PART 2 BANISHING THE 'IRRITABLE DIECUT'

Richard Putch of Dicar continues his series on common diecutting issues that affect productivity, quality and anxiety levels.

In Part 1 of this series, I looked at the negative effects that broken lead edge rule, cracking scores and poor score definition can have on diecut quality and productivity. I also discussed some possible ways to cure these conditions and relieve the associated anxiety.

Let's continue working our way through the top 10 most common causes of frustration on the diecut line by looking at the efficient stripping of slots, design flaws from transferring jobs from flatbed to rotary and, poor diecutting aesthetics.

Efficient Stripping of Slots

How often have you encountered the diecut, or the stack of diecuts, with scrap from the slot either still in position in the blank or hanging from the stack like icicles from the barn roof? The two most common reasons for these dubious dangling digits are incomplete cuts or insufficient ejection of the scrap.

Let's start by following the first rule of troubleshooting check the simplest things first. Look at the cutting die to make sure the steel rule isn't broken, bent, gapped or has rubber missing. Check for impacted scrap in the cutting die. If you find any, you'll want to remove it and probably replace the rubber with the correct rubber.

Check the anvil for excessive wear, or wear patterns that may cause issues such as wagon tracks (fluffy shag carpet like patches often caused by long runs of slotted jobs or multi-out jobs that are separated by a circumferential knife).

That's the easy stuff, but if it doesn't cure the problem, then we need to look deeper.

Probably the most recognizable slots are those of an RSC (regular slotted carton). Typically this style of slot is cut by the male and female tooling on the slotter section of a flexo folder-gluer or printer-slotter. In most cases they're three-eighth inch wide and geometrically parallel in design. Not a problem for a slotter. However, if the carton's end use or graphics dictate the need for a diecut, then the narrow, parallel slot can become an issue.

A C-flute blank has a flute pitch (distance from center to center of each flute) of about five-sixteenth of an inch. If we try to cut this same three-eighth inch slot, in the corrugated direction, with a cutting die we dramatically reduce our chances of success as a pressure competition condition develops.

A snowshoe is a good example of what is happening. If you step in a snowdrift with just your boot on, you sink up to your knee, or some other part of your anatomy depending on the depth of the drift. However, if you're wearing a snowshoe, your weight (force) is spread across the surface. The snow compresses slightly, but the drift is not penetrated. The same happens with the cutting die. If the two pieces of rule are too close together, the cutting force is spread out and sufficient force to penetrate the paper and anvil is lost.

Simply closing the nip to increase the pressure isn't a good solution. You may manage to cut through the paper into the anvil, but dramatically increase the risk of crushing the board or causing undue damage to the die and anvil.

So, to reduce the pressure competition, we need to move the rule further apart. We can accomplish this by tapering the slot. This allows more pressure to be focused on the tips of the serrated knife. We are also cutting across more flute tips which increases the paper's resistance to crushing and enhances cutting.

The amount of taper in the slot is critical to the proper release of the scrap. Depending on their background, designers may specify slot taper as either an angle, such as 1.5 degrees, or as a "reduction" such as a one-quarter inch reduction, meaning the width of the slot will be reduced by one-quarter inch from the top to the bottom of the slot.

The problem I often see with the reduction method is that one-quarter inch is used as the standard reduction. This may be fine for a slot of two-inches or less, but when you get a deeper slot, perhaps six or eight inches, the amount of separation may not be sufficient to relieve the pressure competition of the cutting rule. A taper of one-eighth inch per inch is a good rule of thumb.

As important as a good cut is the proper ejection of the scrap. Super Strip, Dura Strip, Dieprene and Green G'rilla are a few of the ejection materials used in this type of application. They're much firmer than typical product ejection rubber and have a faster recovery rate which is critical for separating the scrap from the blank.

The higher density of these materials makes them prone to lateral displacement under

Parallel slot cut by slotter section. The ragged edge is most likely due to worn slotter tooling.

Tapered slot cut with die

pressure. So as it is compressed it wants to spread out. Typically 1mm of clearance between the knife and all sides of the ejection rubber is adequate to allow for this expansion. If the clearance is not sufficient, over compression can occur and result in incomplete cuts, poor separation due to slow recovery times, damaged rubber and scrap becoming impacted in the die which typically leads to the worst case scenario — a broken die.

You wouldn't think that a piece of rubber could break a piece of hardened steel, but I've seen it happen too many times.

Often these ejection strips are produced with a scalloped or wavy top. The distance between the peak and valley of the wave dictates how far above the steel knife the rubber can extend. If you want the rubber to extend one-quarter inch above the knife, you must be sure the wavelength will allow the rubber to compress without causing undue pressure on the sides of the knife or restricting the ability to cut.

To function properly the material needs to quickly recover to its full height. If it is packed too tightly into the slot or has been damaged by over compression, the recovery rate will be slowed and it may not reach its full height before the next impression. If the scrap is still imbedded in the die as the next impression starts it can quickly become impacted and lead to bursting of the rubber cells and eventually damage the die.

