



Heat Transfer Machinery 101

■ Dye sublimation transfer printing has become increasingly more popular and affordable. The price of printers and the cost of inks are half of what they used to be. The market has matured, and the technology has become far more prevalent and available. This is due, in part, to a wide color gamut, vivid color, clarity of image, durability, return on investment, short run capabilities, personalization and quick turnaround times. The trending growth can be attributed to the influx of digital-based print companies and the ability to print on a variety of products. Dye sublimation has proven that it will be the decoration of choice, replacing traditional textile printing methods, and will stay around for many years to come.

Dye sublimation application to the media can be either a one- or two-step process. A heat press is needed for both. The two-step process utilizes a more traditional method, where printed transfer paper transfers the ink or the "dye stuffs" to the polyester, polyester blend, or polyester-coated substrate. As the printed paper connects with the substrate in a heat press, the heat, pressure and time work together to sublimate, or gas the

inks. The alternative process removes the transfer paper from the equation, allowing the inks to be directly dispersed. A heat press is still needed to fixate the inks into the substrate. This will improve the color fastness of the fabric and eliminate crocking. Both processes have several advantages and disadvantages.

Many heat press manufacturers and model options are available in the domestic or foreign markets. It can be quite overwhelming to anyone considering this purchase. Some important questions to ask yourself are: Will I be using this machine daily? What will I be transferring onto with this machine? What happens if the machine breaks down? Where can I order parts or get service?

Money being an important consideration, a good rule of thumb is to buy the best heat press from a reliable manufacturer you can afford. Refrain from buying the cheapest machine, because chances are it will not stand the test of time, requiring the need to reinvest in another. Look for one that can be supported and has a warranty. Domestic manufacturers of the more expensive production machines typically offer faster

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response times for service, and carry consumable parts such as belts, heaters and electrical components. Consult fellow industry leaders; learn their thoughts and experiences with heat press manufacturers to assist in your decision making process.

Flatbed

There are two types of heat transfer machines to consider: Flatbed or rotary. Flatbed machines are just like they sound, a definitively sized platen will make up your printing area. Plate offerings range from three- by five-feet up to 120 feet square with several sizes in between; what size you choose should be dependent on the largest size you will be transferring onto. Flatbeds can offer a swing away, clam shell, tray or shuttle style — this is usually dependent on your production volume. The latter is usually reserved for higher production or preference; they all will have a similar end result:

- A swing away press has a heater that swings away from the lower platen to allow for loading/unloading away from the heat. When the top heater platen comes back into place, it rises up to meet the heater. This style allows for the pressing of thicker substrates, and provides ample workspace.
- Clam shell presses are just like they sound. The top opens at an angle (up to 90 degrees), exposing the bottom platen. Once the start button is pressed, the clam comes down, and the bottom platen rises up to meet the heater. Ease of operation, quick loading/unloading, and a small footprint make this one of the most affordable and popular options.
- Tray or drawer presses have the advantage of loading or unloading away from the heat source. The reciprocating tray system pulls away from the heater while the other tray is being transferred. These are designed for higher production, and offer a smaller footprint and price tag than the shuttle press. The drawer system works in the same way, but with only one loading platen. The drawer platen will pull away from the heat source to allow for loading and setup. Once the platen is pushed back, it will rise up to meet the heater.
- Shuttle style presses are for higher production. There are three platens on a shuttle press. The one upper heater platen is common to the two lower platens. While one platen is in

the pressing cycle, you can be setting up the next job. When the timer is satisfied, you simply shuttle the upper platen to the other side and the process begins again. The shuttle machine has higher-pressure capabilities, allowing for up to 100 tons of pressure. These types of machines are common with flag manufacturers and the crumb rubber floor mat companies that demand high performance compression presses.

Flatbeds are suitable for textiles as well as harder and heavier substrates like plastics, wood, ceramic and aluminum. Some textile applications include T-shirt logos, full coverage garments, cut pieces, mouse pads, flags, banners, floor mats, hosiery and more. Keep in mind the heavier substrates and textiles are better suited for the swing away, clam shell, drawer or shuttle presses. This is where you load the part to be printed on a solid lower platen, not a tray or trampoline.

The flatbed machines have a heater on top, requiring the operator to lay the media down first and then the printed paper. Another possibility is to have both a top and bottom heater that will transfer both sides at the same time.

Pressure

It is important to consider automatic versus manual pressure. Manual pressure is the physical clamping of a lever or handle. Running one for eight hours is difficult and tiring for the operator. These are common for light duty production environments. Automatic pressure utilizes compressed air with an air cylinder or air bag that adequately controls and applies the pressure, dispersed throughout the platen evenly. The force behind the cylinder or airbag can be quite substantial, providing enough force to get all the ink in every fiber or to transfer onto the harder substrates. Automatic pressure units provide less operator fatigue, promoting a smoother, simpler operation. On a side note, the automatic pressure units need a compressor.

