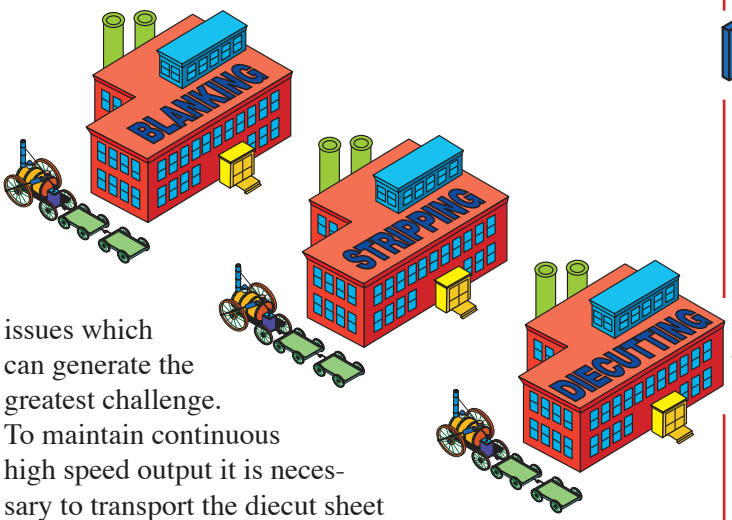
The ABC's of Diemaking & Diecutting

*This **free** electronic publication is dedicated to creating a cooperative information, education, and solutions network for **Design, Diemaking & Diecutting** technicians, supervisors, and managers. **You can be a part of this initiative!** Share or forward this to a colleague, a customer or a supplier.*

The Secret of High Speed Diecutting: Sheet & Diecut Part Alignment

"Knowing others is intelligence; knowing yourself is true wisdom. Mastering others is strength, mastering yourself is true power." *Lao Tzu*

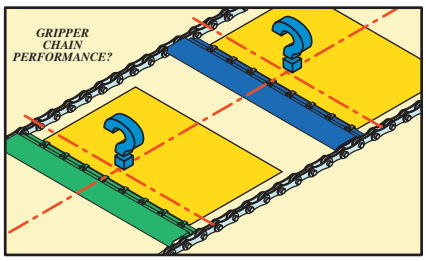
Running a press at high speed and sustaining maximum yield is a ***"Transportation"*** problem. Although we regard a press as a ***"single"*** mechanism it actually consists of several processing centers. These include ***Feeding, Registration, Diecutting, Stripping, Blanking, and Delivery/Waste Management***. Even with this distinction it is easy to overlook the



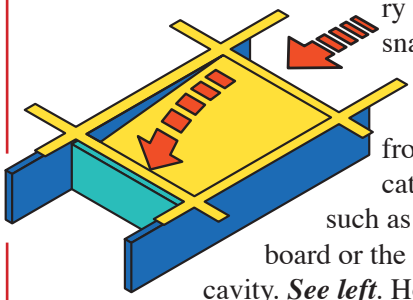
issues which can generate the greatest challenge. To maintain continuous high speed output it is necessary to transport the diecut sheet from diecutting to stripping and to blanking. It is useful to imagine each diecutting discipline as a separate manufacturing center with the sequential transfer of materials from one processing unit to the next. ***See above***. The reason it is important to describe diecutting this way is it helps to illustrate the transportation challenge, as most sheet break up occurs during transportation, from diecutting into stripping, and from stripping into blanking and into the press delivery.

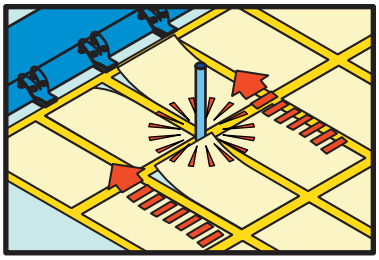
What are the Key Issues Causing Sheet break-Up?

The most obvious assumption to make in diecutting is the diecut parts/layout split apart because of excess tensile stress generated by rapid acceleration, which is compounded by abrupt deceleration, in starting and stopping the diecut sheet at high speed from press station to press station. It would also make sense to point to the operating condition of each gripper, and to the positioning of the grippers by the continuous chain system. ***See top of next column***. It would also be logical to consider the impact of friction, drag, and static as the diecut sheet is dragged across the lower tools and press components.



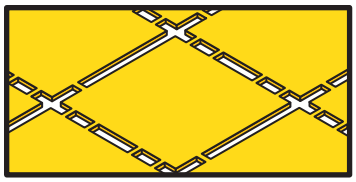
While all of these factors are part of the problem, the primary culprit in sheet break up is snagging. This is generally caused by contact between a part angled downward from the diecut sheet, and catching on an obstacle, such as the rear of the stripping board or the cross rail in a blanking cavity. ***See left***. However, at high speed when diecutting thinner materials it is possible to get upper snagging as flexing of the diecut sheet and/or a diecut part flexing causes contact with the upper tools. ***See below***.





How To Eliminate Snagging?

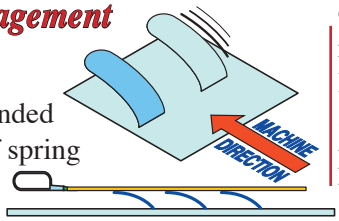
The diecut sheet is integrated and connected using a series of gaps or nicks in the profile of the knife/part which form connecting tags, to hold the loose collection of diecut parts and waste together. ***See below***. However, even with an aggressive and well designed nicking pattern, it is impractical to nick every part and every piece of waste in the layout.



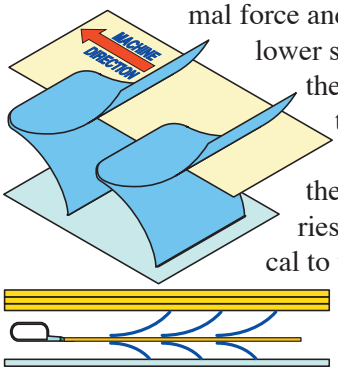
To eliminate problems 3 key remedial actions are taken.

