Shrink-Sleeve Printing

Important Tips for Flexographers Entering the Market

By Ron Ryback

Since shrink sleeves were created more than 30 years ago (utilizing the rotogravure printing process), flexo printing has constantly been compared to the quality of gravure printing. During the past 30 years, advancements in flexographic press technology, photopolymer plates, ink systems and operator skills have provided us a means to rival gravure quality in today's shrink-sleeve market. Our operators take great pride in the quality of products they produce; it is therefore imperative that we, as converters, spend the time needed to teach them how to manufacture high-quality shrink sleeves on press.

Whether you are a narrow-web or wide-web flexo printer, your transition into printing on shrinkable substrates for shrink sleeves will require unique press operator skills. This article is intended to define these skills and review raw material, ink types and specific press conditions.

Shrink-Sleeve Substrates

The three basic substrates used to manufacture shrink sleeves are PVC (polyvinyl chloride), PETG (polyethylene terephtalate glycol) and OPS (oriented polystyrene). PVC is the predominant material used worldwide. Because PVC is used for more than 70 percent of all shrink sleeves in today's market, let's begin by reviewing its physical properties.

The natural dyne level of PVC is sufficient for solvent-based ink systems. This means that you can print either side of the web. If you choose to use a water-based or UV ink system, it may be necessary to increase the dyne level by corona-treating the PVC to allow improved ink wetting and adhesion. Keep in mind that the dyne level should not exceed 44 dyne. Anything higher may create wetting problems when solvent is applied during the seaming process.

On PETG and OPS shrinkable substrates, some suppliers apply an anti-stat coating on one side of the web to help reduce static electricity. In these situations, the supplier defines what side of the web to print by labeling that specific side.

Tension Adjustment

The majority of shrink sleeves are backside-printed. If you currently print a variety of products, it may be necessary to change the color sequence from surface to reverse printing. If this is the case, you should plan the makeready in advance to be certain that clean anilox rolls, ink fountains, plate cylinders and ink are at the press 30 minutes prior to completion of the existing order. Remember that the shrink-sleeve market is competitive. Everything you can do to reduce cost, time and waste will keep your company more competitive in this new market.

Tension management is a critical function when printing on any shrinkable substrate. To prevent snapback—which is created by excessive unwind tension—the unwind tension must always be kept to a minimum. Because each press is unique and web widths vary, no specific tension number can be recommended. To keep unwind tension to a minimum, the web should be floated into the infeed nip roll. When measuring a press sample, if your snapback exceeds 1mm per label you should immediately check unwind tension and adjust accordingly.

The finished roll tension on rewind is typically lower than you would run on any other print product. To determine tension, use this rule of "thumb": exert pressure with your thumb into the printed area of the finished roll. You will be able to feel the roll compress slightly under this pressure.

Photo:The Garron Group

Determining the correct amount of rewind tension is one of the most difficult things for a press operator to learn because most are trained to wind a smooth roll that is typically hard to the touch. Rolls wound too hard could create ink buildup in high-coverage areas, belled edges, ink blocking or heat-activated adhesive in the finished roll. In any case, these factors will increase waste and reduce the overall efficiency of your pressroom.

Temperature Settings
If your press is equipped with chill rollers, they should be set between 85 and 95 degrees F. Utilizing the chill rolls provides an excellent method to keep the web cool and prevent shrinkage. When printing with solvent and water-based ink systems, BCD (between-color dryer) temperature settings are dependent on substrate and line speed.

There is some confusion among printers as to the correct temperature settings, so they inadvertently run lower temperatures, thinking that heat-shrinkable substrates can be damaged by high temperatures. To a degree, they are correct, but most heat-shrinkable materials can be printed with temperatures higher than you think.

On BCD temperatures with line speeds from 250 fpm to 350 fpm, a good initial setting is 150 to 200 degrees F. When print-line speeds exceed 350 fpm, this temperature may be increased to 240 to 250 degrees F. Line speeds for machines operating without chill roll systems are typically lower; BCD temperature must therefore be kept lower to prevent web shrinkage. If you see variation in web width or web shrinking when the press is stopped, your BCD is too high, which will necessitate lowering your BCD temperature until this phenomenon stops.

Auto-Register
Because the majority of shrink sleeves manufactured today are high-quality process-printed images, it is imperative to utilize every tool your press is equipped with. If your press is fitted with an auto-register system, it should always be used.

