

Solid Board

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Vacuum-Assisted Diecutting

Nick-Free Tooling Techniques and Understanding the Vacuum System

Baysek Machines, Inc., Amherst, WI, USA



Diagram 2

Thirty years ago, nick-free vacuum-assisted diecutting did not exist. And in the conception phase, the process was regarded only as a niche method for simple brown circles and pads. The original process was accomplished with friction locked finished pieces and bellow cups to assist

with ejection. Baysek changed the method to include vacuum-assisted suction cups to hold finished pieces in the die and ejection rubber to rid waste (see Diagram 1). Though still relatively new in comparison to traditional rotary and flatbed diecutting, the proven concept has gained notoriety over the years as

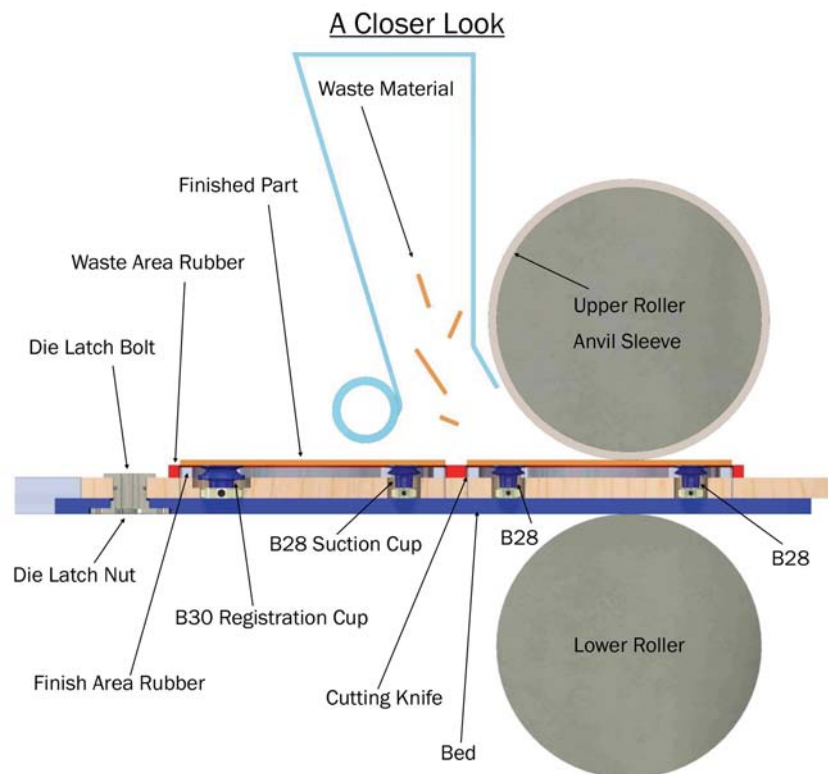


Diagram 1

an accredited, valuable and viable process for accomplishing simple to complex diecutting that traditional diecutting methods struggle with or fail to achieve.

As with most everything on the market, advancements are made as technology allows and this diecutting method is no exception. Our company is grateful to early customers for their confidence and trust in their capabilities and vision, as well as to diemakers for their contributions in enhancing the process over the last 25+ years. Today, customers commonly diecut complex partitions and inner pack, to food and beverage items and everything in between, including high-end digital print items (see Diagram 2), with Baysek servicing over 200 machines worldwide.

Process

The method begins with load-end, suction cup assemblies picking and placing sheets onto the reciprocating flat die (see Diagram 3). Registration suction cups on the lead edge of the die hold the sheet to the die. The die is situated on a 5° angle and is compressed between two rotary anvils. The top anvil is protected with a semi-hard cutting sleeve. Die knife penetrates the sleeve for a shear and angel hair free cut. Suction cups within each die form securely hold finished pieces in the die as it passes beneath a pneumatic waste removal vacuum. Small to large waste pieces are fully automatically extracted up the waste hood and directed to recycling.