- ***: Minimizing Drag, Friction, & Static caused by Rapid Motion***
- ***: Improve Accurate Positioning & Registration by Tension Control***
- ***: Keep the Sheet Flat to Prevent the Diecut Sheet or Parts Flexing***

Implementing a Sheet Management System?

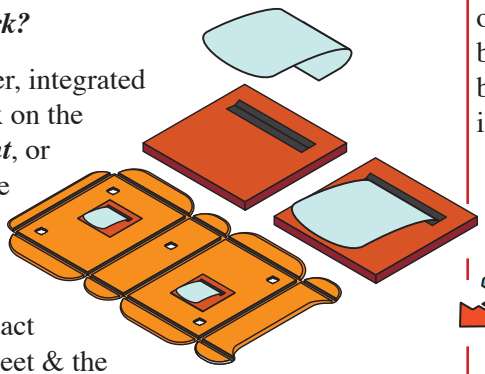


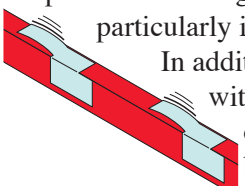
Just imagine a diecut sheet suspended above a flat surface by a series of spring lifters or flyers, all facing and curved in the direction of travel. ***See above***. Each spring lifter can be depressed with minimal force and sheet is only raised off the lower surface by the combination of the pattern of resilient lifters, even though they provide minimal ejection force. Now imagine the same sheet with a similar series of ***"brakes"*** which are identical to the ***"lifter"*** but they are simply inverted and are positioned in the tool above, and are aligned with the lower lifter. ***See left***.



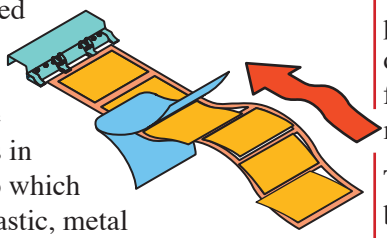
So how does this work?

Clearly the lower lifter, integrated into counter or matrix on the cutting plate, ***see right***, or into the surface of the lower stripping tool, or onto the rails of the blanker, ***see below***, minimize contact between the diecut sheet & the lower tools, eliminating drag, friction and static. If a sheet of diecut parts, with some parts protruding out & above the sheet, and some parts protruding down and below the sheet, the potential for snagging as the sheet is drawn forward, particularly if the sheet also flexes slightly, is high.

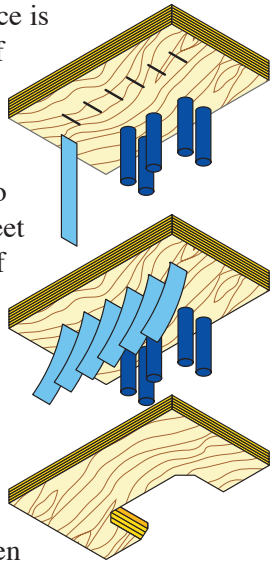




In addition, if the same technique was repeated with overhead & lower flyers, the motion of the sheet would cause each upper brake & lower lifter to gently push each part back into alignment, & also keep the sheet perfectly flat & aligned with the pull of the gripper fingers. ***See below***.

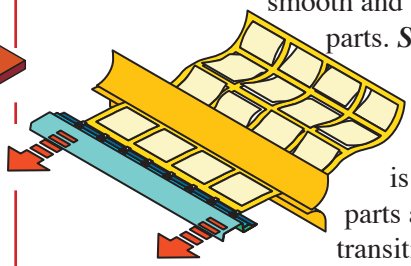


The upper brakes are integrated into the steel rule die, the male stripping tool, and the male blanking tool. These are usually a grouping of slits in the plywood tool holder, into which flexible fingers made from plastic, metal or paperboard can be pre-inserted or very easily inserted on-press. ***See right***. If more down force is required, more strips are added, and if less downforce is required, fewer strips are added. On the male stripper the slits at the rear corners of the tool are slightly angled so they tend to smooth and tension the rear of the sheet and angle it toward the rear corners of the female stripping board. This is designed to tension, flatten and align the diecut sheet and waste parts with the female stripping tool.



The Sheet Funnel?

These principles are also integrated at the critical transition points between diecutting and stripping, and between stripping and blanking. The technique is identical to the upper and lower lifter, however, the two are combined into a continuous strip from one side of the press to the other. As with the lifter and brake the gripper pushes through this minimal resistance barrier, however, the slight resiliency of the lower layer is combined with the low downforce of the upper layer to smooth and straighten out the diecut parts. ***See left***.

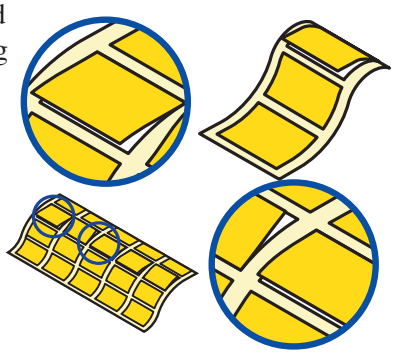


This tool is called the Sheet Funnel, as its role is to gently realign diecut parts and waste as they make the transition from one press unit to the next.

The material used to form the lifters varies from metal, to plastic. to paper, and the choices and the thickness of the material selected for each application, is a function of the caliper of the diecut sheet and the design of the parts/layout.

Summary?

The greatest challenge in sheet fed platen diecutting is to eliminate drag, friction, and static, to eliminate snagging points, and to prevent the diecut sheet and the parts from flexing out of alignment. ***See right***.



These techniques are used by every professional diecutter, however, these

"additions" to the tools are usually made on-press and in response to a sheet break-up problem, which nine times out of ten could have been anticipated. It is important that the Tool Designer, the Diemaker, and the Diecutter review each job/layout and work cooperatively to focus on techniques to increase press speed and to maximum yield.

