

Common Press Set-Up Problems

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Editor's Note: This article was derived from a transcript of a highly popular 2007 Odyssey presentation.

The most important take away from this article is to understand the value of setting up an efficient press system. Most die shops have the same material costs and virtually the same overhead costs; so where you make your money is improving your labor costs. If you can increase your efficiency when you're setting up and running jobs, it will decrease your labor and increase your profit.

This article will cover some of the most common set-up problems.

Poor knowledge of the press system or efficiency of the press

I was talking with a gentleman who was trying to cut polycarbonate, and he was getting distortion of the part. He was using a swing beam press to kiss cut the part. The problem was his cutting pad was too soft. He should have been cutting onto a hardened surface or something harder than the substrate. This demonstrates why you've got to know what type of system you've got and what the capabilities are of that system. If you want a kiss cut, certain machines just will not be appropriate.



Diagram 1

It is important to know which press system will be used (Diagram 1). Do you hand feed, or do you automatically feed? Is it sheet fed or web fed? Is it printed or unprinted? Do you have the ability to automate other operations like knocking out and stacking the parts, de-slugging the part, sheeting the web, slitting the web, laminating web to web or web to sheet? These things will reduce the amount of labor (and costs).

Ordering the proper tooling

If I called a diemaker and didn't tell him anything other than to make me a steel rule die, the odds of my getting a tool that actually worked are about 3.8 billion to one (see page 11). There are four primary things that determine the type of tooling required: length of the job run, type of material being cut, accuracy or tolerance of the cut material, and the type of press being used. For the type of the press running the tooling, there are six choices: clamshell, hydraulic, mechanical, beam, clicker, and traveling head. You need to know the type of cutting operation: is it a kiss cut, cut through, combination tooling, score cut, and is there any creasing and forming? When determining the type of material being cut, keep in mind whether it is a strip or sheet, printed (or formed, embossed, debossed, scored, etc.), how thick is the material, how wide is the material, is it a single or multi-cavity tool?

The material characteristics are important. Does static affect the material handling? How do parts react in the sheet once it is diecut? Is it coil or web? Is it printed or not? How thick is the material? Is the material laminated? Is it single or multi-cavity tool? If you think about other variables, you've got different tooling types, such as steel rule dies, machined dies, etched, and steel rule dies. Heights of steel rule can vary, as well as the thickness of steel rule, not to mention the angle bevel of the knife, type of the rule edge, hardness of the steel rule, steel rule coatings, Teflon, titanium, special coatings, etc. You must also consider different types of dieboard, three quarter, jig cut, laser cut, 5/8" (15.87 mm) dieboard, nylon, and then different variables in cutting medium, like cutting on a nylon plate, spring steel, a hard cutting plate, or epoxy glass. What about the ejection rubber? Is it open cell, closed cell, spot rubber, full rubber, and what density? There are so many more vari-

COMMON SETUP PROBLEMS

Ordering the proper tooling. Take the probability of ordering a "perfect" tool from a diemaker. The odds are over **3.8 BILLION TO 1 !!!!!**

1. **What determines the type of tooling required? (4)**
 - a. Length of job run
 - b. Type of material being cut
 - c. Accuracy or tolerance of cut material
 - d. Type of press used
 - e. Combination tooling
 - f. Progressive tooling
 - g. Bevel or rule
 - h. Inside bevel
 - i. Outside bevel
 - j. Center bevel
 - k. Long center bevel
 - l. Standard bevel
 2. **Type of press running tooling on (6)**
 - a. Clamshell
 - b. Hydraulic
 - c. Mechanical
 - d. Beam
 - e. Clicker
 - f. Traveling Head
 3. **Type of cutting operation: (5)**
 - a. Kiss cut
 - b. Cut through
 - c. Combination
 - d. Score cut
 - e. Creasing/forming
 4. **Type of material (see Larson WorldWide list) (7)**
 - a. Strip or sheet
 - b. Printed
 - c. Not printed (formed, embossed, debossed, scoring, etc.)
 - d. How thick is the material?
 - e. How wide is the material?
 - f. Single cavity tool
 - g. Multi-cavity tool
 5. **Material Characteristics (9)**
 - a. Does static affect material handling?
 - b. How do parts react in sheet once die cut?
 - c. Coil or web
 - d. Printed
 - e. Not printed (embossed, debossed, score, etc.)
 - f. How thick is material?
 - g. Is material laminated?
 - h. Single cavity tool
 - i. Multi-cavity tool
 6. **Type of ejection rubber. (5)**
 - a. Open cell
 - b. Closed cell
 - c. Spot rubber
 - d. Full rubber
 - e. Density of ejection rubber
 7. **Type of tooling (steel rule dies only) (17)**
 - a. Machined die
 - b. Chemical etched tooling
 - c. Steel rule die
 - d. Height of steel rule