Transferring from Flatbed to Rotary

Flatbed and rotary diecutting are two of the best examples of different ways to accomplish the same goal. It seems that virtually everything you do to enhance the efficiency of one is dramatically detrimental to the efficiency of the other.

Often sales reps are asked to bid a job from an existing carton. When they win the job, the carton is handed over to the design lab to create the graphic and structure CAD files. If the job previously ran on a platen press and is moving to rotary, slight design changes are necessary or the results can be disastrous to the productivity and profitability of the job.

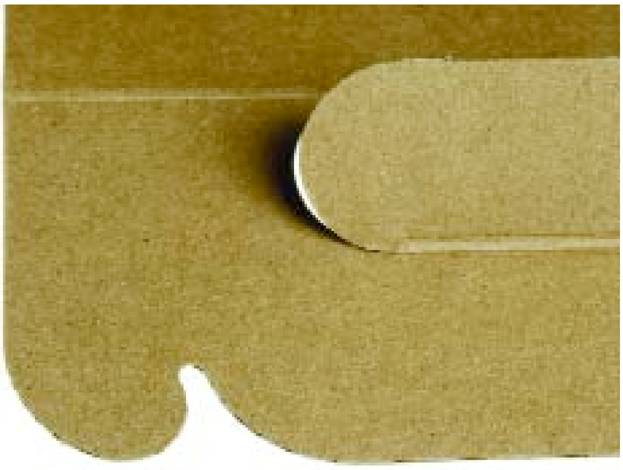
Too many times, perhaps not knowing how the job ran before, a cutting die will be produced to exactly replicate the existing carton.

When platen presses diecut, the goal is to keep the blank and scrap together and flat until it is transferred to the scrap removal (stripper) section where matched upper and lower tools "punch" out the waste. If the scrap prematurely separates it typically results in a jam or crash and the press shuts down. So the dies are designed with the slightest nicks and hairpin slots, and 90-degree rule intersections are mitered to create very slight natural nicks to keep the blank and scrap intact during the diecutting process. This is necessary for the machine to reach optimum production levels.

If the design is directly transferred to a rotary die, everything that was done to maximize efficiency will become the rotary operator's worst nightmare. The slight nicks will cause scrap to hang-up and remain attached to the blank (just like they are designed to do) and, instead of eliminating jams, are likely to cause jams, hinder delivery into the stacker and in general create a great mess.

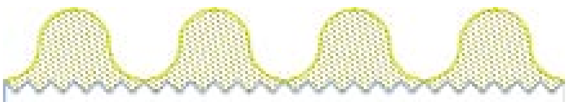
The solution to this is quite simple. First communicate. Make everyone aware that the job is moving from platen to rotary. Then design the die so that the waste areas are isolated. No nicks unless it's a multi-out job and you're separating with a breaker of some type. And if you are, the nicks are going to be very different for rotary than platen which may be using a blanking section to separate the blanks. The steel rule should also be bent to create butt joints instead of miters which make unintentional nicks.

The shape of the scrap is also important. Because scrap is being punched out on a platen press, the shape is not critical. It's going



Above: Smooth edges produced by platen diecutting

Below: Serrated "saw-toothed" edges are a telltale sign of rotary diecutting.



Pitch, the distance between the peak and valley of wavy top rubber, determines how far above the steel knife the rubber can extend.

to be forced through by the stripping tool. However, in rotary where you're relying on rubber to separate the blank and scrap, sharp points, irregular shapes, narrow parallel slots (as discussed earlier) and very small pieces should be avoided. If an irregular shape is necessary, additional rule may be required to cut the scrap into smaller more manageable pieces.

Poor Aesthetics from Rotary

The quickest way to tell if a rotary or platen diecutter has been used is to look at the edge of the blank. If the edge is smooth, chances are a platen diecutter was used. If it has a serrated or "saw toothed" appearance, it's probably been rotary cut.

As the corrugated container has evolved from simple shipping protection to a front line marketing tool, aesthetics have become much more important. Although the serrated edge is thought by many to reduce the chance of paper cuts when handling the carton, color sells and the ragged looking diecuts can take away from all the effort put into attracting the customer.

Serrated rule is a necessity for soft anvil diecutting. However, there are many profiles which can minimize the serrated edges and take rotary closer to the smooth edge of the platen diecut. There are limitations and it becomes a balancing act for the diemaker to choose a rule that provides maximum efficiency based on the basis weight and flute profile of the linerboard, while trying to produce the smoothest edge possible.

Non-symmetrical beveled cutting rules have had a great impact on minimizing the "saw tooth" effect. These rules, such as Klean Cut™, have a serrated edge on one side and are smooth on the other. The rule is installed with the smooth side toward the product and the serrated side to the scrap to produce a much cleaner rotary diecut. A rule like this with 13 teeth per inch is a great choice for E-flute corrugated.

I hope you've found something here to help enhance your efficiency, improve quality, or just take a bit of stress out of your day.

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