

# TECH TALK

**Product: Foam-X® Recovery      Date:      March 9, 2005**

**Subject: Die Cutting                      Revision:**

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## **Die Cutting Foam-X® Recovery Material**

One of the most common applications for the Foam-X® Recovery product is die cutting. Die cutting with steel rule dies allows for the rapid production of flat shapes or cutouts. Typical applications would include letters and shapes, openings in a sheet used as part of an assembly, and 3D assemblies. This process can utilize one of the unique features of Foam-X® Recovery, edge memory. The key elements to consider when die cutting are the press, the steel rule, the ejection rubber and the substrate. Each of these elements must be selected properly to yield satisfactory results.

The polystyrene foam core of Foam-X® Recovery will not compress during die cutting. Foam-X® Recovery has the unique property that the die cut foam will retain its memory and not crush. The foam tends to assume its original thickness. This results in the die cut edges remaining open or near 90 degrees along the cut edge. This material is used when crisp or sharp edges are needed. This product should not be used for embossing.

### **PRESSES:**

Foam-X® Recovery is most commonly die cut on flat bed presses. The presses can be either moving platen type or "clam shell" type. Either type of press can be utilized without affecting the quality of the die cut. The key press consideration is proper "make ready". Make ready is the preparation of the press bed (anvil) to assure that the steel rule cuts evenly through the Foam-X® Recovery without dulling the steel rules. Typically Foam-X® Material is cut on a "hard anvil" to give a sharp edge. Make ready for this type of die cutting utilizes carbon paper. The press is lowered to the point where the steel rule just touches the anvil. The places



where the rule fails to touch the anvil are built up with 1 mil thick shim tape. This process is repeated until a complete imprint of the steel rule is apparent. Make ready is very important because the platen of the press does not necessarily close evenly. This can be caused by misalignment, uneven cutting loads or by deflection of the platen. As a rule of thumb, a 4 post press will deflect 1 mil per ft. Steel rules, that have been dulled by improper make ready will cut poorly, have increased cutting loads and can contribute to liner cracking problems.

### **Definition of Steel Rule Die Cutting**

Steel rule dies work basically the same way as a cookie cutter. They are made of 1"-wide strip steel with one pre-sharpened edge. The cut strips are called "knives." The strip steel is typically made in a thickness range of .014"–.166". To specify thickness, the term "point" is used. The strips are bent to the shape of the trim line and held in place by a block called a "die body." In order to facilitate ejection of the part, strips of a compressible material such as neoprene are glued along the perimeter and protrude above the cutting edge of the rule.

During die cutting, the steel rule die (SRD) assembly is fixed under the top platen, and the Foam-X<sup>®</sup> Recovery Material sheet is placed on a steel bottom platen. Pressure is applied to force the knives of the SRD through the Foam-X<sup>®</sup> Recovery Material sheet. The platens are then opened and the parts removed.

### **Steel Rules:**

The most common type of steel rule used to cut Foam-X<sup>®</sup> Recovery is a 3 point cutting rule.

### Cutting Rules:

Cutting rules may have three types of bevels: A center bevel, inside bevel, and outside bevel.

A *center bevel* is "V" shaped, i.e., honed from both sides. For Foam-X<sup>®</sup> Recovery, the center bevel should be a facet (double double) cut. This means that the "V" is formed by two obtuse angles coming to a point. A center bevel is used when both the inside and the outside of a cut have to be saved, e.g., as in a puzzle. In this case, the cut is wedge-shaped so that the cut face on the periphery is sloping away from the inside and the cut on the inside piece is sloping away from the outside. The longer the bevel and the narrower the thickness (point) of the rule, the straighter the cut.

An *inside bevel* has the straight unhoned side of the rule on the outside of the



cut and the beveled side on the inside of the cut. The rule of thumb is that the beveled side is always towards the scrap.

An *outside bevel* has the straight unhoned side on the inside of the cut and the beveled side on the outside. An outside bevel is used if the inside piece must be saved.

### **Stripping and Ejection Rubbers**

Stripping rubber is essential when cutting Foam-X<sup>®</sup> Recovery Material. It serves to prevent cracking in the die cut piece. Liner cracking problems need to be considered whenever coated products such as Foam-X<sup>®</sup> Recovery Materials are die cut.

Rubber used to merely remove the part from the die is called ejection rubber. Rubber is rated by its hardness. Typical Shore "00" durometer hardness ratings are: Soft 20 – 40, Medium 30 – 50, and Hard 40 – 60. The proper techniques for the use of ejection rubber with Foam-X<sup>®</sup> Recovery Material include:

1. The ejection rubber should be at least the height of the steel rule and preferably 1/16" - 1/8" higher than the rule.
2. The ejection rubber should not touch the steel rule. This prevents dragging on the blade or getting the rubber cut by the rule. This also prevents the liner from being pulled away from the rule by the distorting rubber.
3. A hard rubber is most commonly used to produce a square edge. It is best to completely rubber the rules to prevent cracking.
4. On critical areas, soft rubber can be used for additional build-up to prevent cracking. Critical areas are usually near tight bends or sharp points. For these areas, the stripping rubber can be built up as much as 1/4" above the rule height.
5. The rubber should be selected to allow it to fully compress between the steel rules without crushing the Foam-X<sup>®</sup> Recovery Material or bending the rules when the press is fully closed.