

# WHITEPAPER

## Shrink banders and sleeves

By John R Henry

Shrink sleeves have many uses in packaging. They can be used to label and identify, to group multipacks like a shampoo/conditioner offer, protect fragile glass containers, and make a blah glass container look like fancy ceramic. They can also be used to provide a security or tamper evident seal and this is their most common use.

Most shrink sleeves are made from PVC film but other materials are sometimes used. They are commonly made by folding flat film into a seal and welding a longitudinal seam. Forming from flat film allows access to the full film for printing. Some sleeve material is extruded as a tube but this is usually not printed. As virtually all film is printed, even if just a "Sealed for your protection" message extruded sleeve material will be ignored in this paper. In any event, application is the same for both types of film.

Film is normally supplied on continuous reels or rolls for machine application. In some applications precut sleeves are used. These are applied manually and are outside of the scope of this paper.

Two types of printing are commonly used with sleeves: continuous and registered. While the films are the same, registered film requires an application machine capable of registration.



Continuous and registered film both print a repeating pattern as shown in this example.

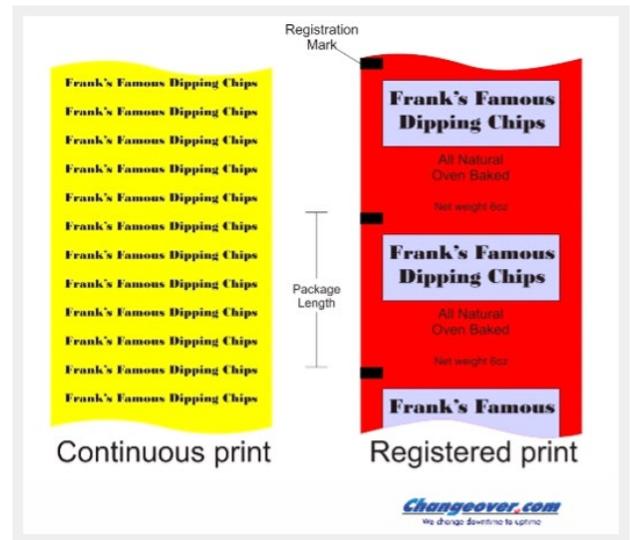
In this example, both sleeves will be cut to approximately the same length when applied to the package. The difference is in how they are dispensed in the machine. The continuous print film is dispensed to a specific length, about 2 inches in the example. No machine will always dispense exactly

2". Length can normally vary by as much as a 1/6th of an inch. The continuous printing assures that there will always be at least 4-5 imprints on every piece. Exactly where the cut occurs will vary. This is fine for tamper evedency where the purpose of the print is to prevent a malefactor from tampering with the product then replacing a plain band with another.

The red, registered print, label serves a different purpose. It serves as the primary product label. The "Frank's Famous..." panel must always be centered on the container. If cut to 2", variability would move the panel all over the package. If the length were cut 1/32" too short, the panel position would move up an inch every 32 packages.

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The solution is registered printing. This film has a registration mark, sometimes called an "eyemark" between each pattern. This sleeve incorporates a black bar. Some marketing people will find this ugly and may camouflage the registration mark into the sleeve graphics. Occasionally an invisible mark will be used. This is similar to the black registration mark but printed in UV ink. A special sensor that can detect this mark will be required



on the application machine. Hidden or invisible registration marks are fine for aesthetic purposes, the designer needs to be sure that the mark can always be reliably read on the plant floor. Failure to do so will result in production delays. While these delays may seem minor, 10 minutes here, 5 minutes there, they quickly add up. Always remember the 10W-40 rule: 10 minutes of daily downtime add up to more than a week of lost production (single shift) and who can afford that?

Designers must always discuss packages with the manufacturing plant before locking the design in place, not after. Simple changes upfront can save major losses later.

When the sleeve is for tamper evidency, a lengthwise perforation, sometimes multiple perforations, are desirable. Without the perforation it is sometimes possible to remove and replace the sleeve in the marketplace defeating the purpose. Unperforated film can also be difficult for the consumer to remove. Perforations allow the film to break easily facilitating opening and preventing removal without breaking.