.918"	(23.3mm)
.923"	(23.4mm)
.937"	(23.8mm)
1.00"	(25.4mm)
1.125"	(28.6mm)
1.250"	(31.8mm)
Special heights up to 4.00" (101.6mm)	
 - e. Thickness of steel rule
 - f. 1 point up to 6 point
(each point equals .014" (0.0356mm) in thickness)

1.5 Point	(.021")
2 Point	(.028")
3 Point	(.042")
 - g. Male female tooling
 8. **Angle of bevel knife edge (4)**
 - a. 30 degrees
 - b. 42 degrees
 - c. 60 degrees
 - d. Special angles (20 degrees, 50 degrees, etc.)
 9. **Type of rule knife edge (3)**
 - a. Ground edge
 - b. Skived edge
 - c. Polished edge
 10. **Hardness of steel rule (3)**
 - a. Extra hard (C53 – C56)
 - b. Hard (C49 – C52)
 - c. Medium hard (C41 – C44)
 11. **Steel rule coatings (3)**
 - a. Titanium
 - b. Teflon
 - c. Special coatings
 12. **Type of die board used(8)**
 - a. 3/4" (19.05mm) thick laminated maple
 - b. Jig saw cut
 - c. Laser cut
 - d. 5/8" (15.875mm) thick laminated maple
 - e. Phenolic board
 - f. Permaplex (Heat resistant)
 13. **Types of cutting medium (what are you cutting against?) (7)**
 - a. Nylon
 - b. Spring steel
 - c. Hardened cutting plates
 - d. Polyethylene
 - e. Epoxy glass board
 - f. Phenolic
 - g. Zinc plated galvanized steel
- SUMMARY
- | | |
|--|------|
| 1. What determines the type of tooling required? | (4) |
| 2. Type of press running tooling on | (6) |
| 3. Type of cutting operation | (5) |
| 4. Type of material | (7) |
| 5. Material characteristics | (9) |
| 6. Type of ejection rubber | (5) |
| 7. Type of tooling (steel rule dies only) | (17) |
| 8. Angle of bevel knife edge | (4) |
| 9. Type of rule knife edge | (3) |
| 10. Hardness of steel rule | (3) |
| 11. Steel rule coatings | (3) |
| 12. Type of die board used | (6) |
| 13. Types of cutting medium | (7) |
| TOTAL OF: 3,886,444,800/1 | |

ables, and if you multiply all them out, as listed on the previous page, it comes to 3.8 billion. And if I missed just one item, it will double this figure, so it could be even higher.

What I'm trying to demonstrate is that it's extremely important that you get your diemaker involved. Twenty years ago when you asked a diemaker to make a tool, all he wanted was a drawing. He may not have cared if it worked or not. That's completely different now. People want to know. They want to know what substrate, they want to know how it handles, they want to know if it's web or coil, and there's a reason for that. You want your diemaker close or you want the diemaker to at least care about what you're doing and what you're running it on.

I had a customer in St. Louis who spent four days on a tool and he couldn't get it to kiss cut and I go down there and the guy had actually welded the rule together. I called the diemaker and the diemaker came in and he looked at my press and he said look around at all the other presses. They were all "into" cutting. They never told him to spend \$150,000 on a new piece of equipment and the cost difference of that die was \$5.00. The diemaker had me a die the next day, it took me 15 minutes to set it up and kiss cut. The guy was down for four days to save \$5.00 on a tool. Again I can't stress how important your diemaker is.

