



# DUPONT™ ARTISTRI® BRITE PIGMENT INK

## DIRECT TO GARMENT INKS

### Application of DuPont™ Artistri® Brite P5003 Pre-treatment Solution

#### APPLICATION

Direct to Garment Printing/Cotton Garments

#### INK TYPE

DuPont™ Artistri® Brite P7000/P6000/P5000/P3500  
Pigment Ink

#### AIM

DuPont™ Artistri® Brite P5003 is a fabric pre-treatment solution for use with dark colored cotton t-shirts enabling clean and consistent printing with DuPont™ Artistri® Brite P7900, P6900, P5910 and P3590 white ink. The advantages of using DuPont pre-treatment with DuPont™ Artistri® ink are:

- Outstanding white ink opacity on dark colored cotton garments
- Excellent wash fastness
- Faster white ink set-up
- Heat tunnel drying and curing of pre-treatment and final garments
- Compatibility with cotton and cotton/polyester blend fabrics
- Faster curing times in heat press workflows

DuPont™ Artistri® Brite P5003 pre-treatment solution was developed for dyed cotton and some cotton blended fabrics and is intended for use with DuPont™ Artistri® Brite P7000, P6000, P5000 and P3500 direct to garment inks.

This guide is intended to provide best practices for using DuPont™ Artistri® Brite P5003 pre-treatment solution with DuPont™ Artistri® Brite P7000/P6000/P5000/P3500 inks. The pre-treatment and final shirt curing can be accomplished in either a belt conveyer heat tunnel or in a heat-press only process. Preferred temperatures are provided for drying and curing; however, it is not uncommon that there can be temperature variability from one heat press or heat tunnel to another. It is recommended that temperatures be measured and adjusted accordingly if out of calibration. In order to achieve best results on dark or light-colored cotton fabrics, proper application of the pre-treatment solution must be practiced. Proper application of the pre-treatment solution is key to obtaining optimum white opacity and ink adhesion to the fabric.

#### SAFETY

Please refer to the supplied SDS sheet prior to use of this product.

#### APPLICATION OF PRE-TREATMENT

DuPont™ Artistri® Brite P5003 pre-treatment solution can be applied manually using a hand sprayer or mechanically by the use of an automatic pre-treatment unit. Automatic pre-treatment applicators are available from a number of printer and silk screen suppliers. An automatic pre-treatment unit offers a number of advantages, not the least of which is a consistent and repeatable application of pre-treatment to the garment. However, DuPont™ Artistri® Brite P5003 can be easily applied through a manual hand sprayer without loss in quality. Instructions for application with a manual hand sprayer are provided below. If an automatic pre-treatment machine is used, please refer to the vendor's usage instructions for proper safety and use.

#### PRE-TREATMENT APPLICATION

Regardless of whether an automatic unit or a hand sprayer is used, the preferred quantity of pre-treatment is 0.095-0.119 g/in<sup>2</sup> (0.015-0.018 g/cm<sup>2</sup>) or 28-35 g sprayed over a 19" x 15.5" (48.3 cm x 39.4 cm) area. Some automatic pre-treat machines allow specifying a spray volume - if one of these machines is used, please refer to the manufacturer's instructions to dial in the correct amount of pre-treatment. In other cases, use the procedure below to determine the correct amount of pre-treatment to apply.

1. Using a scale that is accurate to at least 1 gram, weigh an un-treated shirt.
2. If the employed scale has a "Zero" option, zero the scale on the shirt weight. If not, note the shirt weight.
3. Pre-treat the shirt (manual or automatic). An automatic unit should have a setting that is normal – use that as a starting point.
4. Immediately weigh the pre-treated shirt. Weigh the shirt wet, **DO NOT PRESS THE SHIRT OR DRY BEFORE WEIGHING**. If the un-treated shirt was zeroed, the weight should be between 28g and 35g. If the weight of the un-treated shirt was noted, the wet shirt should be 28g-35g heavier than the un-treated shirt.
5. If the weight was either heavier or lighter than desired, adjust the pre-treatment application and re-run the test.

