6 Wagner Die Supply's Monroe Ejection Materials

Title: "Almost Everything I Know About Die Ejection"

ProTECH Wagner Technical Resource

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***Article by: Roger Brown**, Sales Manager at Monroe Rubber and Plastic, Inc., shares his many years of experience in the diecutting industry specializing in die ejection using open and closed cell rubber ejection materials.*

Since my expertise in die ejection has been predominantly with sponge rubber, I will only deal with that material. This article doesn't focus on other systems of ejection, such as mechanical springs, pneumatics, etc… However, sponge rubber may not be the best alternative to ejection in certain specific applications, and you should be ready to explore other alternatives.

Sponge rubber is a natural material used for ejecting parts out of cutting dies. It is inexpensive, easy to use (cut, shape, place and glue) and can be obtained in a wide variety of shapes, hardness, and thickness. And, if used correctly, it is reasonably durable.

Now to it's use....

This may sound silly, but static rubber sitting on a dieboard has no ejection properties until it is compressed. Similar to bullets in a gun, the rubber must be loaded before it has a chance to do its job. The loading process in a cutting die is placing the substrate-to-be-cut in a die that has been properly "rubbered". You pull the trigger when you close the press. In other words, you compress the rubber by the amount of the substrate's thickness and thickness of any rubber that sticks up over the height of the cutting rule. Therefore, if the substrate is thick, the rubber is loaded to a greater degree than if the substrate is thin. Using the same rubber for both thick and thin substrates will provide different ejection forces. This brings us to the first rule:

The greater rubber is compressed, the greater it's ejection force.

Rubber of different firmness, (durometer) will also provide different ejection forces providing the substrate is the same thickness. Extra firm rubber will provide a greater ejection force than softer rubber under the same loading conditions (same percentage of compression). Therefore, the second rule is:

The firmer the rubber the greater the ejection force.

Rubber has a tendency to deflect, or bulge outward, when compressed. Open cell (cellular) rubber will deflect less than dense rubber and closed cell rubber because during the early stages of compression, the rubber will compresses into the voids (cells) in the structure.

However, once those cells are filled, deflection will be greater. As the press closes, the rubber will start to compress and then deflect to both sides until cutting is complete and the press starts to open. Should one or both sides of the rubber be placed so close to the cutting rule that it is touching the rule, friction will occur on the rule side of the rubber and the rubber will lean to the non-obstructed side taking the substrate above it along for the ride. If this occurs at a nicking area the substrate will be moved by the rubber away from the cutting rule and the nicks will break. More on nicking later. Therefore, the third rule is:

In most instances rubber should be placed about 2mm or 1/16" of an inch away from the cutting rule.

Of course, other mean and nasty things may happen when the rubber is place touching the cutting rule, such as bending the rule away from the vertical plane it was originally placed.

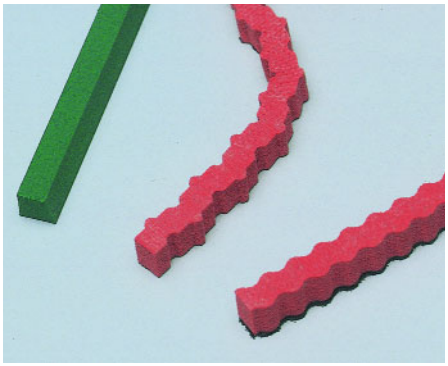
During use, the ejection rubber will tend to wear out and "take a set" - not return to its original height. Therefore it is customary to use ejection rubber that is somewhat thicker (higher) than the height of the exposed cutting rule (rule height less thickness of dieboard).

So we come to the fourth rule of rubbering:

Use rubber that is roughly 2mm or 1/16" higher than the exposed cutting rule.

How about some other rules for using ejection rubber. Open cell rubber is slower to rebound to its original height than closed cell rubber. Therefore, *closed cell rubber should be used when press speeds require faster cutting and ejection speeds*. A good example of this rule is rotary dies (corrugated) vs. flat dies. Rotary dies generally require the rubber to eject and recover much faster than traditional flat dies. However, with the trend toward faster platen presses, this rule needs to be applied to determine the correct rubber in each instance.

New ejection rubber products have been developed by Monroe Rubber & Plastic – Green G'rilla™ and Red Rhino, that are open cell but reacts much faster than traditional open cell rubber. It is called *microcellular*. These materials have the ability to rebound as fast as closed cell materials but still have some of the attributes of traditional open cell materials, such as compression within itself during the early stages of the cutting cycle. Microcellular material has a cell structure that is so small, making it much more durable than



Monroe's family of microcell materials: Green G'rilla (left) and Red Rhino (center and right). All materials are available in standard profile in pads, strips or blocks. Or in Monroe special profiles as shown above: from left to right E-Z Set, Ejectoflex and Side-Wave strips. Call your Wagner location for full details on all Monroe ejection materials.

the traditional open cell materials that most people are used to. Tight areas between two cutting knives tend to trap the substrate being cut requiring greater ejection force to eject this scrap. Therefore, one would expect to use more rubber in this instance. Since the reduced space will not allow for more rubber, we must rely on rule number 2 - *firmer the rubber the greater the ejection force. Therefore in tight, trapped areas use firmer rubber at the same height as the rubber in the balance of the die.*

Other attributes of open and closed cell ejection rubber:

Open Cell:

- Wears out faster when compressed greater than 30% of its height.