Standardize your tooling. You want to standardize your rule height. You want to standardize your feed line height. On a Preco you've got to set feed line height. You can adjust your rollers up and down for feed line height, but what you want to do is make everything the same. When you change out a tool, basically all you're doing is changing your tool, you're making no other adjustments.

Standardize your board thickness (Diagram 2). I'm a big fan of 3/4" (19.05mm) dieboard, and I'll tell you why and I can use this as an example. If I've got a 3/4" (19.05mm)

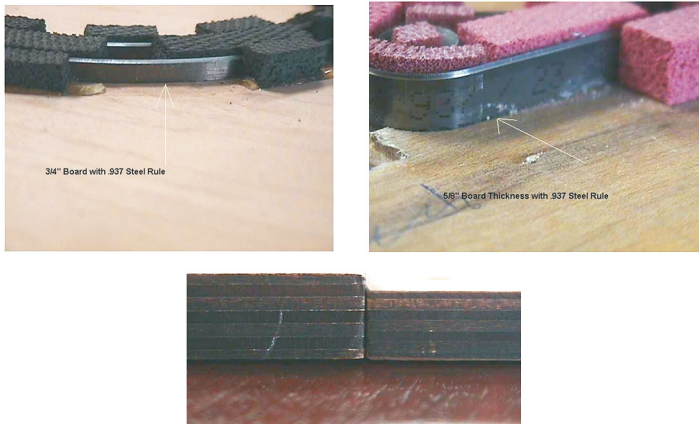


Diagram 2

dieboard, I've got .187" (4.75mm) of rule sticking out. If my dieboard's holding it here, if I'm running it at 5/8"

(15.87mm), I've got .312" (7.92mm) rule sticking out. Any time you get any lateral movement in your tooling, and you will get it at .312" (7.92mm) sticking out, you're going to wear your tool faster, so the lower you keep it down, the less stress factor you have on your blade, the longer your tooling life. Now the problem you've got is you've got 1/8" (3.17mm) difference between your plates. If you're running any quick change tooling, the problem is in all cases you have to change and put a slug or put a shim in to change the differences in the tooling heights. What we've done is we've actually milled the sides of the rule down (Diagram 3). We mill it down to a 5/8" (15.87mm) thickness on the side. There's no steel rule support there, so now if you have to run 5/8" (15.87mm) cutting foams, you can run a 5/8" (15.87mm) board. If you run anything else...plastics, I strongly suggest a 3/4" (19.05mm) board and that allows

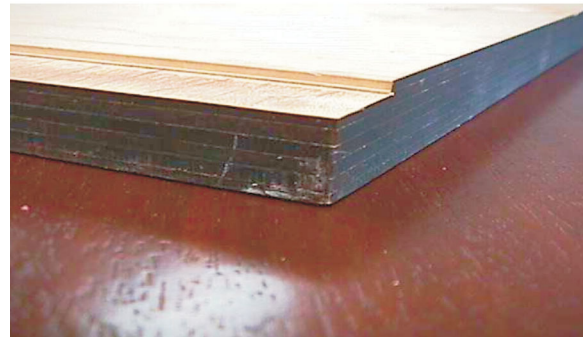


Diagram 3

you an easier way to change your boards out on a quick change tooling.

Proper storage systems for steel rule dies

It is not a good idea to stack dies on top of one another, which will promote warping. Instead, invest in a proper storage system (Diagram 4). A proper storage system will not only help reduce warping, but it will help you reduce

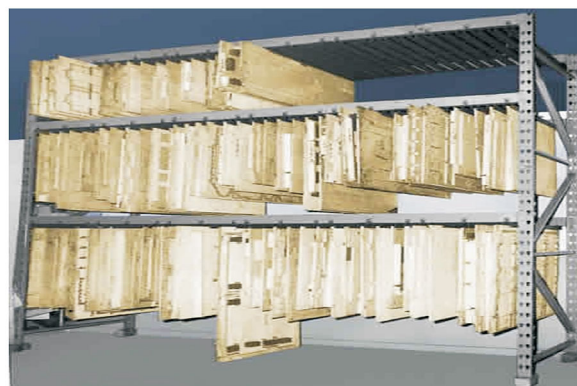


Diagram 4

the time you spend looking for tooling, because each tool will have an individual location. It eliminates tooling damage from contact with other dies. A good system promotes safety, as it provides easy loading and unloading of tooling. There should be no need to move several dies from side to side to locate the one you need. Tooling locations should be entered into your information system, which will give you the ability to maintain a tooling inventory and track tooling usage.