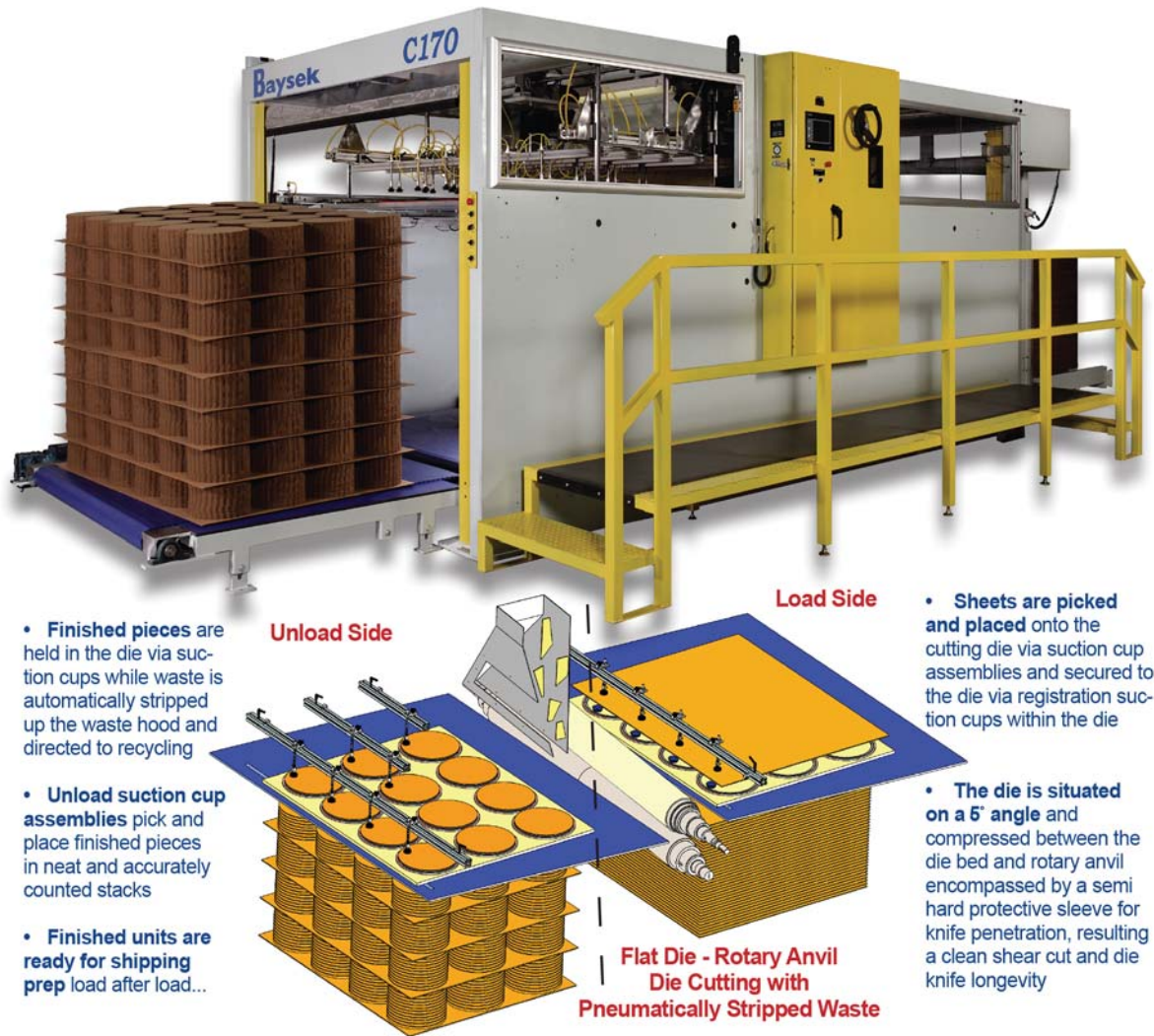


Diagram 3

Unload suction cup assemblies pick and place clean, 100% perimeter-cut finished pieces onto shipping pallets on the unload table. Accurately counted and stacked finished units exit the machine ready for shipping prep completion. The entire process is accomplished by one operator via a computerized control screen.

Advantages

Clear advantages to this vacuum-assisted diecutting method include:



Diagram 4



Diagram 5



Diagram 6

- High quality finished pieces with no nicks/tags, angel hair or paper dust; most desirable to the food and beverage industry (see Diagram 4).
- No-touch/hands-free capability (see Diagrams 5 and 6).
- Able to fully and automatically strip difficult interior waste (see Diagrams 7 and 8).

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Diagram 7

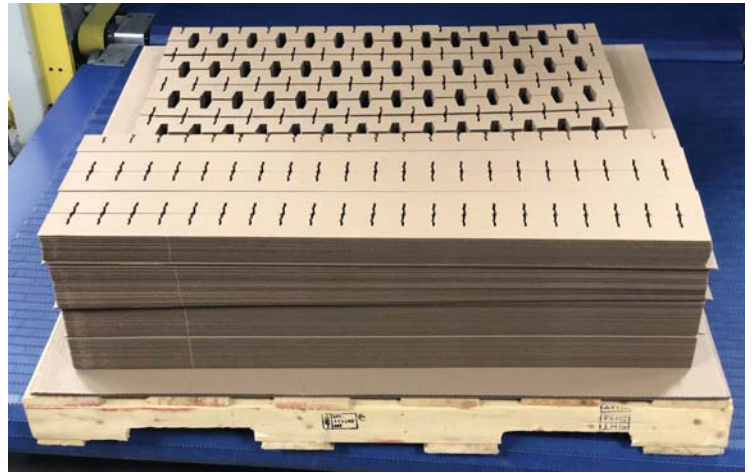


Diagram 8



Diagram 9



Diagram 10

- No hand stripping or need for ancillary equipment, such as bundle breakers (see Diagrams 9 and 10).

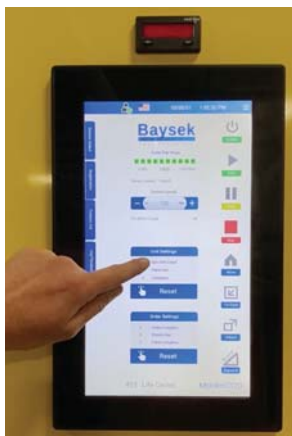


Diagram 11

- One operator uses an easy-to-use, computerized control screen (see Diagrams 11 and 12).



Diagram 12

- Handles irregular and complex shapes (see Diagram 13).

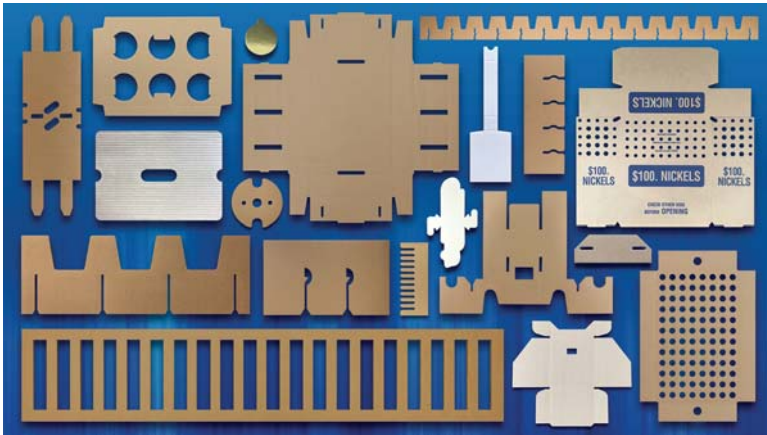


Diagram 13

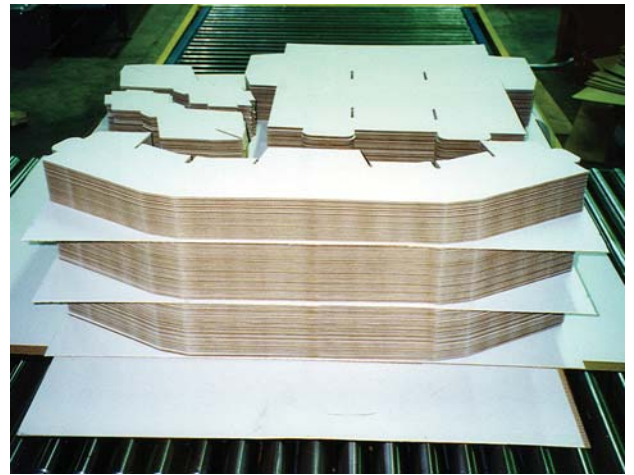


Diagram 14



Diagram 15



Diagram 16

- Multiple size parts and complete job sets on one die (see Diagram 14).
- Versatility, including handling a variety of materials, such as recycled and warped board (see Diagrams 15 and 16); F-flute through double wall corrugated; 20pt to 120pt solid/thin/chip-board; foil/foam/printed laminates; coated, glossy and fish board; single/open face corrugated; corrugated tissue; and more (see Diagram 17).