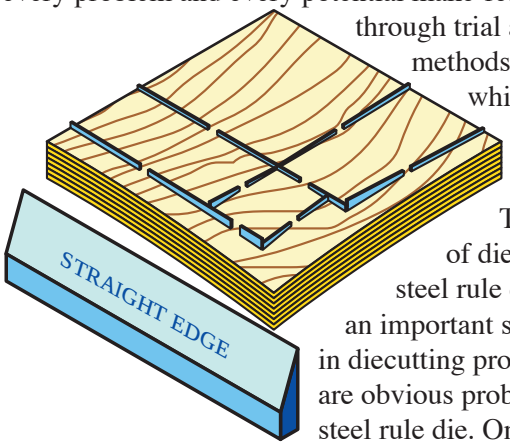
Even if they are not required for every job, it is far more effective to add them and remove them on press, if they are not necessary, which is highly unlikely as they are only a benefit, and/or to make provision in the tools, so flyers/ brakes of pre-set and pre-prepared sizes and thicknesses could be quickly inserted.

Using Bridging to Eliminate Dieboard-Steel Rule Die Warping

"Persistent people begin their success where others end in failure." *Edward Eggleston*

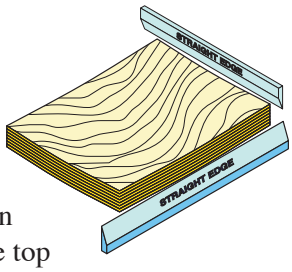
The goal of platen diecutting is to sell the first impression. For many this may seem to be an impossible and an unattainable goal. In fact a typical reaction would state that the number of variables, the number of potential problems, and the inherent complexity of the process renders this mission impossible. However, if you examine the dynamic of any manufacturing process it is a continual cycle of research, of problem solving, and of education.

Every time we complete a production cycle we learn something new, we make mistakes, we face new challenges, we find a better way to do things, and we identify more problems that remain to be resolved. Make-Ready is no different. Our goal in every production cycle is to identify every problem and every potential make-ready problem and through trial and error, find methods and practices which eliminate or minimize these problems.

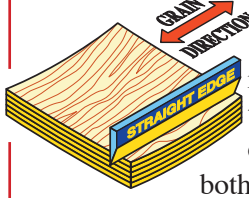


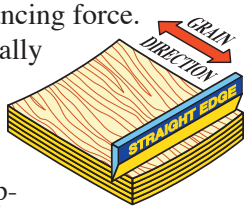
The foundation of diecutting is the steel rule die. Therefore, an important starting point in diecutting problem solving are obvious problems with the steel rule die. One of the most common problems in toolmaking is steel rule die warping, or more precisely dieboard warping. ***See above***. Although widely underestimated this is a critical inhibition to setting and sustaining a kiss-cut make-ready.

Dieboard Warping?

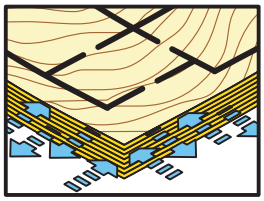


The most common type of dieboard warping is where the corners of the dieboard warp upward. ***See right***. This is a combination of upper veneer shrinkage parallel to the grain direction of the top veneer layer, ***see left***, and shrinkage at right angles to the grain direction of the top veneer layer. ***See below***. To a large extent the conflict between cupping in both directions is cancelled out, except at the dieboard corners, where there is no balancing force. This is a common occurrence and it usually exacerbated by ruling and easy penetration of the veneer layers by dry air from both exposed edges. ***See below***. Usually this is accompanied by slight upward curvature of the grip edge of the die, with less distortion at the rear, where there is less access for air penetration.



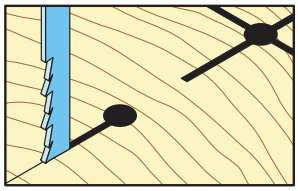


Obviously the application of a protective varnish, or the use of flex channels and metal rails, will prevent or restrict the degree of warping. However, to attack the problem in a more effective manner it is important to examine the use of bridging and the bridging pattern used throughout the dieboard, and particularly at the corners and edges of the tool.

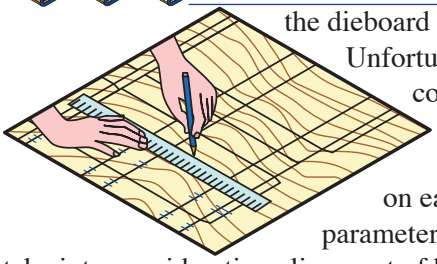


The Bridge Connection?

In practice, because of the labor intensive effort of bridging, diemakers used too few bridges to ensure stiffness and stability in the layout/dieboard. This is because traditionally every bridge had to be hand drawn, drilled, and the jig saw blade removed and inserted for each separate section of the line. ***See right***. To bridge each rule more than twice required two side gauge settings, and obviously the time and the effort of bridging the rule.

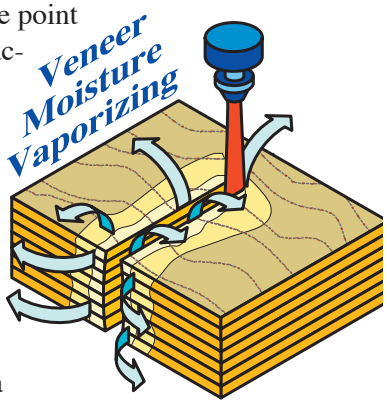


Most companies used to control cost and complexity by having one size of bridger, which meant the logical choice of bridged size was somewhere between the widest and the narrowest size. With a jigged die this was less critical because in many cases the bridges were marked by drawing from one side of

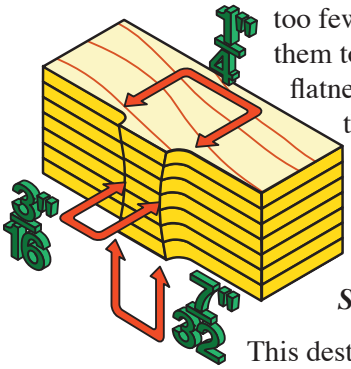


the dieboard to the other. ***See left***. Unfortunately when using a computer program to add bridges, the calculation is focused on spacing on each line, and design parameters do not automatically take into consideration alignment of bridges.