Understanding the condition of your tooling

Many times I visit a plant and see that the tool is completely shot. I had

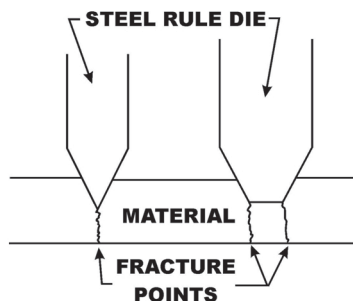



Diagram 5

send me a tool the other day and he was saying he couldn't get it to cut through and when I got the tool in the mail and I looked at it, I thought he had a crease in the rule. He hit the rule so hard it was cracked, and he couldn't understand why it wouldn't cut.

It's pretty easy to tell when your die is bad. Look at the material. When you get a nice, straight, sharp steel rule, this is what happens. You're going through plastic material and it fractures (Diagram 5). If you've ever split wood with an axe, you know you're not going all the way through the log, you go through a set distance and it fractures the rest of the way through when you're splitting wood. The same thing with most materials. Your soft materials you'll have to cut or hit into something, but most of your plastics, your cardboard, they all fracture when you go through a certain depth rule. Now, when you've got a flat spot on there, what happens on that flat spot is it's holding the material. It can't fracture in a flat spot, so it fractures on both sides. There's your angel hair. When you start seeing a lot of those, it's time to change the rule, re-knife the die.


There is a standard rule of thumb for ejection rubber too: you want at least 1/16" (1.59mm) taller than your rule height, and that's the minimum. The reason you've got to have that is because when the knife comes down and penetrates the material, you've got to have it pull off the mate-



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rial. If it doesn't, the part is going to go up with the knife. When you're talking about ejection rubber, I'm not saying cut your own. You really should talk to somebody that knows. There are so many different densities now, there are different bevels, there are different ideas of how to hold the material down. I've actually seen beveled ejection rubber and the reason it's beveled is if you're cutting a kiss cut onto an abrasive or onto an adhesive, the ejection rubber itself being too dense as the blade comes off, you can actually push the adhesive together when you cut it. So if you actually bevel or angle the ejection rubber away from the blades themselves, that allows the flow back of the adhesive. Especially if you're running an unsupportive adhesive, that allows it not to flow back together.

There is a science in ejection rubber, and I think people don't realize that any more; they just take anything they've got on the shop floor and they throw it on a die. You need to talk to ejection experts or your diemaker to get some ideas and try experimenting.

You need to standardize your cutting equipment plates. What I mean by that is your feed line height on automatic press is always the same. Now if you decide to change your cutting plates, you go to a 1/8" (3.17mm) bar plate and you go back to a spring steel cutting plate, you've got 1/16" (1.58mm) difference in height. That may not seem like a lot until you're trying to run something nice and flat and when you cut it, it starts potato chipping up or coming out of the web because it's dropping that 1/16" (1.58mm), so you really want your feed line height to be all the same.

Typically what I recommend on the Preco is a blue tip or spring steel. It's cheap. It's about a 58, 60 Rockwell hard-

ness, it's about 1/16" (1.58mm) thick, it's lightweight, so when you use it, you make a makeready, you can store it with the die for the next time you use it. I think somebody said something about makeready, and if everything's flat you don't have to do a makeready. If it's raining one day and it's dry as a desert three days later, you're going to have to do what they call patch ups, because your wood expands and it shrinks and it swells. In theory there's really no such thing as no makeready, you're going to have to do it. Even with coated boards, there is a variation. When it's raining outside, they still become a nightmare.

After I set something up in the summer and then it starts to rain, it's time to redo it.