Diagram 17

Suction Cup Placement in Cutting Die

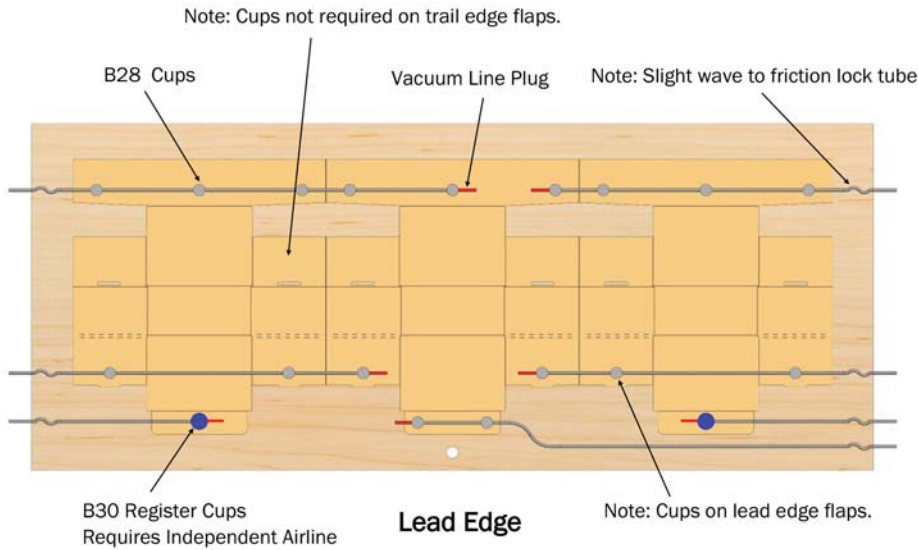


Diagram 18

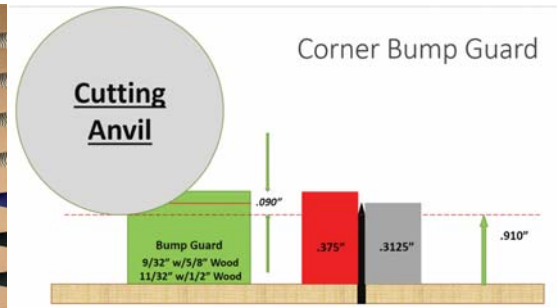


Diagram 20



Diagram 21

Tooling

The die method is different, but it is not difficult. Baysek dies do not utilize special tooling materials and only one single die is required to accomplish both cutting and stripping functions. We welcome diemaker input as technological advancements develop. Diagram 18 shows the tooling layout, Diagram 19 the cutting die standards and Diagram 20 the heights. As more worldwide diemakers become familiar with the nick-free, vacuum-assisted die method, the process becomes even easier for customers to efficiently utilize.

Cutting Die Standards

	<u>Single Wall</u>	<u>Double Wall</u>
Wood Thickness	5/8"	1/2"
Cutting Rule	.937 3pt. CBLB Ground Edge	.937 4pt CB 13t Serr Shallow Profile
Creasing Rule	3pt or 4pt .880/.890	8/4 LC .860/.870
Rubber ~ Exterior Trim	3/8" Micro Cell Strips	1/2" Micro Cell Strips
~ Interior Product	5/16" CC or Micro Cell Strips	(soft) 7/16" CC or Micro Cell Strips
~ Scrap Areas	1/2" Micro Cell Strips	5/8" Micro Cell Strips
~ Slots & Small	1/2" Vulcanized Product	5/8" Vulcanized Product
Corner Bump Guard	9/32" x 3" x 6" Cork	11/32" x 3" x 6" Cork

Diagram 19

Knife

When creating a cutting die to be used with a Baysek Machine, typically long center bevel rule is used in over 90% of the applications, thickness of rule is based on customer preference, but usually in the 3, and 4 point range.

Long side bevel rule is recommended to aid in ejection of parts made from thicker substrates such as double wall corrugated, or small waste areas not attached to larger sections.

Knife Notes

- Knife height is typically 0.937" (23.80mm).
- Machine can accommodate knife heights up to 1.50" (38.1mm)
- 0.937" (23.80mm) knife can be used for double wall with 0.50" (13mm) thick plywood.
- All joints to be mitered.
- Avoid joints on lead edge knife.
- Avoid joining knives at corners
- Avoid joining knives parallel with the lead edge.
- Avoid having a radius against a straight edge, as this may cause tagging.
- At knife intersections, always join knives at 90° angles.
- Bridges gap to be 0.38" (10mm) uniformly spaced 3.00-4.00" (75-100mm) apart.
- Increasing rule thickness will result in higher ejection pressure to the finished and waste pieces.
- If the use of serrated knife is desired, then low profile serration is recommended.
- Use of serrated knife will require adjustments in score rule height to accommodate the depth of the serration.
- Any perforation 0.125" x 0.125" or greater can be used provided skip cut rule is used.
- Cut score perforation rule height must be established from the score height.

Long Center Bevel Knife



Long Side Bevel Knife



Diagram 22

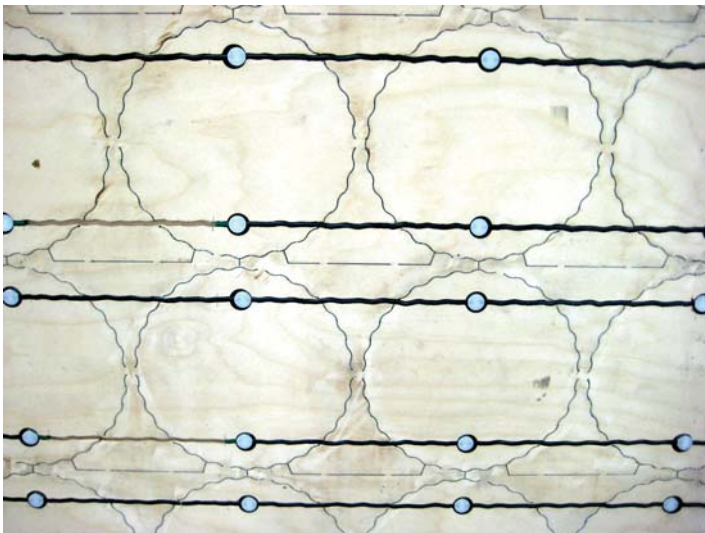
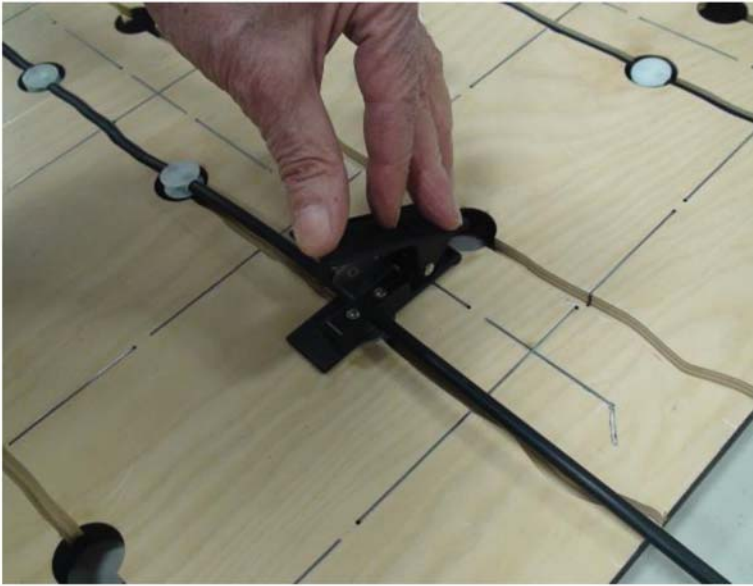


