside of color profile selection, Onyx has the ability to print single color black if the black "Pure Hues" option has been selected within Preflight color management settings or in the Quickset for the printer. Single-color black tends to cure and adhere better in cases of heavy coverage as well as when working with media with a low adhesion characteristic. See the following section on File Preparation for more on pure black vs. rich black.

Other Third-Party RIPs

Other third-party RIPs vary in exactly how they render color and regulate total ink coverage, but will have controls similar to those described above. Please check with your product documentation or product vendor for precise instructions on how to control ink usage.

File Preparation

For the same adhesion and curing reasons noted above, try to prepare your files and/or educate your customers to prepare their files so that ink use is optimized. This recommendation typically applies to areas of solid black or to black text. Sometimes black is intentionally created in the file as a "rich black", using various densities of CMYK for a darker appearance than black only. This can be problematic on corrugated plastic.

The HP print server, when using the color management workflow, automatically creates an optimized "rich black" for any image colors that are specified in the file as 100% black only. Creating a customized "rich black" within the image source file is not recommended for this workflow. When using the ICC color management workflow, the print server will use exactly the CMYK percentages specified. This includes a "pure" black-ink-only black for image colors specified as 100% black only in the file. Use of 100% black in the image source file for this workflow is recommended.

Third-party RIPs vary in how they render black. Check your product documentation and, where possible, prepare your files for optimized black output.

Printer Configuration

The *Media Compatibility Matrix* for the UVR-UVX printers, available on the website at *http://www.colorspan.com/pdfs/UVX-UVR_Media_Compatibility_List.pdf*, recommends the following settings for optimal performance:

	0.0" to 0.25" Media			0.26" to 0.50" Media (Not applicable to UVR)		
Wizard Setting	**HQ**	**Prod**	**BB**	**HQ**	**Prod**	**BB***
Coroplast	n(1)	y	y	n(1)	y	y(3)

1) This print mode is not recommended, media tends to bow too much

3) Media feed may be an issue depending on sheet size, smoothness and/or weight

* = BB ratings apply to 600X300 Production Print Mode

This table indicates that High Quality mode is not recommended because the higher number of passes creates too much heat, causing the media to bow and possibly cause head strikes. This applies primarily to thinner varieties of the media. Billboard mode and 600x300 Production mode may create print quality issues depending on the weight of the sheet.

Lamp Power

When you select "Coroplast" from the Media Wizard, lamp power settings are automatically configured to low for Production mode and to medium for Billboard mode. If you have created a customized Media Wizard entry for your fluted polypropylene media, be sure that your lamps are configured for these same power settings.

Because corrugated plastic media requires a very effective initial UV exposure, you will need to increase the lamp power from these original settings sooner than you might for a less sensitive media. If your bulbs have reached 300-500 hours of use and are still configured for low power in Production mode and medium power in Billboard mode, you may need to change the lamp power to medium or high, respectively. For more information on bulb life, please see ColorSpan Tech Note 2760, *UV Bulb Expectations*.

Dealing with Heat

The UV lamps output a lot of heat energy, which increases correspondingly with the lamp power settings of low, medium, and high. Because corrugated plastic media consists of two layers separated by air, the temperature change to the top surface causes the media to bow. The narrower the media width, the more pronounced this bowing will be.

There are two ways to cope with this tendency to bow. The first is to use a Printing Delay, enabled through the printer's control panel. The printing delay occurs at the end of each pass of the carriage, creating a momentary delay before the carriage returns over the media. This brief delay allows heat to dissipate from the media and the bowing to relax. This is the recommended method. Printing Delay can be configured either through the Media Wizard or through the "Menu -> Printer Settings" option on the control panel.

The second method is to increase the head height of the carriage above the surface of the media. Ordinarily this height is set to 0.085" using the supplied gauge. Increasing the carriage height will add clearance between the bottom of the carriage and the media surface, so that if the media does bow and deflect upwards, the carriage will still be high enough to avoid a glancing head rub or an outright head strike.

Use caution when raising the carriage height beyond the standard 0.085", however. Excessively high head height can create a number of issues:

- Visible overspray on the printed output may increase.
- Airborne ink dust will accumulate more quickly on the UV lamp window glass, reducing the effective light output and therefore diminishing the curing power. Increased cleaning of the UV lamp glass will be necessary.
- Airborne ink dust also will accumulate more quickly on the UV lamp cooling fan intakes on the tops of the lamps, possibly leading to lamp overheating errors. Increased cleaning or replacement of the intake air filter element will be necessary.
- UV light may escape from the shielded areas of the printer and reflect up from the platen surface onto the printheads, possibly causing cured ink in the nozzles that will lead to printhead failure. If a higher head height is required, printhead maintenance through Purging and manual cleaning should be increased in frequency.

Post-Print Handling

UV-curable ink is remarkable in that it typically feels "dry" to the touch immediately after printing. The UV curing process is not as simple as this, however. When the liquid ink is exposed to the appropriate amount of ultraviolet (UV) light, a catalytic reaction begins that converts the liquid ink into a solid ink film. Immediately after exposure to this UV light, the ink is sufficiently solidified that it becomes "pinned" in place. This is the "dry" sensation that is experienced immediately after printing. The catalytic curing reaction, however, does not stop when the UV light source is removed. Once curing has begun, it continues on a molecular level for up to 48 hours. During this time the remaining "liquid" (un-reacted) molecules become catalyzed and bind with other molecules to become part of the cured, solid ink film.

As noted previously, corrugated plastic is sensitive when it comes to ink adhesion. Adhesion does not reach its maximum strength until the curing is completed. For all fluted polypropylene media types, we recommend waiting the maximum cure time of 48 hours before subjecting printed sheets to rough handling.