Poor maintenance of equipment

You've got to maintain your equipment. That's another problem I see in the industry. If you see slugs all over the clamshell or slugs get into the gearing, you'll have all sorts of problems. You've got deflection issues. During the first Odyssey, I was working on a clamshell. I pulled a cutting plate out and was showing people how the die worked, put it back in and proceeded to crush my die. I had left a plug underneath the cutting plate. Thank goodness they had a dieshop here and could immediately make me another one, because I didn't have an extra. But it shows how easy it is to run into problems if you don't maintain your equipment.

Let's talk about plate stack up (Diagram 6) and the importance of maintenance on the plates. You've got a ram in your press and sometimes a spacer and in our case it's usually an aluminum spacer, you've got a die mounting plate which is usually steel and then you've got your die that goes

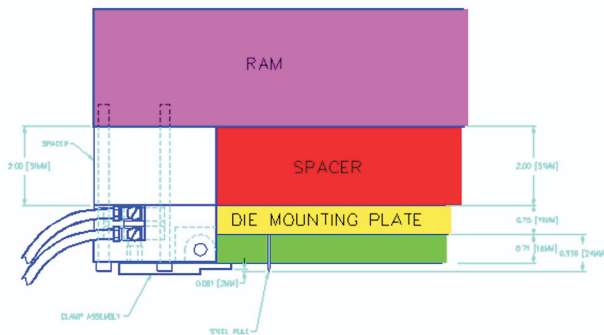


Diagram 6

up against the die mounting plate. Be sure to clean your press spacer plates. Diagram 7 shows what happened after six months down in North Carolina on an aluminum plate next to a steel plate. That oxidation was about .008" (.203mm) thick. You need to take the plates out and wash them down with a 3M penetrate or WD40. Scrub them down and put them back in. Remember, when you pull those plates, you've got to mark them. You don't want to spin a plate

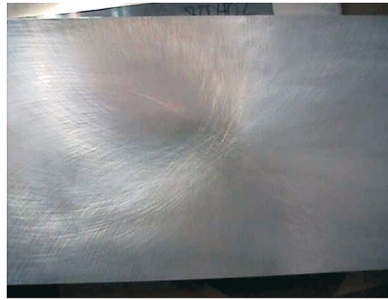


Diagram 7

180° and then put it back in, because then all your makereadies you stored are going to be off by 180°. So when you pull a plate out, you put it back in exactly the same way on any press, because if you don't, it's going to be a nightmare when you try to set up the next job that you thought was already there. You have to do a patch up and you can't, you have to do a makeready.

On the Precos, we've got four posts, we've got inserts. Those really should be greased every day (Diagram 8). If one dries out, it will stick on the post and now the plates won't be parallel. You've got to have a maintenance program, no matter what type of press you have.

We built a little micrometer adjuster where we could check and make sure the plates are parallel in our system (Diagram 9). We actually measure

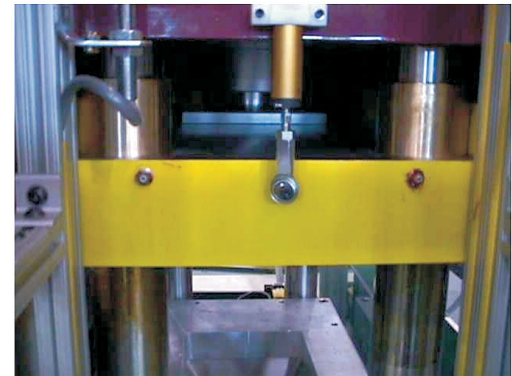


Diagram 8

nine points inside the press before it ships out, three on one side, three in the center and three on the other side. They have to be within three thousandths before they ship out. That's typically the way we do it. It's a homemade job, but anyone can do it with a micrometer that will fit inside the press area.

Again, with a Preco, you have feed systems that have rollers on them that have to be cleaned. Like anything else, if they're not cleaned the rollers are going to get stuff on them and the diameters will change. If the diameter of your roller changes, your feed system changes. I recommend soap and water. If you're going to use alcohol, which a lot of people do, I'd go with the 90% denatured alcohol. Don't go to the grocery store and buy the 70% because it will dry out your rollers and they'll crack. Be sure you wipe off all alcohol.