Diagram 23

Additional tooling parameters include:

- Standard knife is 0.937" (23.8mm) long center bevel or serrated rule (see Diagrams 21 and 22).
- Tubing is friction fit on the back side of the die within routed channels (see Diagrams 23 and 24).
- Up to 12 vacuum lines are allowed on each side (left/right) of the die (see Diagram 25).
- Registration suction cups are utilized for proper sheet transfer from the sheet stack to the die (see Diagram 26). See Diagrams 27 and 28 for more details on suction cup placement.
- Finished part suction cups securely hold finished pieces in each die form

Highly Recommended to Use the Baysek Tubing Cutting Tool



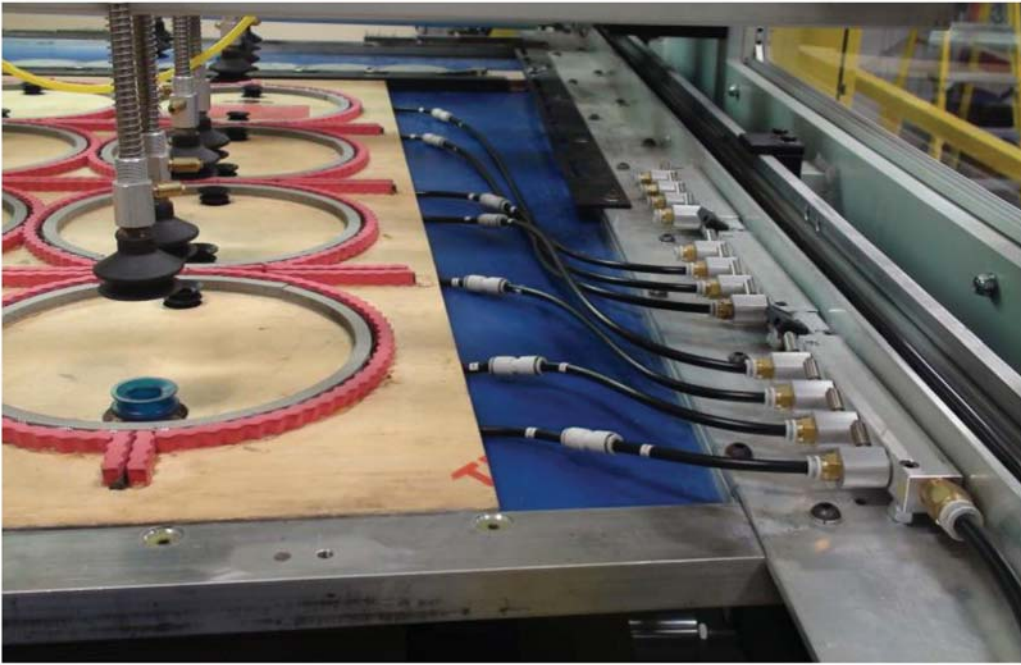
The tubing cutting tool was designed to cut vacuum lines to the exact length required from one suction cup base to the next.

Cutting vacuum lines by hand can create improper fits which results in a loss of vacuum pressure in the cutting die.

Simply run the tubing through the cutting tool, insert the round base on tool into the suction cup hole, and press down to cut the vacuum line, it's that easy!

* Tool designed for 1" holes.

Diagram 24



This is a typical example of how the cutting die connects to the machine bed manifold assemblies which contain 12 vacuum generators per side for a total of 24 connection hoses.