Temperature

Heat is another important feature to keep in mind, and probably the most important. The machines need to have consistent, even heat throughout the area or inconsistent color could result. Once into the larger-format sizes on a flatbed, the heaters should have at least two heated zones. One zone alone will not do an adequate job in keeping the temperature even.

Rotary

Rotary or calendar transfer machines apply dye sublimation prints to fabric, and can fixate or cure pre-printed fabrics. These machines are well suited for roll-to-roll applications and also for the transferring of cut parts available in widths that range from 10 to 220 inches. With an optional table feature, the rotary is capable of three setups: Roll-to-roll for both fabric and paper; a roll of printed paper with cut pieces of substrate; or cut paper and cut substrate. In short, the fabric can be cut before or after it has been transferred. The trend is moving toward cutting after transfer with the advent of new cutters that will optically recognize the garment parts. Rotary machines are suited for banners, flags, table drapes, soft signage, exhibits, athletic wear, mouse pads, ribbons/lanyards, casino tables and much more.

The rotary machine needs to have a transferable area that is wider than the width of the paper being printed. Just as the rotary machines come in several widths so do the printers. If you anticipate transferring a larger size, buy the widest heat rotary machine you can afford. In today's market, printers are quickly becoming a consumable, and are relatively inexpensive, disposable and quickly replaced with a newer, faster technology. Contrarily, the heat transfer machine utilizes the same working technology with a life span of 30 years. Another important consideration in regard to buying the correct machine for your printer is speed. Rotary machines offer various sizes of drum heaters. The bigger the diameter of the drum, the faster the machine will run. A drum with a 12-inch diameter can transfer 3.9 feet per minute with a 35-second dwell time. That speed can keep up with three-and-a-half printers.

The standard rotary machine is fitted with three unwinds and three rewinds. The unwinds and rewinds are capable of holding rolls of fabric and paper with a maximum diameter of 10 inches, and a maximum width no wider than the belt. The machine has one set of winds for the tissue paper; this keeps the dye stuffs from contaminating your belt. One set of winds is for the printed paper, utilizing a pneumatic air bar that holds the paper square to the drum when introducing tension. This is especially crucial when dealing with thin-wall cardboard tubes. Lastly, the fabric unwind is fitted on a stationary bar with end caps that prevent lateral movement; a two-bar tensioning device can be rotated to increase the level of tension when required. All of the



An example of wrinkling fabric as a result of shrinkage or tension-related issues.

remaining unwinds and rewind bars are fitted with a clutch that can regulate the tension pneumatically.

Temperature

For rotary machines, the heating system is either heated air (radiant) or heated oil. There are advantages and disadvantages to both methods. The oil-heated systems are a bit more expensive, but provide a far more consistent heat compared to the other technology. The oil in the uniquely designed, closed system drum is more dense than the circulating air in the radiant machines; therefore, it is more resistant to change and fluctuation of temperature. Oil offers minimum temperature differentials throughout the entire drum, and a straightforward temperature control system that is more energy efficient with one very manageable single heat zone versus the complex multi-heat zone manipulations that come with air heater systems. Air-heated machines do, however, offer quicker heat up and cool down times in comparison to oil-heated systems. Nonetheless the oil-heated systems have demonstrated themselves as the option of choice, producing better end results steadily.

The learning curve for the art of transferring is imperceptibly low. It is a matter of learning and experience based on three controllable variables: Heat, pressure and time. Luckily, each ink manufacturer has their own recommended dwell time. From that starting point, one can adjust the temperature and/or the time based on the substrate until the results are optimal.

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Some other concerns need to be recognized because of their direct correlation to the output. These are moisture in your paper and fabric, temperature of fabric, and the fabric's shrinkage potential. Fabric shrinkage should not exceed more than one-half percent, as wrinkling or ghosting will occur. One can pre-shrink their fabric by running it through the machine alone. Another consideration is the loading of media and printed paper. The fabric and paper that will be unwinding into the machine needs to be from rolls that are straight and even with no possibility of telescoping (tracking from side to side). Both need to be pulled taut to reduce the risk of wrinkling, and the tension maintained as it unwinds into the machine.

Different fabrics require different tensions, as is paper dependent on quality and moisture. Tacky paper or high-temperature tape may need to be utilized to place the printed paper. Tacky paper is better to be used on the flatbed machines; they stay put on the substrate during the heater's movement. Such movement can be caused by static, and may result

in ghosting or double printing. Non-tacky paper is a better option for rotary machines because it is considered more heat stable, and will not cause wrinkling or ghosting. Once all of these parameters are established, the course of progress is well underway to provide for an efficient, streamlined operation.

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