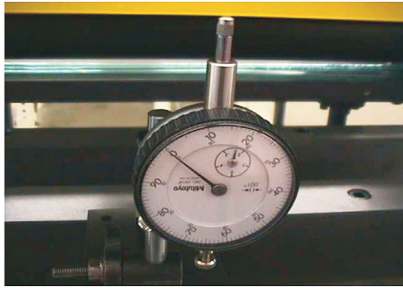


Diagram 9

Another quick thing on your roll feeds is your pressure. You want to maintain constant pressure on the rollers. If you don't and you have one that has more pressure than the other, you increase your surface diameter, which increases your feed. If you're going to

have roll feeds, make sure they're all gapped and also have the same pressure on them at the same time (Diagram 10). Another thing on rollers which is very important is to make sure the rollers are parallel. Rollers have to be parallel within each other and they have to be parallel within .003" (.076mm). Anything greater will cause you tracking problems. We typically do the same thing. We've got a little ball with a micrometer and we measure left or right on the roller, spin around the roller and we get a measurement within .003" (.076mm), so you know your rollers are all the same, in parallel.

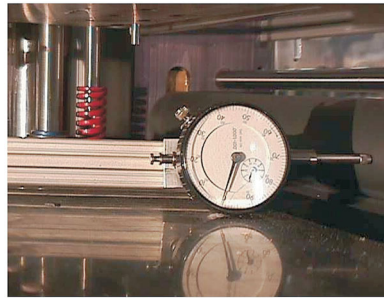


Diagram 10

On a Preco, there's a little silver knob on those rollers and if you look at the very top at 12:00 on that knob, you'll see two set screws and a little bar in the middle. Most of the time those set screws are gone; you've got to put them back in. What those are is a mechanical adjust. What I mean by that is the rollers actually skew up and down for tracking purposes if you're running thicker materials, thinner materials or materials that are thicker on one side than the other. If you put a feeder gauge in them, you put them parallel with each other. A lot of people don't know that and the problem is you look at the press and they've fallen out and you let the rollers just set crooked like this and they are not going to track, not unless you get both rollers on both sides perfectly straight.

Not using or having proper tools for the setup

Another thing that really increases your productivity is having proper tools handy. You should not have to go from one end of the shop to the other because you forgot tape or a screwdriver or something. I bought a little set up from Sears and filled it up with all the things needed for set up:

- Tool cart
- Tool box

- Pen or pencil
- Shim tape adhesive (.001" and .002")
- Shim tape Steel (001" and .002")
- Cellophane tape
- Adjustable wrench
- Pliers
- Allen wrenches (Both Metric and Standard)
- Tape measure
- 12" Square
- Carbon Paper
- Makeready sheets (2 types, soft and hard) job dependent
- Knockout table hold downs
- Feeler gauge for roll feed tension
- Screwdriver with adjustable bits
- Materials hold downs
- Ejection rubber (most likely only strips to spot rubber tooling)
- Ejection rubber glue
- Super glue
- Die shims for Quick change tooling (5/8" boards and 3/4" boards)
- 1/4" airline hose clamps
- Other tools that are helpful
- Jig saw
- Rotozip

Now, basically all these items are in the cart. You roll the cart up next to your press. Now you don't have to spend fifteen minutes going over and looking for something that you didn't have, whether it be a shim, tape, adjustable wrench, pliers, whatever.

One of the life savers, if you're running anything for knock outs, is that rotozip. The easiest thing is to have your diemaker make a knock out, but if your diemaker doesn't make the knock out, you've got to cut it yourself. A router does a great job. I use a Craftsman. It will cut through 3/4" (19.05mm) dieboards. It does a great job if you have to do it in a pinch without having a diemaker do it.

