



How Digital Textile Printing Works.

To better understand how digital printing works on fabric, and to help you define your needs and possible solution requirements, we have defined the 5 basic parts to the process.

1. Fabric

Fabric comes in many different properties such as natural fibers, 100% synthetic, blends of synthetic and natural fibers and in either 2 or 4 way stretch or non-stretch. Each fabric can be digitally printed and you have choices of ink that allow you to print on these fabrics. Many of our customers print natural fiber, non-coated fabrics with our P50i Pigment ink for soft furnishing and fashion applications because of how easy it is to fix after printing. However, some customers use our p40i dye sublimation inks for their synthetic fabrics because of the desired color gamut and how the finished product will be used. (Example: flags and banners, sportswear or soft signage) Knowing your fabric helps define the printing solution.

2. Ink

The biggest question to address when it comes to digital textile printing is what ink to use, and the answer is determined by the desired fabric and use of the fabric.

See the chart below for a general description of what ink is used on different types of fabrics and the necessary finishing steps for each ink.

- **Pigment ink – Natural and Synthetic fibers:** Currently the ink we manufacture the most for soft furnishings, interior decoration and fashion clothing is p50i pigment ink. This ink is a true pigment ink in that there is a pigment colored particle suspended within a binder system in the ink. The binder enables the ink to adhere to the fiber after fixation (roll fixation Calendar). There are 8 colors in the ink set including; Cyan, Magenta, Yellow, Black, (true) Gray, Orange, Violet and Red. This ink set provides for a good color gamut, though the color gamut is not as wide as is possible with dye-based inks. This ink can also print onto the widest range of fabrics including cotton, silk, rayon, cotton/poly blends, and 100% polyester in a variety of weights. No pre-treatment is necessary however optional pretreats are available that increase the color gamut and also the wash fastness but a specific pretreat machine is required. This is becoming extremely popular as Pigment inks are a greener solution that require no water and specialized fixation, steaming or washing etc in process. And when a printer and pretreat machine are added the results are quite spectacular and favored by architects and designers.

- **Acid & Reactive ink – Natural Fibers:** There are 2 different types of common dye based inks available to digital printers. The dye-based inks require the use of a fabric with a specific pre-treatment. Acid and Reactive inks require moist heat as in steaming for fixation. The advantage of the dye-based inks is the color gamut is wider. A general rule of thumb is that the same type of ink should be used digitally in an application that is printed by screen printing. A softer hand or feel is common along with a better wash fastness because of the nature of the Dye inks. Dye inks penetrate fabrics extremely well but require a lot of processing steps to make it ready for use. Typically pretreating, heat, washing and steaming are employed to fixate fabrics. The equipment required in process is typically industrial and specialized. We recommend Acid and Reactive inks for larger scale operations where the meters printed per hour warrant the capital investment.
- **Sublimation/Disperse Dye ink – Polyester, Lycra and Spandex:** applications for Sublimation ink is banners or flags, soft signage and sportswear. The fabric is typically high content Polyester, Lycra and Spandex. Sublimation is the most popular with class 1 and 2 printers. Once printed you transfer off a sublimation ink receptive paper roll or direct print to the fabric. Heat fixation >200°C is needed for the gaseous dye transfer to polyester fibers. The colors are brighter and leave no hand or feel are wash and UV stable. For higher speed printers it's essential to have a degassed ink delivery system and the print heads that is used will need to have a calibrated ink to perform well, or offer long term repeatability. The heat fixation process is either with a Heat Press or Roll fixation Calendar. A broad range of colors (15) including Neon are readily available.

	Cotton	Silk	Polyester	Nylon	Wool
REACTIVE DYE Pretreated Fabric Steam, Wash, Dry	X	X			X
SUBLIMATION DYE Pretreated Fabric Dry Heat			X		
PIGMENT Non-treated Fabric Dry Heat	X	X	X	X	X

3. Printers

There are several types of printers in the market, but all of them can be placed into 1 of 3 classes based primarily on types of ink or fabric feeding methods.

- **Class 1** type printers generally run sublimation/disperse dyes in combination with transfer papers – Sizes of printers and speeds are relative to your market needs. Curing is either by heat press or heat fixation Calendars. (Sportswear manufacture, soft signage and hard surface products)
- **Class 2** printers are for direct to fabric printing and generally are the same printer but with a gutter for printing strike through. This is especially useful in banner printing, like class 1 they still use sublimation/disperse dye inks but can print direct to non-stretch treated polyester fabrics. Curing is mostly done with a roll fixation Calendar. (Sportswear and Soft Signage note: Calendars will transfer and fixate cut pieces for apparel manufacture)
- **Class 3** printers are designed to print fabrics with stretch. Typically Synthetics and natural fibers that have 2 way or 4 way stretch properties. The main difference is that the feeding system has been developed to make sure there is minimal shift in the fabric as it is fed through the printer. There is primarily two types of stretch fabric feeders. One utilizing a large blanket or conveyor that needs a glue to be applied so that fabric is held firm while being printed. The other type is via a roll fed device with a pressure roller. Both work well but it really is dependent on the speed of the prints and type of printer that is incorporated. For example the lower

cost industrial Japanese printers like Roland, Mimaki and Mutoh typically run at production speeds of @ 20-50 sqm/h depending on the model- A roller fed device will be all that is needed because of the relative slow speeds of print and fabric feed. A bespoke printer with larger heads like Ricoh, Konica Minolta etc will run a lot faster because of the number of print heads they use – These printers can reach speed up to 200-400sqm/h and all typically employ a sticky belt/blanket.