The problem with the modern equivalent of the jigged bridge in the laser cutting process, is the cutting action generates tremendous heat at the point of attack, which obviously accelerates moisture loss and veneer shrinkage, ***see right***, and the concave shape of the laser beam, results in a bridge which is much narrower at the core, than at the planned-programmed width. ***See below***.

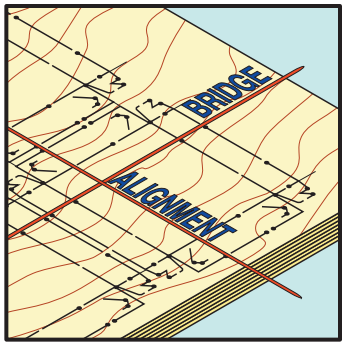


As a result we end up with a steel rule die in which the bridges are too small, there are too few, and there are not enough of them to ensure dieboard stability and flatness. Inevitably this destabilizes the dieboard as there is insufficient strength in the bridging pattern, and the bridge pattern is rarely aligned from one side of the dieboard to the other. ***See below***.



This destabilizes the dieboard, it reduces the dimensional stability/accuracy of the dieboard, and it leads to warping.

The Bridge Solution?

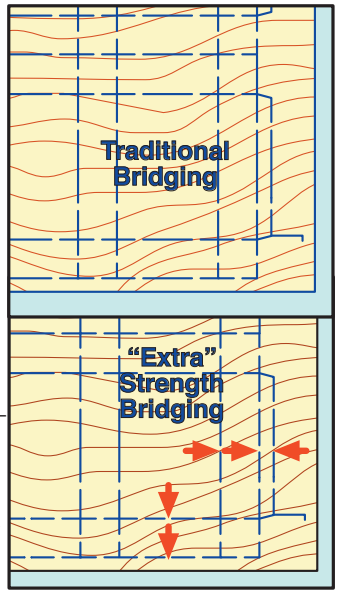


The first thing we should accept is in using lasercut or routed dieboards, and processor outputted finished steel rule shapes, there is no logical reason why we do not incorporate both bridge alignment, the correct width of bridge, and the correct number of bridges. Certainly where there are complex shapes this is more difficult, but in the majority of designs there are many opportunities to incorporate more, larger, and properly aligned bridges.

In the example of the dieboard which warps upward at the corners the number of bridges should be increased in five areas. Obviously in the area of the corners of the dieboard, and it is an advantage to increase bridging frequency parallel to the grip edge of the dieboard. ***See below***. Naturally, it would be an advantage to integrate the higher number, size and alignment of bridges throughout the dieboard, however, at the very least the bridge pattern should be adjusted in these critically sensitive areas of the tool.

Summary?

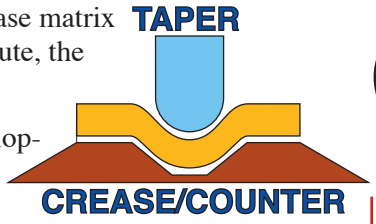
We are no longer producing jigged dies and it is obviously a disadvantage to allow an outdated method of working to compromise the potential of advanced diemaking technology. Bridging is an overlooked, underutilized, and poorly understood critical component of an effective steel rule die. Therefore, it is important to consider more effective methods of bridging the steel rule design to ensure an accurate, a stable, and a warp free steel rule die.



Question: What is the Most Effective Crease Tool Channel Shape?

"Perfection is achieved, not when there is nothing left to add, but when there is nothing left to take away."

It is easy to accept the status quo, particularly when something has been in place for a long time, and particularly something which is unchallenged by the majority of users. But innovation is not just the creation of entirely new product or service, it is more often the refinement of an existing product, to improve one or more performance attributes. For example, the fiberglass counter and the crease matrix strip share an important attribute, the shape of the channel.



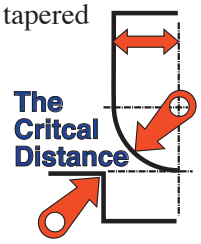
In the 1970's during the development process for the first fully automated counter cutter in Germany, there was a spirited discussion about the most effective shape for the female crease channel. The best shape did not win out, in fact because of engineering, software and toolmaking constraints, the team made a sensible compromise and selected the shape that was significantly inferior. The square or rectangular channel shape common to every tool from every diemaking and Matrix manufacturing company. ***See top***. ***The shape that lost out?*** The tapered crease channel. ***See above***.

The Advantages of the Tapered Crease Channel?

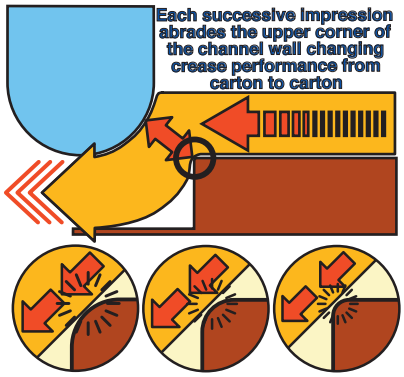
There are a number of key advantages when machining and using a tapered channel for all crease tools. These technical advantages include:

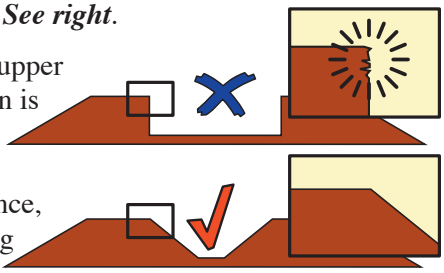
- ***: Strength & Wear Resistance***
- ***: Longer Counter-Matrix Life***
- ***: More Accurate Counters***
- ***: A Stiffer-Stronger Counter***
- ***: Faster Press Speed & Yield***
- ***: Better Creasing & Folding Performance.***

These six important attributes have a significant impact on the creasing and folding process, and although the rectangular or square profile counter channel is dominant, it is important to consider the advantages of the tapered channel.