No set up list, no efficiency

One of the things that I strongly recommend you do is write on the back of the die the job number, date, set up time, what you're cutting against, micrometer stop reading or whatever reading you have for a stop block on your press (Diagram 11). Real important is the operator name and then the number of the impressions of the tool. What you're doing there is you're not trying to cause blame when the tool is rolled or whatever happens and it runs out. What you're trying to find is your best operator, your best set up guy, and you'll find it by how many parts are running before

Job # _____
Date: _____ Set up time _____
Cutting Plate Used: Spring Steel (.031) _____ BarPlate (.125) _____
Micrometer Stop Reading _____
Operator _____
Number of Impressions on Tool _____

Diagram 11

the tool is being changed over, and you'll find that with the operator's name and that's what you want because you want him to train the other operators. You know as well as I do "every operator is the best one." But seriously, you've got to quantify your best operator and that's the best way to do it, with something in writing to find out who does the best job.

Issues with automation

In a knock out system (Diagrams 12-17), one of the things we did is have a knock out board on the back side of our Preco presses. I cut a picture frame around it. That picture frame allows you to put in a knock out board. This knock out board actually fits in that framework that would knock out a part. There are locating pins that go in it that

allow the top to match perfectly with the bottom. Your diemaker can laser cut the knock outs. Typically when you do a knock out, the knock out board should be 1/8" (3.17mm) bigger than the part itself, so they can cut the slugs 1/8" (3.17mm) smaller. Then they just attach them to the board. Then you've got exact placement on the board. Now you can lock it into the die. The top framework has two 6" (152.4mm) air cylinders on top. The top board you match. You can buy aluminum extrusion pieces and slide them in. With a Preco, we put inserts into the dieboard and then you screw the dieboard with the air cylinder into the dieboard. This makes it a lot easier because you can slide these pieces in and then you can hand tighten them. As the board comes around there are two little hand cranks. It reduces the tooling it takes and also the additional holes you've got to draw

in. That's just one type. It again allows you an easier set up. The diagrams show the inside and how the board lines up.

Another thing that's really neat is to use hold downs (Diagram 18). You attach them to your knock out board. In the old days we used foam for knock out and we would cut die foam around the knock out and that would be to hold down the part when you're knocking it out. Now there are hold downs that hold the edge of the material down when you're knocking out and that allows the material to be held down on both sides, compresses, knocks the part out and then comes back up. What that does is stop the part or the material from going into the web and jamming up your dies. You can store your knock outs and stacking fixtures with your tooling.

Some customers of ours were cutting a part on a Preco at 30 strokes a minute. They had a two cavity die. The reason they were running 30 strokes a minute is because they had a lady on the end who was pulling them out by hand. She couldn't run it any faster because she couldn't pull it out