4. Software

The software that comes with the printer converts the data generated in the design created on a computer into information the printer can understand. It will optimize the colors of the design to get as close a match to what you want as possible. It also tells the printer where to place the ink drops and in what size. Some software programs will also let you manipulate an image with steps, repeats and drops so that you don't have to do that in the design software such as Photoshop.

5. Fixing the Fabric

The ink and the fabric you choose will determine how your fabric needs to be fixed (finished):

- Pigment Ink – Dry Heat – Typically through a roll fixation Calendar or Heat Press
- Acid Dye – Steam – Wash – Dry – Typically large Industrial specialized equipment
- Reactive Dye – Steam – Wash – Dry – Typically large Industrial specialized equipment
- Dispersed Dye/ Sublimation – Dry Heat – Typically through a roll fixation Calendar or Heat Press

At Pigmentinc we have been processing fabrics digitally for well over decade and our combined expertise in ink manufacture and fixation has led us to be the first choice for a number of well-known brands and companies. We specialize in-plant setups and can deliver textile decorating solutions through all stages of the process. From simple t-shirts to all over building banners. We also offer a training facilities in Australia, Singapore, Europe and the U.S to help operators, and educational facilities understand the correct process and techniques.

Applications and Benefits

Applications

Print For Pay

Many entrepreneurs and/or designers do not have the ability to print in house, so there is an abundant need for textile print services in all of the ink categories. We currently supply our solution to companies who provide these services. Customers will print everything from very small orders (18" x 18") to very large orders (yardage) for the end user to make their finished products. Other customers using our solution also provide the sewing. The DIY revolution going on worldwide has created many small niche markets that need a provider for their printed fabric. Etsy.com is a great example of the crafter digital market. No doubt you have also seen the growing popularity in the sign industry with banners and graphic displays now in textiles.

Designers

Our solutions have saved designers time, effort, and expense. Prior to using digital printing technology, designers have been limited in three major areas:

- Limitation on Colors due to screen set up costs per color
- Design Security
- Large amount of time from design completion to seeing design on fabric

Pigmentinc has provided a solution for designers for all of the above issues. Digital production has captured the imagination of designers because they now have the ability to combine CAD, graphic design, photographic images and limitless colors. Digital printing in-house keeps your designs secure. Designers can immediately see what their design will look like on fabric and have the ability to make changes instantly.

Manufacturing

Due to the proportion of the textile and apparel industry that relies on manual labor for its high volume commodity products- the Western European manufacturing facilities have outsourced commodity volumes to China for example but a recent trend for European textile and apparel industry is to stay vibrant and economically healthy by focusing on technological based process's that garner a higher perceived value. By moving into a higher quality form of print you now have the ability to print low volumes economically that are commercially viable, A desire from the buyers globally is for more bespoke or one off type digital prints that retain a higher value at retail. Digital printing is cost effective and competitive to screen print in these high value markets.

In addition, digital textile printing increases your ability to incorporate more colors in designs. High import fees, pirating of designs, and the economic need to POD have all contributed to the inclusion of digital textile printing in business models. Our high production customers have cut their costs by eliminating import fees and reduced their inventory loss by printing on demand, letting the cash register drive their sales.

Educational

The evolution of digitally printed textiles is now being recognized and implemented in the educational sector. Many Colleges have Departments for Textile and Apparel. Class 1 and 3 printers can teach both pigment and dye printing in order to prepare their students for their future. To best prepare students for the diverse textile industry through exposure to digital printing, Pigmentinc deliver complete educational equipment packages and training. Currently, we are working with a number of universities to help them obtain the funding necessary to add this technology to their programs.

In House Sampling

A major cost to any size business is sample production cost and the cost of time lost in waiting on sample production. In house digital textile printing is changing how businesses are approaching their sample production by speeding up turn-around times and deeply cutting the cost of sample production. Each of our class of printers has the ability to produce samples because digital textile printing enables you to print exactly the size and quantity needed. Even though the larger machines can print in production mode, you can still print as little as needed. Digital printing eliminates waste of material, time, and money.

Benefits

Sustainability

- Low energy consumption (electricity, water)
- Minimum environmental impact

Less Investment, Higher Savings

- Sampling costs dramatically reduced
- No more engraving departments
- No more cost and stock of screens
- No more colour kitchens
- No set up costs

Manpower Flexibility

- Easy training
- Reduced labour costs
- Quicker response to customer needs

Training and Service

We consider training and service to be of equal importance as the hardware, software, and ink products we offer in meeting the needs of our customers. When you purchase a printing solution from us we will be there to help you get the printing solution into production as quickly as possible, and keep it running. We offer warranty and extended service packages and are always available to help. If you need in depth help on a specific matter such as color management with or workflow issues, we have resources available.

Our team includes technicians familiar with Mutoh, Mimaki, and Roland platforms. We also have the ability to adapt these platforms with fabric handling systems to print direct-to-fabric.

Print trials must be undertaken prior to production – no warranties, express or implied, are given in connection with the accuracy or completeness of any of the information contained herein. Dtg Digital, Forward Thinking and PigmentInc are registered trade marks and or copyright of Impression Technology Pty Ltd, Australia. All copyright reserved.