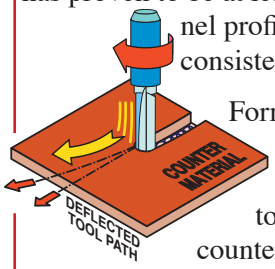


In terms of strength and wear resistance the upper corner of the female channel form one half of the ***Critical Distance*** in creasing, ***see right***, which is highly susceptible to compressive pressure and lateral abrasive draw. ***See left***. The Critical Distance is the most critical part of the male/female crease tool because these are the shearing points which control delamination and the basic geometry of the crease hinge. Under every production scenario the tapered channel upper corner is far stronger, and is more wear resistant than the square channel profile. ***See right***.



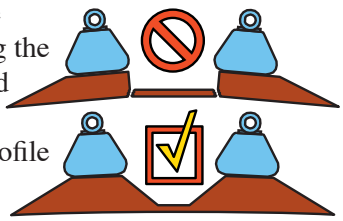


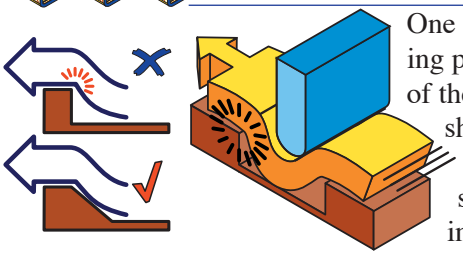
With a square channel upper corner every impression is changing the critical distance of the tools, undermining performance, and gradually degrading fold/open force. It is true that all female crease tools are subject to the abrasive sharing of paperboard, however, the tapered channel profile has proven to be at least twice as strong as the square channel profile. Simply better quality & greater consistency.



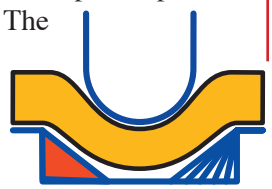
Forming a tapered channel generates far less tool deflection as the counters are machined, ***see left***, which translates to more accurate and more consistent counters, it results in significantly longer routing bit life, and there is lower counter material waste.

The use of a tapered tool to form the channel means the key weak point of the counter is both narrower and substantially stronger. ***See right***. There are far fewer incidents of a slight variation in the depth of machining creating such a weak membrane the counters must be rejected. In addition, controlling the depth when machining a tapered channel is far easier than controlling the depth of a square profile channel.



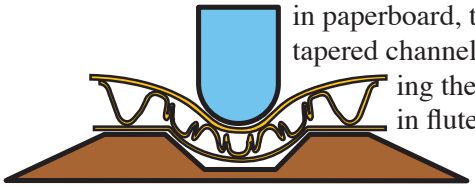


One of the interesting production benefits of the tapered channel shape is it results in higher press speed, significantly lower incidents of sheet break-up, and this approach requires fewer nicks. In fact, in many parts of the world, counters are specified with the tapered profile simply as a means to ensure optimal press speed, particularly on a web fed press. The key advantage is there is much lower incidents of bead snagging on the cross machine direction channels when using a tapered channel. ***See above***.



Unecessary Space

All of the benefits of tapered channels are well proven under production conditions, but it is the impact on creasing and folding quality, consistency, and repeatability, which is the most valued feature. When you examine the profile of the crease bead, there is obviously no technical reason to have a square profile channel. ***See above right***. However, when you recognize that a fluted material crease is a ***"Deformation"*** crease as opposed to the ***"Delamination"*** crease used in paperboard, the shape of the tapered channel is an aid in ensuring the correct bead shape in fluted creasing. ***See left***.



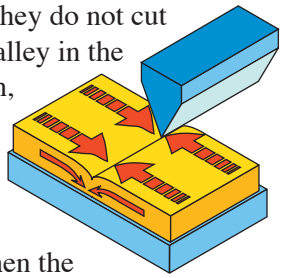
Remembering those spirited discussions, which were fueled with local ***"spirits"***, in Max's Gasthause, I am surprised the industry has continued using a channel shape, which has proven time and time again to be significantly inferior to the tapered channel shape. If performance, cost, quality and consistency are not important issues, then please keep using the square counter and matrix channel profile.

The Purpose of Ejection in Platen Diecutting?

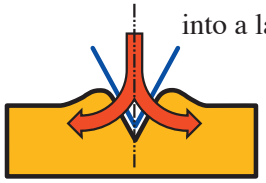
"To realize that you do not understand is a virtue; not to realize that you do not understand is a defect." *Lao Tzu*

Although platen diecutting appears to be a vertical process, as the reciprocation of the platen mechanism would seem to confirm, the majority of converting force is at right angles to the action of the platen.

When the cutting edges of the steel rule die make first contact with the substrate being diecut, they do not cut the material but begin to depress a valley in the surface of the material, toward which, and into which, the knife edges stretch and pull the surrounding material. ***See right***.

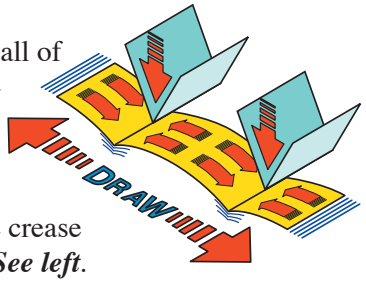


The actual cutting process begins when the surface of the material ruptures under this stress and the edge of the knife/wedge begins to penetrate the surface of the material. Immediately the tip of the knife/wedge penetrates the surface of the material, the knife bevel faces take over and convert the vertical force of the knife/rule into a lateral splitting action. ***See left***.