If you are not comfortable using auto-register, request additional training. This is a fundamental skill every press operator must understand, so don't be afraid to ask for help. If the auto-register is not operating properly, request someone in your organization to contact the manufacturer to make the necessary equipment repair.

Static Control
Static electricity is inherent in all shrinkable substrates and becomes apparent during unwinding, rewinding or whenever the material passes over idler rollers. The static electricity creates a variety of quality problems by attracting dust and dirt particulates from in and around the press. These particulates collect on the film and are transferred onto printing plates and impression rollers, reducing print quality and creating excessive waste due to the increased number of press stops.

Presses equipped with static elimination devices should always have the units turned on whenever shrinkable substrates are printing. Another proven method to help dissipate static electricity on a press is to have at least one earth ground on the press. Some converters believe that the electrical conduit and wiring on the machine provide sufficient

grounding and, to an extent, they do; however, the addition of an earth ground provides a positive method for reducing static electricity.

Web-Threading Path
Reverse (backside) printing on shrinkable substrates may require an alternative web-threading path for your video camera. Because white is the last ink color printed on the label, it becomes very difficult to view the web through the white ink when monitoring register and impression of other colors.

If your press does not have an alternative threading path to view the design from the front, it will be necessary to either relocate the video camera or install additional idler rollers to create a new threading path.

Actual press conditions will vary depending on press type, substrate and ink system. One thing that I learned many years ago during my apprenticeship—and that I still recommend today when training new operators—is to be certain you record all press conditions. This information provides an excellent benchmark to use as a reference.

Slitting On-Press
Some converters may choose to slit on press rather than add another step to the manufacturing process. If your company slits on press, the suggested slitting methods are either razor or shear slitting. Never attempt to crush-slit on press. This method creates a ragged edge that is prone to web breaks on the seaming machine.

Even though razor or shear slitting is preferred, caution should be taken because most shrinkable substrates have a tendency to dull blades very quickly. Once a blade becomes dull, it tends to build up heat due to friction. The heat is then transferred to the web edge, creating a belled edge on the finished roll. Once the material is wound around the belled edge, it becomes baggy and almost impossible to apply solvent on during seaming operation.

Two additional factors can also create belled edges on finished rolls. The first is excessive rewind tension while the roll is being wound. To monitor the rewind tension, remember the rule of "thumb."

Secondly, some presses have a lay-on roll at rewind that is used on a variety of different substrates to improve the quality of roll wind and hardness. If your press has a lay-on roll at rewind, only a minimum amount of lay-on pressure should be used. A good way to ensure minimum pressure is to make certain that the lay-on roll barely touches the core at the beginning of the roll. This minimal amount of contact pressure should then be maintained throughout the remainder of the roll.

Ink Systems
Shrinkable substrates require an ink system that is different from what you are currently using on present product lines. This ink system can be water-, UV- or solvent-based. Regardless of the system type, it must exhibit the same physical characteristics. Shrink sleeves are designed to shrink as much as 75 percent in the transverse direction so that they shrink tightly around the various shapes of containers in today's market. The ink systems must therefore have the ability to shrink at the same rate as the raw materials.

As a converter and printer, I cannot stress enough the importance of identifying an ink that will exhibit this shrinkable trait; provide sufficient scratch and scuff resistance; and possess the physical requirements of being a good printing ink.

Another important requirement of this ink system is for the white ink to have sufficient opacity to hide the color of the container or its contents. At times, it may be necessary to print a double bump of white to achieve the opacity required by your customer.

Because the correct anilox roll selection is an important factor in achieving this goal, here are some anilox-roll-volume recommendations. On a one-bump white, an anilox roll volume of 8 to 10 BCM should be used; on a two-bump white, the volume should be 6 to 7 BCM. Keep in mind, with these recommendations, that it is important for the inks to be completely dry before winding into the finished roll.

Although shrink sleeve may be a new product line with unique characteristics, it is no different from any other new product your company has begun printing in the past. Initially, there is some apprehension due to inexperience with the various substrates, inks and press conditions. In a short amount of time, however, you will gain the confidence to overcome these unknowns and become a true craftsman in our trade.

ABOUT THE AUTHOR: As president of R&R Consulting, Monroe, NC, Ron Ryback assists new converters interested in entering the shrink-label market. He also helps customers with vendor selection for equipment and raw materials, operator training and printing/converting troubleshooting. In addition, Ryback is president and co-founder (with Gary Gates) of The Garron Group Inc., which assists clients with sales, marketing, manufacturing and technical expertise in the flexible packaging industry.