Diagram 12



Diagram 13

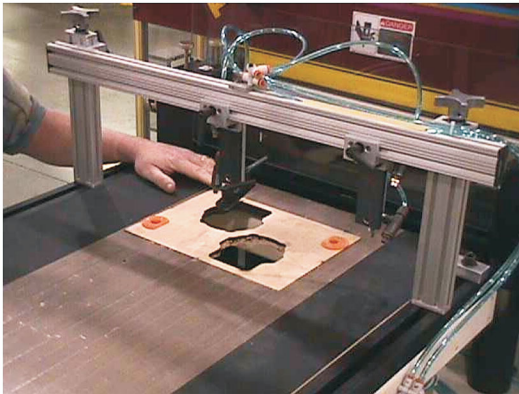


Diagram 14

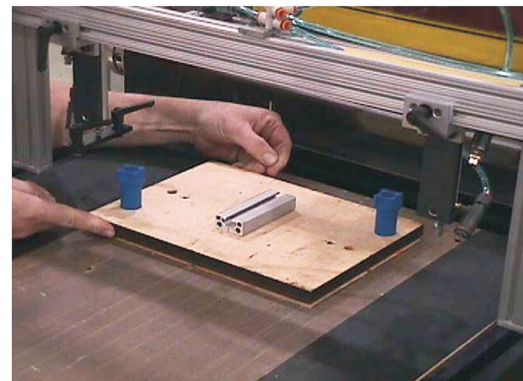


Diagram 15

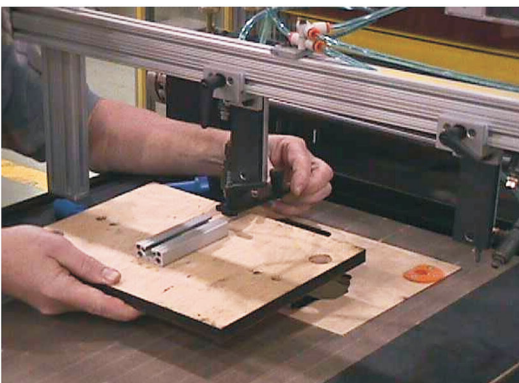


Diagram 16

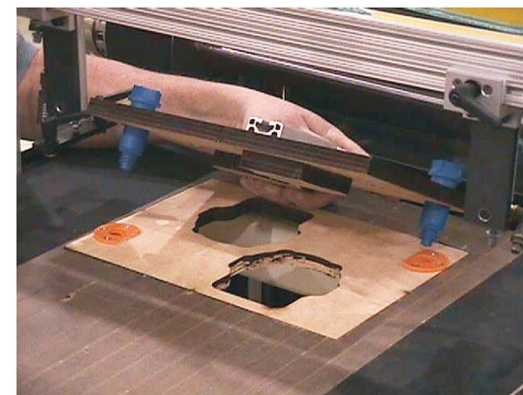


Diagram 17

by hand. After they got the part out, they were manually stripping the slugs out and stripping out the holes in the middle. Then they had to manually count everything and package them. This was a 12,000 part run which took them about 15 hours to run. I don't remember how many people it took. I set this job up using a tool which had what's called feed through punches in it. What that allows you to do is knock the punches out through the back side. Now your small punches have cleared the back of the die. After it's cleared through the back of the die, we went through a set up stage and we knocked out the slug or the large part, and then after knocking out the large part, we knocked out the stack as the final part. One person could do that basically in two hours—a 12,000 piece run. It's called a gasket maker, but the thing is it takes 30 minutes to set the part up. On the other hand, even if it took an hour or two, they'd still be ahead of the game. If you can decrease your labor, you can increase your bottom line and your profit margin.

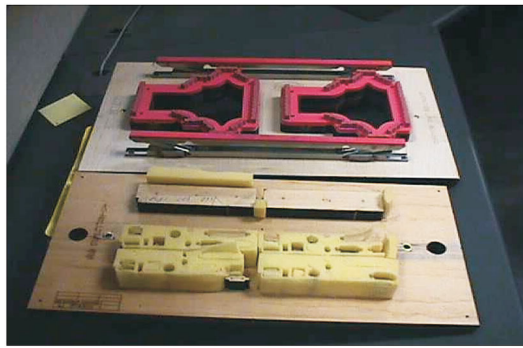


Diagram 18



Diagram 19

Another idea is to use pneumatic core chucks to facilitate quick changeover of rolls on unwinds or rewinds. In the old days you had to undo the set screw, pull them off, put the roll of material on, put it back on, put the set screw back on (Diagrams 19 and 20). Now what we've got which is a lot easier, is just a quick air chuck (Diagrams 21 and 22). Just put it on, little valve right here, kick it on and pull it off. You can change a roll over in a matter of seconds. Again roll change over in seconds compared to a minute saves you time.



Diagram 20

Another method is using a dual unwind. On a dual unwind you can splice it and pretty much run it continuously. The problem is the height and the weight of the roll of material. There's several companies out there that make an unwind or a material handling cart where you can buy the cart itself, pick them up, move them 180 degrees, move them to any height you want, you can load them on, keeps all your operators safe, don't hurt any backs that way (Diagram 23). They run anywhere from \$1,500 on the manual up to about \$5,000 or \$6,000. ↓



Diagram 21

Randy Norman is the Applications Specialist for Preco, Inc., which is a premier supplier of equipment and services for material processing needs. They are a leading designer and manufacturer of precision automated processing systems for high speed and high accuracy cutting, perforating, welding and other specialized industrial processing applications. Along with their proprietary diecutting and laser-based manufacturing capabilities, Preco is also one of the largest contract manufacturing service suppliers. For more information, call 1-913-541-0066 or visit www.precoindustries.com.



Diagram 22



Diagram 23