Diagram 25

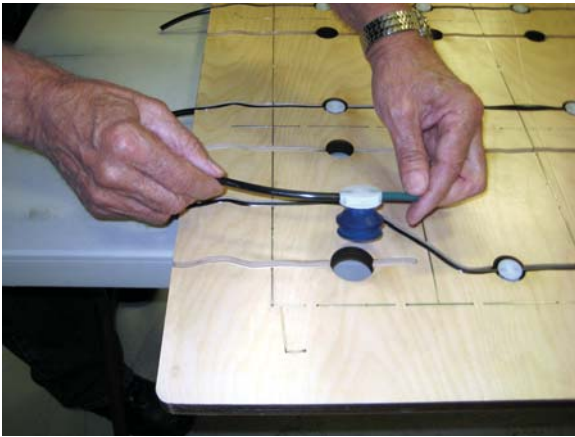


Diagram 26



Diagram 27

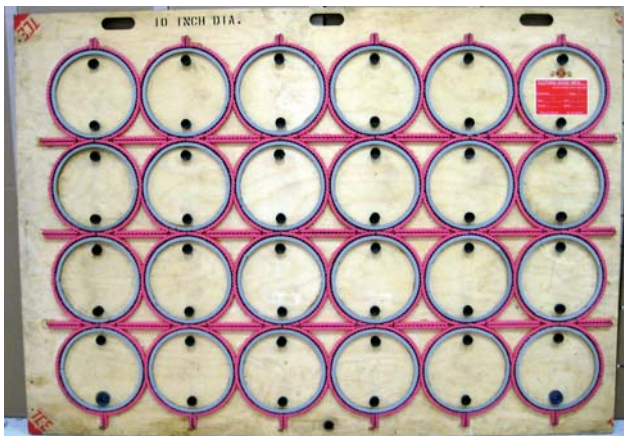


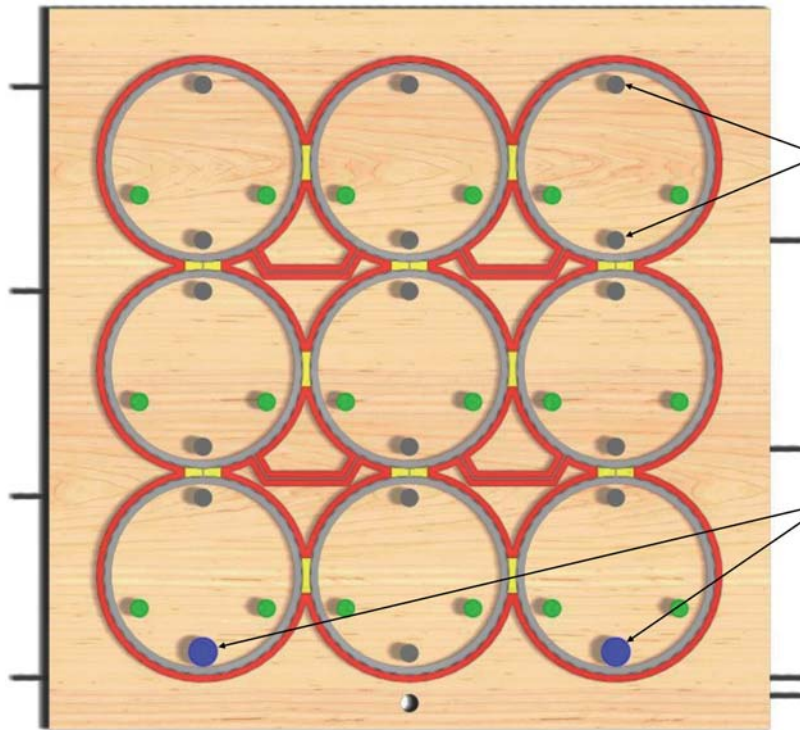
Diagram 28



Diagram 30

to allow full pneumatic waste removal (see Diagrams 27, 28, 29 and 30).

- Maximum finished parts out on one die is 60 (see Diagram 31).
- Our company provides guidelines for suction cup placement, cutting die dimensions, rubbering techniques and more (see Diagrams 32, 33, 34, 35, 36 and 37).



Normally, circle dies up to 10" diameter require just (2) two suction cups for each finished part. Lower ECT weight and larger diameter circles may require additional cup locations indicated in green.

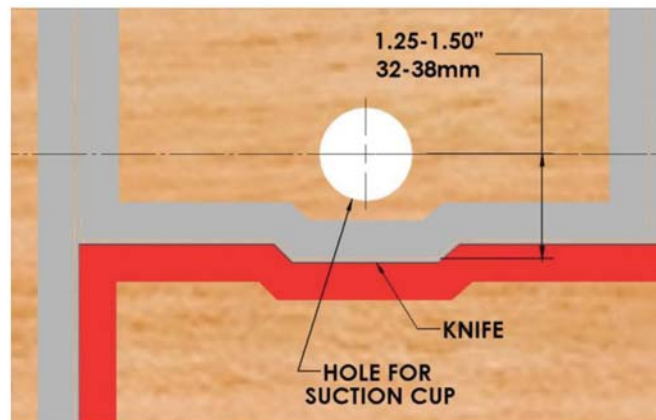
B30 registration cups on each corner of lead edge.

Diagram 29

- Average die setup is 10-15 minutes (see Diagram 38).



Diagram 31



Suction cup holes are recommended as far forward as possible 1.25"-1.50" (32-38mm) from the lead edge knife of each individual part and other areas that may lift off during waste extraction.



Diagram 32

Suction Cup Placement in Cutting Die

General rule is to use only enough suction cups to hold the finished part in place as the die passes under the waste extraction hood. Cups should be placed near the lead edges of the finished product and any leading edge areas that may lift caused by the waste extraction suction.



