BANISHING THE 'IRRITABLE DIECUT'

PART 1

Richard Putch of Dicar discusses several common diecutting issues that affect productivity, quality and anxiety levels.

Working in the diecutting industry for nearly 30 years, I have experienced many diecutting issues personally as an operator or diemaker. I'm often surprised that some of the issues I see today are the same as those I experienced at the beginning of my career. I also remember the frustration as an operator when I knew that the product or tooling wasn't right, but didn't know exactly what the cause or fix was.

In Part 1 of my series, I'll take a look at three of the 10 most common issues that often lead to elevated levels of anxiety on the diecut line. I'll also offer some potential solutions to address the issue and help improve your quality and productivity.

Broken Lead Edge Rule

Probably one of the most common issues I see in rotary diecutting, and perhaps the most troublesome, is when the lead edge knife bends over and fails to continue cutting (Fig. 1). This is usually caused when trim gets caught between the miter of the trim knife to the lead edge rule.

Once a piece is caught it forces the miter open more, additional trim becomes impacted and eventually the lead knife will be distorted to the point it no longer cuts or the knife breaks.

As with most issues I encounter in diecutting, there are a number of variables that can influence this failure. Improper die construction; damaged, worn or improper rule or rubber; insufficient lead edge trim and soft or worn die shells all have the potential to cause lead edge knife damage.

Steps can be taken to minimize the risk of damage from each of these causes. Perhaps the most cost efficient, because it minimizes unscheduled downtime and can prevent catastrophic failures, is the practice of routine maintenance.

Perform a quick inspection of the cutting die after each job and before it's put in the storage rack. Remove any trapped trim, reposition the trim knife and make sure it's secured to the lead knife and replace damaged or missing rubber.

Make sure the job has enough lead trim. As plants try to reduce waste and conserve paper, I

see a continual reduction of lead edge trim. This often leads to the trim being pulled back in and trapped between the knives.

Approximately one-half inch (12mm) should be sufficient for most applications. Much more and you're probably wasting paper, much less and you'll probably experience this issue.

Warped board can also contribute to this issue. As the board flattens in the diecutter adverse force may be projected against the rule causing it to distort and eventually fail.

The ejection rubber used on the lead edge is also very important to the protection of the rule. Rubber used here should be firm, set in tight against the lead edge and should be no more than one-sixteenth inch (1.6mm) above the lead knife. Sometimes operators want to use higher rubber to help with warp. This can lead to additional trim problems as the rubber is pushed over and cut by the knife creating a void that is prone to catching trim. (A, Fig. 2)

Hard bodied steel rule in the 50 to 55RC range increase the beam strength of the rule and limit lateral deflection. If the rule can't deflect from its normal state, there is less chance of the trim becoming trapped between the knives in the first place. Softer rule tends to flex slightly and then spring back with each impression. This leads to fatigue fractures and eventually failure of the rule.

Some of the new diemaking practices being used to prevent lead edge knife damage include harder composite die shells that provide a firmer grip, reduce rule movement, shell wear and cracking. Some diemakers are using lead edge rule supports (B, Fig. 2) to provide additional support to the rule. Some are also bending a small radius at the end of the trim knife to prevent it from drifting back in the die and keeping it tight to the lead knife. (C, Fig. 2)

Cracking Scores

There's no doubt, cracking scores can be the subject of an entire article. However, looking at it in simplest form, there are three variables which contribute to fracture of the liner during scoring, the combined board, the cutting die, and the cutting surface. Each of these variables has a sub-set of variables which contribute to the successful, or unsuccessful, scoring of the board.

First, a few points to consider when you're trying to troubleshoot an inner liner scoring problem.

Fig. 1
One of the most common issues in rotary diecutting, and perhaps the most troublesome, is when the lead edge knife bends over and fails to continue cutting.

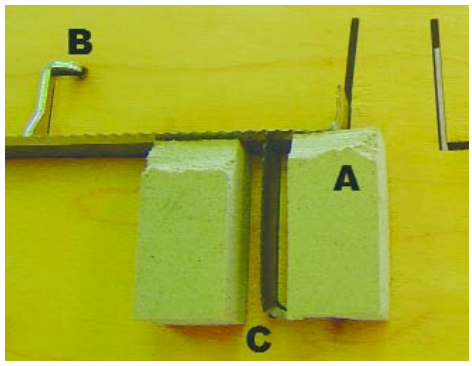

Fig. 2
The ejection rubber used on the lead edge is also very important to the protection of the rule.