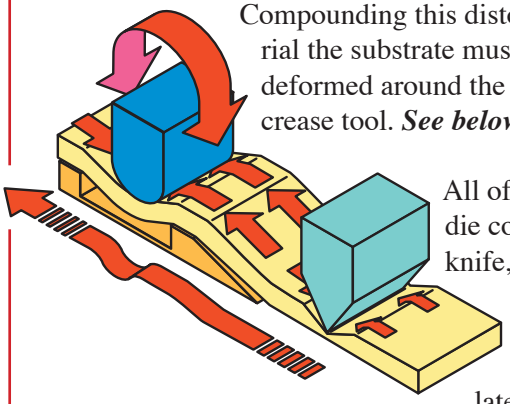


If this pull and then push of the material were isolated it would be a minor issue, however, as every other knife in the die is competing with every other knife in the die, to ***"draw"*** material toward their center of effort, ***see below***, the impact of this competitive stretching becomes a major issue.

In addition, at the same time all of the crease rules in the die/design are punching material into a raised female tool crease channel, which forces and pulls material toward the crease rule and the crease channel. ***See left***.

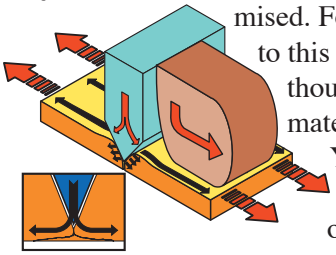


Compounding this distortion of the material the substrate must be stretched and deformed around the protruding female crease tool. ***See below***.



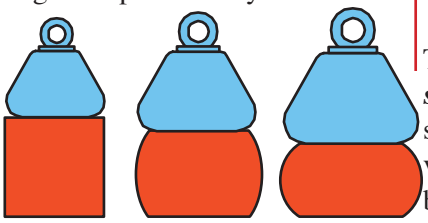
All of the steel rule die components; knife, crease, scoring, perforating and embossing, are pushing and laterally pulling material, while generating high levels of lateral stress in the diecutting process.

If these draw forces are not controlled diecutting converting quality, speed and efficiency will be significantly compro-



mised. Fortunately, we have the antidote to this diecutting health problem even though this critical role for this material is poorly understood. And Yes, we are talking about Ejection Material, installed into and onto the steel rule die.

After initial clamping and before diecut part and waste ejection, the ejection material plays a critical role in controlling tensile stress and in stabilizing the converting process. The practical reality of platen diecutting is if tensile stress and draw are not only ***"managed"*** cutting and creasing performance will be undermined; knife edges and crease tools will rapidly degrade; pressure spikes and variation in pressure will cause instability; nick/tags will prematurely fail and the diecut sheet will break apart; and incidents of flaking and edge chipping will increase. ***See above***.

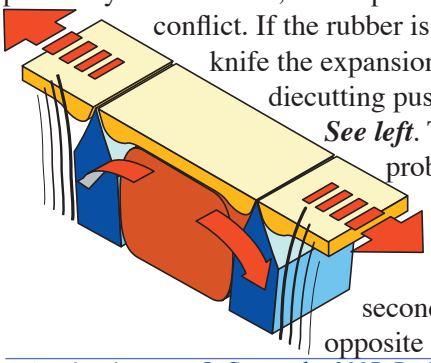


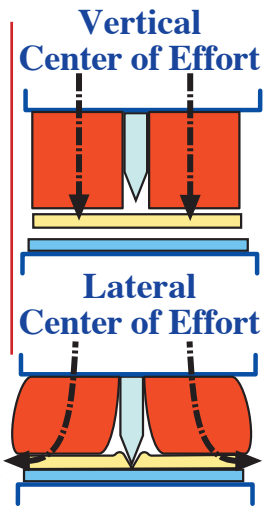
It is important however to point out that we are not trying to eliminate tensile stress/draw, as these forces are essential to effective diecutting, but we are attempting to control and to regulate the distribution of these forces.

How do ejection materials provides the necessary control?

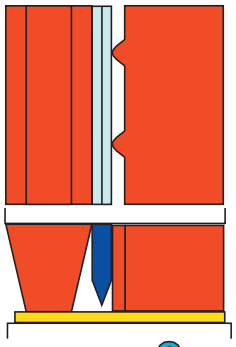
When the press goes on impression and the ejection traps the material being diecut against the surface of the cutting plate, the ejection material compresses. ***See above***. This accomplishes two things. First, it clamps the material securely through the complete press cycle, and second, the compression and expansion of the rubber under load builds up energy, which will be released as the press cycles open, to eject product and waste cleanly from the die.

Unfortunately, ejection tools must be placed in close proximity to each knife, which poses a problem of lateral conflict. If the rubber is positioned against the knife the expansion of the material during diecutting pushes against the knife. ***See left***. This instigates three problems. The first is the expansion of the rubber can flex the knife and cause joints to open, second it will do the exact opposite of what we are looking for by pushing the diecut material away from the knife; ***see left***, and third the unbalanced stress on the strip of rubber rapidly undermines resilient ejection force to develop ***"compression set."***

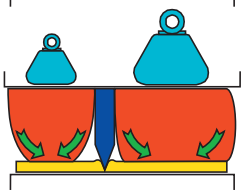




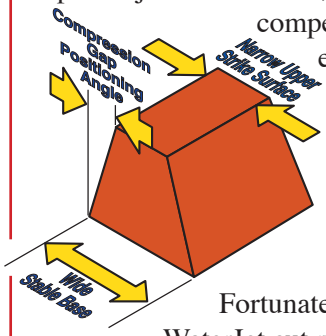
A commonly used option is to space the rubber away from the cutting blade, ***see below***, and while this action solves one problem, the square profile of the rubber, necessary for ejection stability under compression, results in having an excessive amount of resistance or too much rubber on the die.