Diagram 33

Baysek C-170 Cutting Die Dimensions

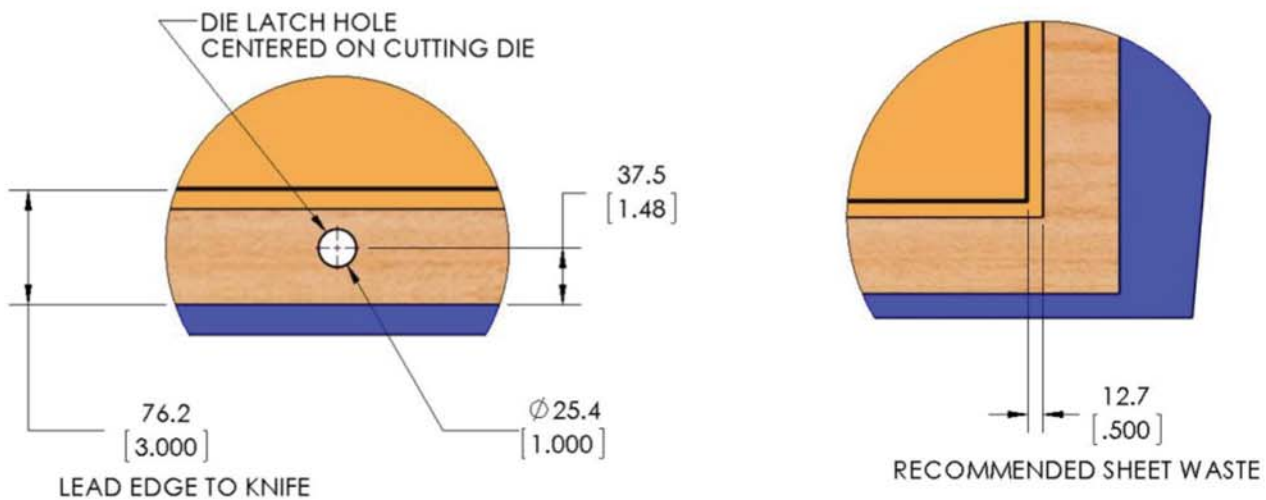
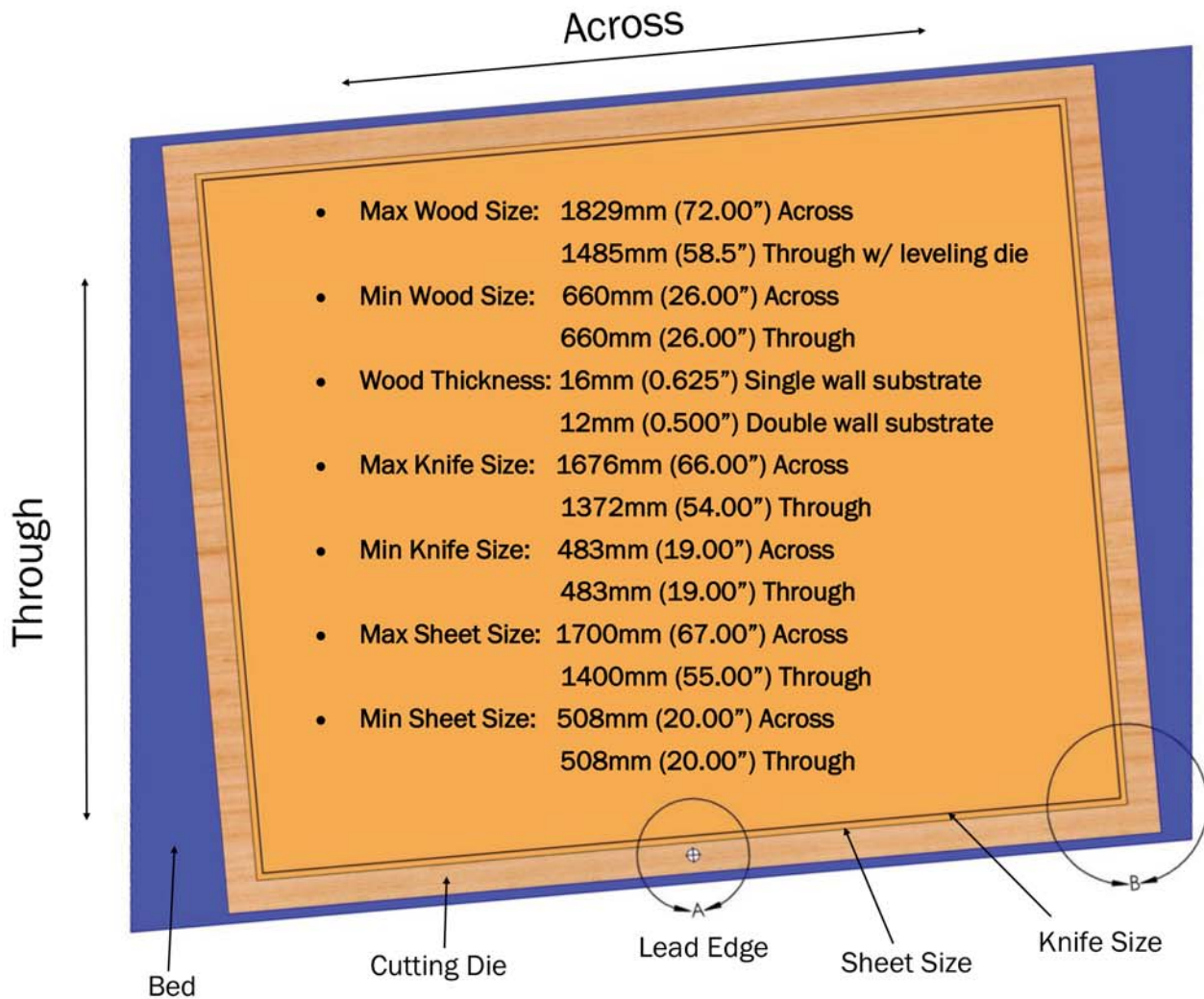
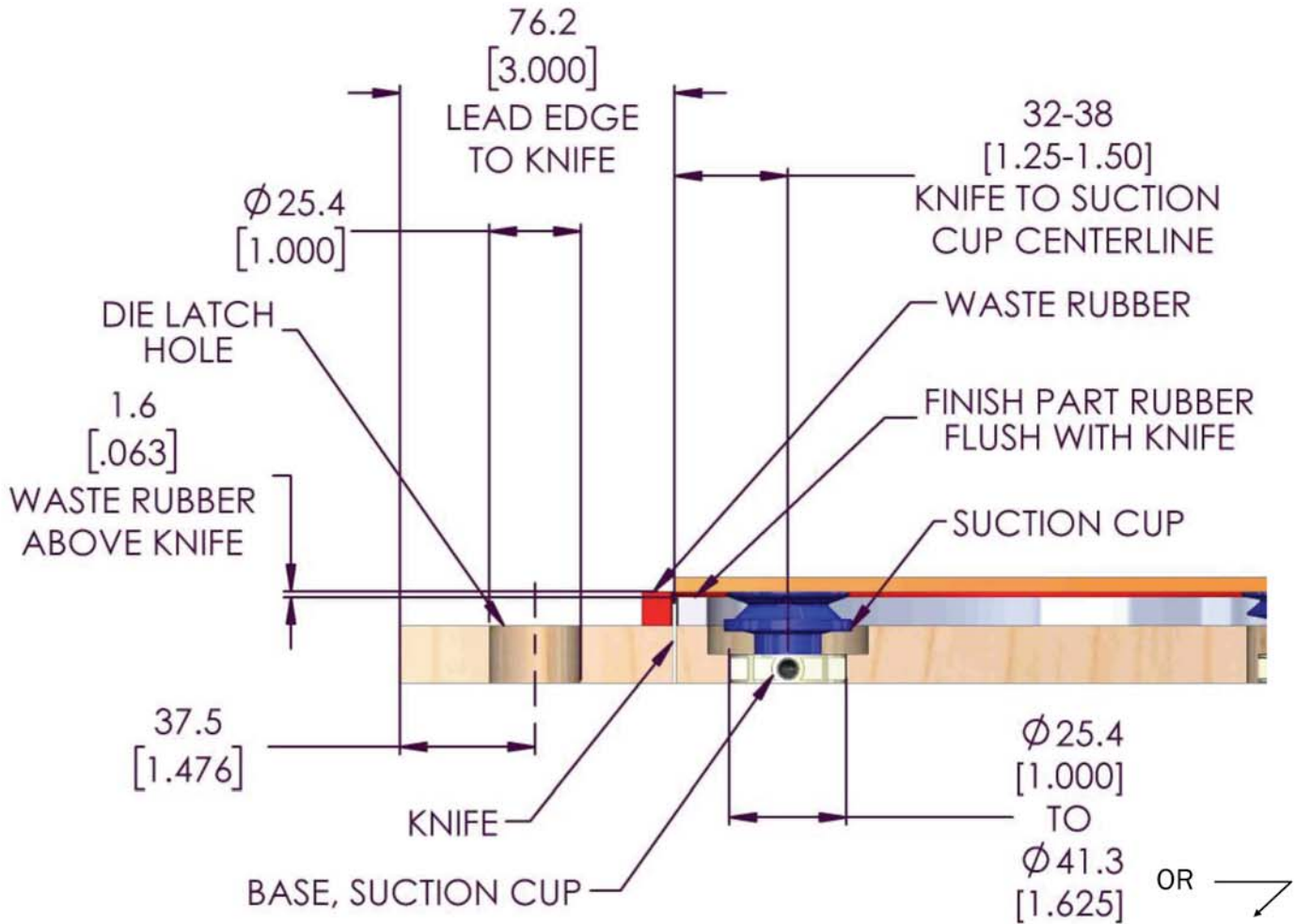


Diagram 34

Cross Section Of Cutting Die



Key Points

- Waste rubber to be 1.6mm/0.063in above knife
- Finish part rubber to be flush with knife
- Hole size in cutting die for suction cups to be determined by the type of base required for the suction cup. Baysek's standard base requires a 25.4mm/1.00in. diameter hole. Baysek's larger base for corner registration suction cups requires a 41.3mm/1.625in, diameter hole. Contact Baysek Machines Inc. or see pages 20-21 for special application suction cups and bases.
- Die latch hole to be centered on cutting die left to right and placed off the lead edge of the die at the dimensions shown above.
- A distance of 75mm/3.00in. is recommended from all edges of cutting die to the knife.
- Suction cup holes are recommended as far forward as possible 1.25"-1.50" (32-38mm) from the lead edge knife of each individual part and other areas that may lift off during waste extraction.