- Scores generally crack with corrugation, not necessarily "around the cylinder." So it's possible to see scores crack across the sheet when running cross corrugated.
- Anvil covers should be concentric and relatively smooth. Otherwise score pressure may be inconsistent or uneven.
- The cutting die should be seated and secured to a clean cylinder. If not, uneven pressure can again occur.
- The creasing rule should be bridged deep enough to seat to cylinder. If not, this can be the equivalent to using incorrect rule height.

- If the rule is "kinked" at the bridge, "rocking" may take place in the die board causing a continual height variance.
- The rule should be rounded at each end to eliminate sharp corners which can tear the liner. Once the tear starts it's easy for it to continue through the sheet.
- It may be possible to lower the score height to relieve pressure and still achieve proper folding.
- A "wider" score face or shouldered surface mount score may distribute the pressure point and still allow proper scoring.
- Flanking the score rule with cushion crease that sets no more than 1/32 below the tip may also be helpful.

On the typical corrugated container, it's the inner liner that usually cracks. When running jobs that consist of litho laminated labels mounted to combined board, I generally find the opposite. The crack tends to occur on the printed outside liner (Fig. 3).

When diecut on a "steel to steel" or hard anvil press, counters or matrix strips permit scoring from both sides of the sheet. The paper fibers are pressed into a channel and formed into a hinge type score. The method reduces the potential to crack.

The use of counters and matrix in soft anvil diecutting is not practical due to the need to control the surface speed and the fact that the anvil surface oscillates and indexes to distribute wear. This presents perhaps the biggest challenge when trying to run labels that have been applied to "doubleback corrugated."

I often encounter cases where the label is 70 to 80# text weight stock that has been fully coated with glue and then applied the doubleback. The glue saturated label becomes very brittle once it is fully cured and is prone to cracking.

Using 10 pt. or "cover weight" stock when possible for the labels is helpful in this instance. The initial cost of the paper may be slightly higher, but the time and waste saved will quickly cover any additional cost.

Fig. 3
On the typical corrugated container, it's the inner liner that usually cracks. When running jobs that consist of litho laminated labels mounted to combined board the crack tends to occur on the printed outside liner.

Poor score definition

Excessive pressure leads to score cracking and waste. The opposite, the lack of sufficient score definition, can be equally problematic and wasteful in downstream operations. Therefore, the diecutter operator must be careful in his efforts to control cracking of the score or setting up a new job. When making changes to the score during the diecutting process, it's important to make sure they will be compatible with downstream operations.

Unfortunately, lack of score definition is usually discovered too late in the finishing process. An example is "auto bottom" style cartons. This design requires a 180-degree fold across the bottom panel of the carton, many times across the fluted medium. These are often referred to as "memory scores" because of their tendency to return to their original position.

With poor score definition these cartons force post glue operations to run at a far slower speed than desired. Lower speeds are necessary to give the glue ample time to tack and bond before the pressure is released from the fold. Those of you who have seen a mountain of

Fig. 4
Score definition can be quite problematic on self locking mailers.

rejected cartons at the end of a folder-gluer know exactly what happens if you don't.

Without the use of a counter matrix, a score like this can certainly be difficult. Employing a wider score such as 8-point is very helpful. If the score is going across the flutes, don't get carried away, but don't be shy on the rule height. Cracking is nearly impossible on the inner liner under this scenario. Score height can be increased by as much as even .050-inch without causing issues. By crushing the medium with a wider or higher score you can dramatically enhance the definition and increase folder-gluer speeds. The addition of cushion crease extrusions or firm rubber such as cork is also quite helpful at creating the score definition necessary to properly fold this type of carton.

Some of the new diemaking practices being used to prevent lead edge knife damage include harder composite die shells that provide a firmer grip, reduce rule movement, shell wear and cracking.

Score definition can also be quite problematic on self locking mailers (Fig. 4). Here, a 180-degree fold of the side panel is accomplished using a set of double scores in the side panels. The side panels fold over the inner flaps and are locked in place with a small tab inserted into a slot in the bottom of the box.

Designers frequently make the lock tab intentionally longer assuring it can "catch" and lock the sides in place. Or, sometimes they'll choose to use twin perforating rules instead of scoring rules believing the corrugated board will fold more precisely and square.

Regardless of whether perf or score is used, the problem arises from the definition of the two scores being "equal." The side panels can bend inconsistently when folded resulting in a "short" inside panel where the tab cannot reach the lock.

To correct this, try two different height scores — with a difference of .015-.020-inch (.38 to .51mm), such as .875 and .890. The score rule closest to the locking slot should have the greater height. This increases the definition and allows the panel to break consistently, permitting the lock tab to properly engage the slot on every carton.

In upcoming articles I'll look at some of the other diecutting issues and pose some solutions to relieve the anxiety of the irritable diecut.

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