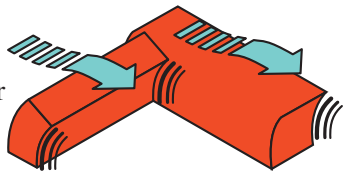
The solution is to use a ***"trapezoidal shape,"*** which has a smaller upper strike surface, and angled wall to provide a stable ***"expansion gap,"*** it has a broad base or footprint for stability, and it is easy to position against the base of the knife. ***See below***.

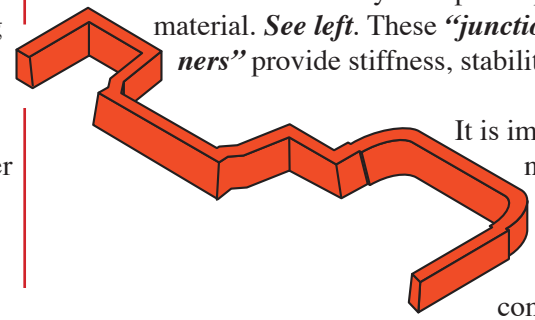


However, even when using the correct shape of ejection material, ejection competes with ejection under pressure; and side to off lay strips can deflect because of the machine direction of the diecut sheet. ***See below***.



Fortunately, WaterJet cut rubber provides an effective solution by linking all of the separate pieces together, and the creation of seamless junctions between what would normally be separate pieces of ejection material. ***See left***. These ***"junctions"*** or ***"corners"*** provide stiffness, stability and control.

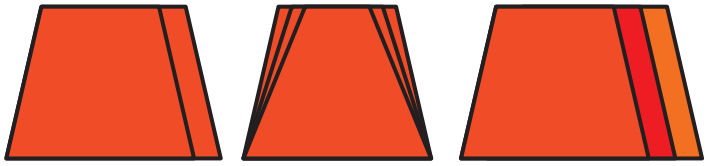




It is important to recognize the more rubber we add to the die the greater the resistance or compressive force

to diecut. In practice as every piece of rubber adds to the overall tonnage required to diecut, it is important to use the minimal amount of rubber necessary to accomplish the task. This can be managed by mixing and matching different durometers of rubber based upon the knife/rule concentration in different areas of the dieboard.

To adjust for different thickness of substrate, the width of the material can be increased or decreased; the angle of the tapered wall of the ejection shape can be increased or decreased; and/or the durometer of the rubber can be adjusted. ***See below.***



Width **Angle** **Durometer**

Summary

Lateral pull and displacement push are essential features of platen diecutting, however, if these forces are unbalanced or they are unrestrained, the converting process can be severely compromised. As a professional toolmaker and a professional press technician, it is important to understand the role of ejection materials in controlling tensile stress and lateral draw forces in platen diecutting.

A Key Discipline in Creating an Effective Diecutting Organization.

"Effectiveness is the foundation of success -- efficiency is a minimum condition for survival after success has been achieved. Efficiency is concerned with doing things right. Effectiveness is doing the right things." *Peter Drucker*

The commercial pressure in diecutting manufacturing is to cut cost, and to meet stringent and changing competitive delivery standards. This is translates into faster press changeover, optimal press speed, and precise scheduling. ***Simpler, faster, better!*** How can we improve methods and practices while cutting man-time, and lowering cost? One of the key disciplines we must adopt is Just-In-Time organization.

In any labor-intensive process the actions key individuals are critical. In the time and motion discipline this is translated into a standard measurement of a 10th of a minute or 6 seconds. In simple terms, this means that every move, every step, and every action; from reaching for a tool, from press in a control button, to taking a step, consumes 6 seconds. How does this knowledge help to improve press changeover?

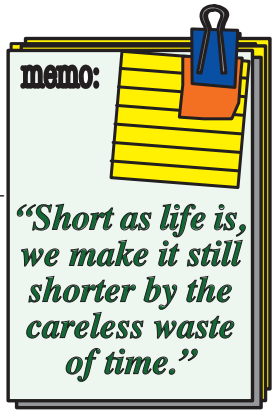
"Waste can be defined as anything other than the minimum amount of equipment, material, parts, tools, space, and the worker's time, which are absolutely essential to add value to the product."
Fujio Cho - Toyota

Imagine a hospital emergency room, just as a patient who has suffered a serious injury is wheeled in. The medical staff immediately gathers around the patient, with everyone in the team knowing their role, and how to work together as a team. Quickly ascertaining the extent of the injury and the remedial steps to take, they jump into action. This is a scene we are all familiar with and we can appreciate the urgency of this customized working environment.

But how does description translate to on-press organization?

The secret of success of the emergency room is every tool, every material, every supply, every component, every piece of information, and anything needed is in a designated place, and ready for immediate access with minimal movement of the surgical team. When we stand on press, or are

making a steel rule die, or assembling a stripping tool, is the work area organized like a hospital emergency room? Do we have an inventory management checklist? Is everything we need stored in single source, color-coded location? Was everything on the inventory checklist purged and replenished after the last changeover?



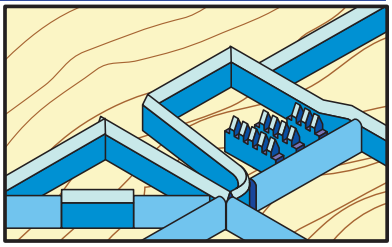
When the operator stands on press, he or she is like a trauma team surgeon. Any unnecessary movement, any misplaced tool, any missing assistant, can be life threatening. Press changeover is not about life or death, although sometimes it certainly feels like that! However, the principles that apply to the organization of an emergency room ready for an emergency are the same principles we need to apply to the organization of the press platform, to the pre-press area, and to the diemaking operation. More than 50% of our effort is wasted because we expend such high levels of non-value added time in compensating for poor Just-In-Time organization!