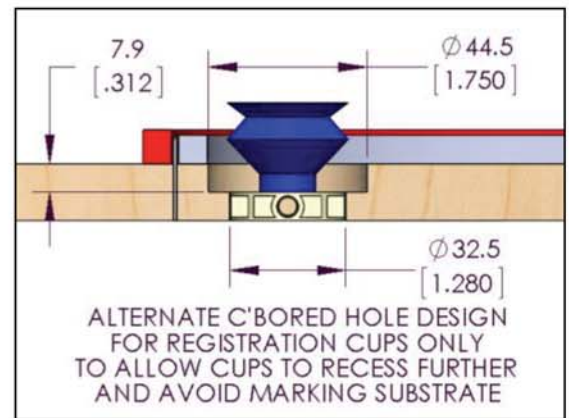


Diagram 35

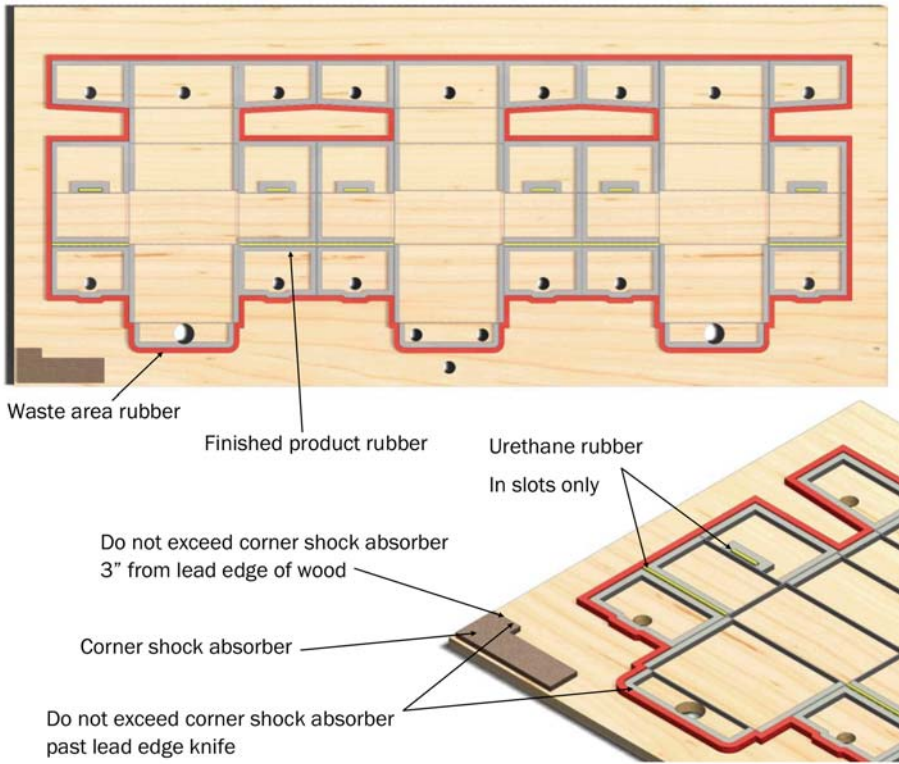


Diagram 36

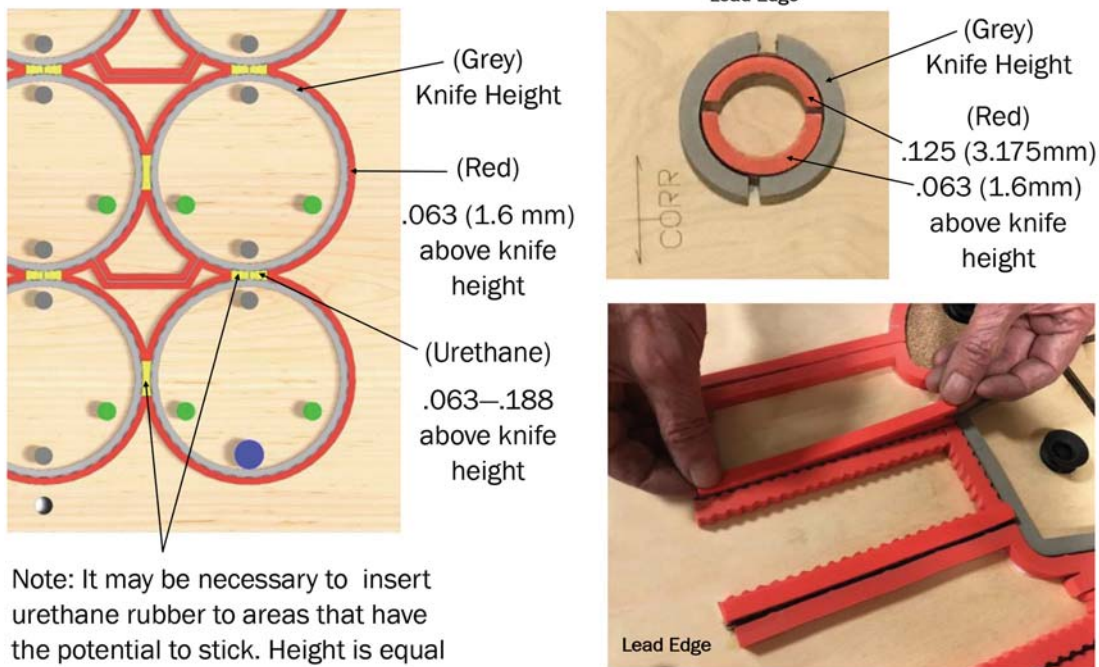
Diecutter

The Baysek diecutter began as an all mechanical machine. Today's model C-170 diecutter has advanced to a servo-driven machine, with touch screen control and remote online machine diagnostics. The C-170 is a simple design with easy access and maintenance. The small package is floor space friendly with no pre-feeders, bundle breakers or load formers. No special foundations or floor prep for installation is required.

