TEKRA
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Tek Tip

Die Cutting Marnot Polyester Film

The Problem

Marnot Polyester is a hardcoated (usually on one side) biaxially oriented polyester (PET) film. This orientation process stretches the film in the x and y directions. The result is a very strong, hard film that is stratified in the z direction, exhibiting a tendency to split in layers when torn or die cut. Because of this, PET will never die cut as easy as polycarbonate or rigid vinyl, which are not oriented in any direction. To minimize splitting, the PET film that is used as the substrate for Marnot is a grade that is softer and easier to die cut than most other grades of PET. However, when this "softer" grade of PET is stabilized to prevent thermal shrinkage, it will harden and become susceptible to splitting.

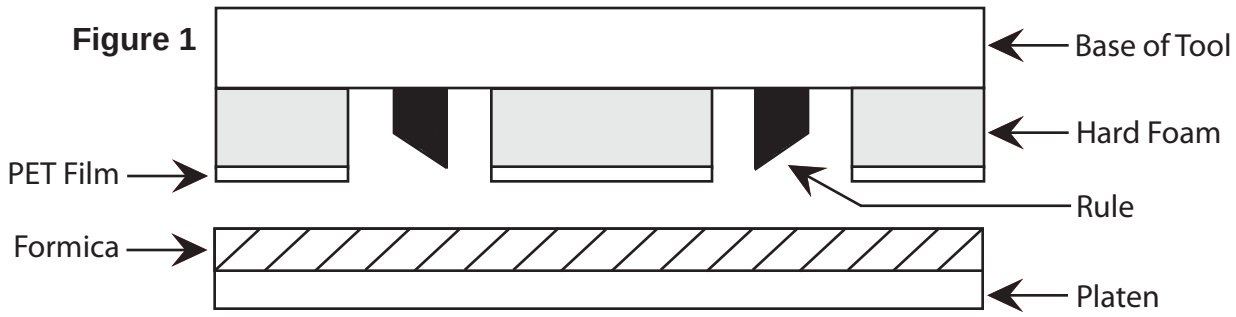
In order to successfully die cut Marnot PET with steel rule dies, care should be taken in the following areas:

The Die

The design of the die and the materials used could have an affect on how cleanly the film cuts and how long the die lasts. Some film and die makers suggest using a 2 pt., ground, side bevel (long bevel facing the waste) rule with a hardness of 450 VPN. Others feel that a ground center bevel will work on all but the thickest films and laminations.

To minimize edge splitting, the film needs to be prevented from following the die as it is retracted after the cut. A rule that has highly polished or coated edges helps to accomplish this by reducing friction during the cut. The film manufacturer also recommends a 2 part ejector system: a hard (Shore A 25) ejector foam (stripping rubber) with a 3 to 5 mil sheet of PET adhered to the stripping rubber with a pressure sensitive adhesive (see figure 1). The object is to keep the film firmly pinned to the cutting plate throughout the cutting process.

Figure 1



Die Cutting Marnot Polyester Film - continued

The Press

To prevent from overworking the press, the operator must make sure that the press has the capacity to cut the film with a particular die. This can be determined using the shear strength of PET (the Marnot coating has a minimal effect on shear strength) which is 21,500 psi for 5 mil and 19,500 psi for 10 mil and the following formula:

$$F = \frac{PA}{2000 \text{ lb/ton}}$$

F = Press tonnage
P = Shear strength of the film
A = Cross-sectional area of the cut edge = total length of the rule (including punches) times the thickness of the film

On complex dies, the compression of the stripping system may also need to be considered. The application of heat to the rule, cutting plate, and the film will ease the cutting process. If the press has a speed control, a dramatic reduction in splitting can be achieved by slowing the press especially at the point of contact between the die and the film.

Setup and Make Ready

In order to minimize die damage that will result in poor cuts and frequent re-ruling, it is important to prevent the cutting edge of the rule from contacting the steel cutting plate of the press. One method is to cover the steel plate that is under the die with a cutting pad of slightly softer material that can be replaced periodically when it becomes worn. Materials similar to a high pressure laminate (Formica) or 14 mil PET (Mylar A) have been suggested. A thin coating of a spray adhesive such as 3M™ Super 77™ Multipurpose Adhesive or 3M™ Scotch-Weld™ HoldFast 70 Cylinder Spray Adhesive may be needed to hold large sheets in place. The use of magnetic press stops that are equal to the height of the rule plus the thickness of the cutting pad will also help minimize die damage. These stops are placed on the upper platen of the press just outside of the die/cutting pad area. After the die, stops, and pad are installed, make-ready can proceed as usual.

There are usually several incremental changes in the die cutting process that together can result in a cleaner cut edge on PET films. Your die maker may also have suggestions on other changes that could be made based on your needs and capabilities.