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• The air in the rubber's cells is forced out when compressed. When the press opens, the rubber sucks in the ambient air, *which at this point contains the dust created by the cutting process*. Eventually the rubber will become hard and un-compressible and will have to be replaced.

Closed Cell:

• The *gas-filled cells will pop when over compressed (35-40%)*, thus creating dead ejection material.

Microcell (Green G'rilla™ and Red Rhino):

• *This material will work without degradation due to intake of carton dust nor will it lose its vitality when over compressed. This material will maintain its strength even when compressed to 50% of its original height.*

• *The cell structure is so fine that it will not even absorb water as the molecular structure of water is greater than the rubber cell size.*

• The rubber material is *inherently stronger than traditional open and closed cell*.

There are some other things going on in a cutting die that will also effect die ejection. Diecutting is misnamed. When observed under a microscope, the substrate is not really being cut in a flat die, it is being blown apart by the tapered bevel of the cutting knife. Picture a wedge used in log splitting. The only time the edge of the wedge is in contact with the log is when it is at rest. Once the wedge is struck by a sledge hammer, it is the tapered angle of the bevel that splits the log, not the lead edge of the wedge.

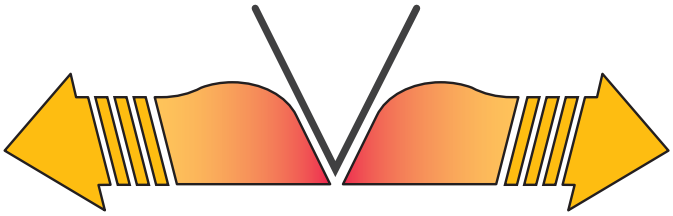
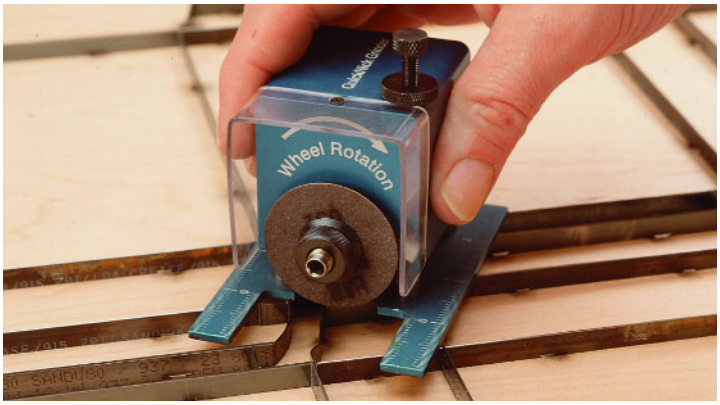


Illustration above shows a cutting knife bevel blowing apart the substrate, much like a wedge splits a log.

The same explosive action is at work in steel rule diecutting. That is why so much carton dust is created in the cutting process particularly when short fiber recycled materials are being cut. While the bevel of the cutting knife is your friend, it can be your enemy by assisting in trapping the substrate in close, tight slots. If both adjacent knives have bevels toward each other, those knives will squeeze the substrate toward each other and trap it in the tight slot, making it even more difficult to eject. Ejection can be helped by not only using a firmer rubber, but by using a single side bevel knife with the bevel on the product side and the non-bevel side of the knife on the scrap or trapped side. This will create minimal squeezing and provide an open channel for the trapped scrap to escape.

Let's now look at nicking.

The object of nicking a sheet is to hold it together through the various functions of the modern platen press. Once the sheet is die cut, it is moved to the stripping section where the scrap is stripped out. Then it goes to the blanking section where the individual "outs" are pushed out of the remainder of the sheet, and vertically stacked. Each movement from cutting to stripping to blanking is a violent, jerking, pulling motion. The only thing holding the sheet together are little "bridges" in the cut areas created by grinding nicks in the cutting knife.
If the ejection rubber is placed against the cutting knife where the



Grinding nicks in cutting knife or rule.

nicks are located, the act of deflecting rubber against the knife will automatically pull the substrate away from the cutting rule, thus breaking the product bridges holding the sheet together. Then during the transfer from the cutting section to the stripping and blanking sections, the sheet will fall apart and cause a press-stopping jam. Thus you can see the advantage of rule #3. By allowing the sheet to travel perfectly vertical (up and down) during the cutting process, you will preserve the nicks or bridges in the sheet. Using the standard rubber being used in the die will generally *NOT* do the job of properly griping and holding the sheet together at the nicks. This is why some diecutters like to use Eurorubber or dense extruded rubber shapes, designed to hold the substrate at nicks during diecutting. There are some negatives with using Eurorubber. First it is dense and will not compress well, and its shape (sharp top radius) sometimes will cause the substrate to mark or deboss. If it is black (which is generally the case) it may mark the substrate as well. Eurorubber has no cell structure making it difficult to glue, thus requiring the use of "Super Set" (a Cyanoacrylate adhesive).

The best solution to the problem of rubbering at the nicks is to use Green G'rilla™ cut to the E-Z-Set shape. We have proved it has the same or greater holding and gripping power of Eurorubber without any of the negatives. Green G'rilla™ can be adhered using Grip N' Strip (a latex based glue), and since Green G'rilla™ is microcellular, it will aid ejection and it will grip and hold as much as needed to hold the nicks together. In addition, it's less expensive than Eurorubber.

For more information, please contact us at: (800) 423-4478 toll free
or visit our website at
www.wagnerdiesupply.com

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2041 Elm Court, Ontario, California 91761