FIGURE 1: DESIGNS WITH A HIGH PERCENTAGE OF WASTE HAVE INCREASED OPPORTUNITIES FOR WASTE TO REMAIN.

HOW TO DETERMINE ACCEPTABLE SCRAP LEVELS

Expecting to achieve more than 99% scrap free for all items you diecut is a lofty goal, however with continuous effort in discovering the causes and documenting the corrective action, progress will be made.

By Rick Putch, Dicar, Inc.

Most of us who work in the wonderful world of diecutting have been asked the question, "What is an acceptable level of waste that is retained in the blanks delivered to customers?" While customers would like the answer to be, "None" or "100% stripped," the reality is if only one part per thousand boxes was supplied, the corrugated supplier has failed to reach that goal. Even if you were to hand inspect every single part, eventually a piece of scrap would be overlooked and remain, resulting in less than 100% scrap free. I personally have not seen any written specification on this, but I'd like to suggest some guidelines to create measurable and obtainable results.

The more percentage of waste in the blank, the higher probability of retaining some of it. Some designs are simple rectangles that only require that the perimeter waste be removed. Those products have a very high probability of being delivered without complaints. On the other hand, designs with a high percentage of waste have increased opportunities for waste to remain (Figure1). If customers mandate a policy that states they will not accept more than 2% waste, how does one determine that amount? Is it by area, volume, or piece count? That would be possible to measure but not so simple to do, therefore not very practical.

For example, if we produced 10,000 diecut corner glued beverage trays, they would have 40,000 slots and 40,000 feet of perimeter trim, cut up into 4" long strips. This could total another 100,000 pieces. If we set area or volume as the basis, then one could deliver the entire load with waste intact since a beverage tray only has about 2% waste by design. Setting the method by piece count would allow nearly 3000 pieces of trim. Having this much trim nestled in the tray former would not be acceptable nor would calculating pieces of trim on every job be desirable.

The simplest way I've found to evaluate the cleanliness of each stack is a quick visual inspection as they head toward the unitizer (Figure 2). After visually scanning and estimating the pieces of trim within a stack, compare it to the chart (Figure 3) against your goals. Figure 4 shows some examples using the chart.

FIGURE 4: SCRAP UNIT EXAMPLES

Expecting to achieve 99% plus for all items you diecut is a very lofty goal, however with continuous effort in discovering the causes of why waste remains, then documenting the action to solve the issue, progress will be made. Here are some specific things to look for:

- Rubber — Many dies have far too much rubber that is too hard. I often see dies with so much hard rubber around the perimeter that it actually restricts the cutting rule from fully penetrating the anvil (Figure 5).

> EVEN IF YOU WERE TO HAND INSPECT EVERY SINGLE PART, EVENTUALLY A PIECE OF SCRAP WOULD BE OVERLOOKED AND REMAIN, RESULTING IN LESS THAN 100% SCRAP FREE.

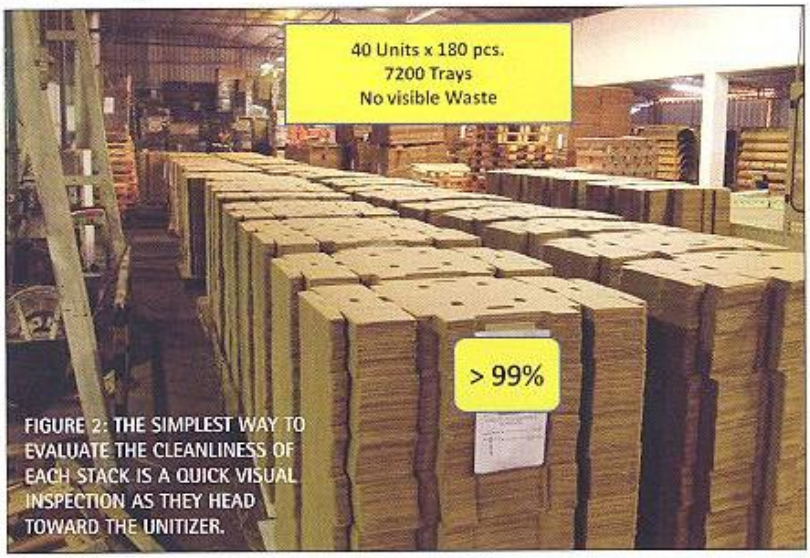


FIGURE 2: THE SIMPLEST WAY TO EVALUATE THE CLEANLINESS OF EACH STACK IS A QUICK VISUAL INSPECTION AS THEY HEAD TOWARD THE UNITIZER.

Scrap Free Percentage Goal					
Flute	Sheets	99%	98%	97%	96%
E	750	8	15	23	30
B	375	4	8	11	15
C	275	3	6	8	11
BC	175	2	4	5	7
Permissible Sheets with Waste					

FIGURE 3: AFTER VISUALLY SCANNING AND ESTIMATING THE PIECES OF TRIM WITHIN A STACK, COMPARE IT TO THIS CHART AGAINST YOUR GOALS.