6. Lighter, higher quality fabrics typically require lower quantities. Heavier, poorer quality fabrics typically require more. Ideally, this pre-treatment quantity should be optimized for different fabric types and colors. This is fabric dependent and tests must be performed to determine the appropriate quantity.
7. Initial optimization can be performed on dark shirts by assessing the opacity of a solid white layer. The L\* value of white should be  $\geq 92$ . If it is not, either there is an insufficient quantity of pre-treatment or insufficient quantity of white ink printed.
8. Further optimization may be necessary to achieve best wash fastness; the prior step will be a good indicator of this.

This procedure is not needed every time a shirt is prepared; it is a set up procedure. Once the right amount of pre-treatment is determined, continue to pre-treat consistently and correctly apply pre-treatment whether an automatic unit or hand sprayer is used. In the rare cases where shirts are not printing or washing correctly, refer to the troubleshooting section below.

### DRYING THE PRE-TREATMENT

The objective of drying after pre-treatment application is to remove water and hold down vertical fibers, providing a flat surface which is easily covered by ink. If vertical fibers remain vertical, then these will either be visible (not completely coated by ink) or typically require more ink to coat them. The user should look for an ideal condition where the pre-treatment is dried at the lowest temperatures, shortest times possible and lowest pressure possible to obtain good print quality. Avoid over-drying the pre-treatment in this step, which can lead to poor wash fastness. Because of differences in the efficacy of heat presses and belt conveyor drying tunnels, the user should test their own system to determine optimum drying procedures.

The pre-treatment can be dried in a heat press or a heat tunnel after application. A thin, disposable parchment paper, non-stick papers, or non-stick polymer sheets are the preferred material for this step. This type of paper gives the best uniformity in drying, and enables better evaporation of volatiles. These sheets should only be used once per garment and then disposed. If unavailable, alternative non-stick paper may be used.

### Preferred method for drying dark cotton shirts with a heat press

- After spraying the garment, wipe with a foam roller, uniformly and in one direction, to get even coverage. Alternatively, a squeegee can be used. However, with a good quality PT machine this step is unnecessary.
- Dry the pre-treated garment with the heat press (using the parchment paper or non-stick polymer sheet as a barrier from the press) for a minimum of 15 seconds, up to a maximum of 40 seconds at 165°C (~330°F) at 70-130 psi. For light colored shirts, the lower end of the range may be acceptable.

### Preferred method for drying dark cotton shirts with a belt conveyor heat tunnel

- Dry the pre-treated garment in the heat tunnel for approximately 30-40 seconds at 165°C (~330°F). The shirt should be slightly damp as it exits the heating box.
- Immediately press the shirt in a heat press for 10 seconds at 165°C (~330°F) at 70-130 psi. This step is necessary to control printing defects due to fibrillation (random fibers sticking up from the shirt which can cause an uneven ink layer). If using high quality, smooth surface shirts and believe such defects will not be encountered, skip this step.

NOTE: Because of the differences in heat tunnel efficiency from manufacturer to manufacturer, it may be necessary to dial in an optimum curing heat and speed.

## PRINTING

### Attaining the Best Quality Print

Each printer manufacturer will have their own best practices for setting up the printer based on printhead, color management and ink delivery methods. The printer OEM recommendations for running the printer should always be followed as a good starting point. Additionally, each customer can and should perform their own tests on their own shirts to determine the best procedure for attaining their specific desired results. If acceptable results are not achieved, please contact the printer manufacturer or distributor technical support staff.

DuPont™ Artistri® Brite P5003 pre-treatment solution was developed to enable fast print speeds by improving the drying rate of inks during printing. This enables the user to increase throughput by allowing the white ink layer to set up more quickly so that color printing can occur almost instantaneously.

- If the capability exists, instead of printing in separate layers, (i.e. first printing a white layer, and then printing a CMYK layer) it is now possible to print in single pass mode where the white ink is printed on the leading edge in front of CMYK inks.
- The printer should be optimized to lay down enough white ink to achieve a L\* value of  $\geq 92$  when printing a solid white graphic.
- Some printers have the capability of printing a first layer of white ink, and then in a second layer of additional white ink and CMYK. This is not recommended. The new pre-treatment was designed to enable fast crashing and drying of the white ink. If printing in this mode, a second pass of white ink will not receive the benefit of the pre-treatment and bleeding between white and CMYK inks may occur, or fine line resolution may be lost.