Ask simple questions? What tools, materials, information, parts, components, and information are needed on-press for changeover? How do you know? Are they all in place, is everything ready, do we have a proven series of benchmarked procedures for the press make-ready! Do you have an inventory management checklist for press changeover?

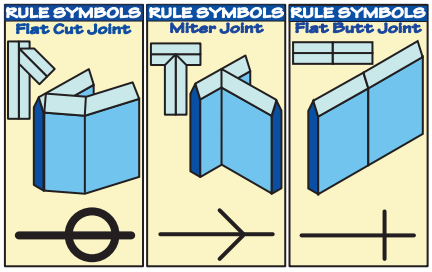
Steel Joint Specification Symbols

I am only one,
But still I am one.
I cannot do everything,
But still I can do something;
And because I cannot do everything
I will not refuse to do the something that I can do.
Edward Everett

Clarity in technical communication is important in any manufacturing process. In diemaking the design and fabrication of a steel rule die requires a detailed and comprehensive series of integrated steps using information and technical data as a guide.



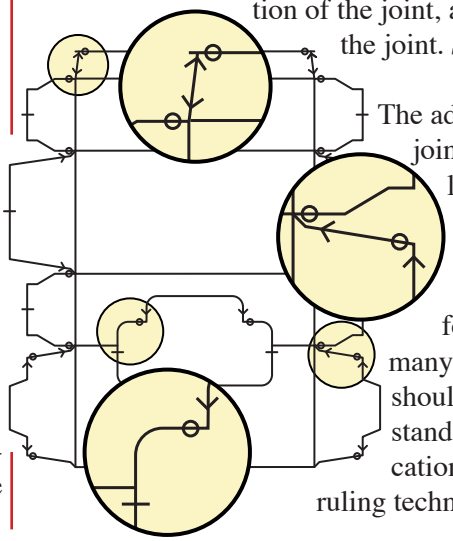
One of the most consistent complaints in diemaking is the selection of the joint position in the profile of the steel rule die. Inevitably the joint will leave a minute but often noticeable tag of uncut material. If the diecutter is using joint positions as natural nicks and/or the joint is positioned in a part of the diecut profile, which is not critical, the problem is not critical. Another related problem is the degree of variation in joint positions from re-rule to re-rule which can cause problems if a rule from an old spares batch is used to repair damage to a rule in the die using a later batch of rule.



Joint positions should not be arbitrary, nor should they vary from diemaker to diemaker throughout an operation and throughout the industry. Therefore it is important to use some form of communication symbol which can be used on faxed drawings or attached to CAD files to indicated both joint position, type, and orientation.

Applying the Symbols

In most steel rule die applications the three standard joints are the ground undercut joint, a miter joint, and a butt joint. To clarify the use of these joints a specific symbol is applied to each joint. ***See above***. In use these symbols are added to the drawing of the design to show the type of joint, the position of the joint, and the orientation of the joint. ***See left***.



The advantage of this use of joint symbol is there is little room for misunderstanding or for ambiguity, These symbols are used effectively every day in many operations and they should be integrated into the standard design and specification procedure to improve ruling technical communication.

Summary

The most important part of steel rule diemaking is the collection of information, the analysis of the information, and the specification of the tool. A key element of the steel rule die is the selection and the positioning of joints. The use of simple but clear ruling symbols standardizes the process to ensure customer needs are accurately reflected in the tool, which is fabricated.

The Art of War or Business

"Opportunities multiply as they are seized." *Sun Tzu*

By the start of the current calendar with the birth of Christ, China had already endured a thousand years, before being brutally unified into a large cohesive entity. During this period conflict was all consuming, the scale of the destruction was immense, the dominant leaders were all Military commanders, and warfare was a way of life, or more appropriately, of death. However, this period gave way to the growth of an immense culturally and scientifically important state, which preserved a valuable written history. Several important literary works, primarily dedicated to warfare and military campaigns, were preserved from this thousand year period of conflict, with its of the most important being ***Sun Tzu's The Art of War****.*

The Literary General

Sun-Tzu was a highly successful military commander who participated in several significant historical battles, where he emerged as a gifted leader and an effective strategist. His legacy, the book ***"The Art of War,"*** *was miraculously preserved through the ages and has been recently upgraded as the result of important archeological discoveries of inscribed clay tables from the period of his life. Although the book was intended and has been used successfully through the ages as an important book of military strategy the lessons on life integrated into every passage has enabled this work to stand alone as a literary document.*

Recently the book has been applied to the economic arena where many of the principles of the book are appropriate for developing a strategy and in mounting an effective commercial campaign.

The Teaching is Sun Tzu

What is fascinating about this ancient text is it contains concepts and ideas which seem as fresh today, albeit in a different context, than they were when they were first written. Sun Tzu's army was modeled on what he called a ***"natural"*** *organization, which had three key characteristics:*

1 They exist to serve a defined purpose

2 They seek and use data as the basis for action, and

3 They are completely flexible and totally adaptable.

If these three important criteria were used as a benchmark against your business or even your department how would you rate? Manufacturing is about the movement of information and material. Which simply means effective manufacturing is built around an accurate and well distributed internal and external information network. This surely is the core of an effective organization. Without accurate information, and an effective means of collection, regeneration, and distribution, it would be difficult to clearly define a specific purpose. Without accurate information, and an effective means of collection, regeneration, and distribution, it would be difficult to clearly provide full flexibility and/or adaptability, even though this is what the marketplace is demanding.

Summary

The Art of War is a fascinating work of military literature, which contains powerful lessons and an effective strategy for any area of activity. Give some thought to the three criteria selected from this work to define an effective organization. Compare this mission statement to your organization, and ask yourself would you risk your future or gamble your life on the strength of the information system, which is the nervous system, the heart, and the arterial flow of your business/army?