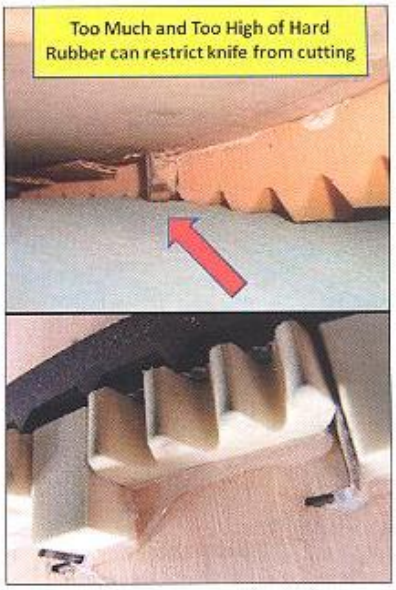
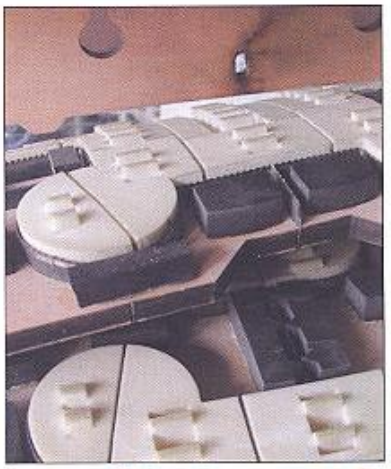


FIGURE 5: MANY DIES HAVE FAR TOO MUCH RUBBER THAT IS TOO HARD.

FIGURE 6: PLENTY OF TRIM WAS ALLOCATED YET MOST OF IT REMAINED ATTACHED TO THE SHEET.

As you can see in Figure 6, plenty of trim was allocated yet most of it remained attached to the sheet. I recognize interior cutouts such as handles and vent holes are often a challenge but as we see in Figures 7 and 8, this is overkill and actually harmful



FIGURES 7 & 8: INTERIOR CUTOUTS SUCH AS HANDLES AND VENT HOLES ARE OFTEN A CHALLENGE BUT THIS IS OVERKILL AND ACTUALLY HARMFUL TO THE PRESS.

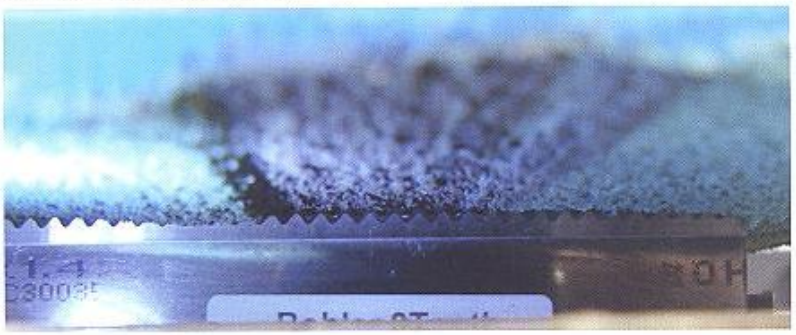
to the press. These "white rubbers" are urethane so while the elastic response factors in it allow for very quick rebound, over compression at rapid cycles converts some of the energy into heat, destroying the cell's structure from the inside out (Figure 9). Waterjet cutting relief holes allows some cooling while reducing the surface area and force required to compress it.

FIGURE 9, ABOVE: THESE "WHITE RUBBERS" ARE URETHANE SO WHILE THE ELASTIC RESPONSE FACTORS IN IT ALLOW FOR VERY QUICK REBOUND, OVER COMPRESSION AT RAPID CYCLES CONVERTS SOME OF THE ENERGY INTO HEAT, DESTROYING THE CELL'S STRUCTURE FROM THE INSIDE OUT.

- Punches are round holes often found in agriculture trays to cut ventilation holes. If these holes remain, the contents can spoil sooner from improper airflow. Bending steel rule into a circle with a seam that can separate is not nearly as effective as a seamless punch with an inside abrupt bevel (Figure 10).
- Wagon Tracks are uneven grooves worn into the anvil covers from lack of rotation or perhaps improper oscillation settings. As seen in Figure 11, the cutting rule is over penetrating in some areas while not nearly deep enough in others.

> PUNCHES ARE ROUND HOLES OFTEN FOUND IN AGRICULTURE TRAYS TO CUT VENTILATION HOLES.

FIGURE 11, BELOW: THE CUTTING RULE IS OVER PENETRATING IN SOME AREAS WHILE NOT NEARLY DEEP ENOUGH IN OTHERS.



Bent Circles

Seamless Punch

FIGURE 10, ABOVE: BENDING STEEL RULE INTO A CIRCLE WITH A SEAM THAT CAN SEPARATE IS NOT NEARLY AS EFFECTIVE AS A SEAMLESS PUNCH WITH AN INSIDE ABRUPT BEVEL.

> IF YOU DECIDE TO ADOPT THIS METHOD, I SUGGEST YOU SPECIFY THE GOAL FOR EACH ITEM RIGHT ON THE ORDER AND POST THE CHART NEAR THE MACHINES AS A CONSTANT REMINDER.

- Scrap Sizes that are larger than 3" through the machine in the direction of travel often can be carried over belts and shafts becoming interleaved between sheets. Making scrap sizes smaller than 2" x 2" typically eliminates the chance for bolt holes in that area, so be careful when chopping up a large area not to create a die that cannot seat tightly to the machine.
- Design — I often say the best way to eliminate waste is to "tuck" it away as opposed to having it removed. Figure 12 shows a design that had nearly 50% waste. The new design ran at higher production speeds with no opportunity for nuisance scrap.

If you decide to adopt this method, I suggest you specify the goal for each item right on the order and post the chart near the machines as a constant reminder. Our industry is blessed with very innovative companies. With today's technology, such as 100% print inspection with inline rejection and glue detection systems, similar quality inspection for scrap retention is not far behind.

FIGURE 12: THIS DESIGN HAD NEARLY 50% WASTE, BUT AFTER A REDESIGN IT RAN AT HIGHER PRODUCTION SPEEDS WITH NO OPPORTUNITY FOR NUISANCE SCRAP.

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