## CURING

Post print curing binds the ink onto the shirt and insures proper wash and usage characteristics. The time and temperature of the heat press or drying tunnel are critical to attaining the best possible print quality. It is recommended that the specific curing system be tested for temperature control. Infrared thermometer guns or adhesive temperature gauge strips are inexpensive methods of checking the given curing device.

Care should be taken to transfer the printed garment, with wet ink, to the heat press so that the image isn't compromised from handling. If there are any signs of overly wet ink, these should be left to hover under the heat press for some short period of time to allow for drying. When applying paper onto the wet printed image, take care to place the paper onto the image without any lateral manipulation of the paper thereafter. Discard any paper which may have folds, creases or wrinkles, as these may transfer to the printed image. Parchment paper, non-stick papers, or non-stick polymer sheets may be used. These non-stick polymer sheets have the benefit of reducing curing time but should be used carefully; over curing can occur (e.g. a cure for 90 seconds with these sheets will cause over curing and poor wash fastness). It is also known that these non-stick polymer sheets can give rise to different levels of gloss or sheen to the printed image.

Preferred conditions which have been optimized are described below. Shorter times or lower temperatures can give rise to poorer wash fastness. (This may be acceptable however. For example, in some cases 60 second cures may be only slightly better than 45 second cures.)

#### **Preferred method for curing dark and light cotton and cotton/poly blend shirts with a heat press**

- Press, using a non-stick sheet as a barrier from the press for 45-60 seconds at 180°C. Some shirts will show scorching or other undesirable effects at 180°C and in these cases, it is recommended that the temperature be lowered and the time increased (i.e. 170°C for 60-70 seconds). A range of temperatures is provided as shirts from different manufacturers/mills will sometimes behave differently and need higher or lower curing temperature. Test shirts of choice in equipment of choice to determine optimum curing conditions.

#### **Preferred method for curing dark cotton and cotton/poly blend shirts with belt conveyor heat tunnel**

Gas and electric conveyor dryers have a wide variance of efficiency. The recommendations below represent a useful starting point. A user should test to determine the best drying time and temperature with their particular drying tunnel.

- Use 5 minutes at 180°C/356°F as a starting point.
- If the wash fastness is insufficient, changing temperature or dwell time can have positive effects on wash fastness.
- If the shirt yellows or stains, reduce the temperature and/or the dwell time.

NOTE: DuPont also offers pre-treatment for white and light-colored garments named DuPont™ Artistri® Brite P5010 pre-treatment solution. This is a product to increase the color yield, wash fastness and image sharpness for prints that do not use a white ink layer. More information on DuPont™ Artistri® Brite P5010 pre-treatment solution is available from your authorized DuPont™ Artistri® reseller.

## **TROUBLESHOOTING**

### **Correct Pre-treatment**

The image below represents a shirt that has been properly pre-treated, printed, heat-pressed and subsequently washed through three (3) industrial washes. Note the white underbase and color retention.

**This is a properly treated, printed and post-treated shirt.**



### **Insufficient Pre-treatment**

If too little pre-treatment solution is applied, the white ink will have a mottled appearance after printing. This is due to an insufficient amount of pre-treatment to keep the white ink layer on the surface allowing the ink to soak into the fibers of the shirt.

**An example of insufficient pre-treatment.**



### **Poor Wash Fastness**

DuPont™ Artistri® Brite P5003 pre-treatment solution has been shown to meet industry accepted standards for wash fastness. If acceptable wash fastness is not attained, it suggested the user:

- Check the actual heating/curing temperature on local equipment using an IR heat gun or an adhesive temperature test. Extremely low temperature curing can adversely affect wash fastness.
- Check to see whether the garment being printing on has a surface application such as a softener or silicone treatment that is repelling the ink.
- Check the cotton/polyester content. While DuPont™ Artistri® Brite P5003 and Artistri® Brite inks will work well with many cotton/poly blends up to a 50/50 ratio, it is possible that some blends may not work in a straight cotton shirt workflow.

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DI-NA0010-EN-AG (06/18)