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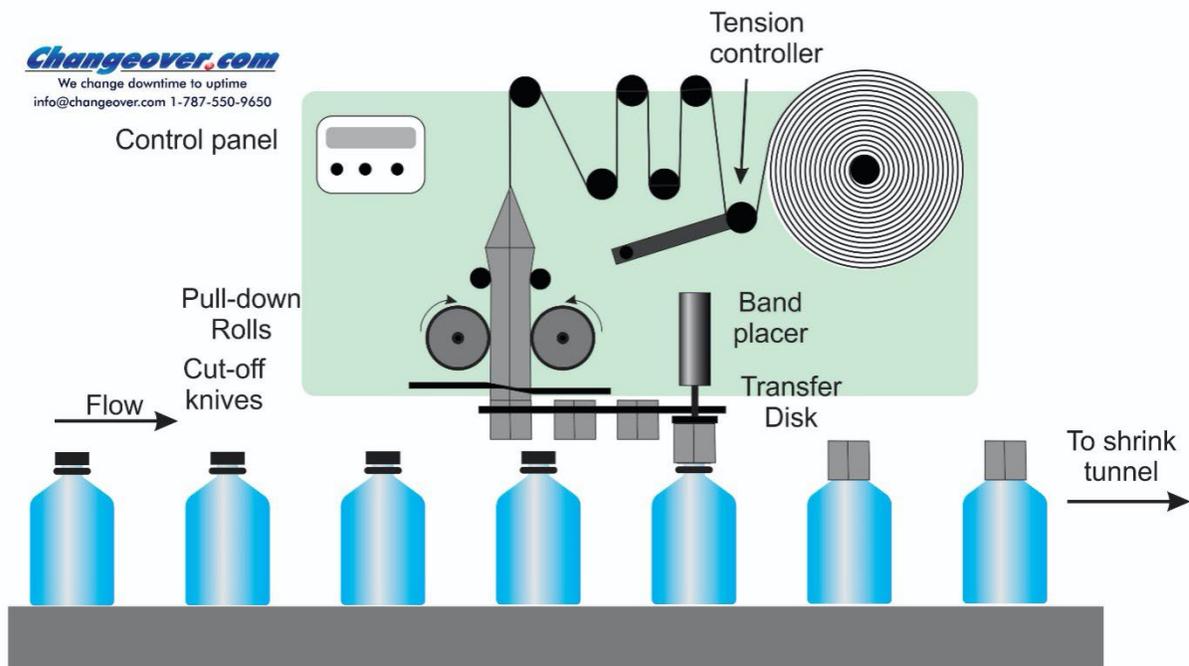


Some applications combine tamper evidency and labeling in the same sleeve. The sleeve is designed to cover the entire bottle and cap. The major portion of the sleeve is designed to remain on the bottle and is not perforated. The portion of the sleeve over the cap is perforated lengthwise as described above. It is also perforated laterally just below the cap. This allows the tamper evidency portion to be easily separated from the main body when the consumer removes the cap.

Longitudinal perforations can be done by the converter. This simplifies the sleeve application

machine eliminating a mechanical step. Lateral perforations can also be done by the converter provided the film has registration marks. Both perforations can be done on the application machine. Lateral perforation is generally best done on the machine as it creates a weak spot in the film which could cause breakages and downtime during production (10W-40 etc)

A typical sleeving machine schematic is shown here



As with all roll-fed machines, be they labelers, wrappers, baggers or sleeves, consistent film tension is critical. The film comes off of its roll, through a tension controller and several dancer rolls to assure that it is straight, flat and tensioned. Some higher speed machines may incorporate a servo motor or other electronic tension controller in the unwinder.

Once off the reel, the film needs to be opened to form a sleeve. Some older designs still use a ball or a tetrahedron block to do this. The ball is inserted into the film which is then pulled through a pair of rollers to hold the ball back and help form the sleeve.

Many more modern machines have a fixed mandrel sized to the inside diameter of the sleeve. This opens and forms the sleeve. It also provides a backing surface. A pair of wheels, sometimes belts, on the outside of the film pull it down over the mandrel. The film is pulled down to the required length or until the registration mark is detected.

The film is cut and the cut piece held open. In this example, it transfers to a placing station where the placer pushed it down over the cap. The bottle and sleeve are then carried to a heat tunnel where the film is shrunk conformally to cap and bottle.

When the sleeve is to be placed over the entire bottle, the process is the same. It may be difficult to place the sleeve all the way down on the bottle. A secondary device such as a top rail mounted on an angle can help. More sophisticated devices such as a pair of rotating brushes can also help pull the sleeve all the way down.

Once applied, the sleeve or band needs to be heated to shrink it to the package. This is done in a heat tunnel. Heat tunnels are primarily either electric or steam. An electrical tunnel incorporates electrical heating elements along both sides. Shrinking is driven by both the radiant heat from the elements and hot air circulated by fans in the tunnel. An issues with electrical tunnels is that they concentrate the



heat on the sides of the bottle with less heat on the front and back of the bottle. This can lead to uneven shrinkage. It is probably not an issue with a simple tamper evidency cap band. It can be an issue when the sleeve is the label with a lot of graphics. The uneven shrinkage can lead to distorted graphics marring the aesthetic impact of the sleeve.

Steam tunnels can be a solution. Steam tunnels fill the entire tunnel with steam. This provides an even temperature throughout and provides more uniform shrinkage.

Shrink film is designed to shrink laterally, not longitudinally. However, there is usually some longitudinal shrinkage as well. This can be exacerbated by the shape of the bottle. If the bottle has a pinched waist, as the film shrinks in, it can pull the film away from the top and bottom of the bottle. One way to solve this issue is to add auxiliary heating elements. As the bottle enters the tunnel, these direct heat at the bottom and top of the sleeve. This shrinks them in over the bottom and top of the bottle preventing them from pulling up or down as the body of the sleeve shrinks.

There are a number of reasons why shrink labels are becoming ever more popular. Shelf appeal is one important one. Ease of application is another.



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