Nick-free, multiple-out finished pieces (up to 60 per cycle) are shear cut, fully pneumatically stripped of waste, accurately counted and neatly stacked with option of straight stack, step stack or with tie sheet inserts at the maximum rate of 1,800 sheets per hour. The entire process is accomplished by one operator via a computerized control screen. Clean and orderly finished units exit the machine ready for shipping preparation, load after load (see Diagrams 39, 40, 41 and 42). 📄

Cutting Die Rubbering Techniques

Additional Examples Of Die Rubbering



Note: It may be necessary to insert urethane rubber to areas that have the potential to stick. Height is equal to or slightly higher than waste rubber.

If you experience the need for taller waste rubber, typically it is needed only on the lead edge of the waste area.

Diagram 37

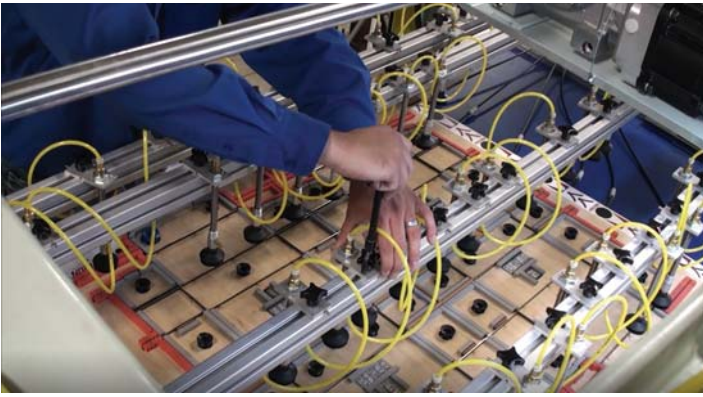


Diagram 38



Registration +/- 1.5 mm cut to sheet

Diagram 39

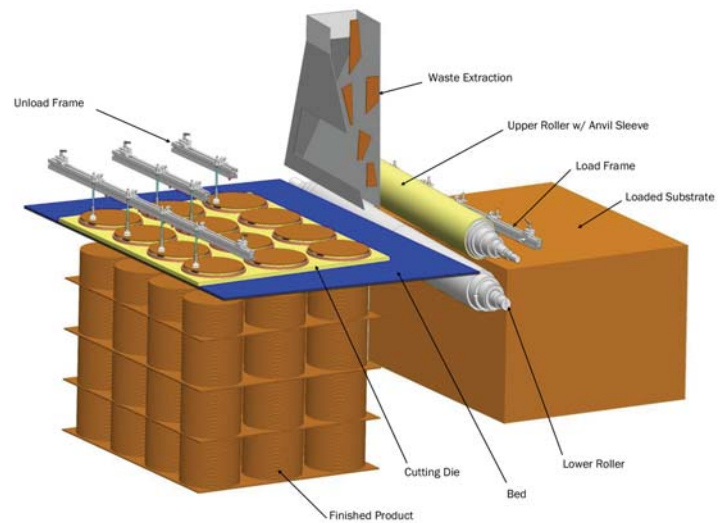


Diagram 41

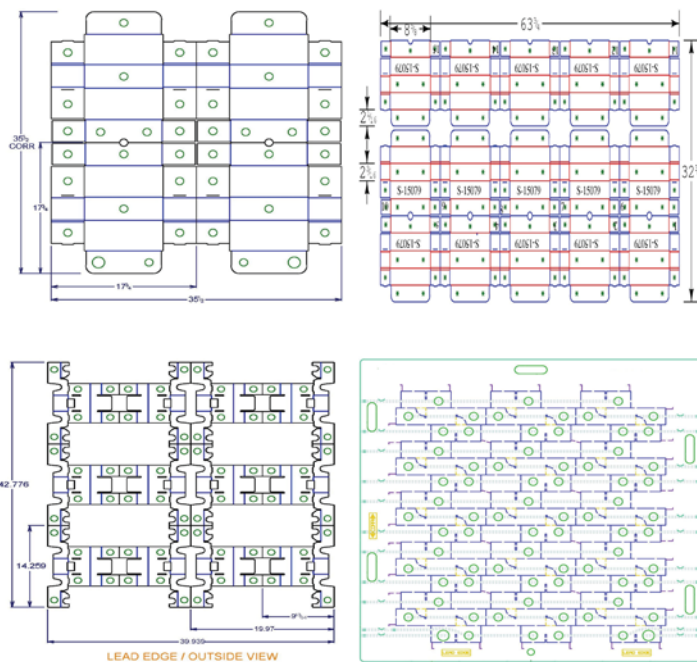


Diagram 40

Dies are fabricated by diemakers all over the world with the assistance of the detailed Baysek Die Guidelines manual. Consulting services with Baysek team members, designers and diemakers are also available upon request. For more information, visit www.baysek.com or contact Baysek Machines, Inc. at 1-715-824-5300 or by email at sales@baysek.com.

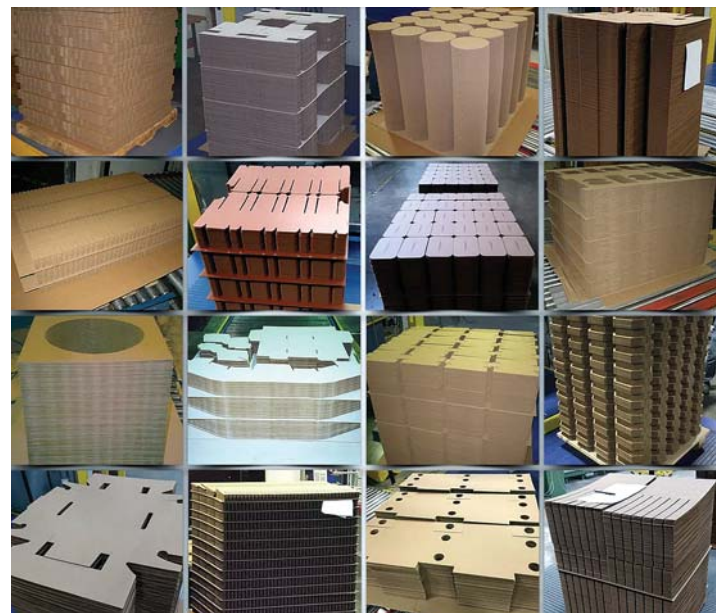


Diagram 42